City of Santa Monica

2025-2030
Local Hazards Mitigation Plan

Prepared in collaboration with:

Earth Consultants International

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Volume III: Appendices

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APPENDIX A: MASTER RESOURCE DIRECTORY

The Resource Directory provides contact information for local, regional, State, and Federal agencies and organizations that are currently involved in hazard mitigation activities. Resources for specific hazards addressed in this document are provided at the end of each hazard section. Please refer to Sections 6 through 13 for these additional resource materials. The organizations included in this Appendix are organized in alphabetical order rather than by governmental level.

The Resource Directory below provides a foundation for potential partners in action item implementation. The Resilience Planning Committee (RPC) may refer to the organizations on the following pages for resources and technical assistance. Given that webpage URLs often change over time, the RPC will maintain and update this master resource directory as needed. This directory may be used by various community members interested in hazard mitigation information and projects.

American Public Works Association (APWA)		
Level: National	Hazard: Multi	www.apwa.org
1200 Main St., Suite 1400 Kansas City, MO 64105-2100		Ph: 816-472-6100 800-848-2792
The APWA is an international educational and professional association of public agencies, private sector companies, and individuals dedicated to providing high quality public works goods and services. Public works and infrastructure covered under the APWA umbrella include, but are not limited to, water, gas, electricity, telephone, mass transportation, communication facilities, and trash collection. This infrastructure and services may be owned and operated by a government agency, or may be provided by privately owned organizations. Regardless of whether publicly or privately owned, these services are considered essential, with their absence resulting in negative impacts to the public's health and welfare.		
American Red Cross Los Angeles Region		
Level: County	Hazard: Multi	http://www.redcross.org/local/california/los-angeles
1450 South Central Avenue, Los Angeles 90021		Ph: 310-445-9908
1450 11th Street, Santa Monica, 90401		Ph: 310-394-3773
The American Red Cross Los Angeles Region serves nearly 10 million people in 88 cities within Los Angeles County, and some pockets of Ventura and Kern counties. They are dedicated to helping victims of disaster and providing programs and services that help the community prevent, prepare for, and respond to emergencies. The Los Angeles Region chapter is comprised of the following five chapters and two support offices, as follows: Metro and Southeast LA, Greater Long Beach and South Bay, Western Los Angeles, San Gabriel-Pomona Valley, and Northern Valley chapters, and Commerce and Palmdale offices. The Western Los Angeles Chapter office is in Santa Monica. Programs and services that they provide include: response with relief when disaster strikes, help keep the community safe and healthy through CPR, First Aid and other courses; serve military members and their families, teach people how to prepare for and respond to a disaster, and connect families around the world. They also work to ensure that there is a safe and adequate blood supply in the area. The American Red Cross is tasked as the primary agency responsible for federally supported Mass Care Services during disasters per the Nation Response Framework, Emergency Support Function 6. Mass care primarily involves providing shelter and feeding services during a disaster.		

Association of State Floodplain Managers (ASFPM)		
Level: Federal	Hazard: Flood	www.floods.org
8301 Excelsior Drive Madison, WI 53717		Ph: 608-828-3000
The ASFPM is a scientific and educational nonprofit organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery. Their aim is to reduce flood loss in the nation.		

Building Seismic Safety Council (BSSC)		
Level: National	Hazard: Earthquake	www.nibs.org/bssc
2121 K Street NW, Suite 800 Washington, DC 20037		Ph: 202-289-7800
The BSSC develops and promotes building earthquake risk mitigation regulatory provisions for the nation and supports advances in building science and technology to improve the built environment. The council's purpose is to enhance public safety by providing a national forum that fosters improved seismic planning, design, construction and regulation in the building community. Under contract with FEMA, the BSSC develops and maintains the NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, which are used as the primary resource for the professional design standard ASCE/SEI 7 Minimum Design Loads for Buildings and Other Structures.		

California Department of Conservation		
Level: State	Hazard: Multi	www.conservation.ca.gov
715 P Street, MS-1900 Sacramento, CA 95814		Ph: 916-322-1080
The Department of Conservation provides services and information that promote environmental health, economic vitality, informed land-use decisions and sound management of our State's natural resources. The Department oversees the California Geological Survey (CGS; included separately below), The California Division of Oil, Gas and Geothermal Resources (CalGEM), the Office of Mine Reclamation (DMR), the Land Resource Protection (DLRP), the State Mining and Geology Board, the California Farmland Conservancy Program, and the State Watershed Program, among others.		

California Department of Forestry and Fire Protection (CAL FIRE)		
Level: State and Local	Hazard: Wildfire	https://www.fire.ca.gov/ https://www.fire.ca.gov/incidents
715 P Street Sacramento, CA 95814		Ph: 916-653-5123
CAL FIRE prevents wildfires in the State Responsibility Area using a variety of fire prevention methods and projects, including brush clearance, prescribed fire, defensible space inspections, emergency evacuation planning, fire prevention education, fire hazard severity mapping, and fire-related law enforcement activities. Despite its name, CAL FIRE is an "all-risk" department and its engines and crews may respond to auto accidents, drownings and other medical aid situations, hazardous materials spills, swift water rescues, search and rescue missions, civil disturbances, train wrecks, and natural disasters such as floods and earthquake response. CAL FIRE's website provides reports about all ongoing emergency responses in California, including all wildfires more than 10 acres in size. In addition, the CAL FIRE website lists all of the year's incidents to date, and statistics on past years' incidents; resources on defensible space and other programs to reduce the wildfire hazard; various programs, and grants available.		
California Department of Transportation (Caltrans) (District 7)		
Level: State and Local	Hazard: Multi	http://dot.ca.gov/caltrans-near-me/district-7
100 S. Main Street, 10th Floor Los Angeles, CA 90012		Ph: 213-897-1200
Caltrans is responsible for the design, construction, maintenance, and operation of the California State Highway system, as well as that portion of the Interstate Highway system within the State's boundaries, amounting to more than 50,000 miles of highway and freeway lanes. Alone and in partnership with Amtrak, Caltrans is also involved in the support of intercity passenger rail service in California. Caltrans also permits more than 400 public-use airports and special-use hospital heliports. Caltrans carries out its mission with six primary programs: Aeronautics, Highway Transportation, Mass Transportation, Transportation Planning, Administration and the Equipment Service Center. Caltrans – District 7 office serves Los Angeles and Ventura Counties. The City of Santa Monica is a local partner with Caltrans District 7. Caltrans has jurisdiction over the Interstate 10 (I-10) freeway and Pacific Coast Highway (PCH), among other routes.		
California Department of Water Resources (DWR)		
Level: State and local	Hazard: Flood	https://water.ca.gov/
715 P Street Sacramento, CA 95814		Ph: 916-653-5791
The DWR manages the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments. The agency was established in 1956 by the State Legislature to plan, design, construct, and oversee the building of the nation's largest state-built water development and conveyance system. The DWR protects, conserves, develops, and manages much of California's water supply, including the State Water Project.		

California Environmental Protection Agency (CalEPA)		
Level: State and local	Hazard: Multi	https://calepa.ca.gov/ https://calepa.ca.gov/environmental-mapping-tools-and-data/
1001 I Street Sacramento, CA 95812-2815		Ph: 916-323-2514
CalEPA's mission is to restore, protect and enhance the environment, to ensure public health, environmental quality and economic vitality. They fulfill this mission by developing, implementing and enforcing environmental laws that regulate air, water and soil quality, pesticide use and waste recycling and reduction. CalEPA's departments are at the forefront of environmental science, using the most recent research to shape the state's environmental laws. CalEPA mapping tools and data website (see link above) provides several resources that allow individuals to search for sites undergoing state or federal cleanup activities, communities most impacted by pollution, water quality and accessibility, urban heat island effects, and other similar information. CalEPA is organized into several different departments, including the California Air Resources Board (CARB), the Department of Pesticide Regulation (DPR), the Department of Resources Recycling and Recovery (CalRecycle), the Department of Toxic Substances Control (DTSC), the Office of Environmental Health Hazard Assessment (OEHHA), and the State Water Resources Control Board (SWRCB).		
California Geological Survey (CGS)		
Level: State and local	Hazard: Multi	www.conservation.ca.gov/cgs
715 P Street, MS 1901 Sacramento, CA 95814		Ph: 916-445-1825
Southern California Regional Office 320 W. 4th Street, Ste. 850 Los Angeles, CA 90013 (Junipero Serra Building)		Ph: 213-239-0878.
The CGS develops and disseminates technical information and advice on California's geology, geologic hazards, and mineral resources. In addition to providing technical and mapping services on landslide, earthquake and burned watersheds, the CGS is the state's scientific representative on tsunami preparedness, mitigation, and response programs.		

California Governor's Office of Emergency Services (CalOES)		
Level: State	Hazard: Multi	www.caloes.ca.gov/
3650 Schriever Avenue Mather, CA 95655		Ph: 916 845- 8510
The Governor's Office of Emergency Services coordinates overall State agency response to major disasters in support of local government. Cal OES is responsible for assuring the state's readiness to respond to and recover from natural, man-made, and war-caused emergencies, and for assisting local governments in their emergency preparedness, response and recovery efforts. CalOES administers several federal grant programs, including Homeland Security Grant Program, Emergency Management Performance Grant, Infrastructure Protection Grants, and Cybersecurity Grants. CalOES also offers Prepare California, a program to supplement local match-funding requirements with state funding. CalOES offers local jurisdictions and the public many preparedness and hazard education resources, including Listos California that offers multi-lingual disaster readiness tools.		

California Governor's Office of Land Use and Climate Innovation (LCI)			
Level: State	Hazard: Multi	https://opr.ca.gov/planning	
1400 Tenth Street Sacramento, CA 95814		Ph: 916-322-2318	Fax: 916-588-3184
Previously known as the Governor's Office of Planning and Research (OPR), LCI, as its new name indicates, serves two main efforts. Under the Planning and Land Use umbrella, this agency provides technical guidance and other resources helpful in drafting and updating general plans; resources to support transportation planning; collaboration with the military on land use planning energy policy; and resources that support local governments with sustainable and resilient land use planning. On the Climate Resilience front, LCI provides resources and grants to help California prepare for the impacts of climate change. The LCI website also provides a link to the State Clearinghouse where environmental documents prepared for CEQA are filed.			

California Natural Resources Agency (CNRA)		
Level: State	Hazard: Multi	http://resources.ca.gov
715 P Street Sacramento, CA 95814		Ph: 916-653-5656
The California Natural Resources Agency restores, protects and manages the state's natural, historical and cultural resources for current and future generations using solutions based on science, collaboration and respect for all the communities and interests involved.		

California Office of the State Fire Marshal (OSFM)		
Level: State	Hazard: Wildfire, Fire, Hazardous materials	https://osfm.fire.ca.gov
715 P Street Sacramento, CA 94244-2460		Ph: 916-568-3800
Part of the California Department of Forestry and Fire Protection (CAL FIRE) team since 1995, the OSFM supports the mission of the CAL FIRE by focusing on fire prevention. OSFM regulates buildings in which people live, controls substances which may cause injuries, death and destruction by fire; provides statewide direction for fire prevention within wildland areas; investigates arson fires in the state; licenses those who inspect and service fire protection systems; regulates and approves fireworks; regulates hazardous liquid pipelines; regulates the use of chemical flame retardants; reviews regulations and building standards; trains and educates in fire protection methods and responsibilities; and tracks incident statistics for local and state government emergency response agencies. The OSFM develops and issues the Fire Hazard Severity Zone maps for the state.		

Climate Mapping for Resilience and Adaptation (CMRA)		
Level: Federal and State	Hazard: Multi	https://resilience.climate.gov/
Web based mapping tool		
The CMRA is a mapping portal hosted and managed by NOAA to help the public understand the climate-related hazards that the nation faces now and in the future. The portal allows viewers to see real-time maps showing where climate-related hazards are occurring today, check how their exposure to five common climate-related hazards is projected to change over time, learn more about climate-related hazards and the federal policies relevant to climate adaptation, and find federal funding opportunities that can help pay for climate resilience projects, including those available through the Bipartisan Infrastructure Law.		

Community Rating System (CRS) (of the National Flood Insurance Program)		
Level: Federal	Hazard: Flood	www.fema.gov/floodplain-management/community-rating-system
P.O. Box 10055 Hyattsville, MD 20782-8055		Ph: 202-646-2500 Loc Ph: 510-627-7100
The Community Rating System (CRS) is a FEMA program that provides incentives to community implementing floodplain management efforts that go beyond the minimum requirements of the NFIP. Property owners can receive reduced NFIP flood insurance premiums if their jurisdiction implements floodplain management practices that qualify it for a CRS rating.		

Environmental Protection Agency (EPA), Region 9 (Pacific Southwest)		
Level: Regional	Hazard: Multi	www.epa.gov/aboutepa/epa-region-9-pacific-southwest
75 Hawthorne Street San Francisco, CA 94105		Ph: 415-947-8000
600 Wilshire Boulevard, Suite 940 Los Angeles, CA 90017		Ph: 213-244-1800
The mission of the EPA is to protect human health and to safeguard the natural environment through the themes of air and global climate change, water, land, communities and ecosystems, and compliance and environmental stewardship. The EPA Southern California Field Office is located in Los Angeles, with its contact information provided above.		
Federal Emergency Management Agency (FEMA), Region IX		
Level: Federal	Hazard: Multi	www.fema.gov
1111 Broadway #1200 Oakland, CA 94607		Ph: 510-627-7100
An agency within the U.S. Department of Homeland Security, FEMA is tasked with responding to, planning for, recovering from and mitigating against disasters. FEMA provides extensive resources to help communities, businesses, and residents prepare for disasters. The Agency is also a major source of funding through grants for hazard mitigation and hazard preparedness. FEMA operates the National Flood Insurance Program and manages a series of mitigation programs and activities, and partners with communities throughout the country. FEMA coordinates the federal response agency support of state and local jurisdictions during disaster events. FEMA also provides reimbursement to jurisdictions for their disaster response costs and facilitates programs to implement mitigation improvements post-disaster.		
Federal Emergency Management Agency (FEMA), Hazard Mitigation Planning		
Level: Federal and State	Hazard: Multi	www.fema.gov/emergency-managers/risk-management/hazard-mitigation-planning http://www.fema.gov/grants/mitigation/state-contacts
California Governor's Office of Emergency Services 3650 Shriever Avenue Mather, California 95655		Ph: (916) 799-6499
This link directs individuals to FEMA's website pages dedicated to information on Hazard Mitigation Plans, including laws, regulations and guidelines; mitigation planning grants; mitigation best practices; specific hazards; and tools. FEMA's Hazard Mitigation Grant Programs (HMGPs) are provided to eligible applicant states/tribes/territories, who in turn provide sub-grants to local government, such as cities. Sub-applicants need to consult the official designated point-of-contact for their applicant state/tribe/territory for information regarding specific programs and application requirements. The second link directs individuals to the points of contact for individual states. In California, HMGP management is handled by the Governor's Office of Emergency Services (contact information provided above).		

Federal Emergency Management Agency (FEMA), Resilience Analysis and Planning Tool (RAPT)		
Level: Federal and State	Hazard: Multi	www.fema.gov/about/reports-and-data/resilience-analysis-planning-tool
Web based mapping tool		
RAPT gives everyone access to powerful data and GIS mapping that can help everyone understand their community. RAPT includes over 100 preloaded layers including community resilience indicators from peer-reviewed research, the most current census demographic data, infrastructure data, and data on weather, hazards, and risk. RAPT also includes easy to use analysis tools, the ability to add in data from other sources, and print and download functions.		

Floodplain Management Association (FMA)		
Level: Federal	Hazard: Flood	https://floodplain.org/
701 Pleasant Grove Ste - 180 Box 121 Roseville, CA 95678		Ph: 916-847-3778
The FMA is a non-profit educational association established in 1990 to promote the reduction of flood losses and to encourage the protection and enhancement of natural floodplain values. Members include representatives from Federal, State and local government agencies, as well as private firms. The association serves as an unbiased forum for legislature, government, industry and science to advance best practices, technologies, policies, regulations, and legal strategies, with a focus on California, Nevada and Hawaii.		

Los Angeles County Certified Unified Program Agency (CUPA)		
Level: County	Hazard: Multi	http://dpw.lacounty.gov/epd/ust/cupa.cfm
County of Los Angeles Department of Public Works, Environmental Programs Division 900 S. Fremont Avenue, Annex Building, 3rd Floor Alhambra, CA 91803-1331		Ph: 1-888-CLEAN-LA Ph:626-458-3517 Santa Monica's CUPA: 310-458-4971
Managed by the Los Angeles County Fire Department, the CUPA is the local administrative agency that coordinates programs regulating hazardous materials and hazardous wastes in all unincorporated and most incorporated areas in Los Angeles County. Programs that they administer include: 1) hazardous materials disclosure, 2) business emergency plans, 3) hazardous waste, 4) underground storage tanks, 5) aboveground petroleum storage tanks, and 6) California accidental release prevention. The City of Santa Monica is one of the few cities in Los Angeles County that has its own CUPA.		

National Floodplain Insurance Program (NFIP)		
Level: Federal	Hazard: Flood	www.fema.gov/flood-insurance
PO Box 10055 Hyattsville, MD 20782-8055		Ph: 877-336-2627 Ph: 202-646-2500
Region 9		Ph: 510-627-7100
The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. NFIP has of a number of programs and activities, including flood insurance for private property owners, mitigation measures to encourage prevention of flood disasters, and partnerships with communities throughout the country.		

National Fire Protection Association (NFPA)		
Level: National	Hazard: Wildfire	www.nfpa.org/
1 Batterymarch Park Quincy, MA 02169-7471		Ph: 800 344-3555 General Ph: 720-237-1752
The mission of the international, non-profit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically based consensus codes and standards, research, training and education. They provide guidance on fire prevention, wildfire preparedness, electrical safety, hazardous materials, community risk reduction, and public safety.		
National Oceanic and Atmospheric Administration (NOAA)		
Level: Federal	Hazard: Multi	http://www.noaa.gov
1401 Constitution Avenue, NW Room 5128 Washington, DC 20230		Ph: 202-482-6090
An agency within the U.S. Department of Commerce, NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship. Some services provided by NOAA include daily weather forecasts, severe storm warnings and climate monitoring, fisheries management, coastal restoration, and marine commerce support.		
National Resources Conservation Service (NRCS)		
Level: Federal, Local	Hazard: Multi	http://www.nrcs.usda.gov/
3550 S Harbor Blvd Suite 2-202 Oxnard, CA 93035		Local Ph: 805-984-2358 Ph: 202-720-7246
NRCS assists private property owners to conserve their soil, water, and other natural resources by delivering technical assistance based on sound science and suited to a customer's specific needs. Cost shares and financial incentives are available in some cases. The contact information provided above is for the field office closest to Santa Monica, CA.		
National Weather Service (NWS)		
Level: Federal	Hazard: Multi	https://www.weather.gov/lox
520 North Elevar Street Oxnard, CA 93030		Ph: 805-988-6610
A line office within NOAA, the NWS is responsible for providing weather service to the nation. It is charged with the responsibility of observing and reporting the weather, and with issuing forecasts and weather alerts and warnings, including floods and fire weather, in the interest of national safety and economy. Briefly, the priorities for service to the nation are: 1) protection of life, 2) protection of property, and 3) promotion of the nation's welfare and economy. The Oxnard Weather Office is responsible for providing weather information for Los Angeles, Ventura, Santa Barbara, and San Luis Obispo counties, as well as adjacent coastal waters out 60 nautical miles. The Oxnard Weather Office provides information to Santa Monica agencies to prepare for upcoming weather events. The contact information provided above is for NWS Oxnard Weather Office.		

National Weather Service, Office of Water Prediction (OWP)		
Level: Federal	Hazard: Flood	http://www.weather.gov/owp/
1325 East West Highway Silver Spring, MD 20910		Ph: 301-427-6904
The Office of Hydrologic Development (OHD) reorganized into the Office of Weather Prediction (OWP). OWP enhances National Weather Service (NWS) products by infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field offices, and providing advanced hydrologic products to meet needs identified by NWS customers. Their products and services improve flood warnings and water resource forecasts. The OWP researchers, develops and delivers national hydrologic analyses, forecast information, data, support services and guidance to inform essential emergency services and water management decisions.		

Seismic Safety Commission (SSC)		
Level: State	Hazard: Seismic	https://ssc.ca.gov
3650 Schriever Avenue Mather, CA 95655		Ph: (916) 263-5506
The California SSC helps to "improve the seismic safety and resiliency of California communities by providing resources and guidance, facilitating research, and fostering collaboration in earthquake preparedness, mitigation, and recovery." The commission "investigates earthquakes, researches earthquake-related issues and reports, and recommends to the Governor and Legislature policies and programs to reduce earthquake risk."		

South Coast Air Quality Management District (AQMD)		
Level: Regional	Hazard: Multi	www.aqmd.gov/
21865 Copley Drive Diamond Bar, CA 91765		Ph: 800-CUT-SMOG (for air quality complaints)
		Reg Ph: 909-396-2000
AQMD is a regional government agency that seeks to achieve and maintain healthful air quality through a comprehensive program of research, regulations, enforcement, and communication. The AQMD covers Los Angeles and Orange Counties, and parts of Riverside and San Bernardino Counties. South Coast AQMD monitors common air pollutants and issues Air Quality Alerts for the Los Angeles region. The AQMD website provides information on wildfire smoke and ash, and safety tips on how to prepare for and respond to air pollution as a result of wildfires.		

Southern California Association of Governments (SCAG)		
Level: Regional	Hazard: Multi	https://scag.ca.gov
900 Wilshire Blvd, Suite 1700 Los Angeles, CA 90017		Ph: 213-236-1800
The SCAG functions as a federally designated metropolitan planning organization and state-designated regional transportation planning agency and council of governments for six counties (Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial), and 191 cities in an area covering 38,00 square miles. SCAG is mandated by the Federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality.		
Statewide California Earthquake Center (SCEC)		
Level: Regional	Hazard: Seismic	www.scec.org/
University of Southern California 3651 Trousdale Parkway, Suite 169 Los Angeles, CA 90089-0742		Ph: 213-740-5843
SCEC (previously known as the Southern California Earthquake Center) gathers new information about earthquakes in California, integrates this information into a comprehensive and predictive understanding of earthquake phenomena, and communicates this understanding to end-users and the general public in order to increase earthquake awareness, reduce economic losses, and save lives. SCEC collaborates with academic, government, industry and other organizations to advance earthquake science by gathering and analyzing data from field observations and laboratory experiments, developing system-level models and simulations of earthquake processes, and communicating that understanding to expand knowledge and reduce earthquake risk. SCEC coordinates the Great ShakeOut Earthquake Drills.		
U.S. Army Corps of Engineers (USACE), Los Angeles District		
Level: Federal	Hazard: Multi	www.spl.usace.army.mil/
915 Wilshire Boulevard, Suite 1101 Los Angeles, CA 90017		Ph: 213-452- 3333
The USACE works in engineering and environmental matters, with offices that provide construction management, dam and levee safety, emergency management, planning for various water resource projects, and various others. A workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals provides engineering services to the nation including planning, designing, building and operating water resources and other civil works projects, designing and managing the construction of military facilities and other federal agencies. During disaster events, the USACE may provide technical expertise and operational management over response and recovery activities, such as non-hazardous debris management operations during the Palisades fire.		

U.S. Census Bureau (USCB)		
Level: Federal	Hazard: Multi	www.census.gov/
4600 Silver Hill Road, Washington, DC 20233		Ph: 800-923-8282
Los Angeles Regional Office 2300 West Empire Avenue, Suite 300 Burbank, CA 91504		Ph: 818-267-1700 & 800-992-3530
The USCB is the nation's leader provider of data about its people and the economy. The agency collects, processes and provides many statistics, some of which are available by census tract or metropolitan statistical area, by county, and by state. The Census Bureau publications collection also includes many current and historical censuses on population and housing. Older census data, which present data describing the people and the economy of each state and county from 1790 to 1960, are also available. The American Community Survey provides information on changing population, housing and workforce. The Decennial Census of Population and Housing counts every resident in the United States every ten years. Census data were used for this study.		

U.S. Department of Agriculture (USDA) Forest Service		
Level: Federal	Hazard: Wildfire	www.usda.gov/
1400 Independence Ave. SW Washington, D.C. 20250 (mailing address)		Ph: 202-205-8333 1-800-832-1355
Region 5: Pacific Southwest 1323 Club Drive, Vallejo, CA 94592		Ph: 707-562-8737
The Forest Service is an agency of the U.S. Department of Agriculture. The Forest Service manages public lands in national forests and grasslands. The agency conducts forest research, and provides leadership in sustainable management, and the conservation, use and stewardship of natural and cultural resources on national forests and grasslands of the U.S. It also helps communities, states, local and tribal governments, forest industries and private forest landowners improve conditions in both urban and rural areas, helping to steward about 900 million forested acres in the country. This includes 130 million acres in urban areas.		

U.S. Department of Homeland Security (DHS)		
Level: Federal	Hazard: Multi	www.dhs.gov/
2707 Martin Luther King Jr. Avenue SE Washington, D.C. 20528-0525 (mailing address)		Ph: 202-282-8000
The mission of the DHS is to secure the nation from the many threats that it faces. The DHS was formed in 2002 by combining 22 different federal departments and agencies under one umbrella. The Operational and Support Components that currently make up the DHS include: U.S. Citizenship and Immigration Services, United States Coast Guard, United Sates Customs and Border Protection, Cybersecurity and Infrastructure Security Agency, Federal Emergency Management Agency (FEMA), Federal Law Enforcement Training Centers, U.S. Immigration and Customs Enforcement, United States Secret Service, Transportation Security Administration, and Countering Weapons of mass Destruction Office, among others. The DHS strives to prevent future attacks against the U.S. and responds to natural and human-made disasters.		
United States Geological Survey (USGS)		
Level: Federal	Hazard: Multi	www.usgs.gov/
12201 Sunrise Valley Drive Reston, VA 20192		Ph: 650-853-8300 1-800-ASK-USGS
Pasadena Field Office: 525 South Wilson Avenue Pasadena, CA 91106-3212		Ph: 626-583-7811
A division of the U.S. Department of the Interior, the USGS provides reliable science-based information on ecosystems, land use, energy and mineral resources, natural hazards, water use and availability. The USGS also prepares and disseminates maps and images of the Earth's features, many of which are available to the public. USGS's Earthquake Hazards Program manages the ShakeAlert Earthquake Early Warning program that detects earthquakes to provide warning to the public and produces ShakeMaps of significant earthquake incidents and scenarios depicting ground motion and earthquake intensity.		
U.S. Geological Survey (USGS) Water Resources Division		
Level: Federal	Hazard: Multi	www.usgs.gov/mission-areas/water-resources http://ca.water.usgs.gov/
12201 Sunrise Valley Drive Reston, VA 20192		Ph: 888-275-8747
The USGS Water Resources' mission is to provide water information that benefits the Nation's citizens; this information is presented in the form of publications, data, maps, and applications software. The USGS Water aims to minimize loss of life and property as a result of water-related natural hazards such as floods, drought, and landslides; effectively manage groundwater and surface-water resources for domestic, agricultural, recreational, and ecological uses; protect and enhance water resources for human health, aquatic health, and environmental quality; and contribute to the wise physical and economic development of our resources for the benefit of present and future generations.		

APPENDIX B: PUBLIC PARTICIPATION PROCESS and MEETING MATERIALS

The Federal Emergency Management Agency (FEMA) requires that public input be considered during the development of mitigation plans. Essentially, public participation is a key component to any strategic planning process, and broad-reaching plans such as this one should not be written in isolation. Agency participation offers an opportunity for impacted departments and organizations to provide expertise and insight into the planning process, whereas public participation offers residents and other stakeholders the chance to voice their ideas, interests, and opinions. To that end, this Santa Monica Local Hazards Mitigation Plan (LHMP, or Plan) is the result of a collaborative effort between various City departments and divisions, local agencies, local residents, other regional and state organizations, and the City's consultant.

To obtain input from a broad cross-section of the community, preparation of the Santa Monica LHMP included a wide-reaching public participation process. This process included several components, as follows:

1) assembling and involving a Resilience Planning Committee (PRC) comprised of individuals from various City departments and local organizations that are already vested in and/or conduct hazard reduction programs and are knowledgeable of the community;
2) conducting surveys to understand the community's level of disaster preparedness, interest in increasing their resilience to hazards, and perceived priorities in hazard mitigation, with the data obtained from these surveys used both in the preparation of the City's Safety Element and the LHMP;
3) hosting several public workshops, both in person and online, to present the findings from the research and analyses conducted as part of the Plan preparation to neighborhood groups, school children, and the community at large, and obtain feedback on the Plan and the process of preparing the Plan; and
4) facilitating several one-on-one meetings with City staff representing various City departments to address specific sections of the Plan, and providing opportunities for local and regional agencies, and the public to review drafts of the LHMP. This last component included publishing the Final Draft Plan on the City's website with a link that allowed for public comment and input regarding the document.

Additional details of these activities are described in the sections below.

Integrating public participation during the development of the City's Safety Element and the LHMP resulted in increased public awareness and significant feedback regarding items that residents wanted addressed, in addition to a better understanding of the level of disaster-preparedness at the community-, family-, and individual-level. Moreover, during the preparation of this Plan update, the southern California region was impacted by wildfires; very strong Santa Ana winds; flooding caused by several sequences of atmospheric rivers, winter storms, and Tropical Storm Hilary; and landslides and mudslides caused by these winter storms. These events raised significant awareness among the community of the natural hazards that can impact Santa Monica and the Los Angeles region in general. In response to this, the Plan addresses several of these community issues and concerns, and incorporates new ideas and perspectives into the action items presented in Section 4.

RESILIENCE PLANNING COMMITTEE AND ADVISORY COMMITTEE

Hazard mitigation in the City of Santa Monica is overseen by the Resilience Planning Committee (RPC), which consists of representatives from the following City departments:

- ✓ City of Santa Monica Manager's Office, Office of Emergency Management
- ✓ City of Santa Monica Fire Department, Fire Prevention
- ✓ City of Santa Monica Public Works Department, Administration
- ✓ City of Santa Monica Public Works, Engineering and Street Services
- ✓ City of Santa Monica Community Development Department, City Planning
- ✓ City of Santa Monica Information Services Department, GIS

These committee members have an understanding of how the community is structured and how the City's residents, businesses, and the environment may be affected by both natural and human-caused hazard events. The RPC guided the development of the Plan, and assisted in developing plan goals and action items, identifying stakeholders and plan reviewers, and sharing local expertise to create a more comprehensive Plan. Many of these same individuals or positions will be responsible for implementation of the Plan and review of its effectiveness. The Office of Emergency Management spearheaded, managed and funded this project.

Input on specific sections of the Plan was also provided by representatives from the following agencies and organizations which together are here referred to as the Advisory Committee:

<u>City of Santa Monica Departments</u>

- ✓ City of Santa Monica Attorney's Office
- ✓ City of Santa Monica Manager's Office, Office of Emergency Management
- ✓ City of Santa Monica Community Development Department, Building and Safety
- ✓ City of Santa Monica Community Development Department, City Planning
- ✓ City of Santa Monica Department of Transportation
- ✓ City of Santa Monica Finance Department
- ✓ Santa Monica Fire Department, Fire Administration
- ✓ Santa Monica Fire Department, Fire Prevention
- ✓ City of Santa Monica Housing and Human Services Department
- ✓ City of Santa Monica Information Services Department
- ✓ City of Santa Monica Police Department
- ✓ City of Santa Monica Public Works Department, Administrative Services
- ✓ City of Santa Monica Public Works Department, Engineering and Street Services
- ✓ City of Santa Monica Public Works Department, Office of Sustainability and the Environment
- ✓ City of Santa Monica Public Works Department, Santa Monica Airport
- ✓ City of Santa Monica Rent Control Department

<u>Regional Government Partners</u>

- ✓ City of Los Angeles, Emergency Management Department
- ✓ County of Los Angeles, Office of Emergency Management
- ✓

<u>Local Educational Institutions</u>

- ✓ Santa Monica College
- ✓ Santa Monica-Malibu Unified School District

Local Hospitals
- ✓ University of California, Los Angeles (UCLA) Health/Santa Monica Medical Center
- ✓ Providence Saint John's Health Center

Local Non-Profits
- ✓ American Red Cross Western Los Angeles Chapter
- ✓ Westside Food Bank

Local Business Organizations
- ✓ Downtown Santa Monica Business Improvement District
- ✓ Santa Monica Chamber of Commerce
- ✓ Santa Monica Travel and Tourism

Individuals from these agencies and organizations, their titles at the time this update was prepared, and their participation in the process of preparing the Santa Monica LHMP, are identified in Table B-1 below. Abbreviations used in this table are as follows:

CDD = Community Development Department
CIP = Capital Improvement Project
CMO = City of Santa Monica Manager's Office
CSM = City of Santa Monica
HHS = Housing and Human Services Department
ISD = Information Services Department
LA = Los Angeles
LHMP = Local Hazard Mitigation Plan
OEM = Office of Emergency Management
OES = Office of Sustainability and the Environment
PW = Public Works Department
SMFD = Santa Monica Fire Department
SMMUSD = Santa Monica-Malibu Unified School District
SMPD = Santa Monica Police Department
UCLA = University of California, Los Angeles

The Final Plan was presented to the Mayor, City Council members, Planning Commissioners, and Public Safety Commissioners for review prior to adoption of the document.

Table B-1: Participants in the 2023-2025 Santa Monica Local Hazard Mitigation Plan Process

Name	Agency	Title	Participation in Meetings and Other Activities Associated with the LHMP			
			Kick-Off Meeting (09/14/2023)	1st Workshop (01/23/2024)	2nd Workshop (05/15/2024)	Other Activities
Lindsay Call	CMO-OEM	Chief Resilience Officer	X	X	X	Project Manager and Facilitator. Present for all bi-weekly meetings and workshops; organized and held meetings with various departments and agencies; reviewed and provided input for all text, graphics and presentation materials; provided updates to the 2016 mitigation action items
Naomi Urabe	CMO-OEM	Administrative Staff Assistant	X	X	X	Facilitated all meetings; was present at almost all bi-weekly meetings; organized sign-in sheets and handouts; organized refreshments and support materials for all meetings.
Patrick Cheng	CMO-OEM	Emergency Services Administrator	X	X	X	Presented early findings of the LHMP to various neighborhood groups and schools; ran the CrisisTrack analyses presented in the report; provided input to presentation materials.
Melinda Espinoza	CMO-Communications	Communications and Marketing Coordinator	X			
Brandon Ward	City Attorney's Office	Deputy City Attorney III	X	X	X	Reviewed Section 4-Action Items
Ivan Campbell	City Attorney's Office	Deputy City Attorney				Reviewed Section 13-Airport Hazards
Susan Y. Cola	City Attorney's Office	Assistant City Attorney				Reviewed Section 13-Airport Hazards
James Brewster	CDD-Building & Safety	Inspection Supervisor	X	X		
Rachel Kwok	CDD-City Planning	Environmental Planner	X	X		Managed preparation of the Technical Background Report to the Safety Element; prepared the City's Safety Element update; co-authored the community survey in support of the Safety Element and LHMP; addressed public comments to the Safety Element.
Jing Yeo	CDD-City Planning	Planning Manager			X	
Jason Kligier	Transportation	Chief Planning Officer			X	
Michelle Kramer	Finance	Assistant Administrative Analyst, Procurement	X			
Nick Felldin	Finance	Senior Accountant				Provided information for Section 4– 2025 action items
Joe Cavin	SMFD-Prevention	Fire Marshal	X	X		Reviewed Section 10; reviewed action items related to fire hazards in Section 4; facilitated access to the new fire hazard severity zone maps.
Dan Caldwell	SMFD-Administration	Fire Battalion Chief	X			Participated in the review of action items in Section 4 related to fire hazards.
Patrick Nulty	SMFD-Prevention	Fire Captain		X	X	Reviewed Section 10; participated in the review of action items in Section 4 related to fire hazards.
Setareh Yavari	HHS	Housing and Human Services Manager		X	X	
Marc Amaral	HHS	Human Services Administrator	X			
John Meschyan	ISD	Principal Network Engineer	X			
Prasanna Joshi	ISD	GIS Analyst		X	X	
Lauren Hartz	ISD	GIS Analyst	X		X	
Neda Peiravian	ISD	GIS Analyst			X	Created City of Santa Monica Hazards Risk Map on City website for public outreach activities.
Brent Crafton	SMPD	Sergeant	X			
Christopher Dishlip	PW-Administrative Services	Assistant Director of Public Works	X	X	X	
Sybille Moen	PW-Administrative Services	Administrative Services Officer				Reviewed Appendix C – Economic Analysis
Alex Nazarchuk	PW-Engineering & Street Services	City Engineer		X		Reviewed Section 8 – Flooding; reviewed Section 9 - Landslides; provided updates to the 2016 mitigation action items.
Jason Hoang	PW-Engineering & Street Services	Senior Civil Engineer			X	
Shannon Parry	PW-OES	Chief Sustainability Officer		X		
Ariana Vito	PW-OES	Senior Sustainability Analyst	X			
Sunny Wang	PW-Water Resources	Water Utilities Manager				Reviewed Section 4 – Action Items; reviewed Section 5 – Plan Maintenance; reviewed Section 8 – Flooding
Dinaz Krueishy	PW-Water Resources	Civil Engineering Associate				Reviewed Section 4 – Action Items; reviewed Section 5 – Plan Maintenance
Amber Richane	PW-Architectural Services	Principal Design and Planning Manager				Reviewed Section 4 – Action Items; reviewed Section 5 – Plan Maintenance
Sebastian Felbeck	PW-Architectural Services	Senior Construction Manager				Reviewed Section 4 – Action Items
Stelios Makrides	PW-Airport	Chief Operations Officer				Reviewed Section 13 – Airport Hazards

Name	Agency	Title	Participation in Meetings and Other Activities Associated with the LHMP			
			Kick-Off Meeting (09/14/2023)	1st Workshop (01/23/2024)	2nd Workshop (05/15/2024)	Other Activities
Diana Hernandez	PW-Airport	Airport Operations Administrator		X		
Daniel Quezada	PW-Airport		X			
Rosemine Patel	Rent Control	Public Information Manager	X		X	
Jerry Gibson	SMMUSD	Facility Use Manager	X		X	
Carey Upton	SMMUSD	Chief Operations Officer	X	X		
Johnnie Adams	Santa Monica College	Chief of Police	X	X		
Daniel Phillips	Santa Monica College	Risk Management		X		
Michael Tuitasi	Santa Monica College	Emergency Manager, VP of Student Affairs	X			
Kurt Kainsinger	UCLA Health-Emergency Management and Special Operations	Director	X			
Travis Bilyeu	UCLA Health Office of Emergency Preparedness	Emergency Management Specialist	X	X		
Alex Lichtenstein	UCLA Health- Office of Emergency Preparedness	Assistant Director			X	
Alexandria Wenscott-Wayne	Providence Saint John's Health Center	Emergency Manager and Safety Director	X			
Savanna Fiehler	American Red Cross-Western LA Chapter			X	X	
Judy Kruger	Santa Monica Chamber of Commerce	President/CEO	X			
Lauren Salisbury	Santa Monica Travel & Tourism	Vice President of Communications	X		X	
Jeremy Ferguson	Downtown Santa Monica, Inc.	Operations and Placemaking Director	X			
Jillian De Vela	City of Los Angeles Emergency Management Department		X	X		
Sinan Khan	Los Angeles County-Office of Emergency Management		X			
Anna Batalin	Westside Food Bank		X			
Members of the Consultant Team						
Tania Gonzalez	Earth Consultants International	Vice-President, Senior Project Consultant	X	X	X	Consultant in charge of project; prepared presentations for all meetings and workshops; attended all bi-weekly meetings and additional virtual meetings with specific individuals; managed the preparation of the graphics and wrote the final draft of the LHMP.
Candice Weber	Terra Nova Planning & Research	GIS Specialist				As sub-consultant to ECI, ran the HazUS models for the LHMP.
Maria Herzberg	Earth Consultants International	Senior Staff Geologist-GIS				Prepared several of the data appendices; prepared several of the GIS files and graphics for report and presentations.
Clay Kelty	Earth Consultants International	Staff Geologist				Wrote preliminary drafts of Sections 6, 7, and 12.
Collette Morse	Morse Planning Group	Principal				As sub-consultant to ECI, wrote preliminary drafts of Sections 8 and 9.
Eva Kinnebrew		Environmental Scientist				As sub-consultant to ECI, prepared some of the charts for Sections 2 and 11, and wrote preliminary drafts of those sections..
Aaron Martin	Earth Consultants International	Staff Geologist-GIS				Prepared several of the final GIS files for the report, and wrote parts of Section 12.

PROCESS FOLLOWED

The City of Santa Monica first completed and submitted a LHMP for approval to FEMA and Cal-OES in 2005. The most recent LHMP before this 2025 update dates from March 2016, with the updating process conducted between July 2013 and August 2015. The 2016 plan was referred to as the "City of Santa Monica All Hazard Mitigation Plan." Efforts to update the 2016 document were meant to begin in 2020, but the COVID-19 pandemic derailed those plans. Thus, activities related to this most recent update began in July 2023, upon the deactivation of Santa Monica's COVID-19 Emergency Operations Center. Grant outreach activities have been supported with funding from FEMA's Hazard Mitigation Grant Program, administered by the California Governor's Office of Emergency Services.

This document is the product of that effort, which includes substantial additions and modifications to the 2016 Plan. The additions and modifications reflect our increased understanding of the impact of climate change on several weather-related hazards such as flooding, wildfires, sea-level rise, extreme heat events, and strong winds; the use of HazUS and other software to better estimate the costs associated with hypothetical but probable hazard scenarios, including earthquakes, tsunamis, flooding, and inundation related to the catastrophic failure of Stone Canyon dam; and a more thorough discussion on the impacts that the hazards discussed can have on sensitive and priority populations. There are several modifications addressed in this 2025 update, but the most significant ones are related to the format of the action items that the City has identified as priorities for the next five years (see Section 4). City staff found that the action items listed in the 2016 document were more focused on public safety preparedness than hazard mitigation. While public safety and City department readiness is a critical element to disaster response, the 2025 update focuses on hardening City infrastructure and addressing planning vulnerabilities.

Meetings and workshops held for this 2025 Plan were facilitated and organized by Lindsay Call and Naomi Urabe from the City's Office of Emergency Management, and the City's consultant, Tania Gonzalez of Earth Consultants International (ECI). These individuals met virtually every other week for the duration of the project to discuss scheduling, specific questions related to the sections being prepared at that time, and discuss input from others. The larger meetings with the Resilience Planning and Advisory committee members, and public workshops held as part of this LHMP update are summarized in the following table. Specific milestones are also listed in Table B-2. Reduced copies of the PowerPoint presentations prepared for the PRC and Advisory Committee meetings, and for the public workshops are provided in this Appendix, after Table B-2. The flyers announcing the Public Surveys and Workshops are also included.

In addition to the city departments and local organizations and stakeholders listed in Table B-1 above, input from other state and federal agencies was also sought as the team prepared the various sections of the report. This list only includes specific discussions related to the LHMP and does not include other activities between agencies on disaster preparedness or response. These agencies include:

- California Geological Survey – on issues regarding tsunamis and tsunami scenarios using HazUS
- Los Angeles County Department of Beaches and Harbors, who provided the team with copy of their Coastal Resiliency Study Final Report
- American Red Cross – who provided information on the Woolsey fire, including number of

people within the evacuation zone, activation of local shelters, evacuation of Malibu, and Santa Monica housing the Malibu Emergency Operations team and providing communications support; and also provided the most recent, updated shelter list

- CAL FIRE – specifically regarding the new fire hazard severity zone maps recently issued by the state
- Verisk – regarding the City's past participation on the Community Rating System (CRS)
- City of Culver City – to request a copy of their LHMP with an emphasis on the use of the STAPLEE process
- FEMA Region 9 – regarding the submittal of the LHMP and review timing
- CalOES – regarding the submittal of the LHMP and review timing
- Beverly Hills Fire Department – regarding LHMP process and best practices
- Culver City Fire Department, OEM – regarding LHMP process and best practices
- West Hollywood Community Safety Department – regarding LHMP process and best practices

Abbreviations used on Table B-2 are identified below:

AM = "Ante meridiem," referring to the time between midnight and noon
CalOES = California Office of Emergency Services
CDD = Community Development Department
CERT = Community Emergency Response Team
CGS = California Geological Survey
ECI = Earth Consultants International, Inc.
GIS = Geographic Information System
HazUS = Hazards US, a software used to estimate losses caused by a variety of natural hazards
HHS = Housing and Human Services Department
ISD = Information Services Department
LA = Los Angeles
LAX = Los Angeles Airport
LHMP = Local Hazard Mitigation Plan
OEM = Office of Emergency Management
OES = Office of Sustainability and the Environment
PM = "Post meridiem," referring to the time between noon and midnight
PW = Public Works Department
RPC = Resilience Planning Committee
SMFD = Santa Monica Fire Department
SMMUSD = Santa Monica-Malibu Unified School District
SMO = Santa Monica Airport
SMPD = Santa Monica Police Department

Table B-2: Milestones and Participation Activities Conducted in Support of This LHMP Update

Date	Milestone / Activity	Summary
April 20, 2023	Pre-proposal meeting	Virtual meeting (2:30-3:00 PM) between Lindsay Call (OEM) and Tania Gonzalez (ECI) to discuss the City's interest in receiving a proposal from ECI to update their LHMP. Following this call, ECI prepared and submitted a proposal to the City.
June 27, 2023	Contract signed	The City of Santa Monica and Earth Consultants International, Inc. (ECI) entered a contractual agreement with ECI tasked with updating the City's LHMP.
July 11, 2023	Internal Kick-off meeting	Virtual meeting (10:00-11:00 AM) between Lindsay Call, Naomi Urabe and Tania Gonzalez to discuss the project with an emphasis on the planning process and proposed methods to engage the public.
July 2023	Resilience and Advisory Committees welcoming package prepared	During the month of July, ECI prepared an introductory package outlining the purpose of LHMPs, the regulatory background, the process, schedule, and role of the advisory committee. The City forwarded these materials to City staff across all City departments and other organizations to identify individuals that were interested in participating in the LHMP update process, and the individuals that would be part of the RPC. A copy of this handout is included in this appendix.
September 7, 2023	Logistics meeting for kick-off meeting and presentation	Virtual meeting (11:00 AM-Noon) between Lindsay Call, Naomi Urabe and Tania Gonzalez, to discuss last-minute details regarding the kick-off meeting, including edits to the PowerPoint presentation, sign-in sheets, and logistics.
September 14, 2023	Kick-off meeting	In-person meeting (10:00 AM-Noon) at the Public Safety Facility, OEM, 2nd Floor, 333 Olympic Blvd., Santa Monica, to kick-off the project. 33 people attended. Most attendees were physically present; a few joined remotely. Participants are identified on Table B-1 above. The PowerPoint presentation used for this meeting is included in this appendix.
September 15 – December 30, 2023	Preliminary research for the hazards sections and HazUS analyses	During this period, ECI conducted preliminary research and analysis of the hazards identified; compiled the results of the questionnaire presented at the kick-off meeting regarding hazards that could impact the city, and provided data to Terra Nova so they could run the HazUS analyses, including earthquakes, tsunami, flooding, and inundation scenarios. Preliminary HazUS results were provided to the City on November 1st.
November 15, 2023	CDD / OEM meeting	Meeting between Rachel Kwok (CDD) and Lindsay Call (OEM) to develop the Safety Element / LHMP public survey on local hazards and disaster preparedness.
January 16, 2024	Community Survey was published	The community survey for the Safety Element and LHMP was published online, with paper copies available in both English and Spanish available at both the Main Library and the Pico Branch library. The survey page could be accessed here (survey is now closed, but link connects to the webpage). The flyer announcing the survey is included in this appendix. The survey was highlighted in the City's staff newsletter and other social media platforms.
January 16, 2024	Preparation meeting for upcoming Workshop	Virtual meeting (2:30-3:30 PM) with Lindsay Call, Naomi Urabe, Patrick Cheng and Tania Gonzalez attending, to discuss the upcoming workshop with the Advisory Committee. Topics discussed included PowerPoint presentation, ways to capture input from the committee, and logistics regarding the sign-in of committee members attending.

Date	Milestone / Activity	Summary
January 23, 2024	Resilience and Advisory Committees Workshop No. 1	In-person workshop (10:00 AM – 2:00 PM) held at the Santa Monica Institute, 330 Olympic Blvd., 2nd Floor. 41 people + consultant invited; 21 attended. The participants are identified on Table B-1 above. A copy of the PowerPoint presentation for this workshop is included in this appendix. The group identified several issues to be considered as part of the LHMP update. These included: 1) Plans and regulations regarding emergency shelters, water self-sufficiency, incorporating the City's coastal action plan; 2) Education and awareness, including information and alarms for tsunamis, Red Cross preparedness programs for different populations (school children, adults in seismic zones, seniors); 3) Natural protection of micro forests, tree canopy and sand/beach dunes; 4) Structure and infrastructure including breakwater at the pier, resilience hubs, seismic retrofit program, earthquake gas shut-off valves, retrofit of water pipes, and earthquake early warning system; 5) Slopes and the bluffs, with an emphasis on proactive bluff maintenance, drainage, resources from state and federal agencies to repair slopes, estimates of potentially impacted structures and impact on lost revenue; 6) wildland fires and their impact on structures along the northern City boundary, loss of revenue due to school closures, impact on asthma patients and emergency department visits, costs to fire department per fire event, public safety shutoffs, and potential personal impacts to staff resulting in absenteeism; 7) Hazardous materials with an emphasis on costs per response event, worst-case scenarios to be considered, proximity of hazmat sites to schools and other sensitive populations, "ocean burping," dispatch issues, and natural gas emissions associated with Playa Vista; and 8) Aircraft hazards, including possible increase in noise related to LAX post closure of SMO, generally small number of passengers, potential impact of aircraft crash on people on the ground, contamination costs associated with historical uses and use of foam, and potential use of SMO for response capabilities.
January – February 2024	Community Emergency Response (CERT) Training meetings	As part of the CERT training meetings, the OEM team provided general information on the LHMP, the specific hazards that are likely to impact Santa Monica, and advocated for CERT training participants to take the LHMP survey to share their feedback on disaster events and preparedness.
February 2, 2024	Presentation to the Santa Monica Unified School District – Grant Elementary School	Lindsay Call and Patrick Cheng of OEM made a presentation on natural hazard education and shared information on natural hazard project-based learning curriculum to all 3rd grade classes, and encouraged the children to share the information learned with their parents and caregivers. They also shared information with school staff on the LHMP Community Workshops and the opportunity for residents to provide feedback on hazards and personal preparedness.
February 12, 2024	Meeting regarding HazUS tsunamis scenarios	Online meeting with representatives from CGS and CalOES regarding tsunami scenarios and loss estimates. Organized by Lindsay Call, attended by Nicholas Graehl CGS), Todd Becker (CalOES), Patrick Cheng (OEM), and Tania Gonzalez (ECI). The meeting was called to discuss the tsunami scenarios using HazUS prepared by the consultant for the LHMP. The consultant considered a near-source tsunami caused by a worst-case earthquake scenario on the offshore section of the Palos Verdes fault in the Santa Monica Bay that could potentially generate a significant tsunami. The CGS/CalOES team forwarded to us a poster they prepared that evaluated a teletsunami originating off Alaska, with HazUS loss estimates calculated at the county level. A decision was made to rely more heavily on the numbers provided by CGS/CalOES, but

Date	Milestone / Activity	Summary
		mentioning the possibility of a near-shore event.
March 4, 2024	Northeast Neighbors Community Meeting	Patrick Cheng of OEM gave a presentation on the LHMP at this neighborhood meeting. He shared information on the LHMP survey and opportunity for residents to provide feedback on hazards and personal preparedness actions.
April 2, 2024	Presentation to the Wilmont Neighborhood Organization	Patrick Cheng of OEM gave a presentation on general disaster preparedness related to specific hazards likely to impact Santa Monica. He also shared information on the LHMP Community Workshops emphasizing these workshops provide residents with the opportunity to provide feedback on hazards and personal preparedness.
April 8, 2024	Presentation to the Ocean Park Association	Patrick Cheng of OEM gave a presentation on general disaster preparedness related to specific hazards likely to impact Santa Monica. He also shared information on the LHMP Community Workshops emphasizing these workshops provide residents with the opportunity to provide feedback on hazards and personal preparedness.
April 9, 2024	LHMP Community Workshops Flyer published	OEM began distributing a flyer in English and Spanish advertising the upcoming community workshops (April 30 and May 2nd) to discuss the LHMP. Announcements regarding the workshops and inviting all members/residents to attend were placed on social media; sent via email to all city agencies, past CERT trainees, and all city neighborhood groups; and flyers were distributed to libraries, schools, City departments, and other agencies. A copy of the flyer that was posted on social media, sent in emails, and posted as hardcopy at various locations around the city, is included in this appendix.
April 10, 2024	CDD / OEM Meeting	Meeting between Cary Fukui (CDD), Roxanne Tanemori (CDD), Lindsay Call (OEM), and Rachel Kwok (CDD) to discuss the Local Coastal Program update and sea level rise mitigation to ensure consistency between the Safety Element and LHMP updates.
April 12, 2024	Preliminary CrisisTrack estimates completed	Patrick Cheng (OEM) used the CrisisTrack damage assessment software to estimate the damages, in US dollars, for properties in Santa Monica within the tsunami, and coastal flooding zones. Because at the time no part of the city was included within a fire hazard severity zone, the wildfire loss estimates for the city were zero.
April 15, 2024	Presentation to the Commission on Sustainability, Environmental Justice and the Environment	Rachel Kwok of CDD and Lindsay Call of OEM made a presentation on the revisions to the City's Safety Element and LHMP. Lindsay provided information on LHMP's basic components, importance of community feedback processes, and opportunities to contribute at the upcoming community workshops. Feedback from the Commissioners included: • Use of best practice reports on sea level rise, be example for other coastline communities • Importance of including extreme heat events in LHMP report and recommendation to consider mitigation measures for disadvantaged community members (elderly, persons without AC) and daytime outdoor workers There was a question on the seismic fault zones, how the zones were determined, and whether the zone is related to damage during the Northridge Earthquake.
April 18, 2024	Santa Monica Malibu Unified School	In addition to both the Grant Elementary presentation on natural hazard (February 2nd) and attending Natural Hazards Design Fair (March 8th) to support Grant Elementary school's disaster curriculum, OEM

Date	Milestone / Activity	Summary
	District Board of Education Meeting	advocated for projects on natural hazards to assist with family/caregiver education on disaster preparedness. During the Board Meeting, OEM provided information how partnering on the 3rd grade project allowed OEM to share LHMP survey information with students' parents. Shared thanks for the District's participation in the LHMP Resilience Planning Committee and advocate for school participation in upcoming LHMP Community Workshops.
April 22, 2024	Preparation meeting for upcoming community workshops	Online meeting, 2:30-3:30 PM) with Lindsay Call (OEM), Patrick Cheng (OEM), Naomi Urabe (OEM), and Tania Gonzalez (ECI) participating, to discuss the PowerPoint presentations for the upcoming community workshops. Both English and Spanish versions will be prepared, with Spanish translation of the English version provided by a consultant retained by the City. Preliminary logistical issues regarding the meeting were also discussed.
April 29, 2024	Preparation meeting for upcoming community workshop	Online meeting (2:30-3:30 PM) with Lindsay Call (OEM), Patrick Cheng (OEM), Naomi Urabe (OEM), and Tania Gonzalez (ECI) participating, to discuss last minute details on the PowerPoint presentations for the community workshops.
April 30, 2024	Community Workshop No. 1	Workshop held at the Thelma Terry Community Room at Virginia Avenue Park, 2200 Virginia Ave Park, Santa Monica, 90404 (6:00-8:00 PM). Meeting was to be hosted in Spanish with English language translation. Unfortunately, no members of the public attended the workshop even though the meeting was advertised several weeks in advance, as described above. No presentation was made. In addition to the PowerPoint presentation (also included in this appendix), oversized copies of five hazards maps were printed and hung on easels in the meeting room for people to review and comment on. The maps highlighted included the Alquist-Priolo Earthquake Fault Zone map, the Seismic Hazards map, Dam Inundation map related to catastrophic failure of Stone Canyon dam, Tsunami inundation map, and a composite map showing all identified natural hazards in the city of Santa Monica. The translator and staff from both OEM and CDD reviewed and discussed the maps. Questions regarding the hazards shown on the figures were addressed by the Consultant.
May 2, 2024	Community Workshop No. 2	Workshop held at the Library Community Room at Montana Avenue Branch Library, City of Santa Monica, 1704 Montana Ave, Santa Monica, CA 90403 (6:00-7:30 PM). Hosted in English with Spanish language translation available. Five members of the public attended this workshop in addition to staff from OEM. The presentation was made in English; no translation services were needed. The same PowerPoint presentation that was given at the online workshop on May 22, 2024 (see below) was used for this workshop. The presentation is on YouTube and can be still viewed. As with the previous workshop, in addition to the PowerPoint presentation, oversized copies of five hazard maps were hung on easels around the room. Questions from the public regarding the hazards shown on the maps were addressed by members of the OEM team and/or the consultant.
May 6, 2024	Compiled Community Survey Responses	Naomi Urabe (OEM) compiled all online and paper responses to the Community survey that had been prepared by CDD and OEM in support of the Safety Element and the LHMP for discussion and consideration as the team moved forward, and in preparation for the upcoming Advisory Committee

Date	Milestone / Activity	Summary
		Workshop on May 15th. 178 people took the survey (1 person submitted 2 entries, for a total of 179 responses), with 168 people submitting their responses online, and 10 submitting paper copies to the library. The survey asked respondents to list the hazards that they have experienced while living/working in Santa Monica. Responses included: earthquake, adverse weather, smoke from wildfires, drought, extreme heat, structure fires, burglaries, infections (likely Covid), failure of critical infrastructure, active shooter, civil unrest, security incident. Several replied "none." With the exception of 8 individuals, the majority reported that they have taken actions to prepare for a natural disaster or emergency. Actions reported include preparation of an emergency supply kit, storing sufficient water supplies, maintaining smoke alarms and fire extinguishers, signed up for emergency alerts, and purchasing rental or home insurance. Many renters reported not being able to make improvements to their units and many also said that limited income prevented them from being better prepared for an emergency. Feedback on action items that the respondents said that the City should consider is summarized below: 1. Insurance coverage: describe types of insurance coverage that residents may need and recommend that all property owners review their insurance coverage with their brokers, including renters' insurance. 2. Training and Neighborhood Watch: Consider the City helping neighborhoods organize themselves; provide training, workshops and drill exercises (both in-person and online); make these programs available to residents and businesses; consider Emergency Preparedness and Response information made available at City events, public library, and the farmers' market; provide information on what to do in event of an aircraft accident, active shooter, cyberattack, terrorist attack; provide information on preparedness kits. Training should be ongoing. 3. Supply distribution: The City should consider providing hazard kits, subsidize battery backup systems, 5-gallon water bottles on an annual rotation/exchange program. These could be provided free or at cost, but with City organizing the availability of these supplies to make it convenient. 4. Communication: Provide emergency information, like telephone numbers and websites, on handy magnetic cards or similar format; consider preparing and distributing a reference sheet with action items and necessary supplies for a variety of hazards; improve communication with schools; provide information on emergency services, shelters, and evacuation plans; make communication of hazards interesting ("fun"). 5. Seismic retrofit and code changes: Consider a low-interest loan program for condominiums and other structures and infrastructure that need to be seismically strengthened; change zoning codes to avoid building in hazard areas; publicly report status of structures that need to be seismically retrofitted; take action against landlords delinquent in fixing their buildings; provide a means by which renters can notify the City of safety infractions and buildings that have not been fixed. 6. Extreme heat: City needs to be better prepared for extreme heat events; adopt a formal policy to make air conditioning mandatory in all buildings including rent-controlled apartments; provide more heating and/or cooling centers; develop public infrastructure to help with heat mitigation

Date	Milestone / Activity	Summary
		(free water stations, cooling zones with water misters, etc.); make cooling centers available for pets. 7. Infrastructure: City needs to upgrade and seismically retrofit the aging water pipes; bury electrical lines; ensure resiliency of City infrastructure and critical facilities; grade down alleys when they are re-surfaced; provide more streetlights; keep sidewalks clear so persons with mobility issues can pass safely at all times; maintain the Santa Monica airport to be used for evacuation and emergency response; retain more City staff in charge of preparedness and mitigation projects. 8. Crime: Improve safety in neighborhoods, especially crime and nuisances caused by unhoused individuals; considerer Ring-camera mandatory laws; surveillance drones and security cameras at the beach. 9. Other issues: Consider local programs for food resiliency, including locally grown food and community gardening; curtail growth by not permitting tall buildings; City should only buy and use software with proven track record; do not approve projects that include road design that obstructs emergency response vehicles.
May 6, 2024	Public Works / OEM Meeting	Lindsay Call of OEM met with the Public Works Department leadership team to discuss the findings from the LHMP, input from the public survey (see above), and discuss potential action items to raise at the upcoming 2nd Advisory Committee meeting/workshop (on May 15).
May 13, 2024	City Attorney's Office / OEM Meeting	Meeting between Lindsay Call (OEM) and Brandon Ward of the City Attorney's Office to prepare for the upcoming 2nd Advisory Committee meeting/workshop and direction on language to use in the mitigation action items.
May 13, 2024	Test for Online Community Workshop	Virtual meeting and test (11:15-11:45 AM) between Lindsay Call (OEM), Naomi Urabe (OEM), and Tania Gonzalez (ECI) to confirm that the link for the online public workshop to be held on May 22nd (see below) worked correctly, and to discuss last-minute logistical details for the in-person Advisory Committee workshop.
May 15, 2024	Resilience and Advisory Committees Workshop No. 2	In-person workshop (10:00 AM – 2:00 PM) held at the Santa Monica Institute, 330 Olympic Drive, 2nd Floor, Santa Monica. 46 people plus consultant invited; 19 people attended. At this meeting, Tania Gonzalez (ECI) first reminded the workshop participants of the LHMP process, with an emphasis on the main items that need to be covered in these documents and the types of action items that should be considered. Reminded the committee members that mitigation actions need to identify the responsible agency or agencies, potential funding sources and constraints, the timeline for implementation, and the plan goals being addressed. Re-introduced the STAPLEE process and provided examples of possible mitigation actions. Then, provided a summary of the hazards being addressed in the LHMP, including loss estimates developed for several earthquake scenarios, a 20-foot run-up tsunami, coastal flooding using the FEMA maps, inundation of the eastern portion of the city as a result of failure of Stone Canyon dam, and after-earthquake structural fires. Based on the loss estimates developed, the hazards were ranked into high risk and lower risk to Santa Monica. The participants were then asked to break into several working groups to develop potential mitigation actions that address the requests from the

Date	Milestone / Activity	Summary
		community. The action items proposed were organized based on type (local planning, local assessment and regulations, structures and infrastructure improvement, natural systems improvements, public education and awareness, and City-readiness initiatives. Committee members were told to expect an online survey where they would be asked to vote on the action items that they consider to be top priorities.
May 21, 2024	OEM / CDD / ECI	Virtual meeting between Lindsay Call (OEM), Rachel Kwok (CDD) and Tania Gonzalez (ECI) to discuss the disaster preparedness, response and recovery section of the Safety Element, and similar items to be covered in the LHMP.
May 22, 2024	Community Workshop No. 3	Online community workshop (7:00-8:30 PM), presented by Tania Gonzalez in English, moderated by Lindsay Call. The meeting was recorded and uploaded to YouTube, where it is still available for viewing. Availability to this YouTube recording was advertised in the City of Santa Monica News website (SaMoNews) and a several other City of Santa Monica webpages. 58 people participated in the online community workshop. As of August 5, 2025, there were 318 views of the presentation recording on the City's YouTube channel.
May 28 – July 10, 2024 July 30, 2024	Local Hazards Prioritization Survey Survey results were compiled	An online survey was sent to all 48 individuals in the Resilience and Advisory Committees that participated in the LHMP update process. The survey included all proposed action items developed during the workshop on May 15th, and asked individuals to rank the action items within each category from highest to least priority. 28 responses were received. The results of the survey were compiled at the end of July, with the results used to prepare Section 4 in the LHMP.
August 15 – September 30, 2024	Public review of the Final Draft of the Santa Monica Safety Element	The Final Drafts of the City's Safety Element and Technical Background Report were posted online for the public to review and comment on during the 45-day public review period. A total of 7 public comment letters were received. The CDD (Rachel Kwok) provided a link for comments, with all comments addressed in the Final version of the Safety Element.
August 20, 2024	PW / OEM Meeting	Lindsay Call (OEM) facilitated a meeting with the Public Works Department (PW) leadership team to discuss the hazard mitigation action items that were identified by the Resilience Planning Committee.
August 27, 2024	Department Head Meeting	Lindsay Call (OEM) made a presentation to all the Santa Monica Department Heads (Executive Team) to present the findings of the hazard analyses and the mitigation actions being proposed. The PowerPoint presentation for this meeting is included in this appendix.
September 26, 2024	CDD / OEM Meeting	Meeting between Lindsay Call (OEM) and Community Development Department staff to review the Safety Element and LHMP progress, and review the public comments on the Safety Element. The public comments received were used to inform revisions to the Safety Element and the action items in the LHMP.
October 9, 2024	Planning Commission Meeting	Representatives from CDD (Rachel Kwok) and OEM (Lindsay Call) made a presentation to the Commission to update them on the Safety Element and the LHMP.
October 30, 2024	Interdepartmental Meeting	Meeting between OEM (Lindsay Call) and representatives from the CDD (Rachel Kwok), SMPD (Alejandro Mendoza), ISD-GIS (Lauren Hartz and Neda Peiravian), and DOT (Jason Kligier) to finalize the evacuation routes to be included in the Safety Element, and to finalize the mitigation actions in the LHMP related to evacuation planning.

Date	Milestone / Activity	Summary
November 13, 2024	Building Safety Commission Meeting	Representatives from CDD (Rachel Kwok) and OEM (Lindsay Call) updated the Commission on the Safety Element and the LHMP. Commissioner McLaughlin prepared a series of questions addressing specific hazard concerns (water supply, hazardous materials, bluff maintenance, seismic upgrade of buildings, tsunami/coastal flooding, emergency plan and essential facilities, wildfires and smoke impacts, extreme heat events, and energy resilience) that CDD and OEM representatives addressed, with action items identified for both the Safety Element and the LHMP.
November 25, 2024	PW / OEM Meeting	Lindsay Call (OEM) organized a meeting with Public Works Department (PW) (Peter James, Stelios Makrides, Christopher Dishlip) to finalize the hazard mitigation action items identified that would fall under the purview of PW for implementation.
February 3, 2025	SMFD / CDD / OEM Meeting	Online meeting (1:30-2:30 PM) with representatives from the Santa Monica Fire Department (Joe Cavin, Patrick Nulty, Daniel Galvan), Planning Division (Rachel Kwok, Jing Yeo), OEM (Lindsay Call) and consultant (Tania Gonzalez) to discuss Fire Hazards section with an emphasis on additional action items and expectation that the State will release new fire hazard severity zone maps that will impact Santa Monica. Additional action items to be considered include defensible space, parking restrictions and construction bans on red-flag days, hardening and redundancy of water supplies in fire hazard zones, and non-combustible fencing between properties.
February 6, 2025	North of Montana Association Meeting	Santa Monica Fire Department and OEM staff met with neighbors to discuss Palisades Fire incident and listened to public questions/comments about potential improvements. This feedback was used by OEM and SMFD to develop post-fire mitigation action items.
February 11, 2025	Safety Element Adoption	City Council adopted the Safety Element Update of the General Plan. CDD (Rachel Kwok) made a presentation. OEM (Lindsay Call), SMFD, and consultant (Tania Gonzalez) attended meeting to be available to answer questions related to the LHMP update and general emergency preparedness and response questions.
February 24, 2025	Sustainability Commission Meeting	Representatives from CDD (Rachel Kwok) and OEM (Lindsay Call) updated the Commission on the Safety Element and the LHMP. Information was provided on the City's response and recovery to the Palisades fire. Listened to public questions and comments regarding potential improvements. This feedback was used by OEM and SMFD to develop post-fire mitigation actions that were included in the LHMP.
February 26, 2025	Santa Monica Palisades Fire Recovery Town Hall Meeting	Virtual meeting where federal, regional, and local government representatives presented information on the Palisades fire recovery. This feedback was used by OEM and SMFD to develop post-fire mitigation action items incorporated into the LHMP update.
March 13, 2025	SMFD / OEM Meeting	In-person meeting between OEM (Lindsay Call) and SMFD personnel (Tom Clemo, Dan Caldwell, Daniel Galvan) to discuss the Palisades fire and additional mitigation actions to be recommended based on the immediate lessons learned.

Date	Milestone / Activity	Summary
March 19, 2025	SMFD / OEM Meeting	Presentation by OEM for SMFD Command & General Staff on hazard analysis findings and proposed mitigation action items.
March 25, 2025	SMFD / OEM Meeting	Meeting with City Fire Marshall (Joe Cavin) to discuss revised fire hazard severity maps and finalize LHMP mitigation action item updates.
June 9, 2025	HHS / OEM Meeting	Meeting with City Housing and Human Services Department staff (Alana Riemermann) to discuss the Aging and Disability Action Plan's draft goals to ensure alignment with LHMP mitigation action items.
July 30, 2025	PW / Water Resources / OEM Meeting	Meeting with Public Works staff (Sunny Wang, Dinaz Krueishy) to discuss hazard mitigation action items related to water infrastructure improvements.
August – September 2025	Final Draft of LHMP posted on City's website for public review	
November 18, 2025	City Council meeting to adopt LHMP	

Handout Materials, Flyers and PowerPoint Presentations for Kick-Off Meeting, Advisory Committee Meetings, Community Workshops and Community Survey

Kick-Off Meeting Materials and Presentation

July 2023

To: **City of Santa Monica Resilience Planning Committee**
Subject: **Introduction Materials – Disaster Mitigation Planning Process**
From: Tania Gonzalez, Earth Consultants International, Inc. (714) 412-2654 (tgonzalez@earthconsultants.com)

Greetings! Ms. Lindsay Call, Chief Resilience Officer from Santa Monica's Office of Emergency Management, has identified you as a potential Resilience Planning Committee (RPC) member for the 2023-2024 City of Santa Monica Local Disaster Mitigation Plan Update. To facilitate this effort and prepare the bulk of the reports, the City has retained the services of Earth Consultants International, Inc. (ECI). However, as discussed further below, Disaster Mitigation Plans need to include extensive participation from City officials and stakeholders, and your role in this process is therefore very important.

The following pages provide a quick overview of the following topics:

- What are Disaster Mitigation Plans?
- Why does the City need this Plan?
- What are the requirements that Disaster Mitigation Plans need to fulfill?
- What is your role as an Advisory Committee member?
- What are the schedule and deliverables on this project?

What are Disaster Mitigation Plans? And Why Develop a Local Natural Hazards Mitigation Plan?

(Besides the fact that it is Federally mandated?)

Disaster Mitigation Plans are documents required of all states, cities and tribes by federal mandate (Disaster Mitigation Act of 2000 – Public Law 106-390). This law amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288) that provided funding for disaster relief and recovery and for some hazard mitigation planning. The planning and funding criteria are spelled out in the Federal Register (Title 44 of the Federal Code Register, Part 201 and 206).

The Disaster Mitigation Act required that Disaster Mitigation Plans (also known as Local Hazard Mitigation Plans) be submitted for approval to the local FEMA office by November 1, 2004, with updates required every five years. The City of Santa Monica's first approved Natural Hazards Mitigation Plan dates from 2005, and the most recent update dates from 2016. Updated Plans are to highlight the progress accomplished during the previous five years, and identify new action items that the City intends to implement during the next five-year cycle. The action items identified should be City- and project-specific, and prioritized using a cost-benefit analysis. Originally, the

Kick-Off Meeting Materials and Presentation

intent of the Act was to deny post-disaster recovery funds to those jurisdictions that do not have an approved Disaster Mitigation Plan. To date, to our knowledge, FEMA has not enforced this provision, but they do deny grant money to be used for pre-disaster planning. The flip-side of this provision is that once the City's Plan has been approved by FEMA, the City can request and obtain grant funding through various State- and Federal-funded disaster preparedness grant initiatives to reduce its vulnerability to the natural hazards identified in the Plan.

The primary motivation behind the Disaster Mitigation Act is that as the costs of damage from natural disasters have continued to increase, the Federal and State governments and communities all around the United States have come to realize the importance of identifying effective ways to reduce their vulnerability to disasters. Local Hazard Mitigation Plans assist communities in reducing their risk from natural hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the area.

A Disaster Mitigation Plan should provide a set of action items that if implemented can help reduce the risk from natural hazards through education and outreach programs, by fostering the development of partnerships, and by implementing preventive activities (such as land use programs) that restrict and control development in areas subject to damage from natural hazards.

The resources and information contained within the Mitigation Plan:

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

The Federal requirements for approval of a Natural Hazard Mitigation Plan include:

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

The following components must be part of the planning process:

- Complete documentation of the planning process;
- A detailed risk assessment on hazard exposures in the community;
- A comprehensive mitigation strategy, which describes the goals and objectives, including proposed strategies, programs and actions to avoid long-term vulnerabilities;
- A plan maintenance process, which describes the method and schedule for monitoring, evaluating and updating the Plan and integration of the Hazard Mitigation Plan into

Kick-Off Meeting Materials and Presentation

other planning mechanisms;

- Formal adoption by the City Council; and
- Plan review by both the Federal Emergency Management Agency (FEMA) and the State's Office of Emergency Services (OES).

Natural Hazard Land Use Policy in California

Planning for natural hazards should be an integral element of any city's land use planning program. All California cities and counties are required to have Safety Elements, one of seven mandatory elements of their General Plans, that document the natural hazards specific to the area, and provide the framework by which ordinances to reduce these hazards are implemented. However, Safety Elements are typically updated only once every 15 to 25 years, and are often superseded by other local and statewide planning regulations. ECI is currently updating the Technical Background Report to the Safety Element of the City of Santa Monica. The previous Safety Element dates from 1995.

With the requirements for Local Hazard Mitigation Plans, the Federal Emergency Management Agency has essentially exported the California municipal Safety Element idea to the rest of the country, but they also have expanded on it by requiring a more publicly open and economically quantifiable planning process for community disaster reduction, and a process by which the document is reviewed yearly and updated every five years. Current Safety Elements emphasize hazard mapping and develop forward-looking land use planning policies to minimize those hazards. FEMA has directed that, following the hazard mapping effort, an emphasis be placed on hazard mitigation policies that are based on quantifiable vulnerability, loss, and risk analysis. FEMA also requires extensive public participation in this process, because they recognize that without public education and citizen buy-in of mitigation needs, it is nearly impossible to mobilize the level of support necessary to fully begin to deal with multi-hazard mitigation over multi-decadal timescales.

The continuing challenge faced by local officials and state government is to keep the local hazard mitigation plans effective in responding to the changing conditions and needs of California's diverse and growing communities without forgetting the effect that low-probability but high-risk natural events (such as major earthquakes and floods, which can skip entire generations and are therefore likely to be dismissed over time) can have on the built environment. This is particularly true in the case of planning for natural hazards where communities must balance development pressures with detailed information on the nature and extent of hazards. Planning for natural hazards therefore calls for local plans to include inventories, policies, and ordinances to guide the safe development of areas that history shows can be greatly impacted by infrequent but large-magnitude natural hazard events. These inventories should include the compendium of hazards facing the community, the built environment at risk, the personal property that may be damaged by hazard events, and most of all, the people who live in the shadow of these hazards.

Kick-Off Meeting Materials and Presentation

Disaster Mitigation Planning for
The City of Santa Monica, California
Introduction Materials for Kick-Off Meeting of the Advisory Committee
July 2023

Proposed Schedule

It is the City's intent to complete this project in the next eight months, and preferably at the end of the first quarter of 2024. The time it takes for the State's Office of Emergency Services and the FEMA Region IX Office to review and approve the document is not included in this estimate as it not known what their schedule will be at the time the Plan is submitted to them for approval. In our experience, the approval process from these agencies takes about four to five months, with that timeframe dependent on several variables that are beyond our control. Our proposed schedule to complete Santa Monica's Disaster Mitigation Plan is as follows:

1. Hold the kick-off meeting with members of the Committee – as soon as possible in late August or early September 2023.
2. Update and prepare the first draft of the Plan, including HazUS analyses to estimate the losses that could occur as a result of two earthquake scenarios – to be submitted within 2 months after kick-off meeting.
3. Resilience Committee and designated City staff review the Draft – 3 weeks. While the review is ongoing, we will prepare the materials for the public workshops.
4. Conduct public workshops – 2 presentations spaced 2 weeks apart, and meet with Committee.
5. Incorporate comments from Committee, City staff and public into the Final Draft – submit Final Draft 4 weeks after last public workshop.
6. Hold meeting with Committee to discuss action items, including prioritization, timeline and responsible agency or City department.
7. City will place Final Draft on its website and make hard-copies available at the City offices. Public review to take 1 month. At the same time, Committee members will also review Final Draft.
8. Incorporate final comments and prepare Final Plan – 3 weeks.
9. Allow City Council to review the document prior to adoption of the Plan – 2 to 3 weeks.
10. Prepare cross-walk and final packaging of document for submittal to FEMA and Cal-EMA – 2 weeks.

Proposed Report Format

The 2015-2016 Plan and the new Technical Background Report to the Safety Element will be used as much as possible to manage costs. However, City-specific discussions regarding its vulnerabilities will be developed and incorporated into the text. The action items will be developed with extensive participation from the Resilience Committee, other City staff and the community.

The report will consist of three main parts and various sections as described below.

Kick-Off Meeting Materials and Presentation

Disaster Mitigation Planning for
The City of Santa Monica, California
Introduction Materials for Kick-Off Meeting of the Advisory Committee
July 2023

Part I: Mitigation Action Plan

- **Executive Summary: Five-Year Action Plan:** Overview of the Hazard Mitigation Plan's mission, goals, and action items.
- **Section 1: Introduction:** Describes the background and purpose of developing the Local Natural Hazard Mitigation Plan Update for the City of Santa Monica.
- **Section 2: Community Profile:** Presents the history, geography, demographics, and socio-economics of the City of Santa Monica. It serves as a tool to provide an historical perspective of natural hazards in the city, and a springboard to understand how natural hazards can impact the city in the future.
- **Section 3: Risk Assessment**: Summarizes the findings regarding hazard identification, vulnerability and risk associated with natural hazards in the city of Santa Monica.
- **Section 4: Multi-Hazard and Hazard-Specific Goals and Action Items**: Summarizes the process used to develop goals and action items. Section 4 is the "Policy Document" that establishes the specific action items that the City will undertake to reduce its risk to natural hazards.
- **Section 5: Plan Maintenance**: Establishes procedures for Plan implementation, monitoring and evaluation.

Part II: Hazard Analysis

Each of the hazard-specific sections includes information on the history, hazard causes and characteristics, hazard assessment, goals and action items, and local, state, and national resources available to mitigate or reduce the impact of these hazards. The hazards that we propose to address in the City of Santa Monica are listed below. However, an analysis of potential hazards by the Advisory Committee during the Kick-off meeting may result in a modified scope.

- **Section 6:** Earthquakes and earthquake-induced damage
- **Section 7:** Slope instability and other geologic hazards
- **Section 8:** Floods, and catastrophic inundation due to failure of reservoirs
- **Section 9:** Climate change and severe weather hazards
- **Section 10:** Hazardous materials management
- **Section 11:** Hazards associated with the Santa Monica Airport and its re-development

Part III: Resources and Informational Materials

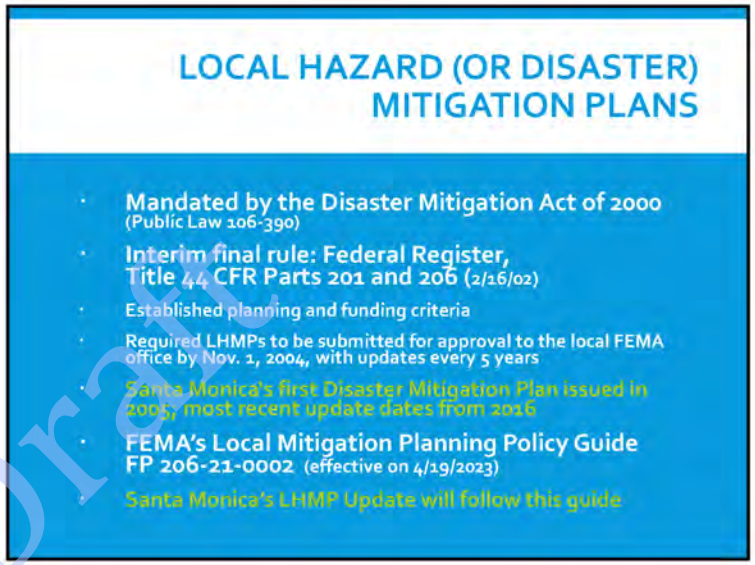
The appendices will provide users of Santa Monica's Local Natural Hazards Mitigation Plan with additional information to assist them in understanding the contents of the Mitigation Plan, and potential resources to assist them with implementation. Several of these appendices are also required by FEMA to be included in LHMPs.

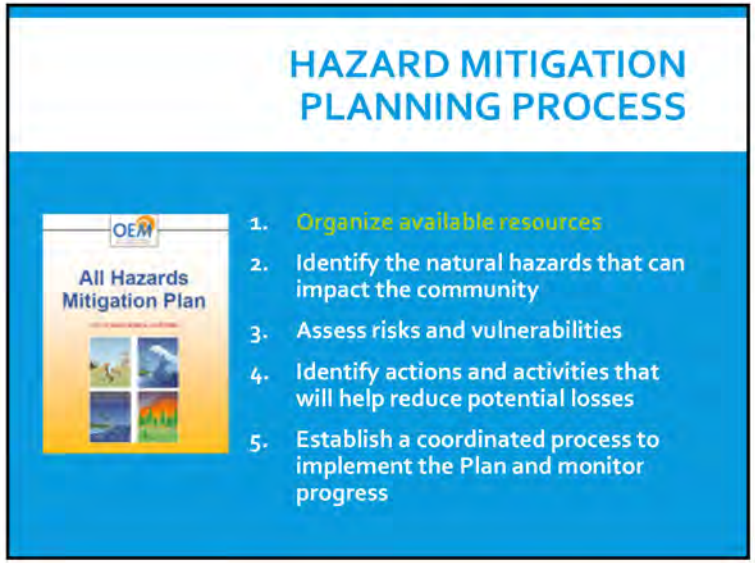
- **Appendix A:** Plan Resource Directory
- **Appendix B:** Public Participation Process
- **Appendix C:** Benefit / Cost Analysis
- **Appendix D:** Acronyms
- **Appendix E:** Glossary

Kick-Off Meeting Materials and Presentation

- **Appendix F:** California Disasters
- **Appendix G:** List of Major Dams in Los Angeles County
- **Appendix H:** Maps
- **Appendix I:** References
- **Appendix J:** Plan Adoption

Kick-Off Meeting Materials and Presentation





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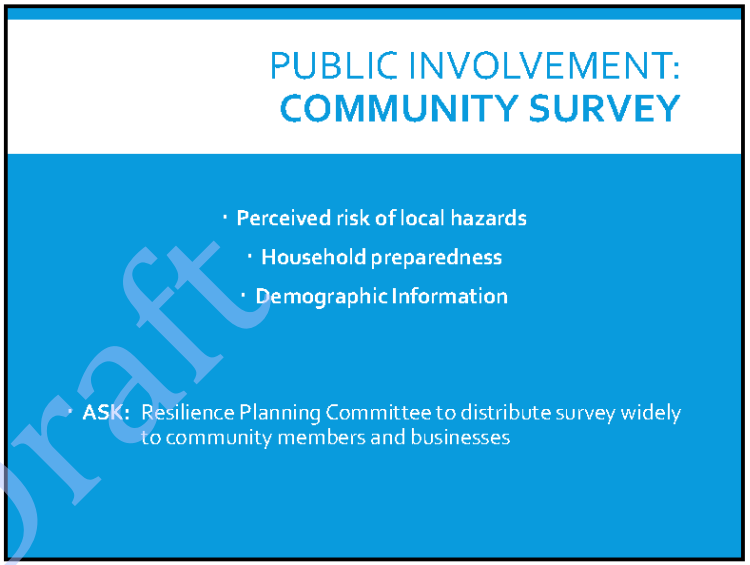


Kick-Off Meeting Materials and Presentation

PHASE 5: IMPLEMENT THE PLAN AND MONITOR PROGRESS

- Adopt the plan
- Implement mitigation measures
- Monitor, evaluate and update plan
- Continue public involvement



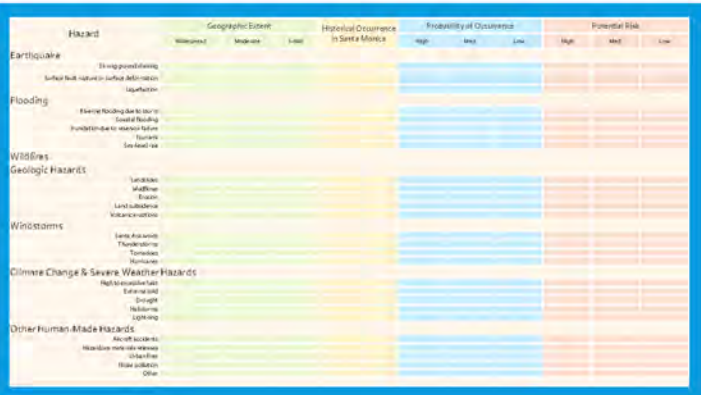

SANTA MONICA'S CURRENT MITIGATION PLANNING STATUS

Phase 1:	Resilience Planning Committee has been established; potential additional stakeholders need to be identified; public survey & workshops to be conducted
Phase 2:	Hazards have been identified, profiled and risks by geographic area have been assessed
Phase 3:	Vulnerabilities and loss estimations are being conducted for different hazards (HazUS)
Phase 4:	Need to evaluate existing actions and develop new goals, objectives, and mitigation actions; need to prioritize these
Phase 5:	Evaluate the implementation strategy used for the 2016 Plan; modify if / as appropriate

PLAN WILL ADDRESS

- Seismic Hazards
- Geologic Hazards
- Flooding Hazards
- Fire Hazards
- Climate Change and Extreme Weather Hazards
- Hazardous Materials Management
- Airport Hazards

HAZARDS MATRIX



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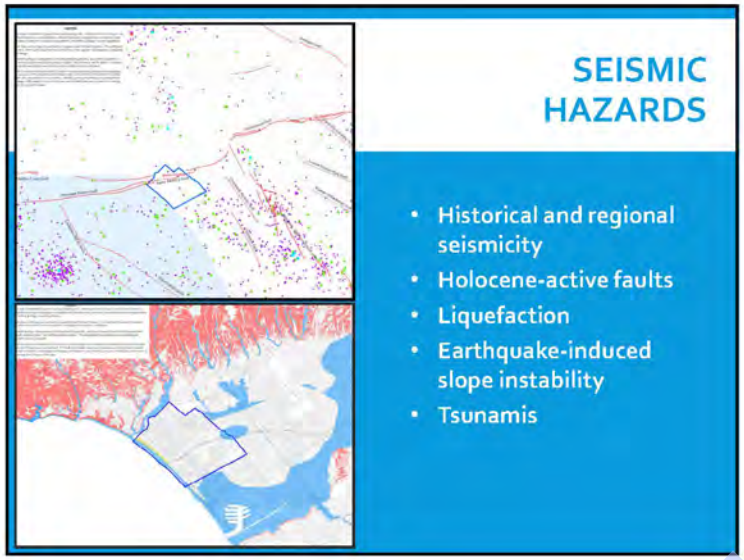

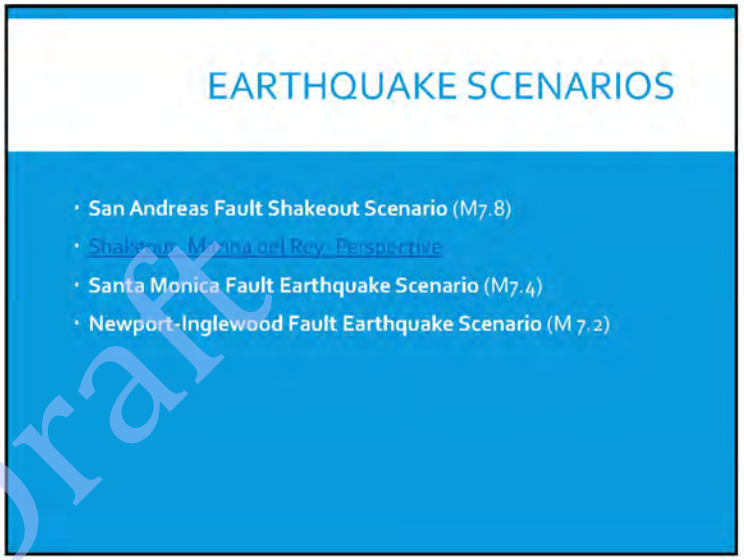

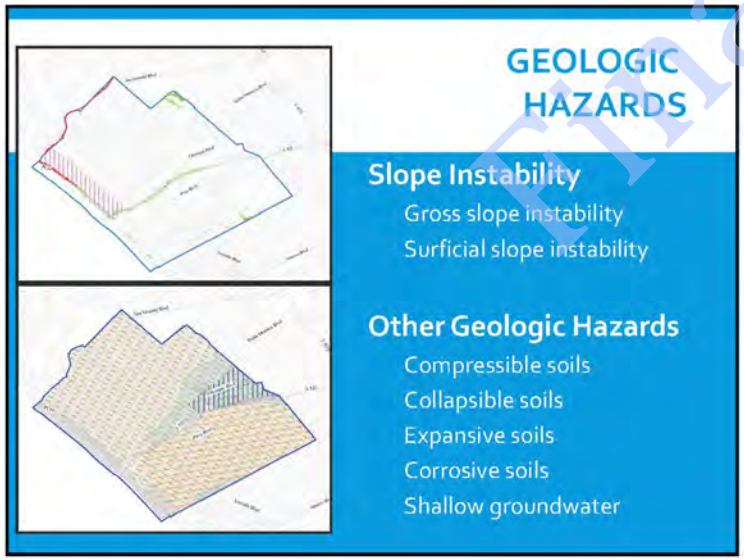

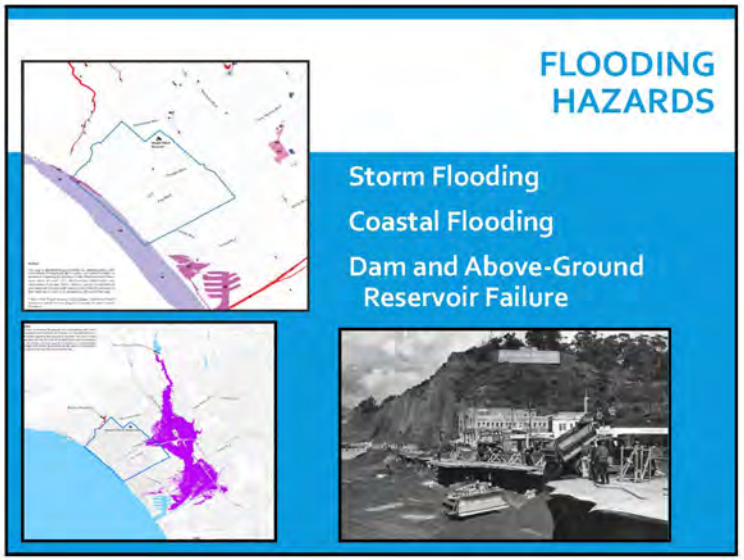

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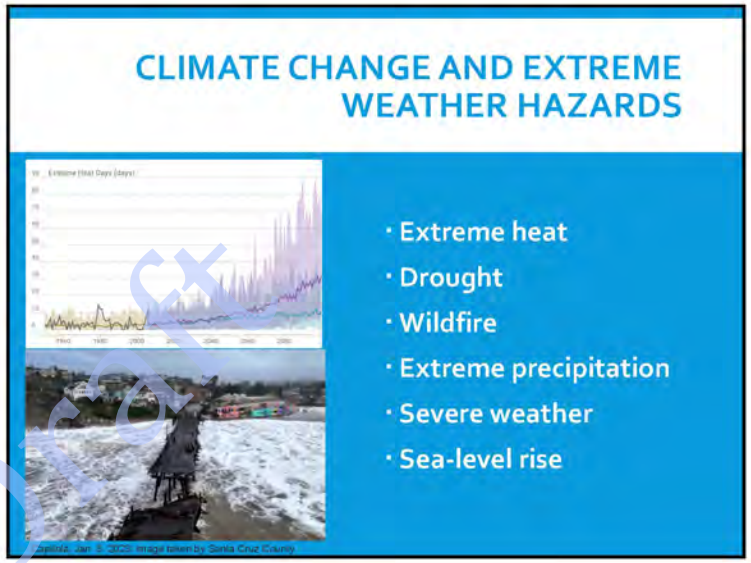

Kick-Off Meeting Materials and Presentation

ISSUES NOT COVERED BUT ADDRESSED BY REFERENCE

- Public health hazards related to vector control
- Pandemics
- Firearms
- Cybersecurity
- Urban wildlife
- Transportation hazards

YOUR ROLE IN THE LHMP PROCESS

Attend Meetings

- Kick-off meeting ✓
- One to two working meetings to help draft and prioritize action items

Review Draft sections of the LHMP

- Provide edits and feedback

Monitor effectiveness of the Plan

SCHEDULE

2023	
September:	Kick-off meeting
September – October:	Update and prepare first draft.
October:	Public survey
November:	Resilience Committee members and designated City staff review the Draft. ECI prepares materials for public workshops
2024	
January:	Conduct public workshops; meet with committee
February:	Prepare final draft
March:	Meet with committee to discuss action items; publish Final Draft on City's website; committee members review Final Draft
April:	Prepare FINAL Plan
May:	City Council reviews and adopts Plan. ECI prepares cross-walk and final package for submittal to agencies

THANK YOU!!

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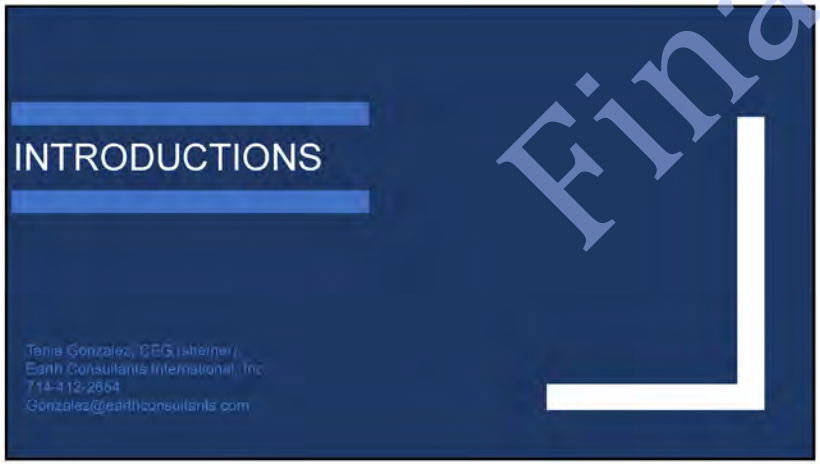
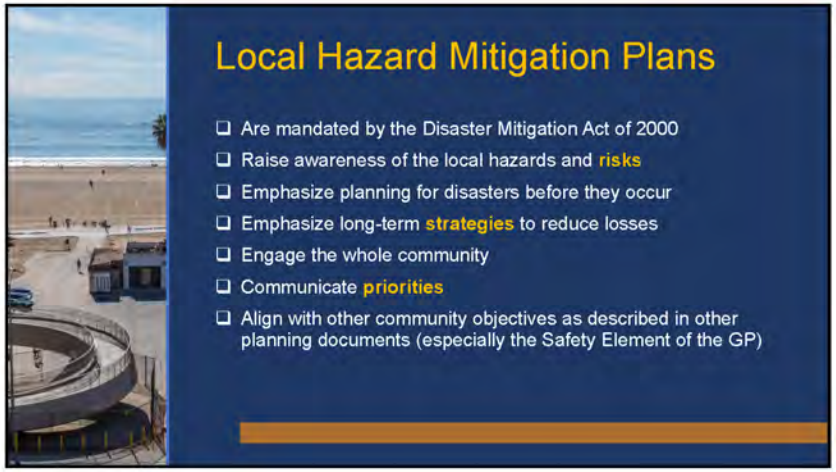
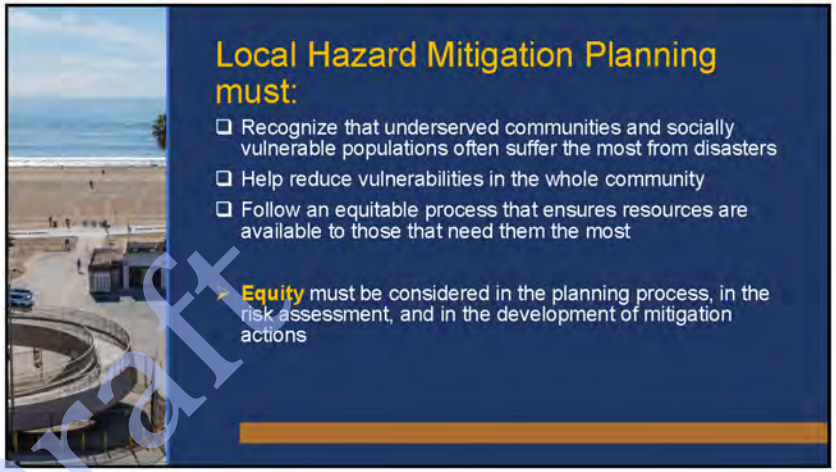
tgonzalez@earthconsultants.com

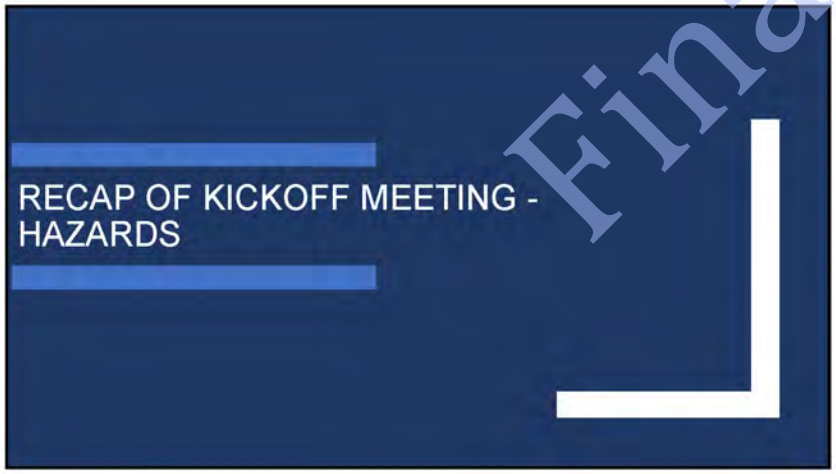
January 23, 2024 Resilience Planning and Advisory Committees Workshop Presentation



January 23, 2024 Resilience Planning and Advisory Committees Workshop Presentation







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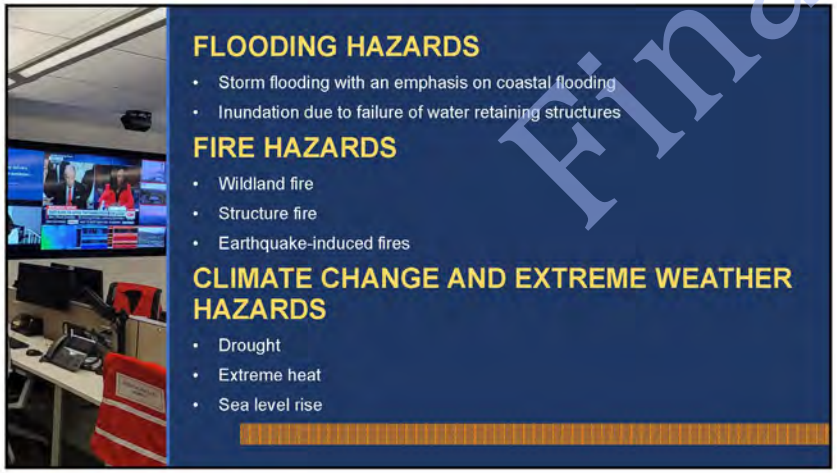

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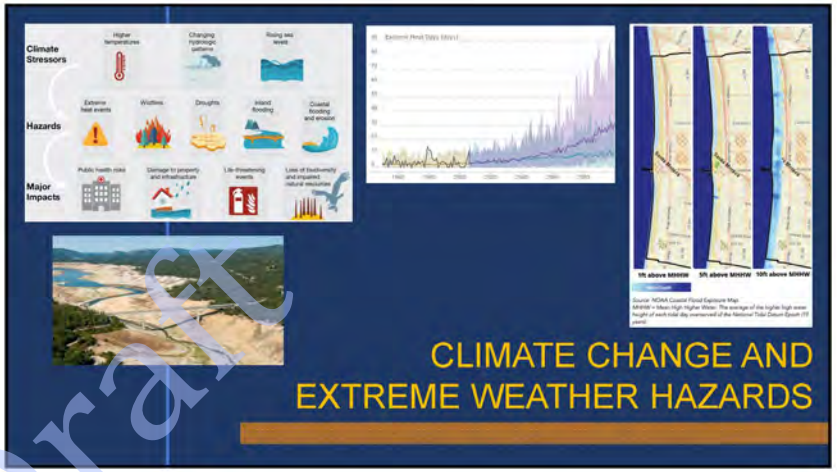

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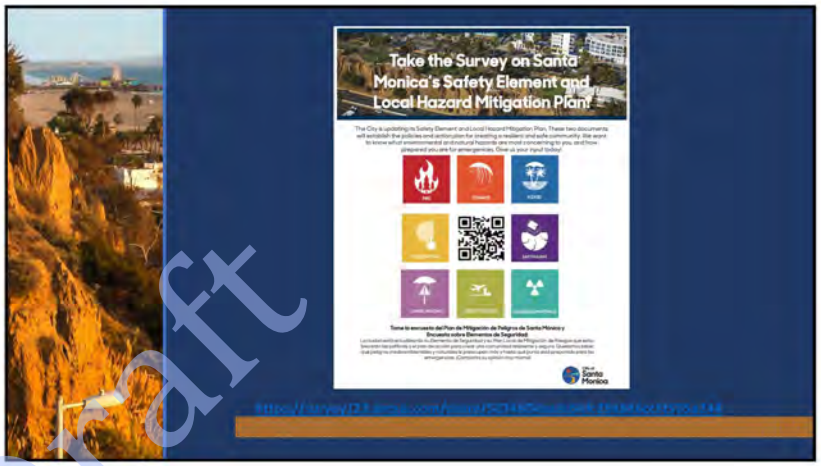

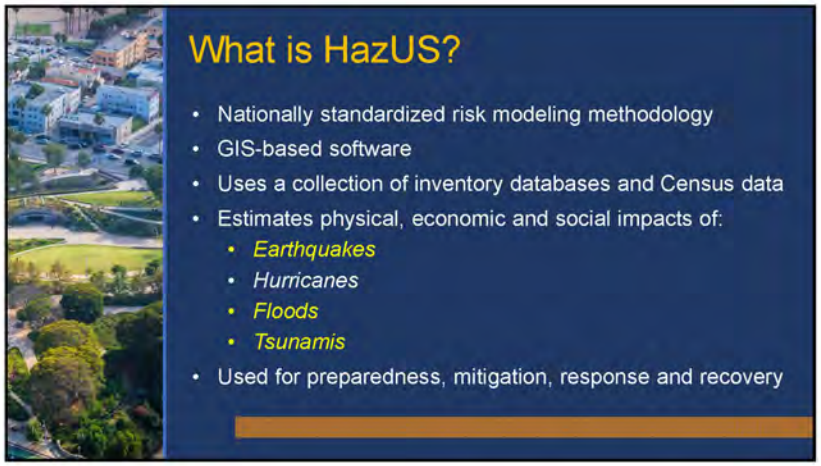

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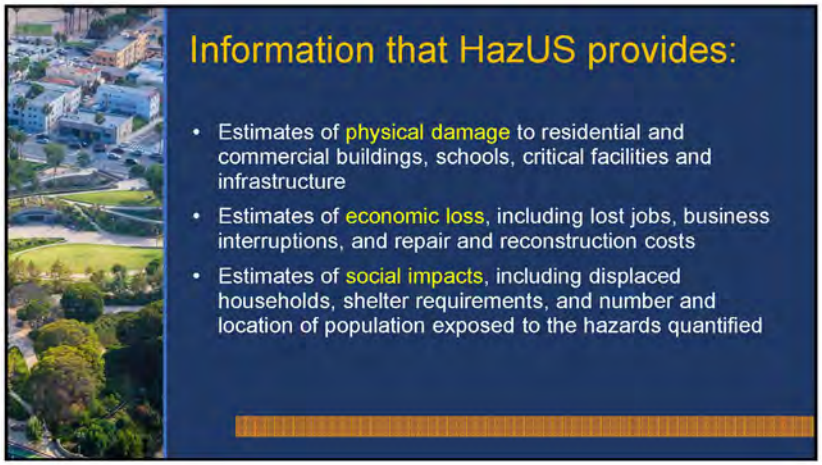

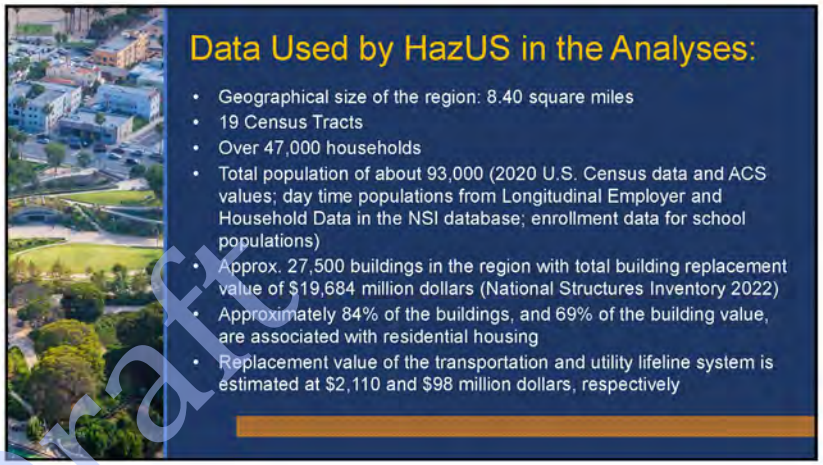

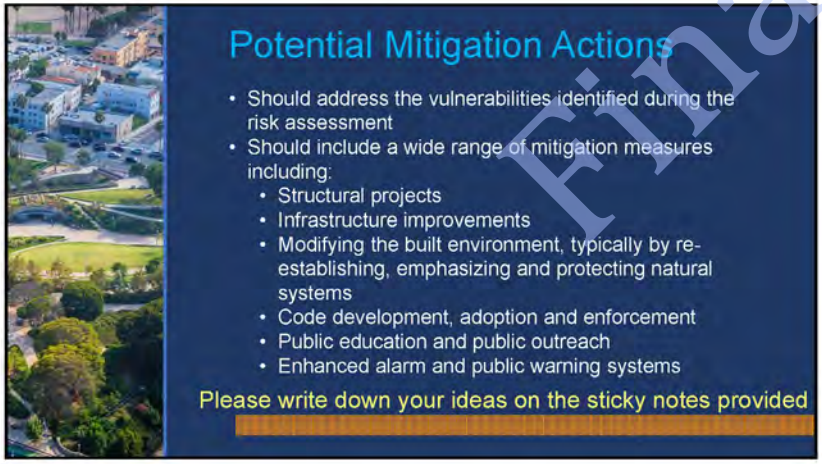

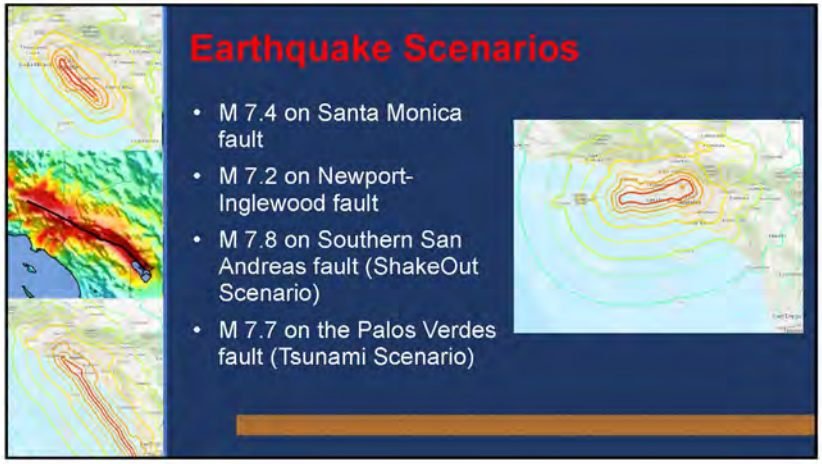

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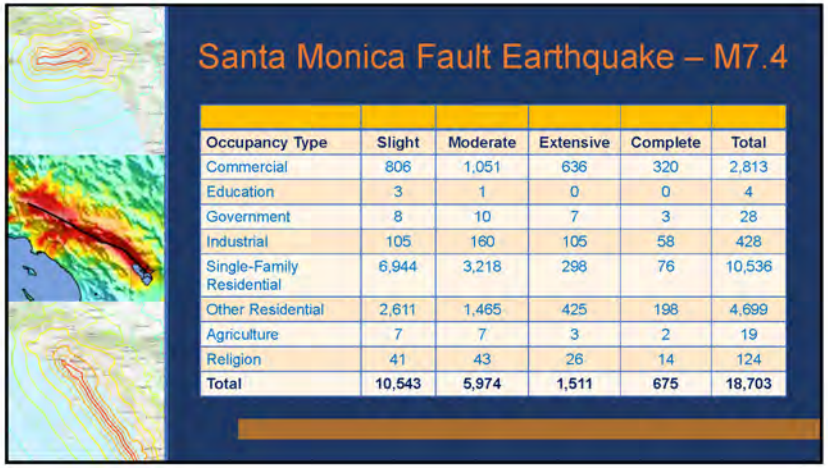
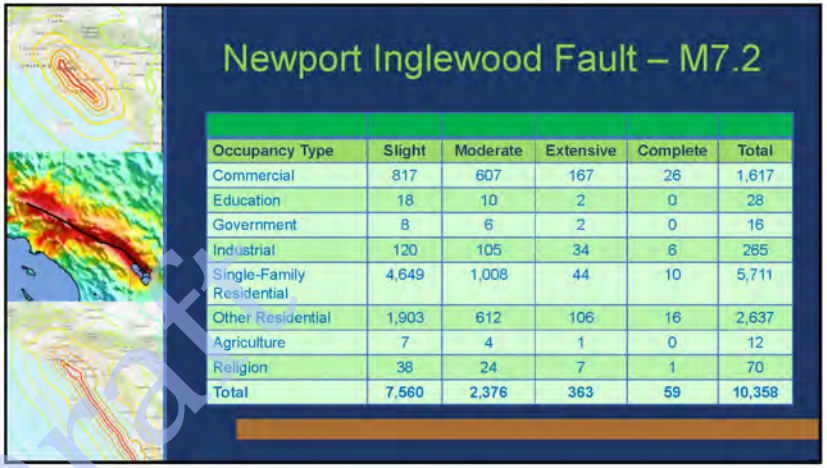
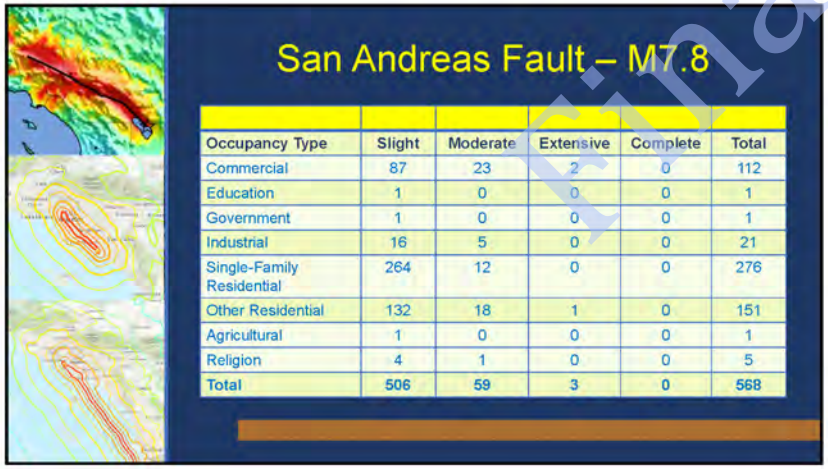


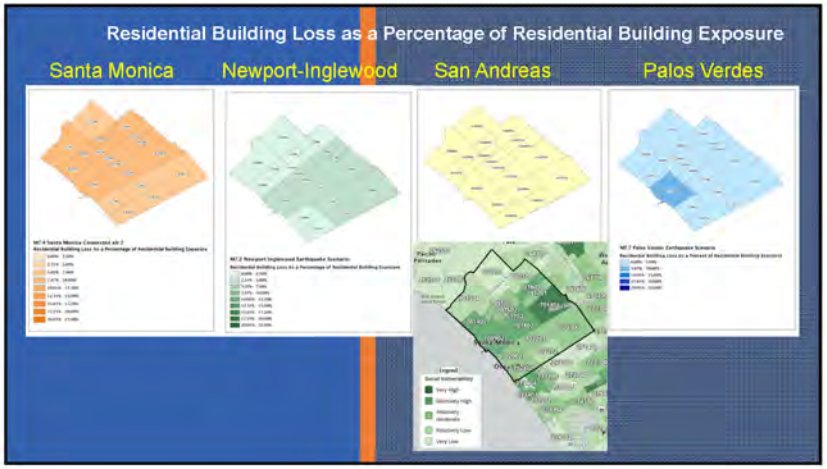
Occupancy Type	Slight	Moderate	Extensive	Complete	Total
Commercial	806	1,051	636	320	2,813
Education	3	1	0	0	4
Government	8	10	7	3	28
Industrial	105	160	105	58	428
Single-Family Residential	6,944	3,218	298	76	10,536
Other Residential	2,611	1,465	425	198	4,699
Agriculture	7	7	3	2	19
Religion	41	43	26	14	124
Total	**10,543**	**5,974**	**1,511**	**675**	**18,703**



Occupancy Type	Slight	Moderate	Extensive	Complete	Total
Commercial	817	607	167	26	1,617
Education	18	10	2	0	28
Government	8	6	2	0	16
Industrial	120	105	34	6	265
Single-Family Residential	4,649	1,008	44	10	5,711
Other Residential	1,903	612	106	16	2,637
Agriculture	7	4	1	0	12
Religion	38	24	7	1	70
Total	**7,560**	**2,376**	**363**	**59**	**10,358**



Occupancy Type	Slight	Moderate	Extensive	Complete	Total
Commercial	87	23	2	0	112
Education	1	0	0	0	1
Government	1	0	0	0	1
Industrial	16	5	0	0	21
Single-Family Residential	264	12	0	0	276
Other Residential	132	18	1	0	151
Agricultural	1	0	0	0	1
Religion	4	1	0	0	5
Total	**506**	**59**	**3**	**0**	**568**



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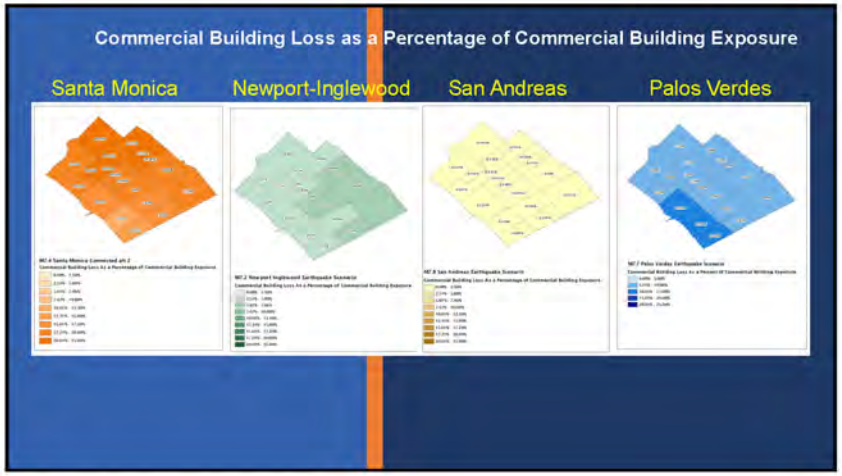
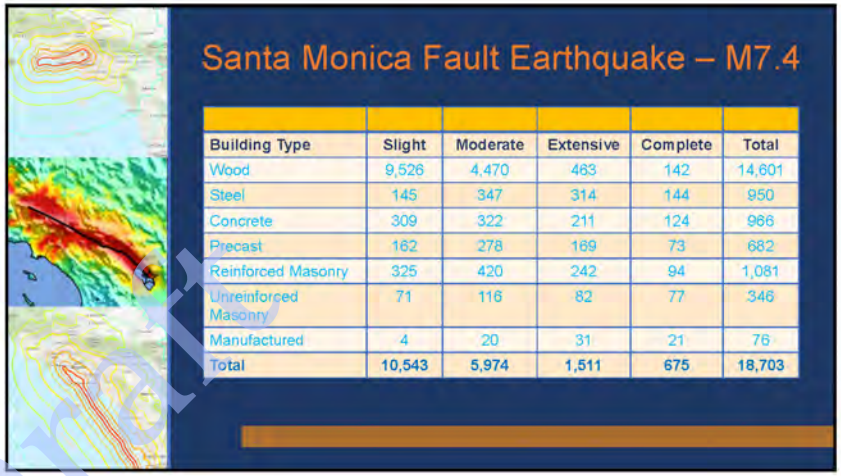
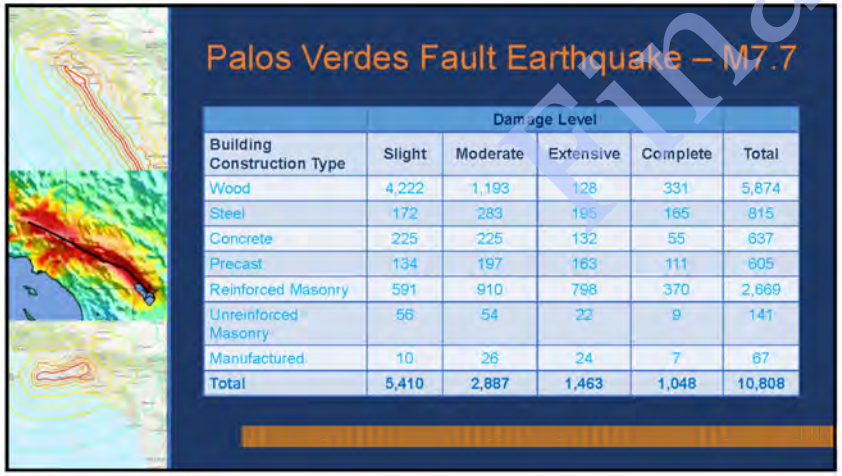




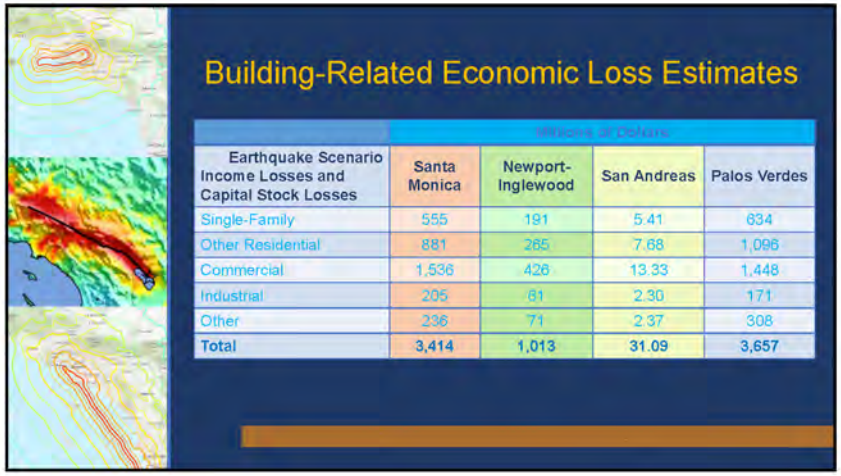
Santa Monica Fault Earthquake – M7.4

Building Type	Slight	Moderate	Extensive	Complete	Total
Wood	9,526	4,470	463	142	14,601
Steel	145	347	314	144	950
Concrete	309	322	211	124	966
Precast	162	278	169	73	682
Reinforced Masonry	325	420	242	94	1,081
Unreinforced Masonry	71	116	82	77	346
Manufactured	4	20	31	21	76
Total	**10,543**	**5,974**	**1,511**	**675**	**18,703**



Palos Verdes Fault Earthquake – M7.7

	Damage Level				
Building Construction Type	Slight	Moderate	Extensive	Complete	Total
Wood	4,222	1,193	128	331	5,874
Steel	172	283	195	165	815
Concrete	225	225	132	55	637
Precast	134	197	163	111	605
Reinforced Masonry	591	910	798	370	2,669
Unreinforced Masonry	56	54	22	9	141
Manufactured	10	26	24	7	67
Total	**5,410**	**2,887**	**1,463**	**1,048**	**10,808**



Building-Related Economic Loss Estimates

Earthquake Scenario Income Losses and Capital Stock Losses	Santa Monica	Newport-Inglewood	San Andreas	Palos Verdes
Single-Family	555	191	5.41	634
Other Residential	881	265	7.68	1,096
Commercial	1,536	426	13.33	1,448
Industrial	205	81	2.30	171
Other	236	71	2.37	308
Total	**3,414**	**1,013**	**31.09**	**3,657**

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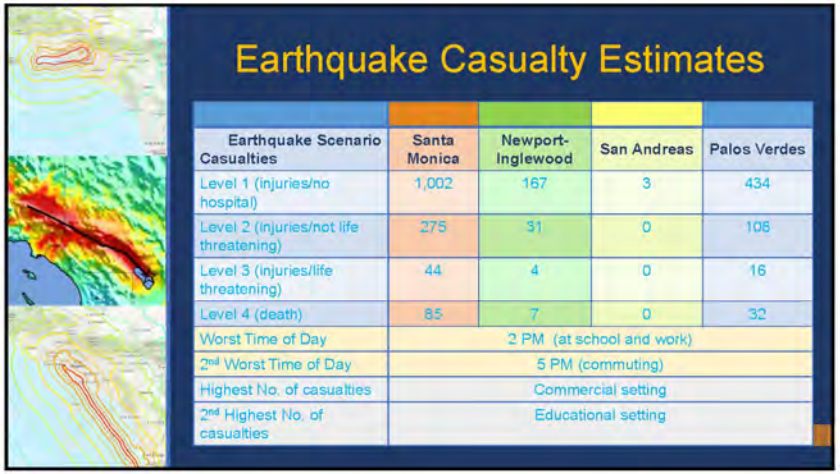
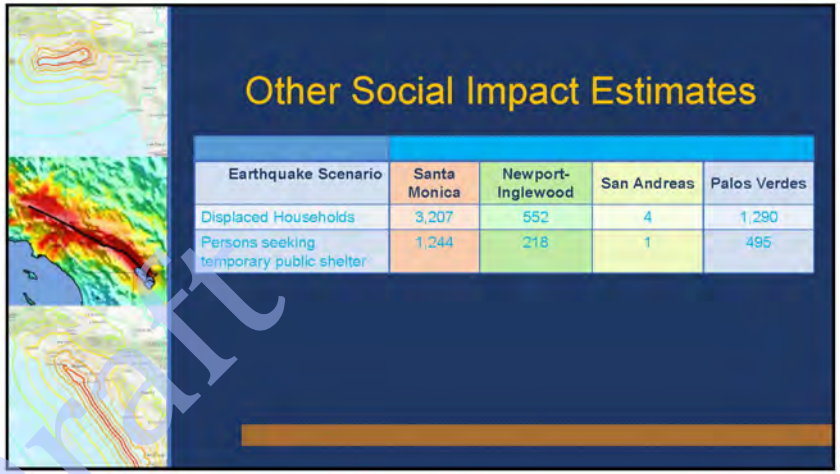
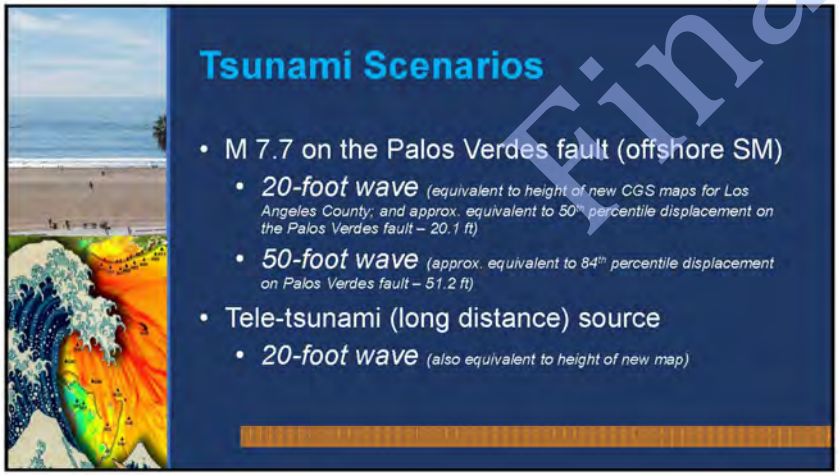


Earthquake Scenario Casualties	Santa Monica	Newport-Inglewood	San Andreas	Palos Verdes
Level 1 (injuries/no hospital)	1,002	167	3	434
Level 2 (injuries/not life threatening)	275	31	0	106
Level 3 (injuries/life threatening)	44	4	0	16
Level 4 (death)	85	7	0	32
Worst Time of Day	2 PM (at school and work)			
2nd Worst Time of Day	5 PM (commuting)			
Highest No. of casualties	Commercial setting			
2nd Highest No. of casualties	Educational setting			



Earthquake Scenario	Santa Monica	Newport-Inglewood	San Andreas	Palos Verdes
Displaced Households	3,207	552	4	1,290
Persons seeking temporary public shelter	1,244	218	1	495



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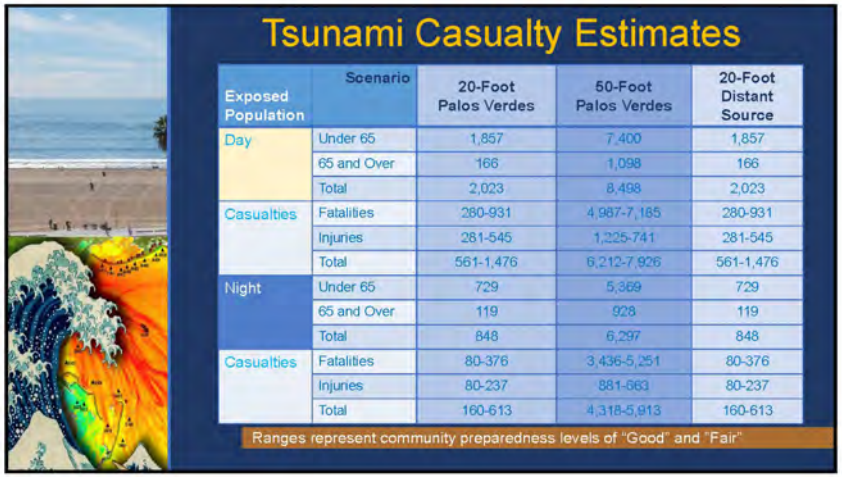
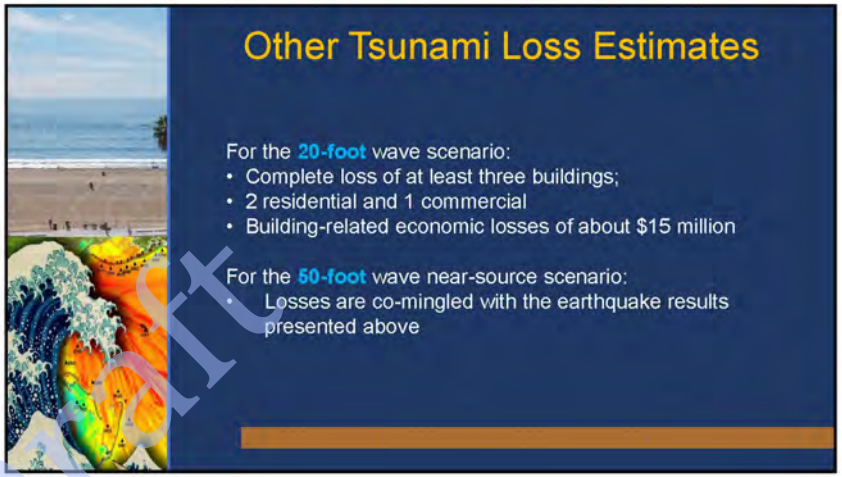
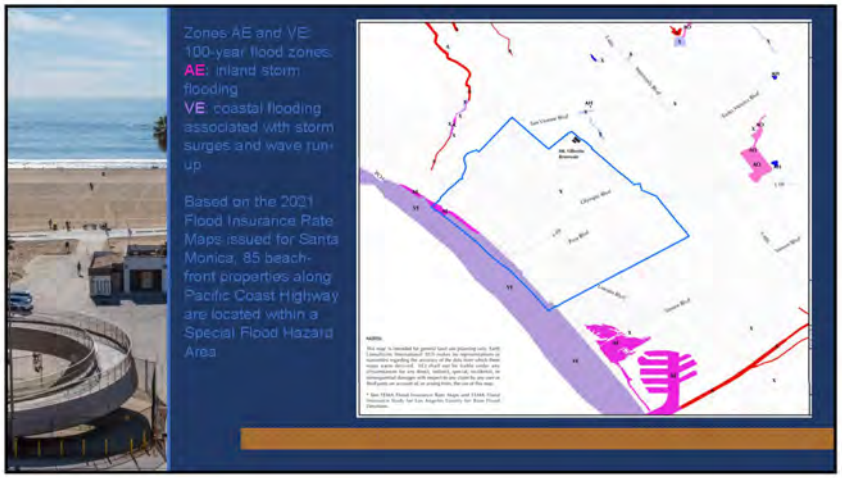


Exposed Population	Scenario	20-Foot Palos Verdes	50-Foot Palos Verdes	20-Foot Distant Source
Day	Under 65	1,857	7,400	1,857
	65 and Over	166	1,098	166
	Total	2,023	8,498	2,023
Casualties	Fatalities	280-931	4,987-7,165	280-931
	Injuries	281-545	1,225-741	281-545
	Total	561-1,476	6,212-7,926	561-1,476
Night	Under 65	729	5,369	729
	65 and Over	119	928	119
	Total	848	6,297	848
Casualties	Fatalities	80-376	3,436-5,251	80-376
	Injuries	80-237	881-663	80-237
	Total	160-613	4,318-5,913	160-613





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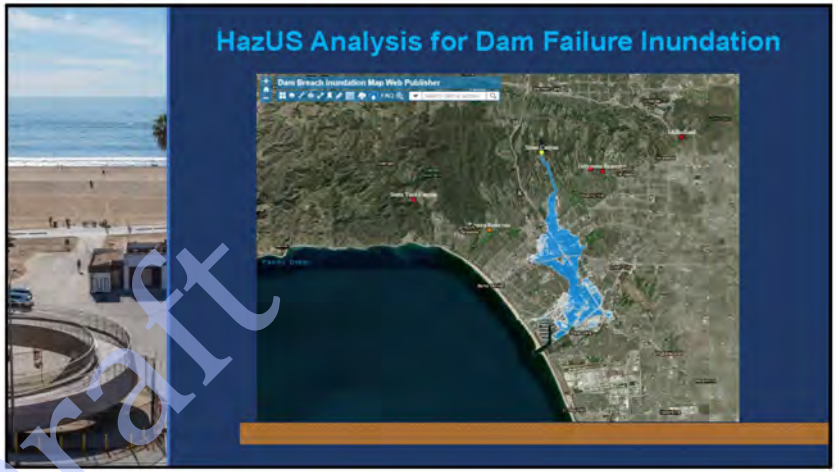

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SUMMARY

	Deaths	Injuries	Buildings with > Moderate Damage	Displaced Households	Bldg -Related Economic Losses
Earthquake Only	0 – 85	0 – 1,321	64 – 8,160	4 – 3,207	$31 – 3,667 Million
Tsunami	80 – 7,185	80 - 741	3	1,290 (includes due to EQ)	>$15 Million
Landslide					
Coastal Flood	0	0	Few	3 - 4	< $4.62 Million
Inundation due to Dam Failure	0	Few?	214	464	$227.17 Million
Wildfire					
Structure Fire					
After-Earthquake Fire			3 – 5 ignitions; could affect several bldgs.	30 - 165	$20 – 80 Million
Sea Level Rise					$189 Million
Extreme Heat					
Strong Winds (Santa Anas)					
Hazmat Release					
Aircraft Crash					

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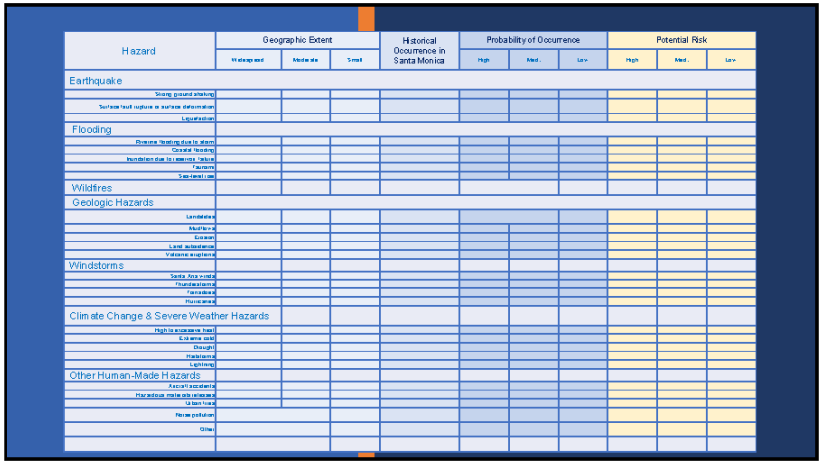
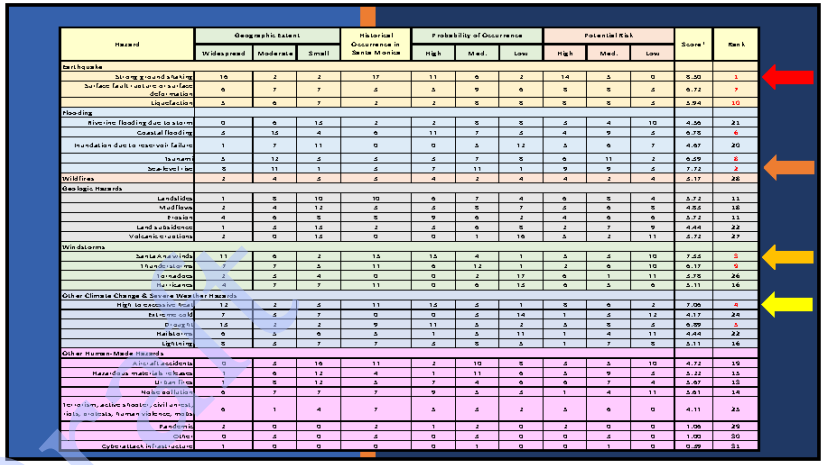
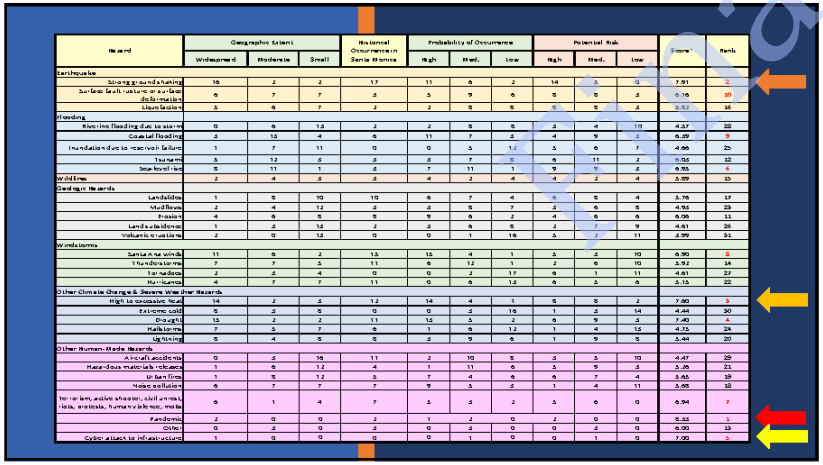


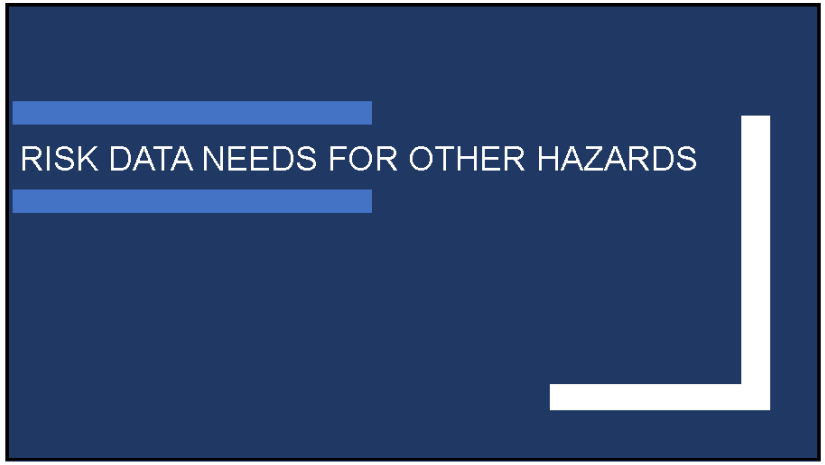
Hazard	Geographic Extent			Historical Occurrence in Santa Monica	Probability of Occurrence			Potential Risk		
	Widespread	Moderate	Small		High	Med.	Low	High	Med.	Low
Earthquake										
Strong ground shaking										
Surface fault rupture or surface deformation										
Liquefaction										
Flooding										
Riverine flooding due to storm										
Coastal flooding										
Inundation due to reservoir failure										
Tsunami										
Sea-level rise										
Wildfires										
Geologic Hazards										
Landslides										
Mudflows										
Erosion										
Land subsidence										
Volcanic eruptions										
Windstorms										
Santa Ana winds										
Thunderstorms										
Tornadoes										
Hurricanes										
Climate Change & Severe Weather Hazards										
High to excessive heat										
Extreme cold										
Drought										
Hailstorms										
Lightning										
Other Human-Made Hazards										
Aircraft accidents										
Hazardous materials releases										
Urban fires										
Noise pollution										
Other										



Hazard	Geographic Extent			Historical Occurrence in Santa Monica	Probability of Occurrence			Potential Risk			Score[1]	Rank
	Widespread	Moderate	Small		High	Med.	Low	High	Med.	Low		
Earthquake												
Strong ground shaking	16	2	2	17	11	6	2	14	5	0	5.30	1
Surface fault rupture or surface deformation	6	7	7	5	5	9	6	5	5	5	6.72	7
Liquefaction	5	6	7	2	2	5	5	5	5	5	5.94	10
Flooding												
Riverine flooding due to storm	0	6	15	2	2	5	5	5	4	10	4.56	21
Coastal flooding	5	15	4	6	11	7	5	4	9	5	6.75	6
Inundation due to reservoir failure	1	7	11	0	0	5	12	5	6	7	4.67	20
Tsunami	5	12	5	5	5	7	5	6	11	2	6.59	8
Sea-level rise	5	11	1	5	7	11	1	9	9	5	7.72	2
Wildfires	2	4	5	5	4	2	4	4	2	4	5.17	26
Geologic Hazards												
Landslides	1	5	10	10	6	7	4	6	5	4	5.72	11
Mudflows	2	4	12	5	5	5	7	5	6	5	4.86	18
Erosion	4	5	5	5	9	6	2	4	6	6	5.72	11
Land subsidence	1	5	12	2	5	6	5	2	7	9	4.44	22
Volcanic eruptions	2	0	14	0	0	1	16	5	2	11	5.72	27
Windstorms												
Santa Ana winds	11	6	2	15	15	4	1	5	5	10	7.55	3
Thunderstorms	7	7	5	11	6	12	1	2	6	10	6.17	9
Tornadoes	2	5	4	0	0	2	17	6	1	11	5.75	26
Hurricanes	4	7	7	11	0	6	12	6	5	6	5.11	16
Other Climate Change & Severe Weather Hazards												
High to excessive heat	12	2	5	11	15	5	1	5	6	2	7.06	4
Extreme cold	7	5	7	0	0	5	14	1	5	12	4.17	29
Drought	15	2	2	9	11	5	2	5	5	5	6.39	5
Hailstorms	6	5	6	5	1	5	11	1	4	11	4.44	22
Lightning	5	5	7	7	5	5	1	1	7	5	5.11	16
Other Human-Made Hazards												
Aircraft accidents	0	5	15	11	2	10	5	5	5	10	4.72	19
Hazardous materials releases	1	6	12	4	1	11	6	5	9	5	5.22	13
Urban fires	1	5	12	5	7	4	6	5	7	4	5.97	13
Noise pollution	6	7	7	7	9	5	5	1	4	11	5.61	14
Terrorism, active shooter, civil unrest, riots, protests, human sickness, mass	6	1	4	7	5	5	2	5	6	0	4.11	25
Pandemic	2	0	0	2	1	2	0	2	0	0	1.06	29
Other	0	5	0	5	0	5	0	0	5	0	1.00	30
Cyber attack to infrastructure	1	0	0	0	0	1	0	0	1	0	0.39	31



Hazard	Geographic Extent			Historical Occurrence in Santa Monica	Probability of Occurrence			Potential Risk			Score	Rank
	Widespread	Moderate	Small		High	Med.	Low	High	Med.	Low		
Earthquake												
Strong ground shaking	16	2	2	17	11	6	2	14	5	0	7.91	2
Surface fault rupture or surface deformation	6	7	7	5	5	9	6	5	5	5	6.16	10
Liquefaction	5	6	7	2	2	5	5	5	5	5	5.72	16
Flooding												
Riverine flooding due to storm	0	6	15	2	2	5	5	5	4	10	4.67	28
Coastal flooding	5	15	4	6	11	7	5	4	9	5	6.39	8
Inundation due to reservoir failure	1	7	11	0	0	5	12	5	6	7	4.66	25
Tsunami	5	12	5	5	5	7	5	6	11	2	6.06	12
Sea-level rise	5	11	1	5	7	11	1	9	9	5	6.95	4
Wildfires	2	4	5	5	4	2	4	4	2	4	3.89	33
Geologic Hazards												
Landslides	1	5	10	10	6	7	4	6	5	4	5.76	17
Mudflows	2	4	12	5	5	5	7	5	6	5	4.96	23
Erosion	4	5	5	5	9	6	2	4	6	6	6.06	11
Land subsidence	1	5	12	2	5	6	5	2	7	9	4.61	26
Volcanic eruptions	2	0	14	0	0	1	16	5	2	11	5.99	31
Windstorms												
Santa Ana winds	11	6	2	15	15	4	1	5	5	10	6.90	3
Thunderstorms	7	7	5	11	6	12	1	2	6	10	5.92	14
Tornadoes	2	5	4	0	0	2	17	6	1	11	4.61	27
Hurricanes	4	7	7	11	0	6	12	6	5	6	5.13	22
Other Climate Change & Severe Weather Hazards												
High to excessive heat	14	2	5	12	14	4	1	5	5	2	7.60	5
Extreme cold	5	5	5	0	0	5	16	1	5	14	4.44	30
Drought	15	2	2	11	12	5	2	5	5	2	7.40	4
Hailstorms	7	5	7	6	1	6	12	1	4	13	4.75	24
Lightning	5	4	5	5	5	9	6	1	9	5	5.44	20
Other Human-Made Hazards												
Aircraft accidents	0	5	15	11	2	10	5	5	5	10	4.47	29
Hazardous materials releases	1	6	12	4	1	11	6	5	9	5	5.25	21
Urban fires	1	5	12	5	7	4	6	5	7	4	5.65	18
Noise pollution	6	7	7	7	9	5	5	1	4	11	5.65	18
Terrorism, active shooter, civil unrest, riots, protests, human sickness, mass	6	1	4	7	5	5	2	5	6	0	4.94	7
Pandemic	2	0	0	2	1	2	0	2	0	0	5.55	1
Other	0	5	0	5	0	5	0	0	5	0	6.00	13
Cyber attack to infrastructure	1	0	0	0	0	1	0	0	1	0	7.00	5



January 23, 2024 Resilience Planning and Advisory Committees Workshop Presentation

	Deaths	Injuries	Buildings with > Moderate Damage	Displaced Households	Bldg.-Related Economic Losses
Earthquake	0 – 85	0 – 1,321	64 – 8,160	4 – 3,207	$31 – 3,657 Million
Tsunami	80 – 7,185	80 - 741	3	1,290 (includes due to EQ)	>$15 Million
Landslide					
Coastal Flood	0	0	Few	3 - 4	<$4.62 Million
Inundation due to Dam Failure	0	Few?	214	464	$227.17 Million
Wildfire					
Structure Fire					
After-Earthquake Fire			3 – 5 ignitions; could affect several bldgs.	30 - 165	$20 – 80 Million
Sea Level Rise					$189 Million
Extreme Heat					
Strong Winds (Santa Anas)					
Hazmat Release					
Aircraft Crash					

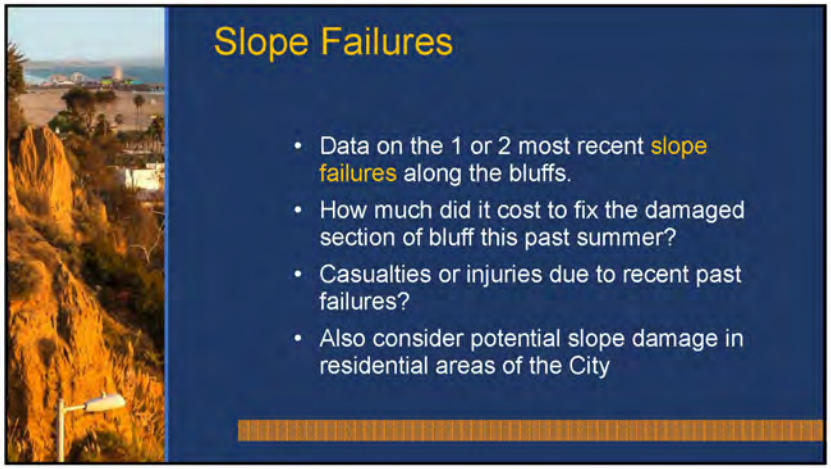
LUNCH

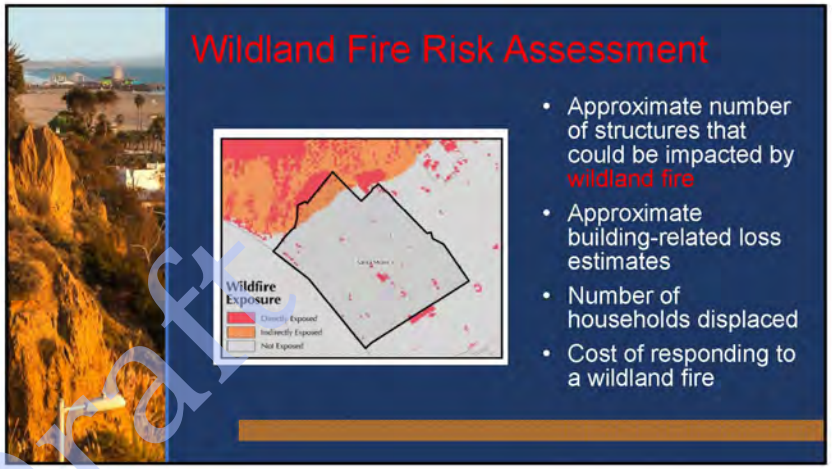
WORK SESSION

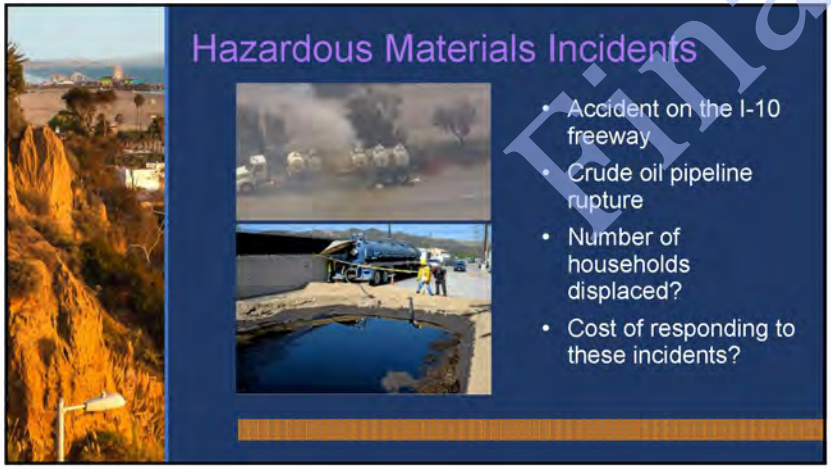
Possible Scenarios or Actual Events from Which We Can Estimate Risk & $$

- Loss of life and/or injuries?
- Number of buildings damaged
- Estimated $ loss due to damaged buildings and infrastructure
- Number of displaced households
- Number of people who will need shelter
- Cost of cleanup and reconstruction

January 23, 2024 Resilience Planning and Advisory Committees Workshop Presentation







January 23, 2024 Resilience Planning and Advisory Committees Workshop Presentation

Flyers for Community Survey and Community Workshops

The City is updating its Safety Element and Local Hazard Mitigation Plan. These two documents will establish the policies and action plan for creating a resilient and safe community. We want to know what environmental and natural hazards are most concerning to you, and how prepared you are for emergenices. Give us your input today!

Tome la encuesta del Plan de Mitigación de Peligros de Santa Mónica y Encuesta sobre Elementos de Seguridad:

La ciudad está actualizando su Elemento de Seguridad y su Plan Local de Mitigación de Riesgos que establecerán las políticas y el plan de acción para crear una comunidad resistente y segura. Queremos saber qué peligros medioambientales y naturales le preocupan más y hasta qué punto está preparado para las emergencias. ¡Comparta su opinión hoy mismo!

City of Santa Monica

Flyers for Community Survey and Community Workshops

TALLERES COMUNITARIOS LOCALES DE MITIGACIÓN DE RIESGOS

Infórmese más a fondo sobre los peligros naturales en Santa Monica.
¡Haga preguntas! Comparta sus ideas de cómo contribuir a hacer Santa Monica una ciudad más resiliente.
¡Participe con nosotros en uno de los dos talleres gratuitos para la comunidad!

LOCAL HAZARD MITIGATION COMMUNITY WORKSHOPS

Find out more about Santa Monica's natural hazards. Ask questions! Share your thoughts on how to make Santa Monica a more resilient city. Join us at one of our two free community workshops!

COMMUNITY WORKSHOP #1
TALLER COMUNITARIO #1

MARTES, 30 DE ABRIL
TUESDAY, APRIL 30
6:00 - 7:30 PM

VIRGINIA AVE PARK
Thelma Terry Meeting Room
2200 Virginia Ave
Santa Monica, CA 90404

Presentado en español con interpretación disponible al inglés / Hosted in Spanish with English language translation available

COMMUNITY WORKSHOP #2
TALLER COMUNITARIO #2

JUEVES, 2 DE MAYO
THURSDAY, MAY 2
6:00 - 7:30 PM

MONTANA AVE LIBRARY
Meeting Room
1704 Montana Ave
Santa Monica, CA 90403

Hosted in English with Spanish language translation available / Presentado en inglés con interpretación disponible al español

Light refreshments will be served.
Se servirán refrigerios ligeros.

City of Santa Monica

Questions? ¿Preguntas?
Email: OEM@santamonica.gov

April 30, 2024 Public Workshop Presentation (Spanish Version)

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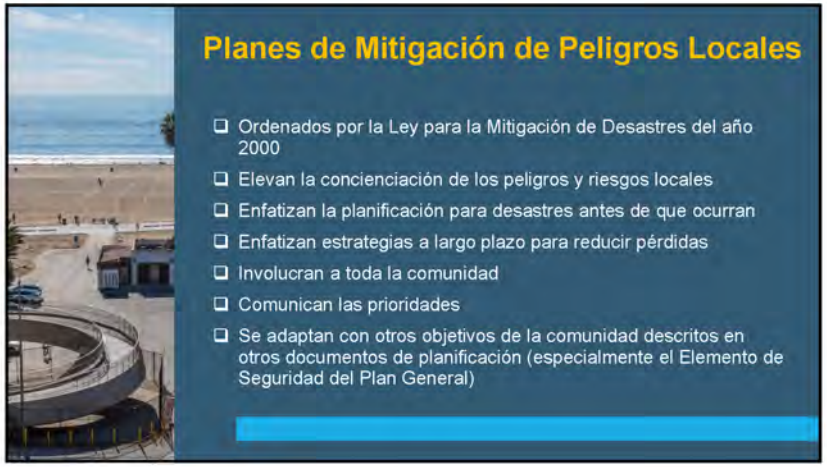

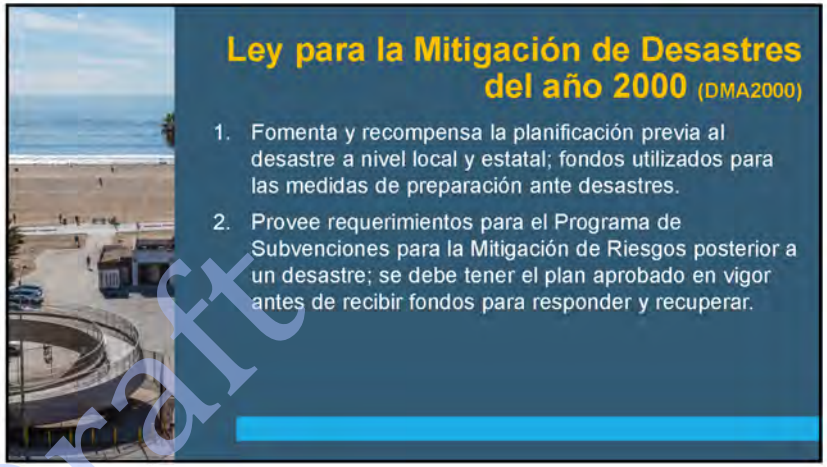

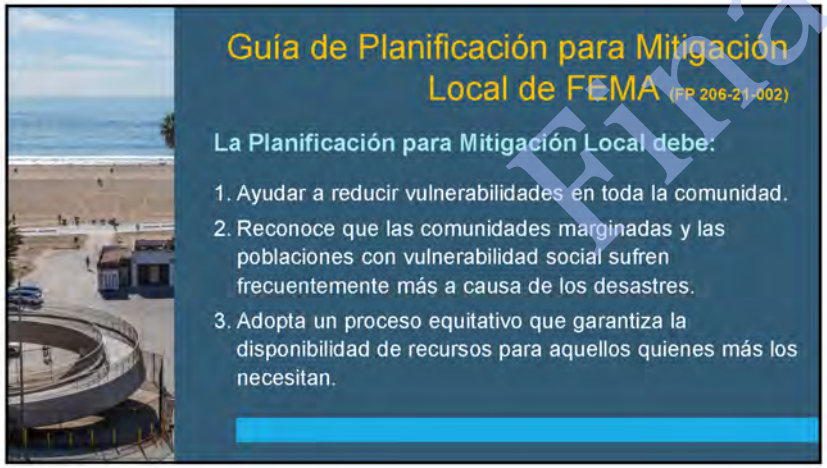

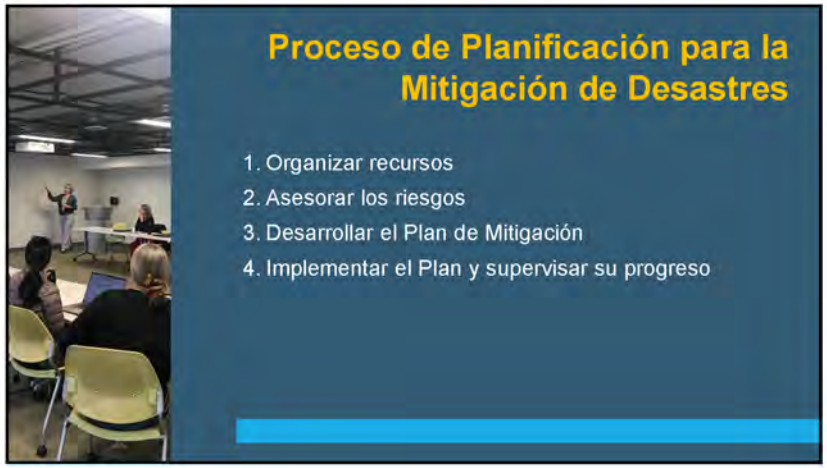

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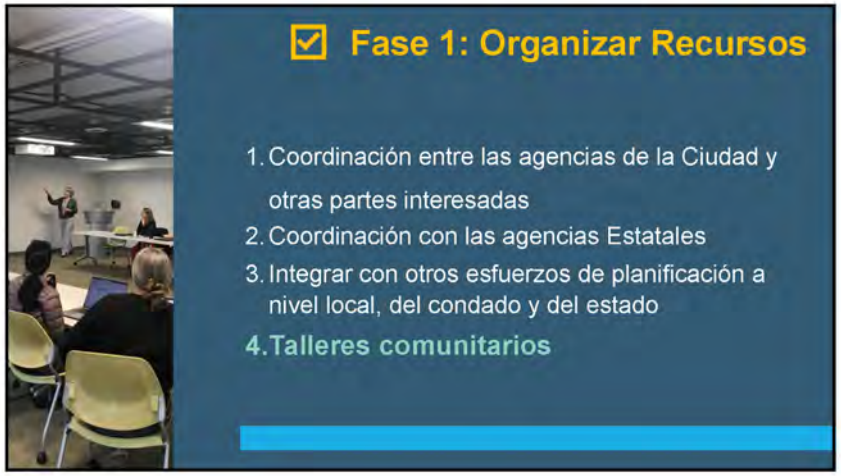

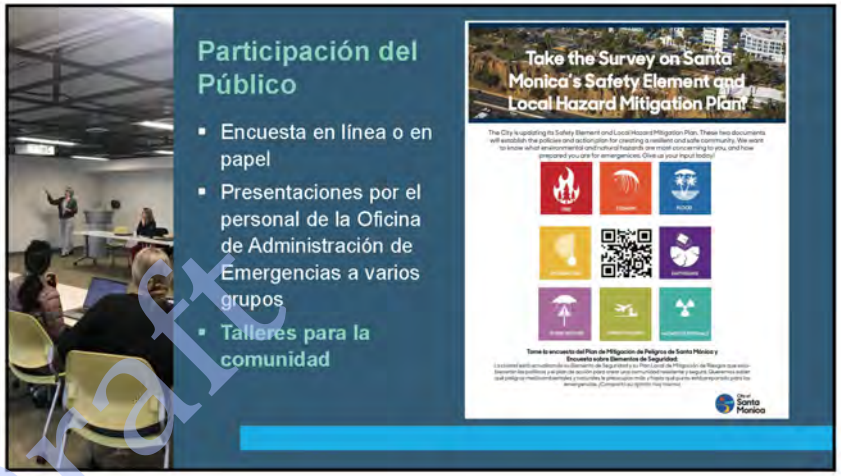

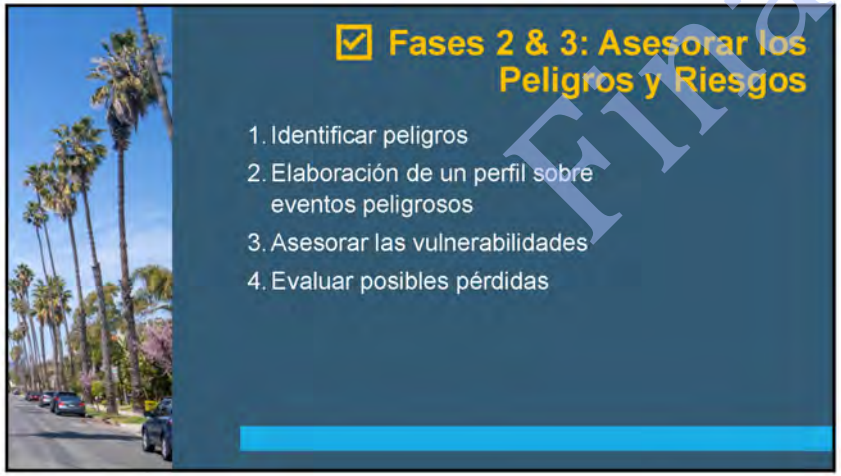

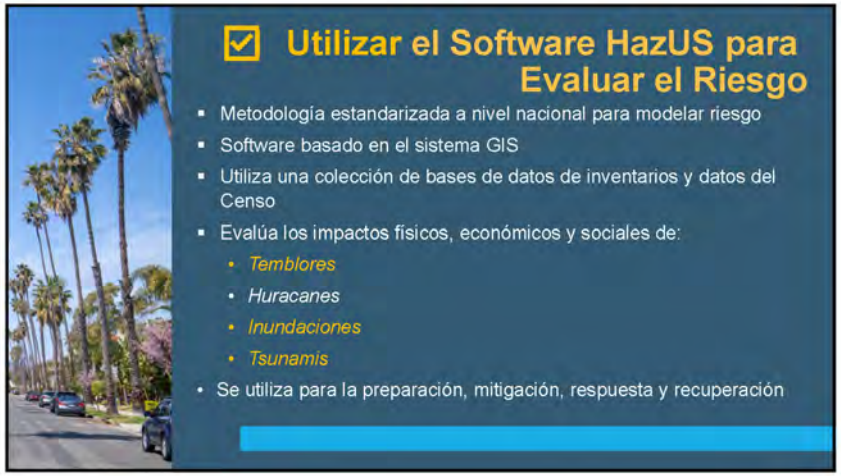

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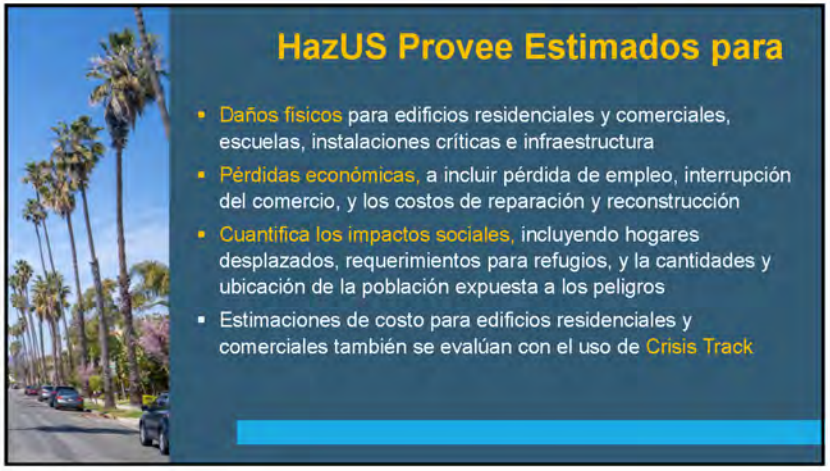
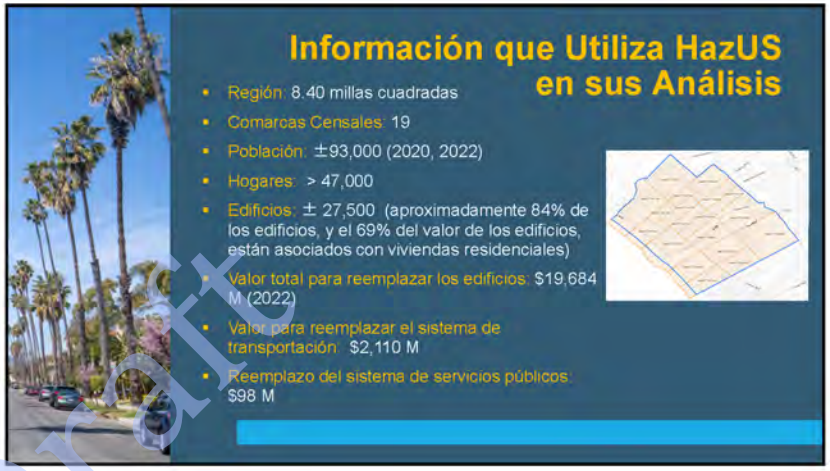
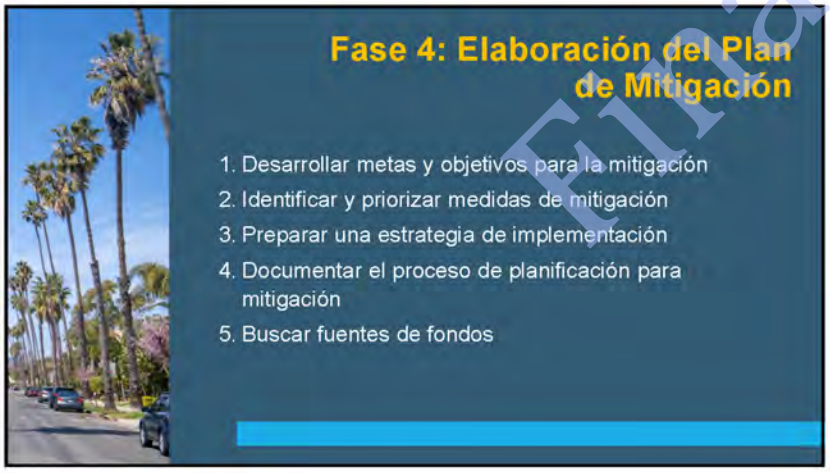
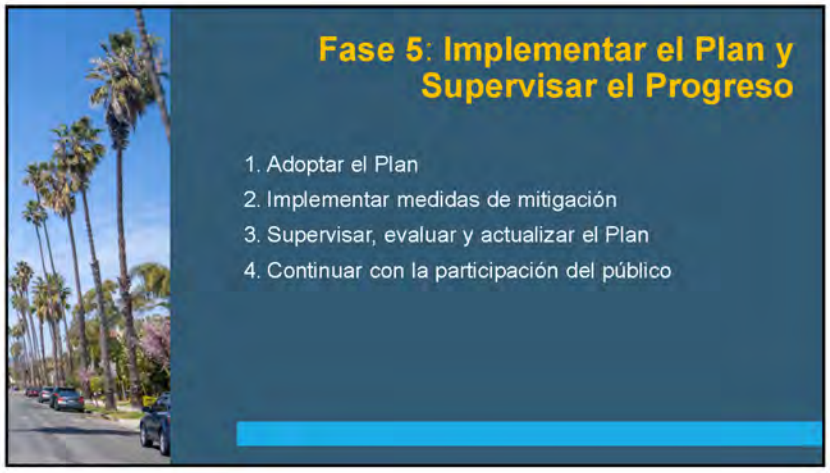




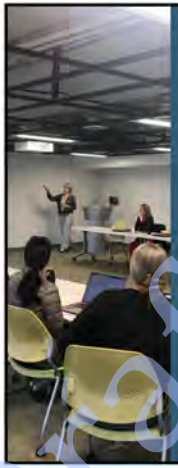




April 30, 2024 Public Workshop Presentation (Spanish Version)

PELIGROS EN LA CIUDAD DE SANTA MONICA

Con una Discusión de Áreas a Riesgo
& Evaluación de Pérdidas



Asesoramiento Preliminar de

Peligro	Ocurrencia Histórica	Riesgo Percibido
Temblores	Si	Alto
Aumento del nivel del mar	Si	Alto
Tormentas de Viento – Vientos de Santa Ana	Si	Alto
Calor Alto a Excesivo	Si	Alto a Moderado
Sequía	Si	Moderado
Inundación – Costera	Si	Moderado
Erosión	Si	Moderado
Tsunami	Si	Moderado
Incendios urbanos / Incendios forestales	Si / No	Moderado a Bajo
Deslizamiento de tierra/Flujo de lodo	Si	Bajo
Fuga de materiales peligrosos	Si	Bajo
Inundación a causa de falla de una represa	No	Bajo
Accidentes aéreos	Si	Bajo

TEMAS PRINCIPALES CUBIERTOS

EARTHQUAKE
FLOOD
FIRE
SEVERE WEATHER
HAZARDOUS MATERIALS
AIRPORT HAZARDS

- Peligros Sísmicos
- Peligros de Inundación
- Peligros de Incendios
- Peligros del Cambio de Clima & de Clima Severo
- Peligros Geológicos
- Administración de Materiales Peligrosos
- Peligros Asociados con el Aeropuerto

Peligros & Riesgos Sismicos

EARTHQUAKE

- Temblores a causa de fallas de terremotos locales y a distancia
- Ruptura de una falla
- Licuación
- Tsunami (maremoto)
- Otros peligros secundarios

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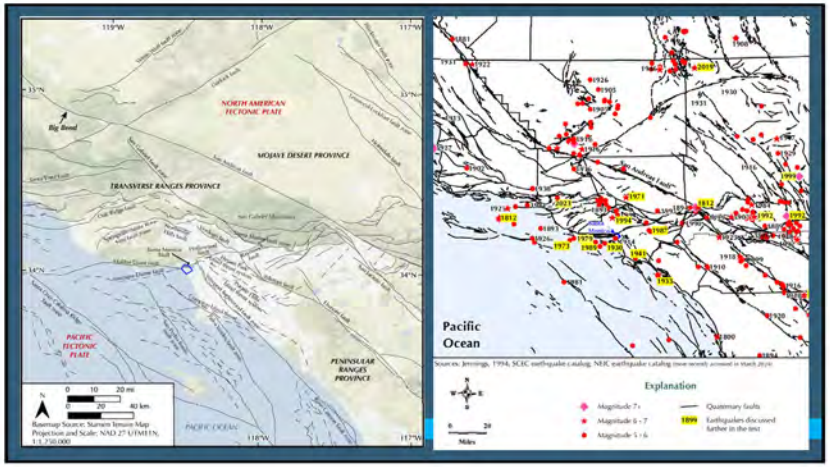

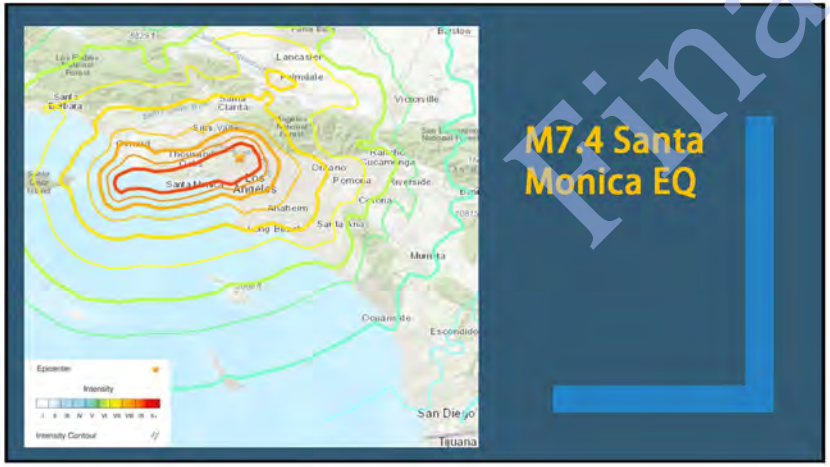

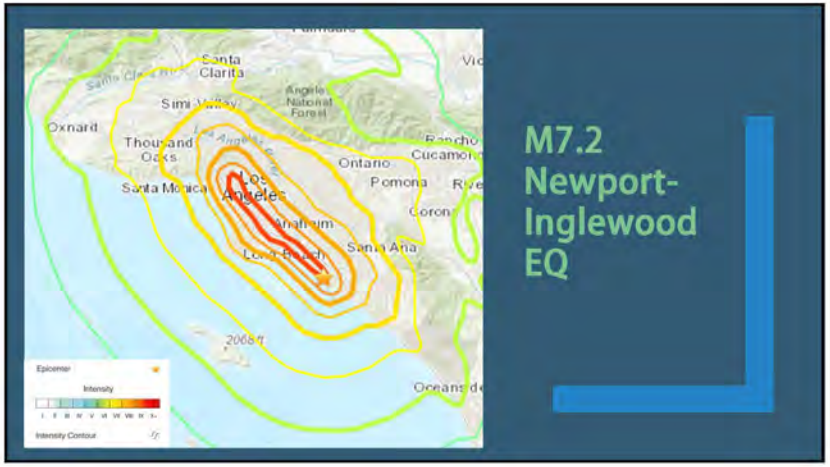

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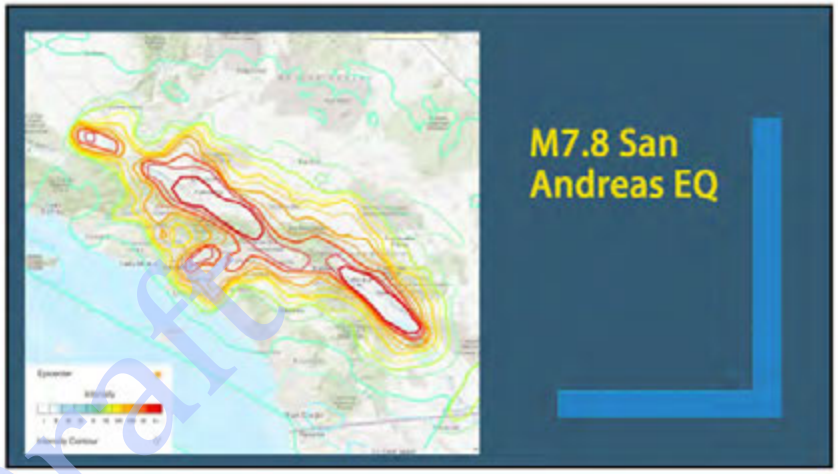

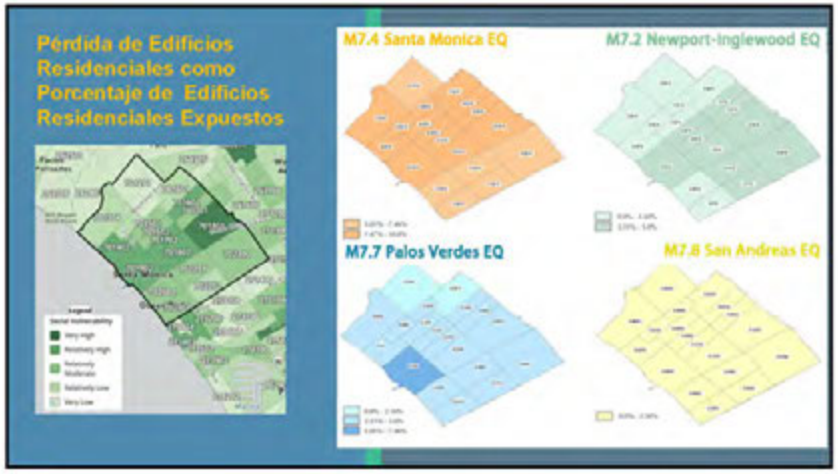

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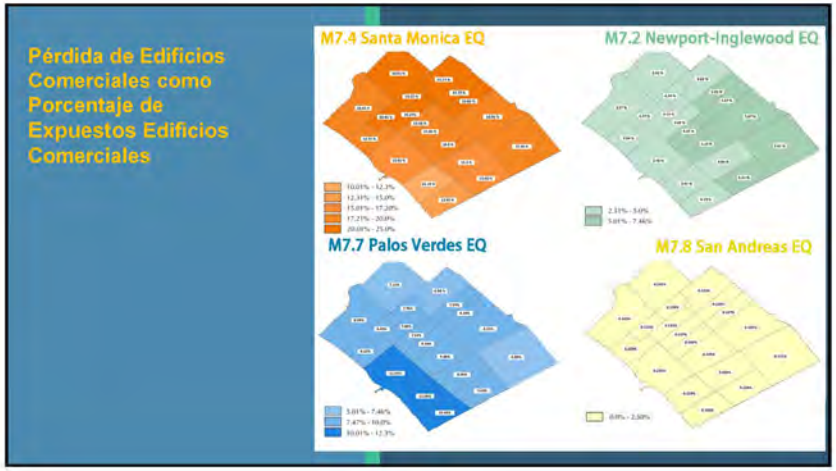

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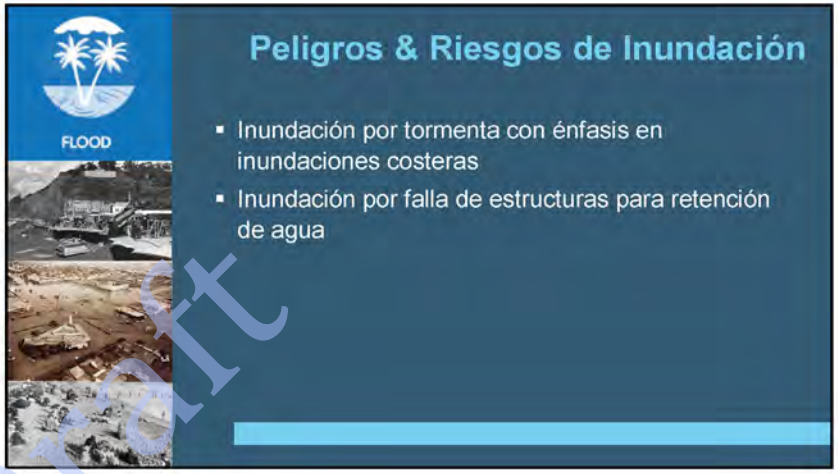

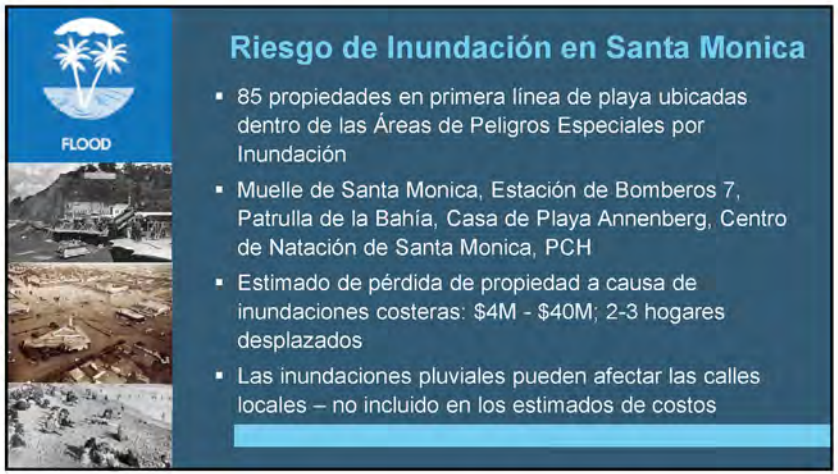

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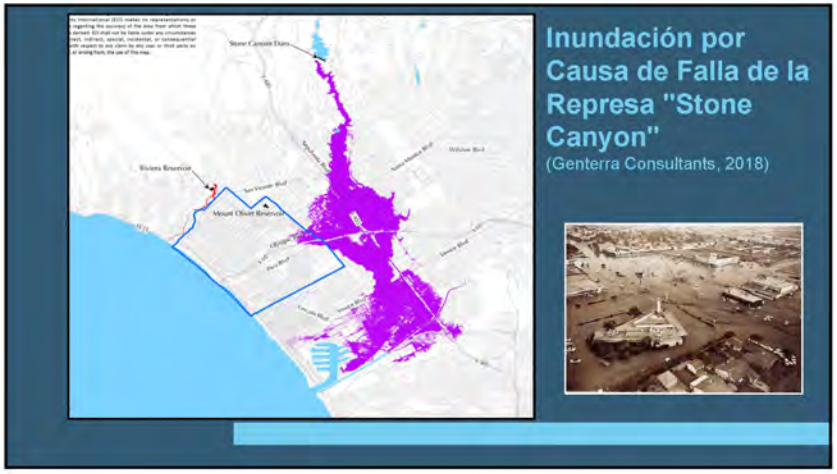

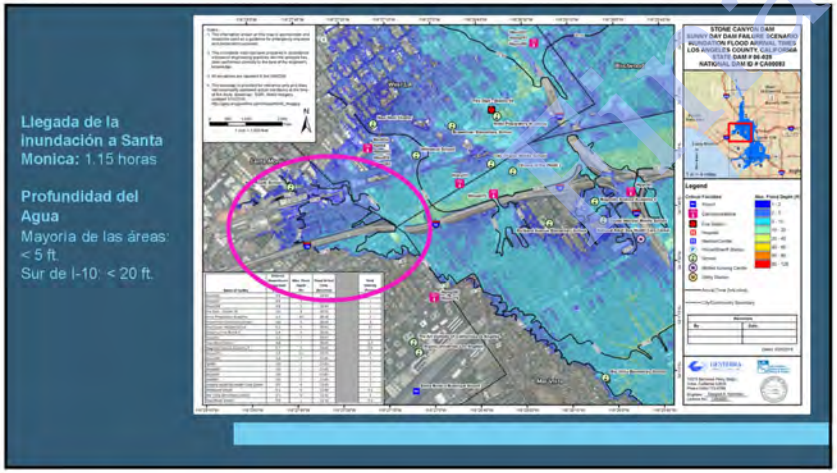

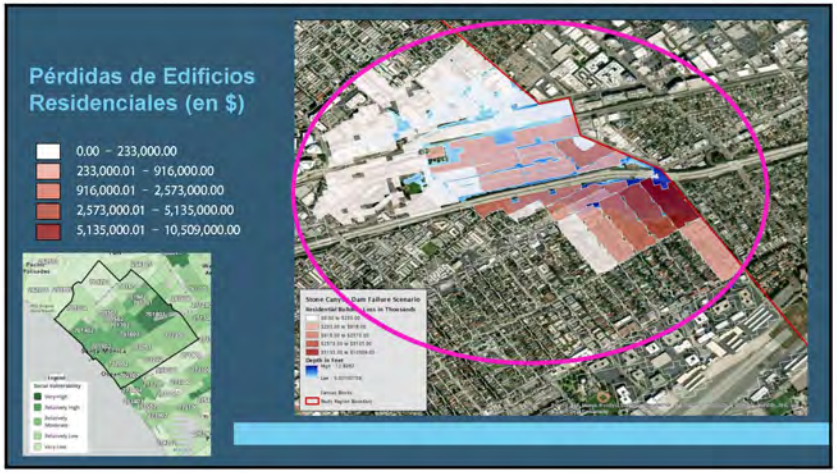

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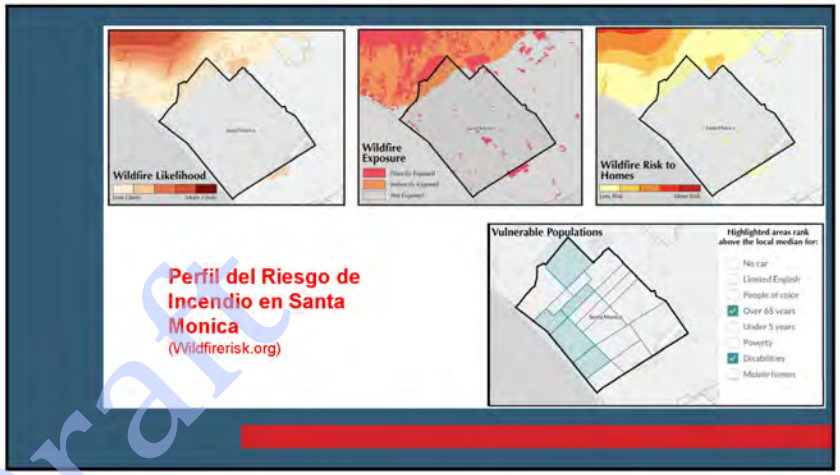
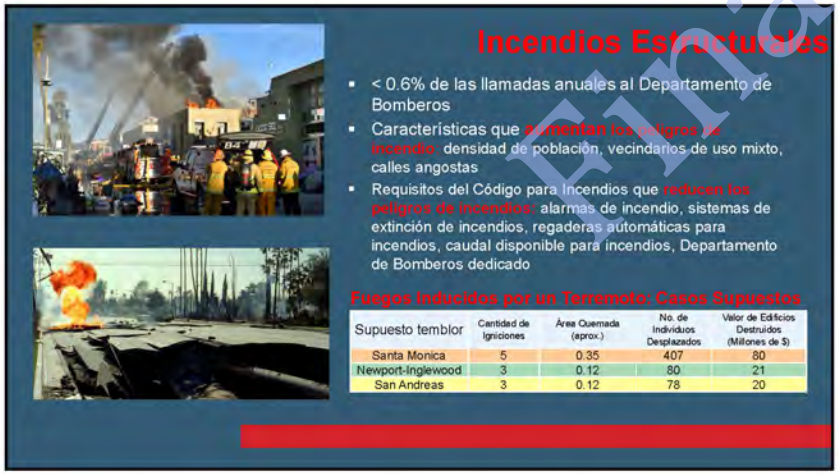
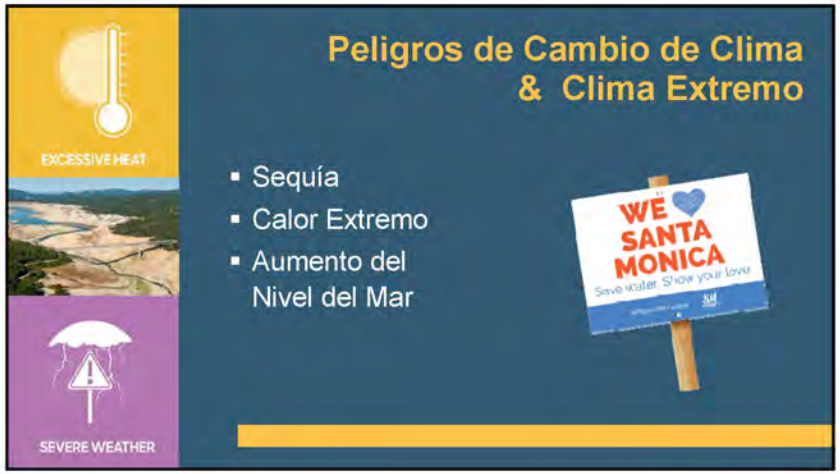




Supuesto temblor	Cantidad de Igniciones	Área Quemada (aprox.)	No. de Individuos Desplazados	Valor de Edificios Destruidos (Millones de $)
Santa Monica	5	0.35	407	80
Newport-Inglewood	3	0.12	80	21
San Andreas	3	0.12	78	20



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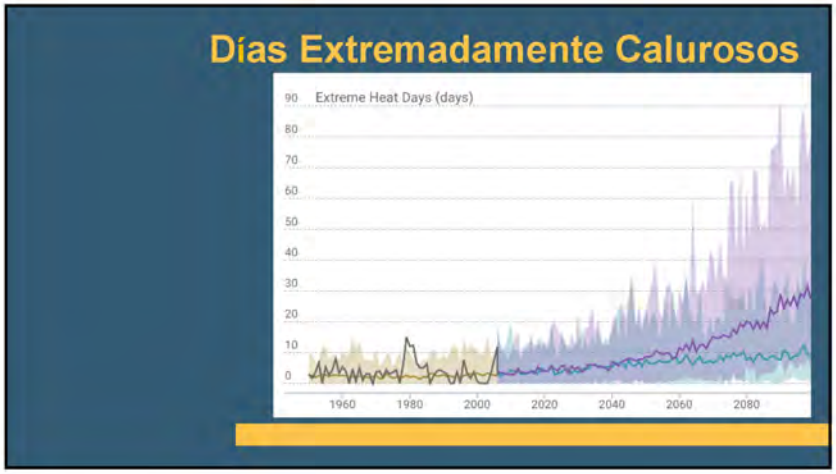

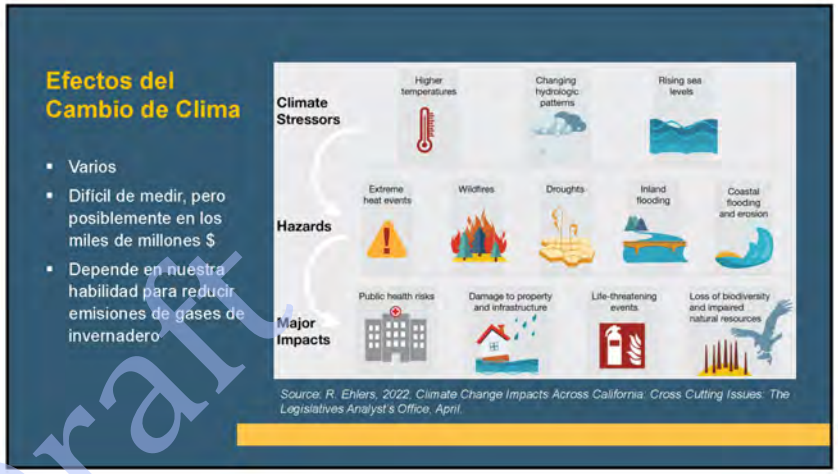

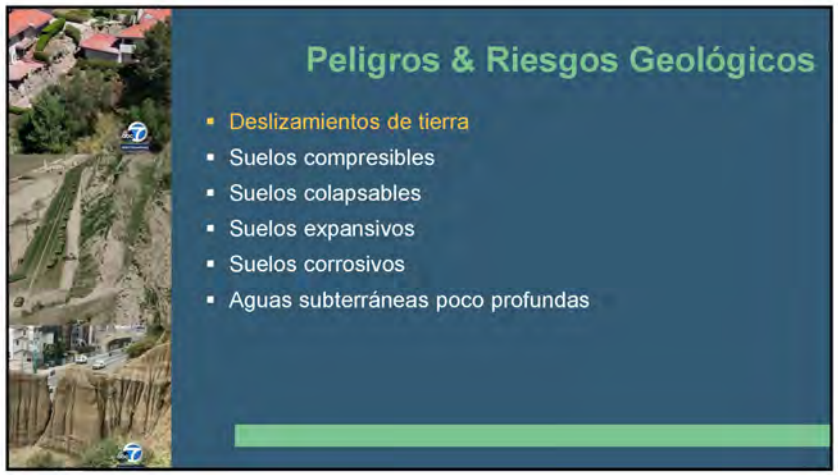

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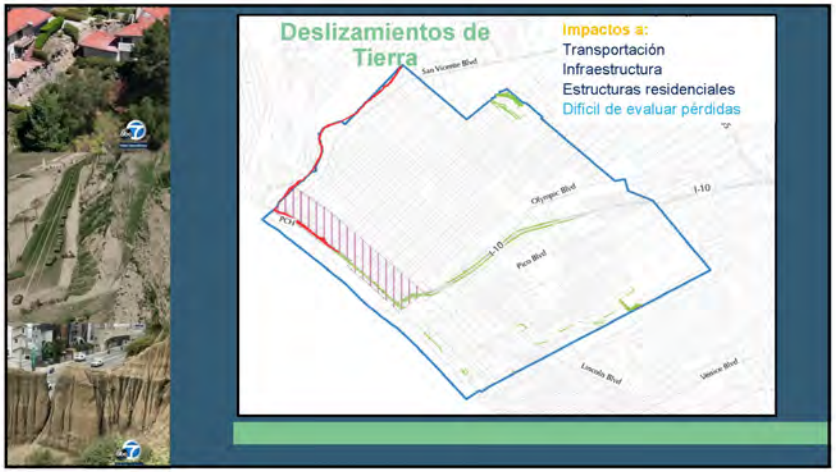

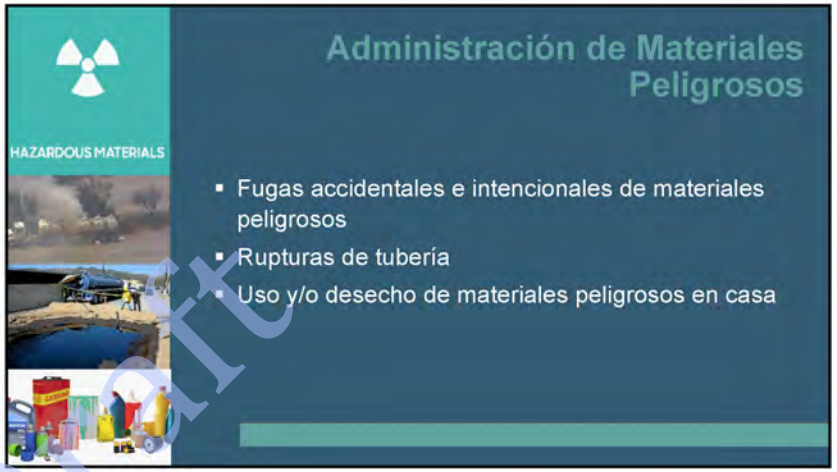

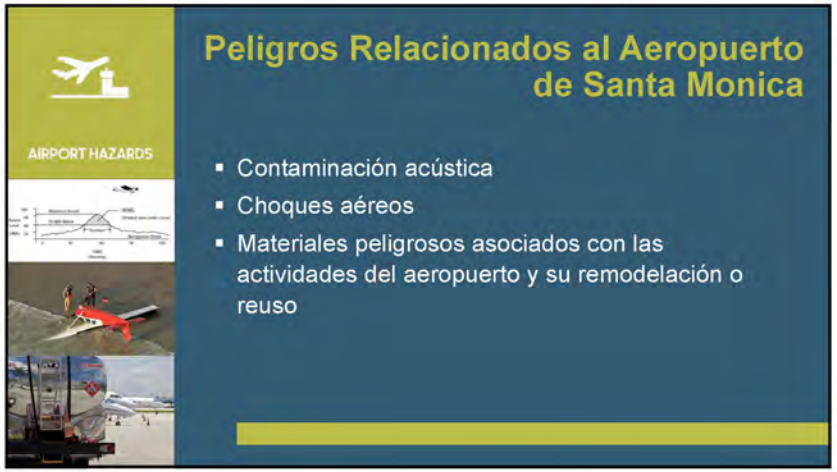

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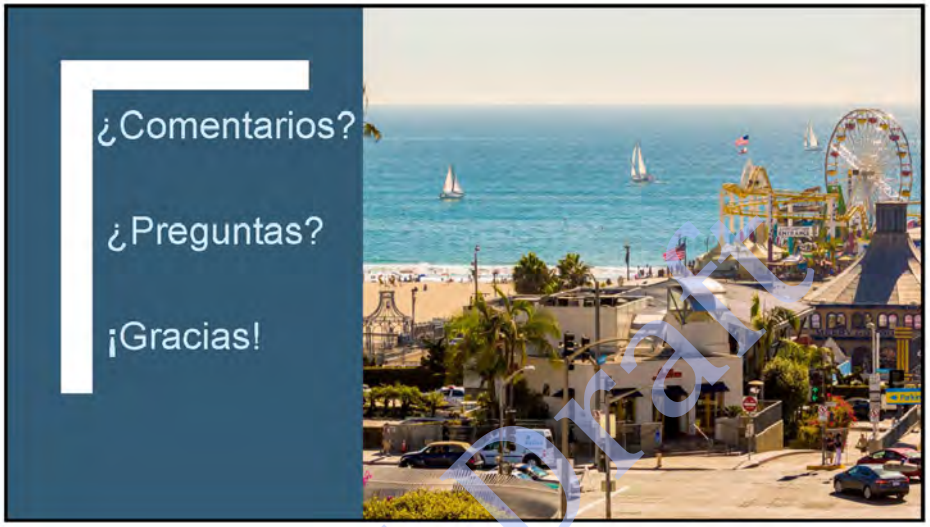

May 15, 2024 Resilience and Advisory Committees Workshop

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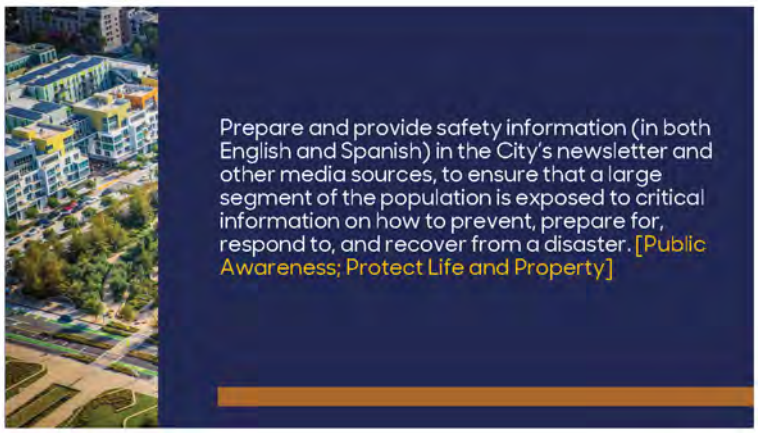

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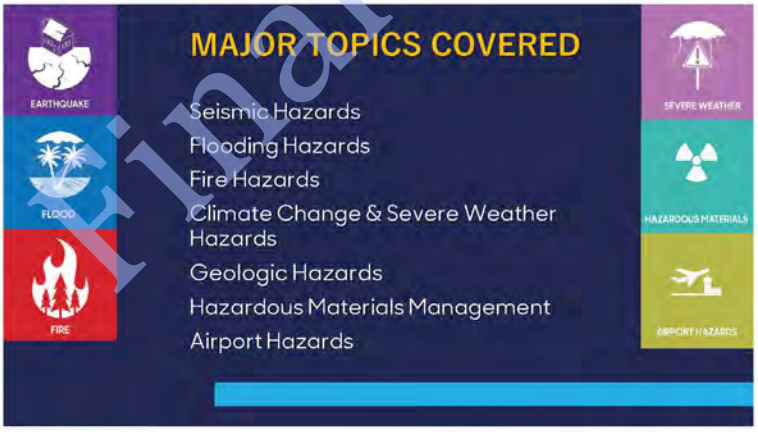

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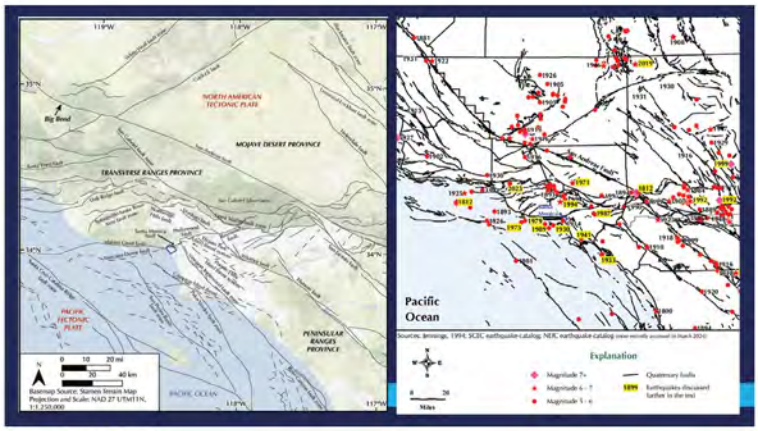
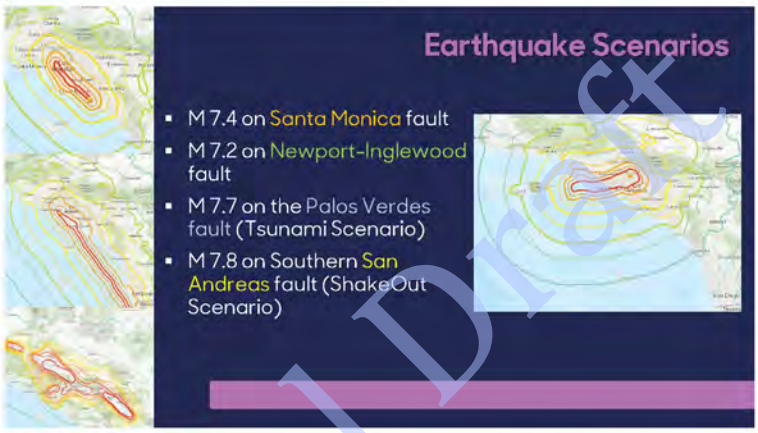
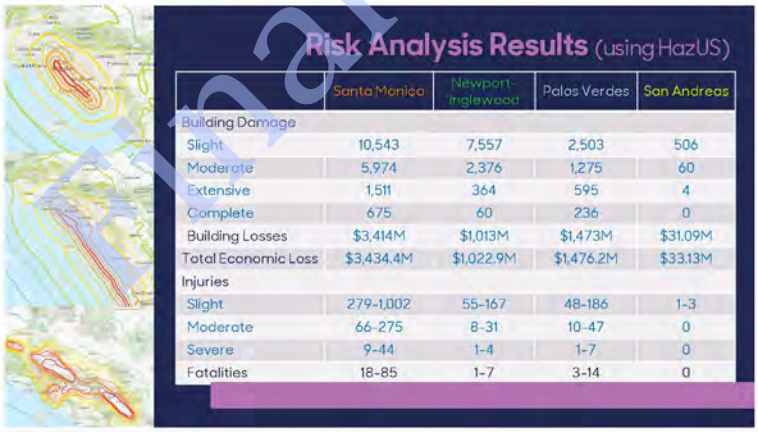
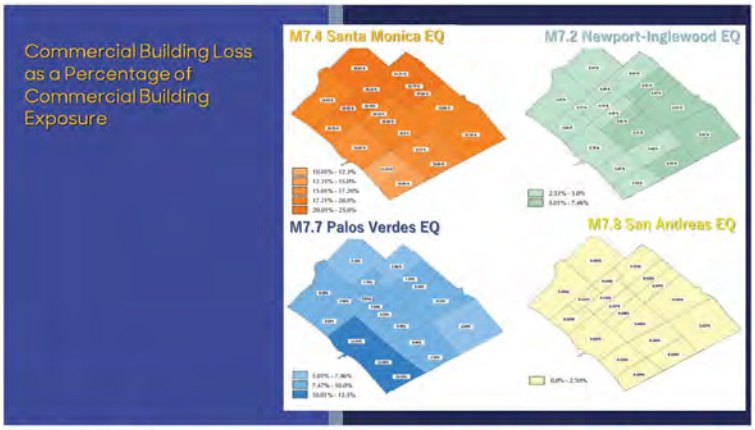


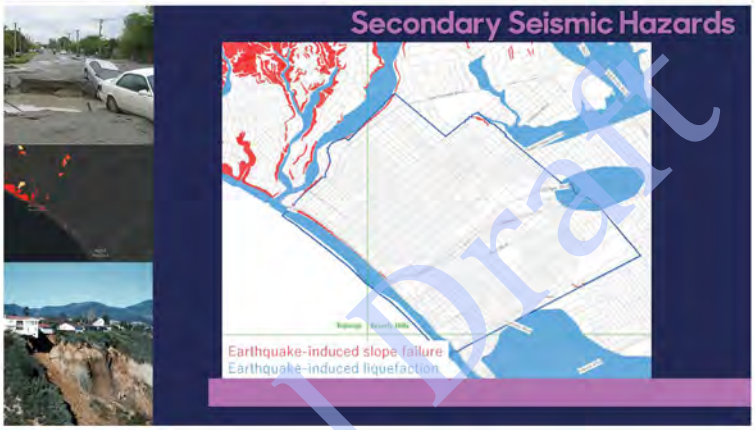




	Santa Monica	Newport-Inglewood	Palos Verdes	San Andreas
Building Damage				
Slight	10,543	7,557	2,503	506
Moderate	5,974	2,376	1,275	60
Extensive	1,511	364	595	4
Complete	675	60	236	0
Building Losses	$3,414M	$1,013M	$1,473M	$31.09M
Total Economic Loss	$3,434.4M	$1,022.9M	$1,476.2M	$33.13M
Injuries				
Slight	279-1,002	55-167	48-186	1-3
Moderate	66-275	8-31	10-47	0
Severe	9-44	1-4	1-7	0
Fatalities	18-85	1-7	3-14	0

May 15, 2024 Resilience and Advisory Committees Workshop





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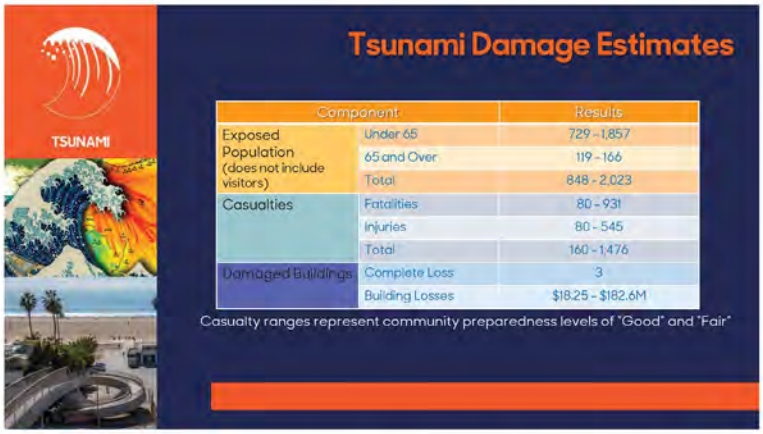

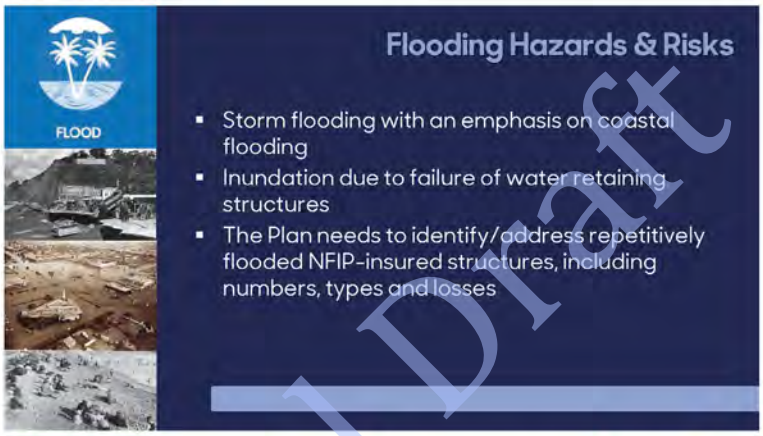

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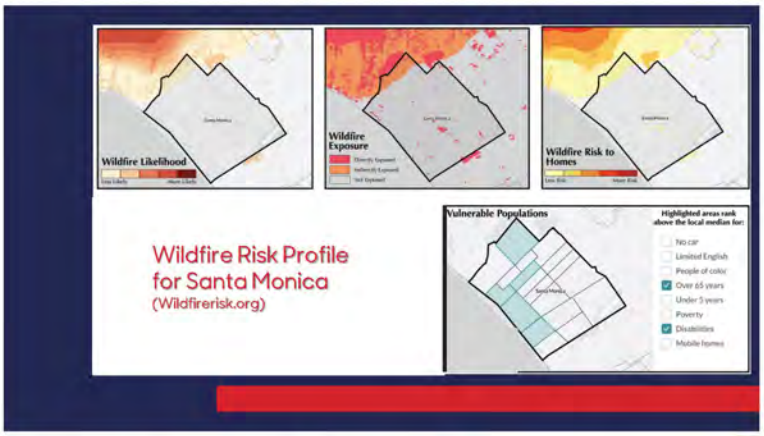

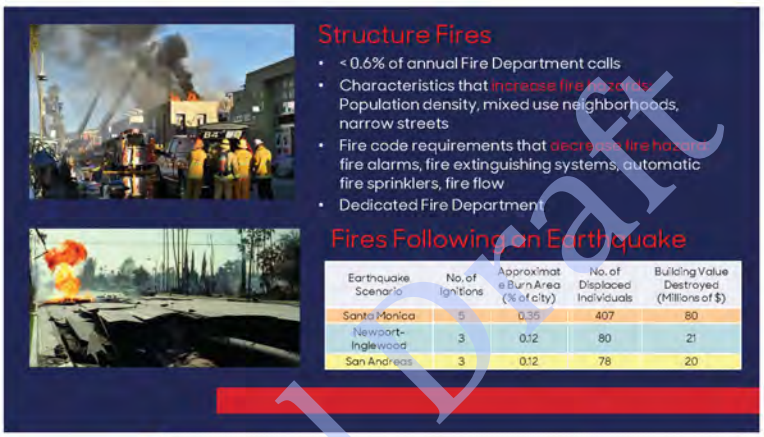

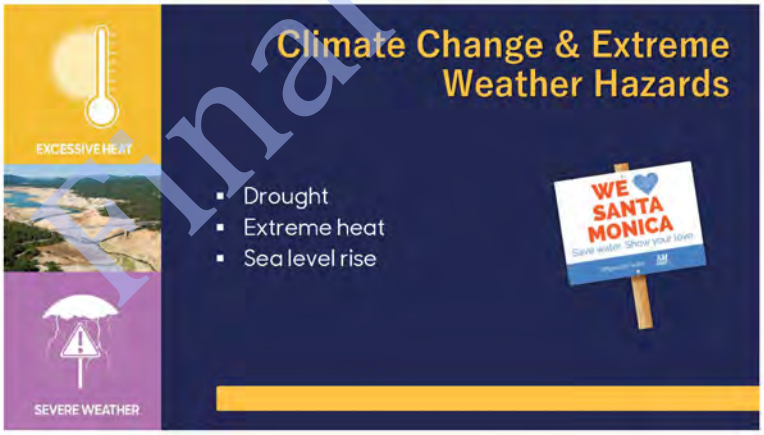

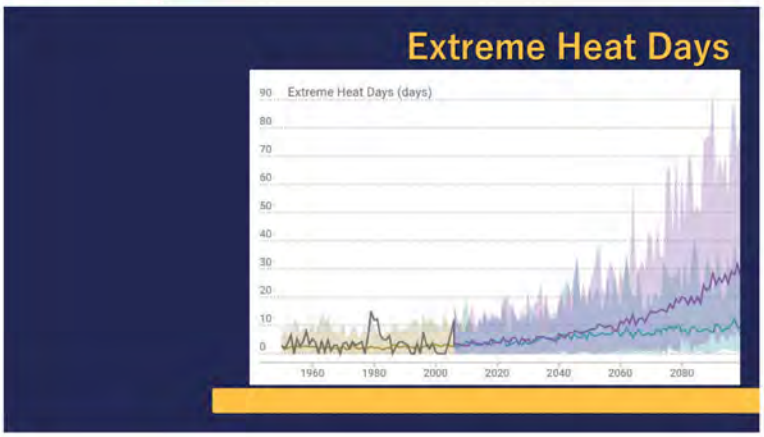

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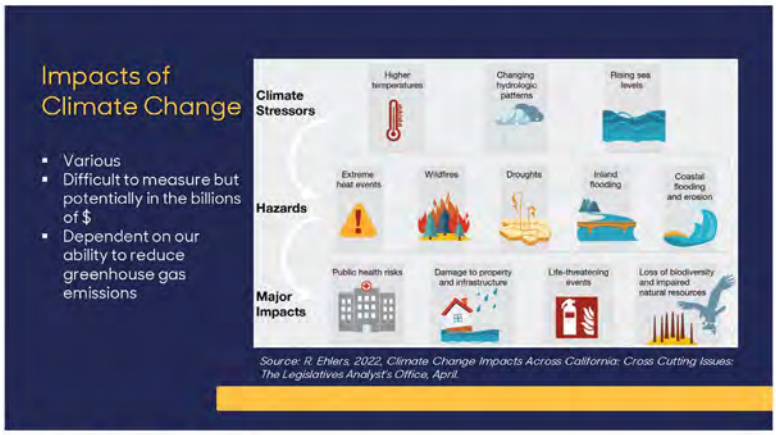

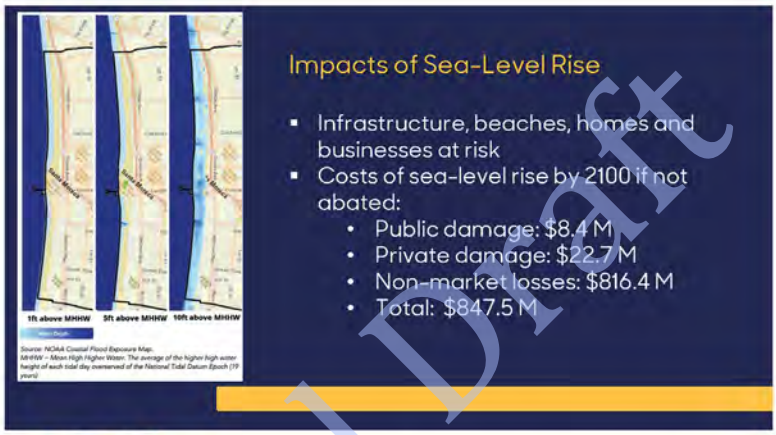

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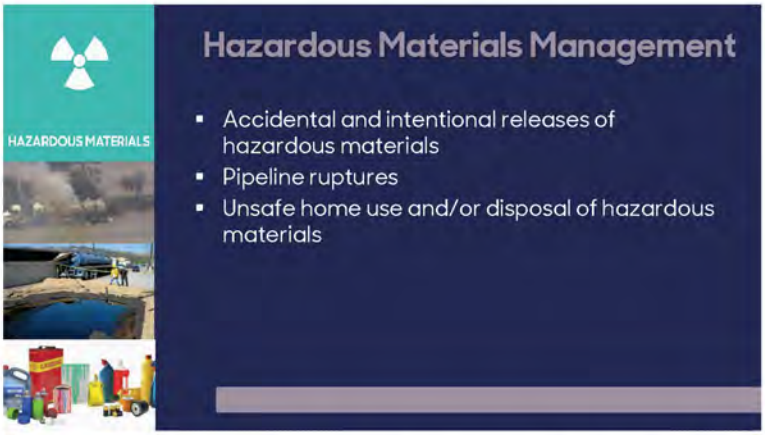

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SUMMARY (CONTINUED)

- Hazards with lower risk include:
  - Coastal flood
  - Wildland fire
  - Landslide
  - Structure fires
  - Hazardous materials release
  - Aircraft crashes

FACILITATED BREAKOUT GROUPS TO DEVELOP MITIGATION ACTIONS

Reminders:

- Must cover a wide range of actions
- Responsible agency (no orphan actions!)
- Potential funding sources (local, State, Federal) and constraints
- Timeline (ongoing, short- and long-term)
- Plan goals addressed
- Use STAPLEE process to identify priorities

Residents Survey/Mtg Requests:

- Information and Training on:
  - Insurance coverage and availability
  - Preparing neighborhoods help themselves
  - Disaster preparedness for earthquake, fire, airplane crash, cyberattack, terrorist attack, active shooter, emergency kits
- Distribution of supplies (hazard kits, water, battery backups)
- Increased and recurrent communication on disaster preparedness
- Increased enforcement and assistance with seismic retrofits
- Upgrade / retrofit utilities, infrastructure
- Enact legislation making air conditioning mandatory in multi-residential buildings
- Invest on measures to help City be more extreme-heat resistant
- Improve street safety (more street lights, clear sidewalks, discourage loitering, manage crime)
- Food resiliency programs, such as community gardens

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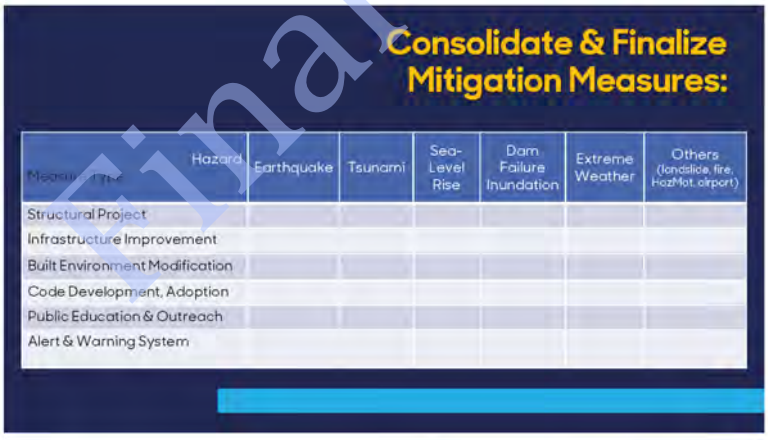

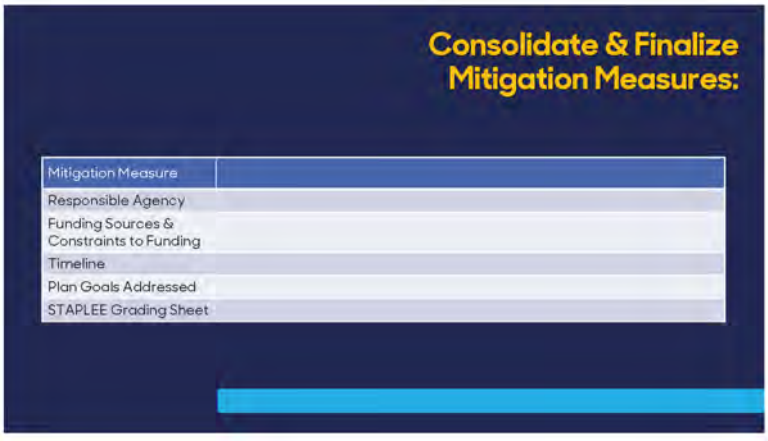

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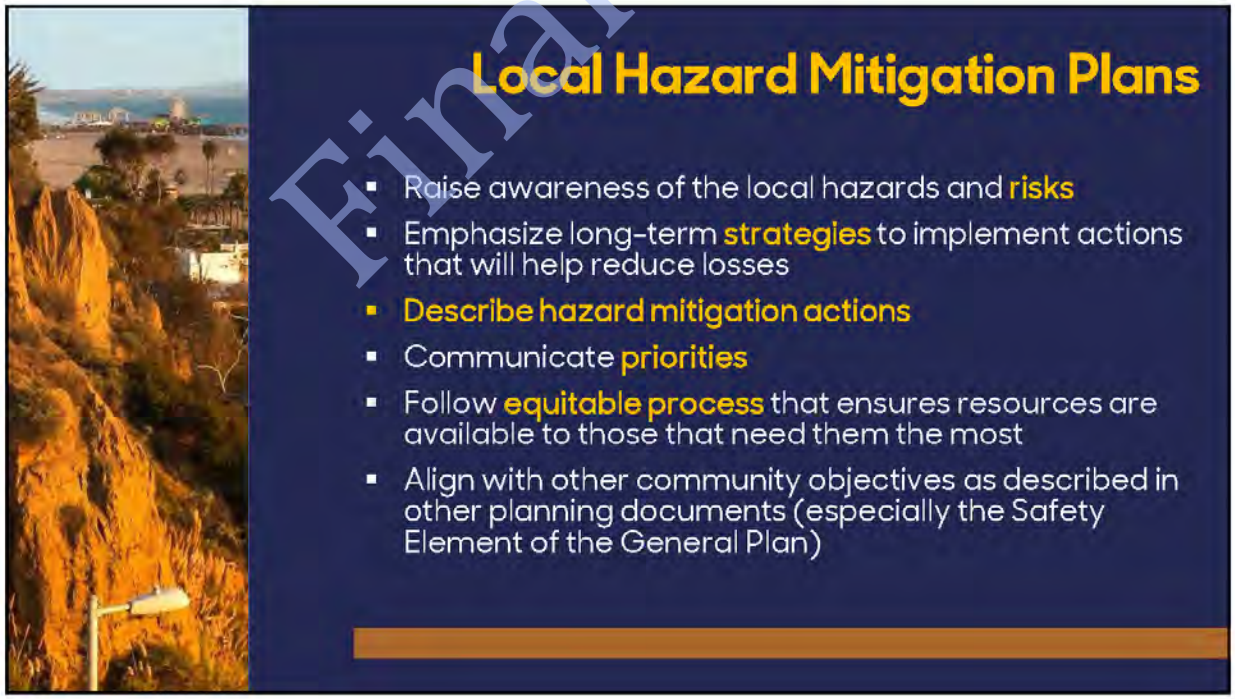

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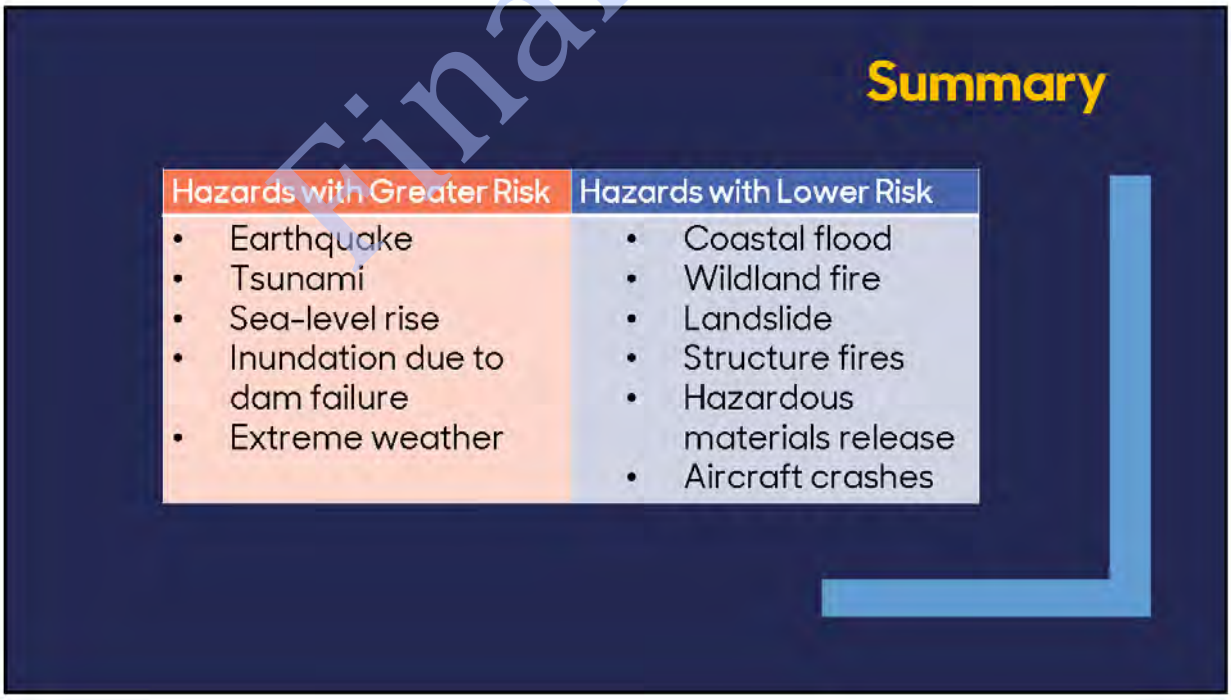

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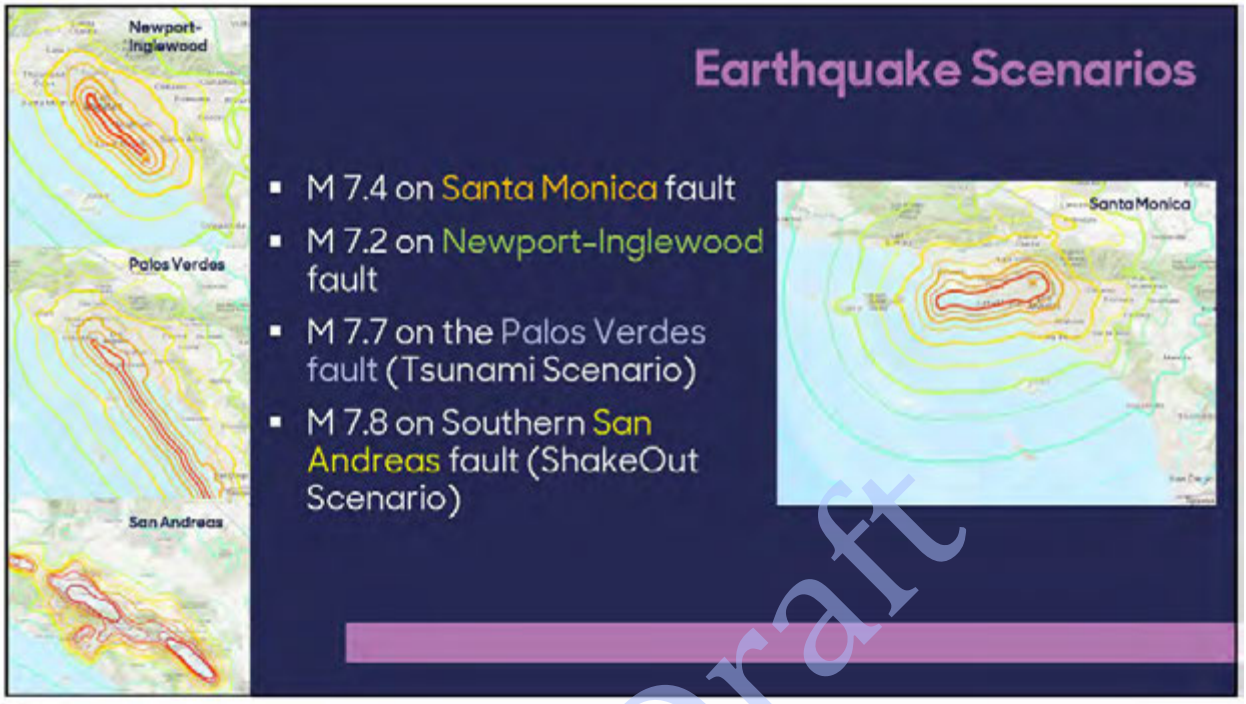

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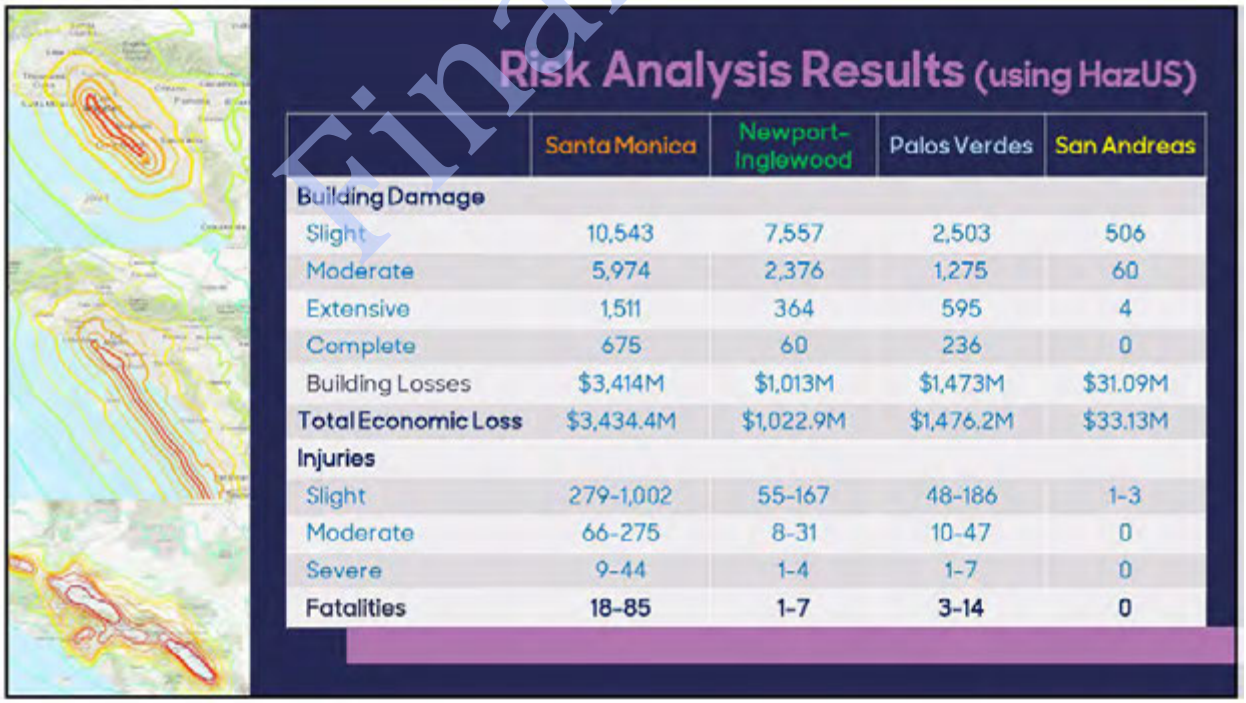

	Santa Monica	Newport-Inglewood	Palos Verdes	San Andreas
Building Damage				
Slight	10,543	7,557	2,503	506
Moderate	5,974	2,376	1,275	60
Extensive	1,511	364	595	4
Complete	675	60	236	0
Building Losses	$3,414M	$1,013M	$1,473M	$31.09M
Total Economic Loss	$3,434.4M	$1,022.9M	$1,476.2M	$33.13M
Injuries				
Slight	279-1,002	55-167	48-186	1-3
Moderate	66-275	8-31	10-47	0
Severe	9-44	1-4	1-7	0
Fatalities	**18-85**	**1-7**	**3-14**	**0**

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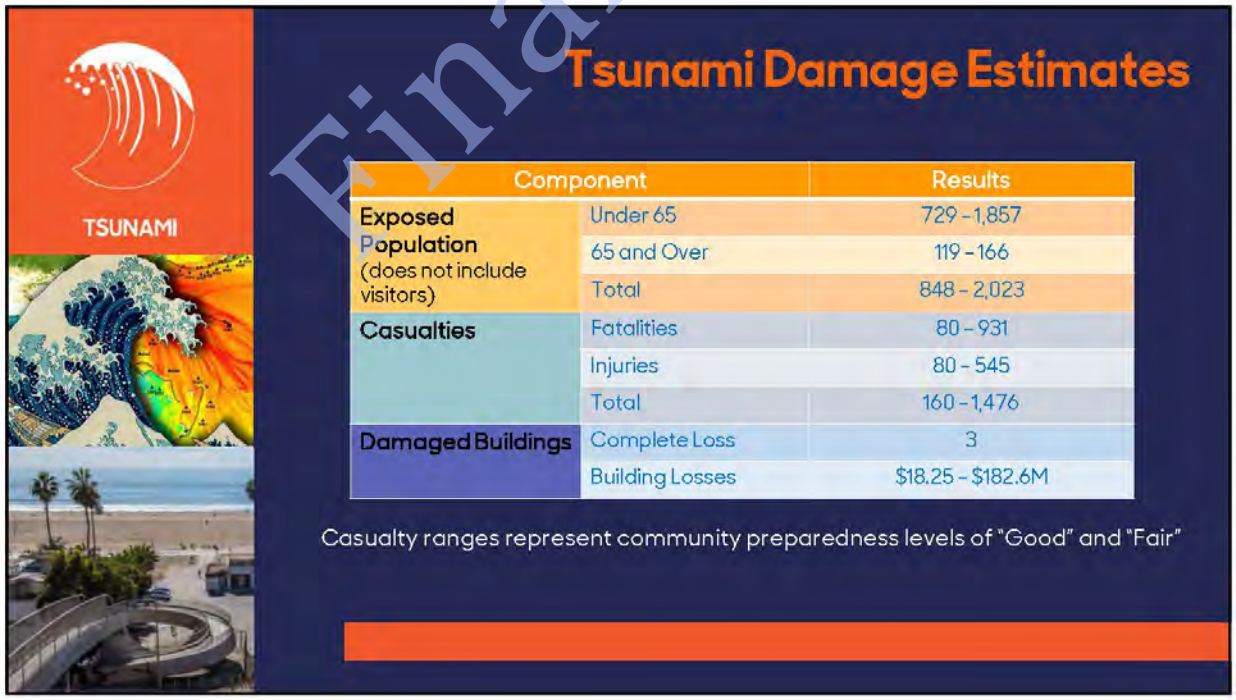

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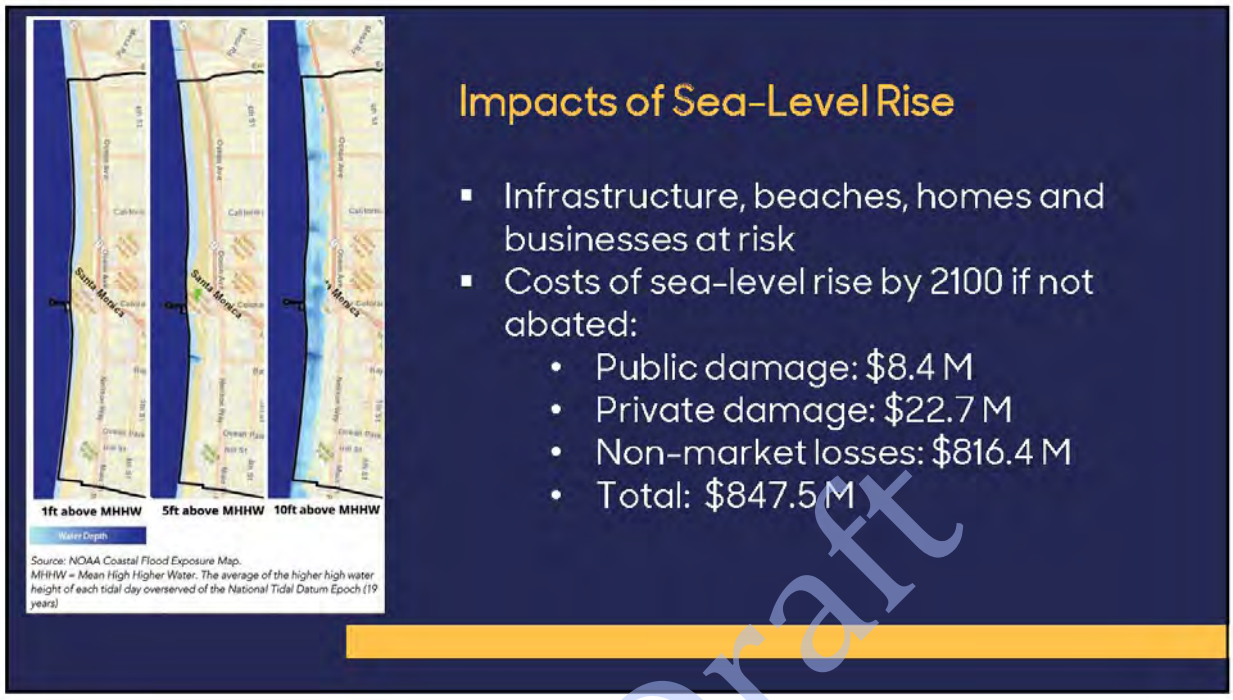

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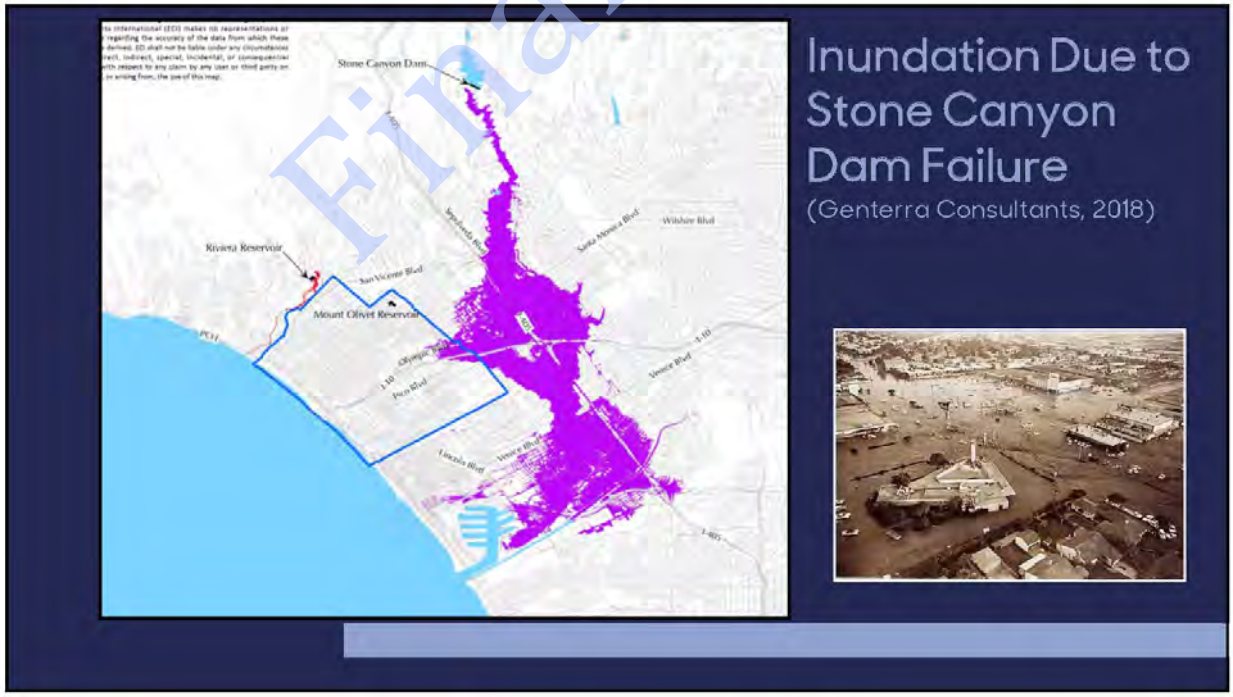

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HazUS Inundation Scenario Loss Estimates

- 214 buildings will be at least moderately damaged
  - *205 residential*
  - *7 commercial*
  - *2 industrial*
- 23 residential buildings will be completely destroyed
- No essential facilities will be impacted
- 464 households (1,393 people) will be displaced
- 59 people will seek temporary shelter in public shelters
- Building losses: $56M – $120M
- Total building-related economic losses: $227 M

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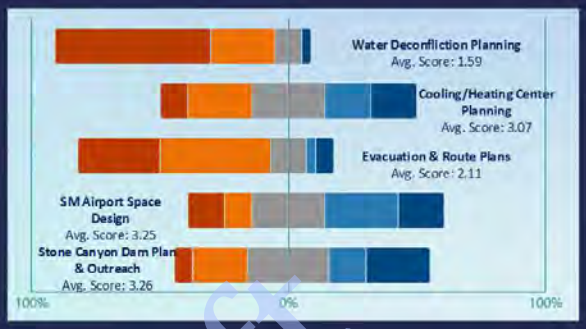
Local Planning

RANKING (#1 is Highest Priority)

1. Water Deconfliction Planning
2. Evacuation & Route Planning
3. Cooling & Heating Center Plan
4. SMO Space Design
5. Stone Canyon Dam Plan & Outreach



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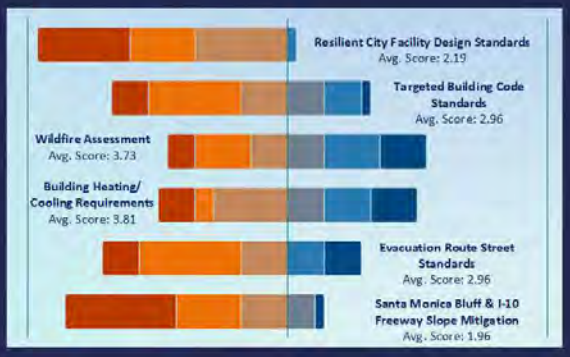
Assessment & Regulation

RANKING (#1 is Highest Priority)

1. Santa Monica Bluff & I-10 Freeway Slope Mitigation
2. Resilient City Facility Design Standards
3. Targeted Building Code Standards
4. Evacuation Route Street Standards
5. Building Heating/Cooling Requirements
6. Wildfire Assessment



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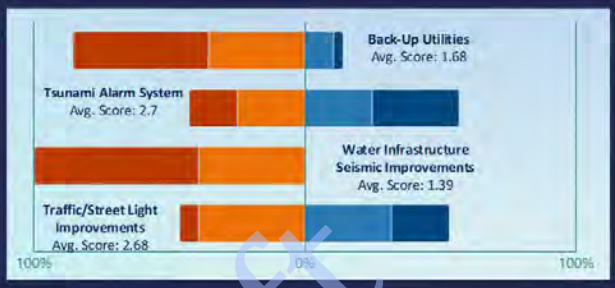
Structure & Infrastructure

RANKING (#1 is Highest Priority)

1. Water Infrastructure Seismic Assessment
2. Back-Up Utilities
3. Traffic/Street Light Improvements
4. Tsunami Alarm System



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Natural Systems Improvement

RANKING (#1 is Highest Priority)

1. Natural Dune Restoration
2. Food Resilience through Community Gardening

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Education & Awareness

RANKING (#1 is Highest Priority)

1. Inclusive Emergency Communications
2. Business & Partner Liaison Program
3. School Hazard Mitigation Education

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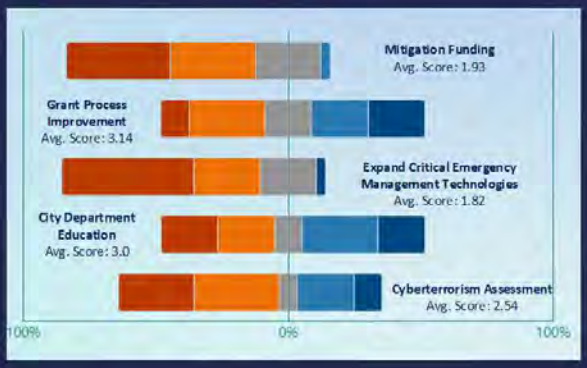
City Readiness

RANKING (#1 is Highest Priority)

1. Expand Critical Emergency Management Technologies
2. Mitigation Funding
3. Cyberterrorism Assessment
4. City Department Education
5. Grant Process Improvement



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APPENDIX C: ECONOMIC ANALYSIS OF HAZARD MITIGATION PROJECTS

INTRODUCTION

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

This appendix outlines several approaches for conducting economic analyses of hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from the Federal Emergency Management Agency (FEMA) Cost-Benefit Analysis webpage. There are several useful online publications that describe the process of conducting a BCA, including equations, developed by and for FEMA. Links to several of these publications or webpages are listed throughout this section, or at the end, in the Resources section. FEMA has also developed a software package, or toolkit, referred to as the BCA Toolkit, for a variety of natural hazards.

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

WHY EVALUATE MITIGATION STRATEGIES?

Mitigation activities (also referred to as mitigation actions or action items) reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life. Mitigation activities also reduce emergency response costs, which would otherwise be incurred.

Evaluating hazard mitigation provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Evaluating mitigation projects is a complex and difficult undertaking influenced by many variables. First, natural and human-made disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" or "cascading effects" throughout the community, greatly increasing the disaster's social and economic consequences.

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

WHAT ARE SOME ECONOMIC ANALYSIS APPROACHES FOR MITIGATION STRATEGIES?

The approaches used to identify the costs and benefits associated with hazard mitigation strategies, measures, or projects fall into two general categories: benefit-cost analysis (BCA) and cost-effectiveness analysis (CEA). The distinction between the two methods is based on the way in which the relative costs and benefits are measured. Additionally, there are varying approaches to assessing the value of mitigation for public sector and private sector activities.

Benefit-Cost Analysis

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

In BCA, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e., if net benefits exceed net costs, the project is worth pursuing). A project must have a benefit/cost ratio greater than 1.0 in order to be funded.

Cost-Effectiveness Analysis

Cost-effectiveness analysis (CEA) evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis however, does not necessarily measure costs and benefits in terms of dollars. For example, CEA is often used in healthcare to inform decisions regarding the allocation of resources. Determining the economic feasibility of mitigating hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows:

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

- **Investing in Private Sector Mitigation Activities**
  Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:
  1. Request cost sharing from public agencies;
  2. Dispose of the building or land in question either by sale or demolition;
  3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or

4. Evaluate the most feasible alternatives and initiate the most cost-effective hazard mitigation alternative.

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

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws may require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

How Can an Economic Analysis Be Conducted?

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

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

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

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

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

   - **Consider Costs and Benefits to Society and the Environment.** These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people

attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.

- **Determine the Correct Discount Rate[1].** Determination of the discount rate can refer only to the risk-free cost of capital, but it may also include the decision maker's time preference and also a risk premium. Inflation should also be considered.

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

   - **Net Present Value.** Net present value is the value of the expected future return on an investment minus the value of expected future cost expressed in today's dollars. If the net present value is greater than the project's costs, the project may be deemed feasible for implementation.

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

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

HOW ARE THE BENEFITS OF MITIGATION CALCULATED?

Economic Returns of Natural Hazard Mitigation

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

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

[1] Discount rate, or the cost of capital, refers to the time value of money, essentially recognizing that money today is worth more than the same amount of money in the future. Typically presented as a percentage used to determine the present value of a future cash flow.

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

Additional Costs from Natural Hazards

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

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy.

Decision makers should understand the total economic impacts of natural disasters to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural and human-caused hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models (see list below) are available to help in conducting an economic analysis for natural hazard mitigation activities.

Santa Monica's budget is largely funded through sales taxes, transient occupancy taxes paid by overnight hotel visitors, and parking revenue; combined, these income sources make up 46% of General Fund revenues, including Capital Improvement Projects. The City is still recovering from a tremendous hit to these revenue streams caused by the COVID-19 pandemic. The City experienced another dip to these revenue streams during the 2025 Palisades fire, which caused temporary evacuation conditions within the city and challenges related to wildfire debris impacts on local beaches. Economic analysis for hazard mitigation projects within Santa Monica must consider a potential disaster's impact to tourism, retail and hospitality industries as it could have long-reaching devastating impacts on the City's finances.

Benefit-cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. The City of Santa Monica's recent challenges in tax revenue have left the Capital Improvement Program underfunded, which is the funding source for most City hazard mitigation programs. Incorporating hazard mitigation into community and government capital improvement projects can increase the viability of project implementation. Requiring hazard mitigation of capital improvement projects is a best practice for achieving community resilience and ensuring continued hazard reduction.

SELECTED RESOURCES

Anagnos, T., Comerio, M.C., and J. P. Stewart, P., 2016, Earthquake loss estimates and policy implications for nonductile concrete buildings in Los Angeles: *Earthquake Spectra*, Vol. 32, No. 4, pp. 1951–1973; doi:10.1193/060415EQS088M.

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APPENDIX D: ACRONYMS

Federal Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AB	Assembly Bill
AIA	Airport Influence Area
ARC	American Red Cross
ASCE	American Society of Civil Engineers
ATC	Applied Technology Council
ATSDR	Agency for Toxic Substances and Disease Registry
AWWA	American Water Works Association
BCA	Benefit-Cost Analysis
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BOCA	Building Officials and Code Administrators International
BRIC	Building Resilient Infrastructure and Communities
BSSC	Building Seismic Safety Council
CDBG	Community Development Block Grant
CDC	U.S. Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COVID-19	Coronavirus Disease 2019
CRS	Community Rating System
CWA	Clean Water Act
DOE	Department of Energy
DOT	Department of Transportation
DFE	Design Flood Elevation
DR	Federal (or Presidential) Major Disaster Declaration
EAP	Emergency Action Plan
EDA	Economic Development Administration
EM	Federal (or Presidential) Emergency Declaration
EPA	Environmental Protection Agency
ER	Emergency Relief
EWP	Emergency Watershed Protection (NRCS Program)
EPCRA	Emergency Planning and Community Right-to Know Act
FAA	Federal Aviation Administration
FAS	Federal Aid System
FAY	Federal Award Year
FDAA	Federal Disaster Assistance Administration
FEMA	Federal Emergency Management Agency
FIA	Federal Insurance Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FM	Federal Fire Management Assistance Declaration
FMA	Flood Mitigation Assistance (FEMA Program)
FMAG	Fire Management Assistance Grant

FS	Federal Fire Suppression Authorization
GSA	General Services Administration
Hazus/HazUS	Hazards United States (an earthquake damage assessment prediction tool)
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team
HUD	U.S. Department of Housing and Urban Development
IA	Individual Assistance
IBC	International Building Code
IBHS	Institute for Business and Home Safety
ICARP	Integrated Climate Adaptation and Resilience Program
ICC	International Code Council
ICBO	International Conference of Building Officials
IHMT	Interagency Hazard Mitigation Team
LHMP	Local Hazard Mitigation Plan
MHFP	Multi-Hazard Functional Plan
NASA	National Aeronautics and Space Administration
NCDC	National Climate Data Center
NCEI	National Center for Environmental Information (NOAA)
NDC	Non-Ductile Concrete building (reinforced concrete-frame building)
NEHRP	National Earthquake Hazards Reduction Program
NEMA	National Emergency Management Agency
NEMIS	National Emergency Management Information System
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFDRS	National Fire Danger Rating System
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHMP	Natural Hazard Mitigation Plan (also known as "409 Plan")
NIBS	National Institute of Building Sciences
NIFC	National Interagency Fire Center
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NSHMP	National Seismic Hazard Mapping Project
NSF	National Science Foundation
NWS	National Weather Service
OCC	Operations Coordination Center
OCD	Office of Civil Defense
OEP	Office of Emergency Planning
PDA	Preliminary Damage Assessment
PIO	Public Information Office
POST	Police Officer Standards and Training
PPA/CA	Performance Partnership Agreement/Cooperative Agreement (FEMA)
PSA	Public Service Announcement
RCRA	Resource Conservation and Recovery Act

R100	100-year probability teletsunami
R500	500-year probability teletsunami
RFR	Request for Reconsideration
RTPA	Regional Transportation Planning Agency
SARA	Superfund Amendments and Reauthorization Act
SB	Senate Bill
SBA	Small Business Administration
SBCCI	Sothern Building Code Congress International
SDWA	Safe Drinking Water Act
SEMS	Standardized Emergency Management System
SFHA	Special Flood Hazard Area
SHMO	State Hazard Mitigation Officer
SMF	Steel Moment Frame building
SPC	National Weather Service Storm Prediction Center
SVI	Social Vulnerability Index
TOR	Transfer of Development Rights
TRI	Toxic Release Inventory
UBC	Uniform Building Code
UGB	Urban Growth Boundary
URM	Unreinforced Masonry
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFA	United States Fire Administration
USFS	United States Forest Service
USGS	United States Geological Survey
WSSPC	Western States Seismic Policy Council

California and Local Acronyms

ADDI	American Dream Downpayment Initiative
ALUCs	Airport Land Use Commissions
ALUCP	Airport Land Use Compatibility Plan
APEFZ	Alquist-Priolo Earthquake Fault Zone
APEFZA	Alquist-Priolo Earthquake Fault Zoning Act
ARP	Accidental Risk Prevention
AWTF	Advanced Water Treatment Facility
BOF	California Board of Forestry and Fire Protection
BSC	California Building Standards Commission
BSA	California Bureau of State Audits
CAAP	Climate Action and Adaption Plan
CAER	Community Awareness & Emergency Response
Cal-Adapt	State program providing data and tools for climate adaptation, planning, building resiliency and fostering community engagement
CalARP	California Accidental Release Prevention
CalBO	California Building Officials
CalEPA	California Environmental Protection Agency

CAL FIRE	California Department of Forestry and Fire Prevention
CalGEM	California Geologic Energy Management Division
CALGreen	California Green Building Standards Code (Part 11, Title 24 of CCR)
Cal OES	California Governor's Office of Emergency Services
Cal/OSHA	California Occupational Safety and Health Administration
CalRecycle	California Department of Resources Recycling and Recovery
CalSTARS	California State Accounting Reporting System
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CBC	California Building Code
CBO	Community Based Organization
CBSC	California Building Standards Commission
CCR	California Code of Regulations
CD	Civil Defense
CDAA	California Disaster Assistance Act
CDBG	Community Development Block Grant
CDF	California Department of Forestry and Fire Protection
CDFW	California Department of Fish and Wildlife
CDMG	California Division of Mines and Geology (now CGS)
CDPH	California Department of Public Health
CEA	California Earthquake Authority
CEC	California Energy Commission
CEPEC	California Earthquake Prediction Evaluation Council
CEQA	California Environmental Quality Act
CERS	California Environmental Reporting System
CESQG	Conditionally Exempt Small Quantity Generator
CESRS	California Emergency Services Radio System
CFM	Community Fault Model
CFSC	California Fire Safe Council
CGS	California Geological Survey
CHHS	California Health and Human Services Agency
CHIP	California Hazardous Identification Program
CHMIRS	California Hazardous Materials Incident Reporting System
CHP	California Highway Patrol
CISN	California Integrated Seismic Network
CLETS	California Law Enforcement Telecommunications System
CNRA	California Natural Resources Agency
CSTI	California Specialized Training Institute
CUEA	California Utilities Emergency Association
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
DAD	Disaster Assistance Division (of the state Office of Emergency Services)
DASH	Downtown Area Short Hop (mini-bus service in Los Angeles)
DFM	California Department of Water Resources Division of Floodplain Management
DFO	Disaster Field Office
DGS	California Department of General Services
DHSRHB	California Department of Health Services, Radiological Health Branch
DIR	California Department of Industrial Relations

DOC	California Department of Conservation
DOF	California Department of Finance
DOJ	California Department of Justice
DPA	California Department of Personnel Administration
DPIG	Disaster Preparedness Improvement Grant
DR	Disaster Response
DSA	Division of the State Architect
DSOD	California Department of Water Resources Division of Safety of Dams
DSR	Damage Survey Report
DSW	Disaster Service Worker
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EAS	Emergency Alerting System
EDIS	Emergency Digital Information System
EERI	Earthquake Engineering Research Institute
EIR	Environmental Impact Report
EMA	Emergency Management Assistance
EMI	Emergency Management Institute
EMMA	Emergency Managers Mutual Aid
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPEDAT	Early Post Earthquake Damage Assessment Tool
EPFT	Elysian Park Fold and Thrust belt
EPI	Emergency Public Information
EPIC	Emergency Public Information Council
ESA	California Emergency Services Act
ESC	Emergency Services Coordinator
FEAT	Governor's Flood Emergency Action Team
FHSZ	Fire Hazard Severity Zone
FIR	Final Inspection Reports
FIRESCOPE	Firefighting Resources of So. Calif Organized for Potential Emergencies
FMA	Flood Management Assistance
FRAP	Fire and Resource Assessment Program
GSP	Groundwater Sustainability Plan
HAZMAT	Hazardous Materials
HAZMIT	Hazardous Mitigation
HAD	Housing and Community Development
HEICS	Hospital Emergency Incident Command System
HEPG	Hospital Emergency Planning Guidance
HIA	Hazard Identification and Analysis Unit
HMBP	Hazardous Materials Business Plan
HMEP	Hazardous Materials Emergency Preparedness
HMGP	Hazard Mitigation Grant Program
HOME	Home Investment Partnership Program
IDE	Initial Damage Estimate
IA	Individual Assistance
IFG	Individual & Family Grant (program)

IRG	Incident Response Geographic Information System
IPA	Information and Public Affairs (of state Office of Emergency Services)
IPCC	Intergovernmental Panel on Climate Change
ISZ	Inner Safety Zone (airport)
LA	Los Angeles
LAC or LACo	Los Angeles County
LACCVA	Los Angeles County Climate Vulnerability Assessment
LAC AHMP	County of Los Angeles All-Hazards Mitigation Plan
LAX	Los Angeles Airport
LCP	Local Coastal Program
LADOT	City of Los Angeles Department of Transportation
LAMSA	Los Angeles Metropolitan Statistical Area
LCP LUP	Local Coastal Program Land Use Plan
LEMMA	Law Enforcement Master Mutual Aid
LEPC	Local Emergency Planning Committee
LHMP	Local Hazard Mitigation Plan
LRA	Local Responsibility Area
LUST	Leaking Underground Storage Tank
MARAC	Mutual Aid Regional Advisory Council
METRO	Los Angeles County Metropolitan Transit Authority
MHID	Multi-Hazard Identification
MTA	Metropolitan Transportation Authority (also known as LACMTA)
MWD	Metropolitan Water District
NGO	Non-governmental Organization
NIFZ	Newport-Inglewood Fault Zone
NOFO	Notice of Funding Opportunity
NOI	Notice of Interest
NPP	Nuclear Power Plant
OA	Operational Area
OASIS	Operational Area Satellite Information System
OCC	Operations Coordination Center
OCD	Office of Civil Defense
OEP	Office of Emergency Planning
OEHHS	Office of Environmental Health Hazard Assessment
OES	California Governor's Office of Emergency Services (also Cal OES)
OPC	California Ocean Protection Council
OPR	California Governor's Office of Planning and Research
OSCF	Orphan Site Cleanup Fund
OSFM	California Office of the State Marshal
OSHPD	California Office of Statewide Health Planning and Development
OSPR	California Office of Spill Prevention and Response
PSHA	Probabilistic Seismic Hazard Analysis
PTAB	Planning and Technological Assistance Branch
PVA	Physical Vulnerability Assessment
RA	Regional Administrator (OES)
RADEF	Radiological Defense (program)
RAMP	Regional Assessment of Mitigation Priorities
RAPID	Railroad Accident Prevention & Immediate Deployment

RDO	Radiological Defense Officer
RDMHC	Regional Disaster Medical Health Coordinator
REOC	Regional Emergency Operations Center
REPI	Reserve Emergency Public Information
RES	Regional Emergency Staff
RIMS	Response Information Management System
RMP	Risk Management Plan
RPU	Radiological Preparedness Unit (OES)
RPZ	Runway Protection Zone (airport)
RRT	Regional Response Team
RUST	Replacement of Underground Storage Tanks
RWQCB	Regional Water Quality Control Board
SAM	State Administrative Manual
SAVP	Safety Assessment Volunteer Program
SCEC	Statewide California Earthquake Center (previously Southern California Earthquake Center)
SDWA	Safe Drinking Water Act
SM	Santa Monica
SMFD	Santa Monica Fire Department
SMPD	Santa Monica Police Department
SCO	California State Controller's Office
SEPIC	State Emergency Public Information Committee
SGC	California Strategic Growth Council
SHMA	Seismic Hazards Mapping Act
SHMO	State Hazard Mitigation Officer
SHMP	State Hazard Mitigation Plan
SLA	State and Local Assistance
SLC	California State Lands Commission
SMC	Santa Monica College
SMCAAP	Santa Monica Climate Action and Adaption Plan (or CAAP)
SMGB	California State Mining and Geology Board
SMO	Santa Monica Airport (also used SMA)
SRA	State Responsibility Area
SSC	California Seismic Safety Commission
SWEPC	Statewide Emergency Planning Committee
SWRCB	State Water Resources Control Board
UCBC	Uniform Code for Building Conservation
UCERF	Uniform California Earthquake Rupture Forecast
UPA	Unified Program Account
UC	University of California
USC	University of Southern California
WDRs	Water Discharge Requirements
WC	California State Warning Center

Industry and Other Acronyms

A&W	Alert and Warning
AA	Administering Areas
AAR	After Action Report
ACMs	Asbestos-Containing Materials
B/CA	Benefit/Cost Analysis
BCP	Budget Change Proposal
CADD	Computer-Aided Design and Drafting
CD	Soil Class CD (stiff soil class)
CERT	Community Emergency Response Training
CMU	Concrete Masonry Unit
CPTs	Cone Penetration Tests
CRC	Climate Ready Community
ESAs	Environmental Site Assessments
FSR	Feasibility Study Report
FTE	Full Time Equivalent
FY	Fiscal Year
g	Acceleration of Gravity
GHG	Greenhouse Gases
GIS	Geographic Information System
GPS	Global Positioning System
IA	Individual Assistance
ICC	Increased Cost of Compliance
LAG	Lowest Adjacent Grade
LAN	Local Area Network
M	Magnitude
M_L	Local Magnitude (or Richter Magnitude)
MMI	Modified Mercalli Intensity
M_{max}	Maximum magnitude earthquake
M_w	Moment Magnitude (or seismic moment)
MCL	Maximum Contaminate Level
MOU	Memorandum of Understanding
MPE	Maximum Probable Earthquake
MRE	Most Recent Event
MSL	Mean Sea Level
NBC	Nuclear, Biological, Chemical
NGVD	National Geodetic Vertical Datum of 1929
OA	Operational Area
OASIS	Operational Satellite Information System
OSB	Oriented Strand Board
PA	Public Assistance
PC	Personal Computer
PGA	Peak Ground Acceleration
PGV	Peak Ground Velocity
PM	Particulate Matter
PSA	Public Service Announcement
PSA	Peak Spectral Acceleration

PSPS	Public Safety Power Shutoff
PTR	Project Time Report
RCP	Representative Concentration Pathways
RFI	Request for Information
RL	Repetitive Loss property
SOP	Standard Operating Procedure
SRL	Severe Repetitive Loss Property
SVE	Soil Vapor Extraction
TEC	Travel Expense Claim
TTT	Train the Trainer
UCERF	Uniform California Earthquake Rupture Forecast
UPS	Uninterrupted Power Source
URM	Unreinforced Masonry Building
USAR	Urban Search and Rescue
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WAN	Wide Area Network
WGCEP	Working Group on California Earthquake Probabilities
WUI	Wildland Urban Interface

APPENDIX E: GLOSSARY

Acceleration	The rate of change of velocity with respect to time. Acceleration due to gravity at the earth's surface is 9.8 meters per second squared. That means that every second that something falls toward the surface of earth its velocity increases by 9.8 meters per second.
Acceleration of gravity (g)	The acceleration of gravity (equal to 32 feet per second squared, or 980 centimeters per second squared), and generally expressed as a percentage of gravity.
Acre-foot	Measure of water volume defined as the amount of water required to cover one acre of surface area to a depth of one foot. One acre-foot is approximately equal to 326,000 gallons. Typically used to report the capacity of a reservoir.
Active fault (also referred to as Holocene-active fault)	For implementation of Alquist-Priolo Earthquake Fault Zoning Act (APEFZA) requirements, an active fault is one that shows evidence of, or is suspected of having experienced surface displacement within the past 11,700 years. APEFZA classification is designed for land use management of surface rupture hazards. A more general definition (National Academy of Science, 1988), states "a fault that on the basis of historical, seismological, or geological evidence has the finite probability of producing an earthquake" (see potentially active fault).
Acute	Quick, one-time exposure to a chemical.
Adaptive capacity	The ability of a species (including humans) to cope and persist under changing conditions through local or regional acclimation, dispersal or migration, adaptation (e.g., behavioral shifts), and/or evolution.
Adjacent grade	Elevation of the natural or graded ground surface, or structural fill, abutting the walls of a building. See *highest adjacent grade* and *lowest adjacent grade*.
Aftershocks	Minor earthquakes following a greater one and originating at or near the same place.
Aggradation	The building up of earth's surface by deposition of sediment.
Alluvial	Pertaining to, or composed of alluvium, or deposited by a stream or running water.
Alluvial fan	A low, outspread, relatively flat to gently sloping surface consisting of loose sediment that is shaped like an open fan, deposited by a stream at the place where the stream comes out of a narrow canyon onto a broad valley or plain. Alluvial fans are steepest at the mouth of the canyon, and spread out, gradually decreasing in gradient, away from the stream source.
Alluvium	Surficial sediments of poorly consolidated gravels, sand, silts, and clays deposited by flowing water.
Amplitude	The height of a wave between its crest (high point) and its mid-point.
Anchor	To secure a structure to its footings or foundation wall in such a way that a continuous load transfer path is created and so that it will not be displaced by flood, wind, or seismic forces.

Andesite	Volcanic (rapid cooling) rock of intermediate composition between the mafic-rich (and silica-poor) basalt and the silica-rich rhyolite. Rock type commonly found in subduction zones. Derives its name from the Andes mountains, where this rock type is very common.
Apparatus	Fire fighting vehicles of various types.
Appurtenant structure	Under the *National Flood Insurance Program*, a structure which is on the same parcel of property as the principal *structure* to be insured and the use of which is incidental.
Aquifer	A body of rock or sediment that contains sufficient saturated permeable material to allow the flow of groundwater and to yield economically significant quantities of groundwater to wells and springs.
Argillic	Alteration in which certain minerals of a rock or sediments are converted to clay.
Armor	To protect slopes from *erosion* and *scour* by *flood* waters. Techniques of armoring include the use of riprap, gabions, or concrete.
Arsenic	A naturally occurring, toxic element that occurs in rocks, soils and groundwater. Above certain concentrations, it can cause skin, bladder and other cancers.
Artesian	An adjective referring to ground water confined under hydrostatic pressure. The water level in wells drilled into an *artesian* aquifer (also called a confined aquifer) will stand at some height above the top of the aquifer. If the water reaches the ground surface the well is a "flowing" *artesian* well.
Aspect	The direction a slope faces.
Asset	Any human-made or natural feature that has value, including, but not limited to people, buildings, infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.
Atmospheric river	Narrow streams of water vapor transported in the lower atmosphere that are thought responsible for most of the storms on the west coast of the United States.
Attenuation	The reduction in amplitude of a wave with time or distance traveled.
Automatic aid agreement	An agreement between two or more agencies whereby such agencies are automatically dispatched simultaneously to pre-determined types of emergencies in pre-determined areas.
A zone	Under the *National Flood Insurance Program*, area subject to inundation by the *100-year flood* where wave action does not occur or where waves are less than 3 feet high, designated Zone A, AE, A1-A30, A0, AH, or AR on a *Flood Insurance Rate Map* (FIRM).
Baffles	Temporary devices used to slow down and divert the flow of water and mud away from a given area and into a channel or debris basin. Baffles are often made of hay wrapped into long cloth tubes that are pinned to the ground with wooden stakes.

Basal detachment fault	Also referred to as a décollement (from French décoller 'to detach from'), is a horizontal to sub-horizontal gliding plane at the contact between two distinct rock masses that results in different styles of deformation in each block. In a compressional setting like the Los Angeles basin, the block above the detachment fault typically develops more intense deformation in the form of folding and faulting compared to the layer or block below.
Basalt	Fine-grained extrusive (rapid cooling) igneous rock rich in magnesium and iron; typically dark in color.
Base flood	Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100-year flood.
Base Flood Elevation (BFE)	Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as the standard for the National Flood Insurance Program.
Basement	Under the *National Flood Insurance Program*, any area of a building having its floor subgrade on all sides. (Note: What is typically referred to as a "walkout basement," which has a floor that is at or above grade on at least one side, is not considered a basement under the *National Flood Insurance Program*.)
Basin	As used in this report, refers to groundwater basin, which is an area underlain by permeable materials (sediments) capable of storing and furnishing significant amounts of water to groundwater wells. The basin is the three—dimensional body under the area described as a basin, including the depth of the water-yielding subsurface materials.
Beaufort scale	A scale devised in 1805 by Admiral Francis Beaufort of the British Navy to classify wind speed based on the wind's effect on the seas and vegetation. The scale ranges from 0 (calm) to 12 (hurricane).
Bedding	The arrangement of a sedimentary rock in beds or layers of varying thickness and character.
Bedrock	The solid rock that underlies loose material, such as soil, sand, clay, or gravel.
Bench	A grading term that refers to a relatively level step excavated into earth material on which fill is to be placed.
Benefit	A net project outcome, usually defined in monetary terms, that may include direct and indirect effects. For benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable risk reduction factors, such as a reduction in expected property losses and protection of human life.
Benefit-cost analysis (BCA)	A systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. Used to measure cost-effectiveness/
Berm	Horizontal portion of the backshore beach formed by sediments deposited by waves.
Bioaccumulative	Substances, such as pesticides and other chemicals, that slowly accumulate in an organism reaching concentrations higher than in the surrounding environment because the substance is not readily eliminated through excretion or catabolism. Typically said of substances that at higher concentrations become toxic.
Bioregion	A major, regional ecological community characterized by distinctive life forms and distinctive plant and animal species.

Blind thrust fault	A thrust fault is a low-angle reverse fault (top block pushed over bottom block). A "blind" thrust fault refers to one that does not reach the surface.
Block slide	A type of translational slide where large and relatively intact slabs of rock or earth are rapidly transported downslope. These landslides can be large and damaging and occur where alternating layers of strong and weak rock slope downhill.
Braided stream	A stream that divides into or follows an interlacing or tangled network of several small, branching and reuniting shallow channels separated from each other by channel bars. Also referred to as an anastomosing stream.
Breakaway wall	Under the *National Flood Insurance Program*, a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system. Breakaway walls are required by the *National Flood Insurance Program* regulations for any enclosures constructed below the *Base Flood Elevation* beneath elevated buildings in *Coastal High Hazard Areas* (also referred to as *V zones*). In addition, breakaway walls are recommended in areas where *flood* waters flow at high velocities or contain ice or other debris.
Brush	A collective term that refers to stands of vegetation dominated by shrubby, woody plants, or low-growing trees.
Brushfire	A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.
Building	A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.
Building code	Regulations adopted by local governments that establish standards for construction, modification, and repair of buildings and other structures.
Built-up roof covering	Two or more layers of felt cemented together and surfaced with a cap sheet, mineral aggregate, smooth coating, or similar surfacing material.
Bulkhead	Wall or other structure, often of wood, steel, stone, or concrete, designed to retain or prevent sliding or *erosion* of the land. Occasionally, bulkheads are used to protect against wave action.
Carcinogen	Material capable of causing cancer in humans.
Cast-in-place concrete	Concrete that is poured and formed at the construction site.
CEQA	The California Environmental Quality Act (Chapters 1 through 6 of Division 13 of the Public Resources Code). A state statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
Chronic	Continual or repeated exposure to a hazardous material.
Cladding	Exterior surface of the building envelope that is directly loaded by the wind.
Clay	A rock or mineral fragment having a diameter less than 1/256 mm (4 microns, or 0.00016 in.). Commonly applied to any soft, adhesive, fine-grained deposit.

Claystone	An indurated clay having the texture and composition of shale, but lacking its fine lamination. A massive mudstone in which clay predominates over silt.
Climate	The average condition of weather over time in a given region.
Climate change	Long-term shifts in weather patterns and temperatures. These changes may be natural, but since the 1800s have been driven by human activities, especially the burning of fossil fuels which generates gases that trap heat in the atmosphere.
Climate change adaptation	The process of adjustment to actual or expected climate and its effects.
Climate change mitigation	A human intervention to reduce the human impact on the climate system. Typically includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks (carbon sinks).
Clod	Lump or mass of soil or sediment.
Code official	Officer or other designated authority charged with the administration and enforcement of the code, or a duly authorized representative, such as a building, zoning, planning, or *floodplain management* official.
Coliform	A group of rod-shaped bacteria that are found in water, soil, and on vegetation, and are present in large numbers in the feces of warm-blooded animals. The coliform count is used as an indicator of the sanitary conditions of foods and water. Most genera of coliform are not harmful to humans, but a few kinds, including some strains of Escherichia coli (E. coli) can be debilitating to sensitive individuals, including children, seniors, and those with compromised immune systems.
Collapse	A relatively sudden change in the volume of a soil mass resulting in the local settlement of the ground surface, with the potential to cause significant damage to overlying structures. If due to strong ground shaking, the soil grains in the soil column are re-arranged by the shaking so that the pore space between grains is reduced and the grains become more tightly packed, resulting in the overall reduction of the thickness of the soil column. This is referred to as earthquake-induced subsidence. Collapse can also occur in certain types of sediments, where with the introduction of water (due to an increase in irrigation, for example), the cement between soil grains dissolves, allowing the soil particles to become more tightly packed, again resulting in the local settlement of the ground surface. This process is also referred to as hydro-collapse or hydroconsolidation.
Colluvium	Loose, unconsolidated sediments deposited at the base of a slope by rainwash, sheetwash, slope creep, or mudflows; these materials typically are poorly sorted, containing a variety of grain sizes and rock types. Can also refer to loose sediment formed from the in-place weathering of rocks.
Column foundation	Foundation consisting of vertical support members with a height-to-least-lateral-dimension ratio greater than three. Columns are set in holes and backfilled with compacted material. They are usually made of concrete or masonry and often must be braced. Columns are sometimes known as posts, particularly if the column is made of wood.
Community at Risk	Wildland interface community in the vicinity of Federal lands that is at high risk from wildfire.

Community Rating System (CRS)	An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.
Community Resilience	Ability of a community to prepare for anticipated natural hazards, adapt to changing conditions and withstand and recover rapidly from disruptions. FEMA identified 22 indicators that they used to develop their Community Resilience Challenges Index (CRCI).
Complex (Fire)	Two or more individual incidents located in the same general area and assigned to a single incident commander or unified command.
Compressible soil	Geologically young unconsolidated sediment of low density that may compress under the weight of a proposed fill embankment or structure.
Computer-Aided Design And Drafting (CADD)	A computerized system enabling quick and accurate electronic 2-D and 3-D drawings, topographic mapping, site plans, and profile/cross-section drawings.
Concrete Masonry Unit (CMU)	Building unit or block larger than 12 inches by 4 inches by 4 inches made of cement and suitable aggregates.
Conglomerate	A coarse-grained sedimentary rock composed of rounded to subangular fragments larger than 2 mm in diameter set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica or hardened clay. The consolidated equivalent of gravel.
Connector	Mechanical device for securing two or more pieces, parts, or members together, including anchors, wall ties, and fasteners.
Consolidation	Any process whereby loosely aggregated, soft earth materials become firm and cohesive rock. Also the gradual reduction in volume and increase in density of a soil mass in response to increased load or effective compressive stress, such as the squeezing of fluids from pore spaces.
Contour	A line of equal ground elevation on a topographic (contour) map.
Contraction joint	Groove that is formed, sawed, or tooled in a concrete structure to create a weakened plane and regulate the location of cracking resulting from the dimensional change of different parts of the structure. See *Isolation joint*.
Corrosion-resistant metal	Any nonferrous metal or any metal having an unbroken surfacing of nonferrous metal, or steel with not less than 10 percent chromium or with not less than 0.20 percent copper.
Corrosive soils	Soils with a high proportion of certain chemicals or salts that make them corrosive to metal or concrete.
Coseismic rupture	Ground rupture occurring during an earthquake but not necessarily on the causative fault.
Cretaceous	The final period of the Mesozoic era (before the Tertiary period of the Cenozoic era), thought to have occurred between about 136 and 65 million years ago.
Critical facility	Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.

Dam	Any artificial barrier that has the ability to capture water, wastewater or any liquid-borne material for the purpose of either storing it or controlling it.
Dam failure	Uncontrolled release of captured water due to the partial or complete breach of a dam or levee.
Dead load	Weight of all materials of construction incorporated into the building, including but not limited to walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, *cladding*, and other similarly incorporated architectural and structural items and fixed service equipment. See *Loads*.
Debris	(Seismic) The scattered remains of something broken or destroyed; ruins; rubble; fragments. (Flooding, Coastal) Solid objects or masses carried by or floating on the surface of moving water.
Debris avalanche	A type of surficial slope failure that involves the rapid movement of a relatively thin section of saturated rock and/or soil down a steep slope, usually carrying vegetation and other debris within the slurry. Also called a mudflow.
Debris basin	Structure designed to capture sediment, gravel, boulders, and vegetative debris that wash out of canyons during storms but allows water to flow into the downstream storm drain system, thereby reducing flood risk for communities downstream.
Debris burning	Any fire originally set for the purpose of clearing land or for burning rubbish, garbage, range, stubble, or meadow burning.
Debris impact loads	Loads imposed on a structure by the impact of floodborne debris. These loads are often sudden and large. Though difficult to predict, debris impact loads must be considered when structures are designed and constructed. See *Loads*.
Debris flow	A saturated, rapidly moving saturated earth flow with 50 percent rock fragments coarser than 2 mm in size which can occur on natural and graded slopes.
Debris line	Line left on a structure or on the ground by the deposition of debris. A debris line often indicates the height or inland extent reached by *flood* waters.
Deck	Exterior floor supported on at least two opposing sides by an adjacent structure and/or posts, piers, or other independent supports.
Décollement	See basal detachment fault.
Defensible space	An area, either natural or human-made, where material capable of causing a fire to spread has been treated, cleared, reduced, or changed in order to provide a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, defensible space is defined as an area with a minimum of 100 feet around a structure that is cleared of flammable brush or vegetation. Distance from the structure and the degree of fuels treatment vary with vegetation type, slope, density, and other factors.
Deflected canyons	A diversion in the trend of a stream or canyon caused by any number of processes, including folding and faulting.
Deformation	A general term for the process of folding, faulting, shearing, compression, or extension of rocks.

Design flood	The greater of either (1) the *base flood* or (2) the *flood* associated with the *flood hazard area* depicted on a community's flood hazard map, or otherwise legally designated.
Design Flood Elevation (DFE)	Elevation of the *design flood*, or the flood protection elevation required by a community, including wave effects, relative to the *National Geodetic Vertical Datum*, *North American Vertical Datum*, or other datum.
Design flood protection depth	Vertical distance between the eroded ground elevation and the *Design Flood Elevation*.
Design stillwater flood depth	Vertical distance between the eroded ground elevation and the *design stillwater flood elevation*.
Design stillwater flood elevation	Stillwater elevation associated with the *design flood*, excluding wave effects, relative to the *National Geodetic Vertical Datum*, *North American Vertical Datum*, or other datum.
Development	Under the *National Flood Insurance Program*, any human-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations or storage of equipment or materials
Diabase	Mafic shallow intrusive rock similar in composition to a basalt or plutonic gabbro.
Differential settlement	Non-uniform settlement; the uneven lowering of different parts of an engineered structure, often resulting in damage to the structure. Sometimes included with liquefaction as ground failure phenomenon.
Digitize	To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse mercator (UTM), or table coordinates) for use in computer applications.
Dike	A tabular shaped, igneous intrusion that cuts across bedding of the surrounding rock. An embankment to confine or control water, often built along the banks of a river to prevent overflow of lowlands. A levee.
Disaster declaration (DR)	Declaration for event that causes more damage than state and local governments and resources can handle without federal government assistance. A federal DR puts into motion long-term federal recovery programs, some of which are matched by state programs, to help disaster victims, businesses, and public entities to jumpstart recovery efforts.
Dispatch	The implementation of a command decision to move a resource or resources from one place to another.
Displacement	The length, measured in kilometers, of the total movement that has occurred along a fault over as long a time as the geologic record reveals.
Displacement time	The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.

DMA 2000	Disaster Mitigation Act of 2000. Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by Public Law 106-390, October 30, 2000. DMA 2000 is intended to establish a continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage which result from disasters by (1) revising and broadening the scope of existing disaster relief programs; (2) encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by the States and by local governments; (3) achieving greater coordination and responsiveness of disaster preparedness and relief programs; (4) encouraging individuals, States, and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance; (5) encouraging hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and (6) providing Federal assistance programs for both public and private losses sustained in disasters .
Drought	A prolonged period of lower than normal precipitation levels, which leads to a shortage of water.
Duration	How long a hazard event lasts.
Dust storm	High wind event common in arid and semi-arid regions. Strong winds pick up sand and other particulates and transport them by saltation and suspension to another location.
Dynamic analysis	A complex earthquake-resistant engineering design technique (UBC - used for critical facilities) capable of modeling the entire frequency spectra, or composition, of ground motion. The method is used to evaluate the stability of a site or structure by considering the motion from any source or mass, such as that dynamic motion produced by machinery or a seismic event.
Earth flow	Imperceptibly slow-moving surficial material in which 80 percent or more of the fragments are smaller than 2 mm, including a range of rock and mineral fragments.
Earthquake	Vibratory motion propagating within the Earth or along its surface caused by the abrupt release of strain from elastically deformed rock by displacement along a fault.
Earth's crust	The outermost layer or shell of the Earth.
Effective Flood Insurance Rate Map (FIRM)	See *Flood Insurance Rate Map*.
El Niño	Phenomenon that originates, every few years, typically in December or early January, in the southern Pacific Ocean, off of the western coast of South America, characterized by warmer than usual water. This warmer water is statistically linked with increased rainfall in both the southeastern and southwestern United States, droughts in Australia, western Africa and Indonesia, reduced number of hurricanes in the Atlantic Ocean, and increased number of hurricanes in the Eastern Pacific.
Emergency declaration (EM)	Declarations issued by the federal government to supplement state and local or Tribal nation efforts to provide emergency services, such as protection of lives, property, public health and safety, or to lessen or avert the threat of a catastrophe.

Emergency Planning and Community Right to Know (EPCRA)	The portion of SARA that specifically outlines how industries report chemical inventory to the community.
Enclosure	That portion of an elevated building below the *Design Flood Elevation (DFE)* that is partially or fully surrounded by solid (including breakaway) walls.
Encroachment	Any physical object placed in a floodplain that hinders the passage of water or otherwise affects the flood flows.
En echelon	In geology, this term applies to parallel to subparallel, closely spaced to overlapping or step-like features such as faults and tension fractures that are oblique to the overall structural trend.
Engineering geologist	A geologist who is certified by the State as qualified to apply geologic data, principles, and interpretation to naturally occurring earth materials so that geologic factors affecting planning, design, construction, and maintenance of civil engineering works are properly recognized and used. An engineering geologist is particularly needed to conduct investigations, often with geotechnical engineers, of sites with potential ground failure hazards.
Environmental Protection Agency (EPA)	Federal agency tasked with ensuring the protection of the environment and the nation's citizens.
Eolian (also written Aeolian)	Derived from the action of the wind; usually refers to sediments deposited by the wind, like sand dunes, but also refers to the landforms created by wind action.
Ephemeral stream	A stream or reach of a stream that flows only briefly in direct response to precipitation.
Epicenter	The point at the Earth's surface directly above where an earthquake originated.
Episodic erosion	Erosion induced by a single storm event. Episodic erosion considers the vertical component of two factors: general beach profile lowering and localized conical scour around foundation supports. Episodic erosion is relevant to foundation embedment depth and potential undermining. See *Erosion*.
Equity	All people are justly and fairly included in society, and everyone is able to participate, prosper and achieve their full potential (Cal OES definition).
Erodible soil	Soil subject to wearing away and movement due to the effects of wind, water, or other geological processes during a flood or storm or over a period of years.
Erosion	Under the *National Flood Insurance Program*, the process of the gradual wearing away of landmasses. In general, erosion involves the detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.
Erosion analysis	Analysis of the short- and long-term *erosion* potential of soil or strata, including the effects of wind action, *flooding* or *storm surge*, moving water, wave action, and the interaction of water and structural components.

Erosion hazard area	Area anticipated to be lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.
Essential facility	Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
Estuarine	Related to or formed in an estuary, the area where a river meets the sea. Estuarine sediments are typically deposited in brackish water and consist predominantly of marine and riverine clay and silt with a relatively large concentration of decomposed terrestrial organic material.
Evacuation	Movement of people from an area, typically their homes, to another area considered to be safe, typically in response to a natural or human-made disaster that makes an area unsafe.
Expansive soil	A soil that contains clay minerals that take in water and expand. If a soil contains sufficient amount of these clay minerals, the volume of the soil can change significantly with changes in moisture, with resultant structural damage to structures founded on these materials.
Exposure	In regards to climate change, the amount and rate of change that a population or system experiences from the direct (e.g., temperature, precipitation changes) or indirect (e.g., habitat shifts due to changing vegetation composition) impacts of climate change. In regards to hazardous materials, coming into contact with a hazardous substance, either through inhalation, skin contact, or ingestion. In general, the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.
Extent	The size of an area affected by a hazard or hazard event.
Extratropical cyclone	Cyclonic storm events like Nor'easters and severe winter low-pressure systems. Both West and East coasts can experience these non-tropical storms that produce gale-force winds and precipitation in the form of heavy rain or snow. These cyclonic storms, commonly called Nor'easters on the East Coast because of the direction of the storm winds, can last for several days and can be very large – 1,000-mile wide storms are not uncommon.
Extreme heat	Summertime temperatures that are much hotter or more humid than average. Because climate varies with location, the definition of extreme heat varies in different locales. However, in most of the United States, extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees.
Extremely hazardous substance	A substance that shows high acute or chronic toxicity, carcinogenity, bioaccumulative properties, is persistent in the environment, or is water reactive (California Code of Regulations, Title 22).
Fault	A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.
Fault segment	A continuous portion of a fault zone that is likely to rupture along its entire length during an earthquake.

Fault slip rate	The average long-term movement of a fault (measured in cm/year or mm/year) as determined from geologic evidence.
Fault strand	A fault that is mappable as a single, fairly continuous feature.
Fault trace	The intersection of the fault plane with the Earth's surface. If not erased by erosion, the fault trace may be visible in the form of cracks, scarps, deflected or offset channels, furrows or ridges, and differences in the type of geologic material across the fault. Also used to denote the line plotted on a map to show the location of a fault.
Federal Emergency Management Agency (FEMA)	Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery.
Federal Insurance Administration (FIA)	The component of the *Federal Emergency Management Agency* directly responsible for administering the flood insurance aspects of the *National Flood Insurance Program*.
Fill	Material such as soil, gravel, or crushed stone placed in an area to increase ground elevations or change soil properties.
Fire complex	Two or more individual fire incidents located in the same general area which are assigned to a single incident commander or unified command.
Fire behavior	The manner in which a fire reacts to the influences of fuel, weather and topography.
Fire flow	The flow rate of a water supply expressed in gallons per minute (gpm), measured at 20 pounds per square inch (psi) residual pressure, that is available for fire fighting.
Fire frequency	The number of fires occurring within a defined area in a given time period.
Fire regime	The long-term fire pattern characteristic of a region or ecosystem described using a combination of seasonality, fire return interval, size, spatial complexity, intensity, severity, and fire type.
Fire resistant	A characteristic of a plant species that allows individuals to resist damage or mortality during a fire. Also used to describe construction materials that resist damage to fire.
FIRESCOPE	**FI**refighting **RES**ources of **C**alifornia **O**rganized for **P**otential **E**mergencies. A cooperative effort involving all agencies with fire-fighting responsibilities in California. The goal of this group is to create and implement new applications in fire service management, technology and coordination, with an emphasis on incident command and multi-agency coordination. This dynamic state-wide program serves the needs of California fire service management as an ongoing program.
First responders	A group designated by the community as those who may be first to arrive at the scene of a fire, accident or chemical release.
Fire weather	The weather conditions that influence fire behavior, including air temperature, atmospheric moisture, atmospheric stability, clouds and precipitation.
Five hundred (500)-year flood	*Flood* that has as 0.2-percent probability of being equaled or exceeded in any given year.
Flash flood	A flood event occurring with little or no warning where water levels rise at an extremely fast rate.

Flight operations	Departures and arrivals combined, of aircraft at an airport.
Flood	A rising body of water, as in a stream or lake, which overtops its natural and artificial confines and covers land not normally under water. Under the *National Flood Insurance Program*, either (a) a general and temporary condition or partial or complete inundation of normally dry land areas from: (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudslides (i.e., mudflows) which are proximately caused by flooding as defined in (2) and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when the earth is carried by a current of water and deposited along the path of the current, or (b) the collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as flash flood or abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding as defined in (1), above.
Flood-damage-resistant material	Any construction material capable of withstanding direct and prolonged contact (i.e., at least 72 hours) with floodwaters without suffering significant damage (i.e., damage that requires more than cleanup or low-cost cosmetic repair, such as painting).
Flood depth	Height of the flood-water surface above the ground surface.
Flood elevation	Height of the water surface above an established elevation datum such as the *National Geodetic Vertical Datum*, *North American Vertical Datum*, or *mean sea level*.
Flood hazard area	The greater of the following: (1) the area of special flood hazard, as defined under the *National Flood Insurance Program*, or (2) the area designated as a flood hazard area on a community's legally adopted flood hazard map, or otherwise legally designated.
Flood insurance	Insurance coverage provided under the National Flood Insurance Program.
Flood Insurance Rate Map (FIRM)	Under the *National Flood Insurance Program*, an official map of a community, on which the *Federal Emergency Management Agency* has delineated both the special hazard areas and the risk premium zones applicable to the community. (Note: The latest FIRM issued for a community is referred to as the *effective FIRM* for that community.)
Flood Insurance Study (FIS)	Under the *National Flood Insurance Program*, an examination, evaluation, and determination of *flood* hazards and, if appropriate, corresponding *water surface elevations*, or an examination, evaluation, and determination of mudslide (i.e., mudflow) and/or flood-related erosion hazards in a community or communities. (Note: The *National Flood Insurance Program* regulations refer to Flood Insurance Studies as "flood elevation studies.")
Flooding	See *Flood*.

Floodplain	Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.
Floodplain management	Operation of an overall program of corrective and preventive measures for reducing *flood* damage, including but not limited to emergency preparedness plans, flood control works, and *floodplain management regulations*.
Floodplain management regulations	Under the *National Flood Insurance Program*, zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as floodplain ordinance, grading ordinance, and erosion control ordinance), and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of *flood* damage prevention and reduction.
Flood-related erosion area or flood-related erosion prone area	A land area adjoining the shore of a lake or other body of water, which due to the composition of the shoreline or bank and high water levels or wind-driven currents, is likely to suffer *flood*-related *erosion* damage.
Floodway	The channel of a river or other watercourse, and the adjacent land areas that must be kept free of encroachment in order to discharge the base flood without cumulatively increasing the water surface elevation more than a certain height.
Flow failure	A type of liquefaction-induced failure that generally occurs in slopes greater than 3 degrees, and that is characterized by the displacement, over tens to hundreds of feet, of blocks of soil riding on top of the liquefied substrate.
Footing	Enlarged base of a foundation wall, pier, post, or column designed to spread the load of the structure so that it does not exceed the soil bearing capacity.
Footprint	Land area occupied by a structure.
Freeboard	Under the *National Flood Insurance Program*, a factor of safety, usually expressed in feet above a *flood* level, for the purposes of *floodplain management*. Freeboard tends to compensate for the many unknown factors that could contribute to flood heights greater than the heights calculated for a selected size flood and floodway conditions, such as the hydrological effect of urbanization of the watershed.
Frequency	A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.
Fuel	The source of heat that sustains the combustion process. In wildland fires, fuel is the combustible plant biomass, including grass, leaves, ground litter, shrubs, plants and trees.
Fuel load	The amount of fuel that is potentially available for combustion.
Fuel moisture	The moisture content expressed as a percentage of the dry weight of the fuel.

Fuel modification zone	Ribbon of land surrounding a development within a fire hazardous area that is designed to diminish the intensity of a wildfire as it approaches the structures.
Functional downtime	The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.
Funnel clouds	Cone-shaped or needle-like clouds that extend down from the main cloud base but do not extend to the ground surface. If a funnel cloud touches the ground, it becomes a tornado.
Gabion	Rock-filled cage made of wire or metal that is placed on slopes or embankments to protect them from *erosion* caused by flowing or fast-moving water.
Geographic area impacted	The physical area in which the effects of the hazard are experienced.
Geographic Information Systems (GIS)	A computer software application that relates physical features on the Earth to a database to be used for mapping and analysis.
Geogrid	A tough polymeric net-like material that is placed between the horizontal layers of artificial fill to strengthen a human-made slope.
Geomorphology	The science that treats the general configuration of the Earth's surface. The study of the classification, description, nature, origin and development of landforms, and the history of geologic changes as recorded by these surface features.
Geotechnical engineer	A licensed civil engineer who is also certified by the State as qualified for the investigation and engineering evaluation of earth materials and their interaction with earth retention systems, structural foundations, and other civil engineering works.
Glacials	Refers to glacial periods, or ice ages, that occurred in the Quaternary, when large, continental-sized ice sheets covered the Northern Hemisphere. When the ice sheets retreated, these periods are called interglacials. Several glacials and interglacials occurred during the Quaternary.
Goal	General guideline that explains what is to be achieved. Typically, broad-based, long-term, policy-type statements that represent global visions. Goals help to define the benefits that a plan is trying to achieve. The success of a LHMP is measured by the degree to which its goals have been met.
Grade beam	Section of a concrete slab that is thicker than the slab and acts as a footing to provide stability, often under load-bearing or critical structural walls. Grade beams are occasionally installed to provide lateral support for vertical foundation members where they enter the ground.
Grading	Any excavating or filling or combination thereof. Generally refers to the modification of the natural landscape into pads suitable as foundations for structures.
Granite	Broadly applied, any completely crystalline, quartz-bearing, plutonic rock.

Graywacke	Dark-colored poorly sorted sandstone with angular grains of quartz, feldspar and small rock fragments in a clay-rich matrix. Thought to be related to turbidite deposits; typically found on the edges of continental shelves and the bottoms of oceanic trenches.
Greenhouse gas (GHG) emissions	Gases released during the combustion of fossil fuels, such as coal and natural gas, that accumulate in the atmosphere and trap solar radiation. Carbon dioxide makes up the majority of these gases, but methane and nitrous oxide are also important components.
Ground failure	Permanent ground displacement produced by fault rupture, differential settlement, liquefaction, or slope failure.
Ground lurching	A form of earthquake-induced ground failure where soft, saturated soils move in a wave-like manner in response to intense seismic ground shaking, forming ridges or cracks at the surface.
Ground motion	The vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions
Ground oscillations	A type of liquefaction-induced failure where liquefaction occurs at depth, in an area where the ground surface is too level to permit the lateral displacement of the overlying soil blocks. The blocks instead separate from one another and oscillate above the liquefied layer. This may result in the opening and closing of fissures or cracks, and the formation of sand boils or sand volcanoes.
Ground rupture	Displacement of the earth's surface as a result of fault movement associated with an earthquake.
Hail	Solid precipitation consisting of fragments of ice water called hailstones.
Hazard	A source of potential danger or adverse condition. Hazards in this how to series will include naturally occurring events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.
Hazard event	A specific occurrence of a particular type of hazard.
Hazard identification	The process of identifying hazards that threaten an area.
Hazard mitigation	Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.

Hazardous material (HAZMAT)	Substance that has the ability to harm humans, property or the environment. The United States Environmental Protection Agency defines hazardous waste as substances that: 1) may cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; 2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed; and 3) whose characteristics can be measured by a standardized test or reasonably detected by generators of solid waste through their knowledge of their waste. Hazardous waste is also ignitable, corrosive, or reactive (explosive) (EPA 40 CFR 260.10). A material may also be classified as hazardous if it contains defined amounts of toxic chemicals.
Hazard profile	A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.
Hazardous Waste Operations and Emergency Response (HAZWOPER)	The Occupational Safety and Health Agency (OSHA) regulations that cover safety and health issues at hazardous waste sites and response to chemical incidents.
Hazard reduction	Any treatment of a hazard that reduces its threat.
HazUS (Hazards U.S.)	A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.
Head scarp	The upslope portion of a landslide, generally defined by a steep slope at the head, where displaced material has moved away from the undisturbed portion of the slope.
Heat wave	Periods of excessive heat, typically exceeding 95 degrees Fahrenheit, often with high levels of humidity, and lasting more than three days.
Hexavalent chromium	Compounds that contain the element chromium in its +6 (hexa) oxidation state. These compounds are used extensively in several different industries; however, it is a known human carcinogen and thus its use is now regulated. Groundwater in many parts of the country has been contaminated with varying levels of hexavalent chromium.
High-hazard dam	Dam whose failure or improper operation can cause loss of human life.
High-velocity wave action	Condition in which *wave heights* or *wave runup depths* are greater than or equal to 3.0 feet.
Highest adjacent grade	Elevation of the highest natural or regarded ground surface, or structural fill, that abuts the walls of a building.
Holocene	An epoch of the Quaternary period spanning from the end of the Pleistocene to the present time (the past about 11,700 years).

Hurricane	An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74-miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.
Hurricane clip or strap	Structural connector, usually metal, used to tie roof, wall, floor, and foundation members together so that they can resist wind forces.
Hydrocompaction	Settlement of loose, granular soils that occurs when the loose, dry structure of the sand grains held together by a clay binder or other cementing agent collapses upon the introduction of water.
Hydrodynamic loads	Loads imposed on an object, such as a building, by water flowing against and around it. Among these loads are positive frontal pressure against the structure, drag effect along the sides, and negative pressure on the downstream side.
Hydrology	The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.
Hydrostatic loads	Loads imposed on a surface, such as a wall or floor slab, by a standing mass of water. The water pressure increases with the square of the water depth.
Hypocenter	The earthquake focus, that is, the place at depth, along the fault plane, where an earthquake rupture started.
Hypothermia	Abnormally low body temperature (typically below 95 degrees Fahrenheit) that is accompanied by any of several signs, including uncontrollable shivering, disorientation, memory loss, slurred speech, drowsiness, and apparent exhaustion.
Igneous	Type of rock or mineral that formed from molten or partially molten magma.
Ignition point	The location of the ignition.
Ignition source	The origin or source of a fire.
Infiltration	The process by which water seeps into the soil, as influenced by soil texture, soil structure, and vegetation cover.
Infrastructure	Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, drydocks, piers and regional dams.
Inner Safety Zone (ISZ)	High-risk area in and adjacent to an airport runway that is subject to approach undershoot accidents, emergency landings on straight out departures, and runway overruns. Also referred to as the Inner Departure/Approach Zone.
Intensity	A measure of the effects of a hazard event at a particular place.

Intrusive	Said of igneous rocks that formed from magma invading existing rocks in the subsurface, and cooling off over millennia in the subsurface, leading to the formation of relatively large crystals (crystallizing). Intrusive rocks typically form veins, dikes, sills, batholiths, laccoliths, and other similar structures.
Invasive plants	Plants that aggressively expand their ranges over the landscape, typically at the expense of native plants that are displaced or destroyed by the newcomers. Invasive species are typically considered a major threat to biological diversity.
Inventory	The assets identified in a planning area that could be lost when a disaster occurs. Assets include people, buildings, transportation and other valued community resources.
ISO	Insurance Services Office. Private organization that formulates fire safety ratings based on fire threat and responsible agency's ability to respond to the threat. ISO ratings from one (excellent) to ten (no fire protection). Many insurance companies use ISO ratings to set insurance premiums.
Isolation joint	Separation between adjoining parts of a concrete structure, usually a vertical plane, at a designated location such as to interfere least with the performance of the structure, yet such as to allow relative movement in three directions and avoid formation of cracks elsewhere in the concrete and through which all or part of the bonded reinforcement is interrupted. See *Contraction joint*.
Itinerant aircraft	Aircraft that use an airport on an irregular basis, without regular scheduling. Typically refers to aircraft that are not based at that particular airport, and that do not fly in an out of that airport on a regular basis. The opposite are referred to as Local aircraft.
Jet stream	A relatively narrow stream of fast-moving air in the middle and upper troposphere. Surface cyclones develop and move along the jet stream.
Jetting (of piles)	Use of a high-pressure stream of water to embed a pile in sandy soil. See *pile foundation*.
Joist	Any of the parallel structural members of a floor system that support, and are usually immediately beneath, the floor.
ka	Thousands of years before present.
Lacustrine	Pertaining to or related to a lake. Refers both to sediments deposited in a lake environment, and the landforms associated with lakes.
Ladder fuels	Fuels that provide vertical continuity between strata, allowing fire to move from the surface fuels to the crowns of shrubs and trees with relative ease.
Landslide	A general term covering a wide variety of mass-movement landforms and processes involving the downslope transport, under gravitational influence, of soil and rock material en masse.
Lateral force	The force of the horizontal, side-to-side motion on the Earth's surface as measured on a particular mass; either a building or structure.
Lateral spreading	Lateral movements in a fractured mass of rock or soil which result from liquefaction or plastic flow or subjacent materials.
Left-lateral fault	A strike-slip fault across which a viewer would see the block on the opposite side of the fault move to the left.

Levee	Human-made structure, usually an earthen embankment, used to contain, control, or divert the flow of water to try and reduce flooding risk.
Level-of-service standard (LOS standard)	Quantifiable measures against which services being delivered by a service provider can be compared. Standards based upon recognized and accepted professional and county standards, while reflecting the local situation within which services are being delivered. Levels-of-service standards for fire protection may include response times, personnel per given population, and emergency water supply. LOS standards can be used to evaluate the way in which fire protection services are being delivered, for use in countywide fire planning efforts.
Lifeline system	Linear conduits or corridors for the delivery of services or movement of people and information (e.g., pipelines, telephones, freeways, railroads).
Lineament	Straight or gently curved, lengthy features of earth's surface, frequently expressed topographically as depressions or lines of depressions, scarps, benches, or change in vegetation.
Liquefaction	Changing of soils (unconsolidated alluvium) from a solid state to weaker state unable to support structures; where the material behaves similar to a liquid as a consequence of earthquake shaking. The transformation of cohesionless soils from a solid or liquid state as a result of increased pore pressure and reduced effective stress.
Litter	Recently fallen plant material that is only partially decomposed, forming a surface layer on some soils.
Live loads	*Loads* produced by the use and occupancy of the building or other structure. Live loads do not include construction or environmental loads such as wind load, snow load, rain load, earthquake load, flood load, or dead load. See *Loads*.
Load-bearing wall	Wall that supports any vertical load in addition to its own weight. See *Non-load-bearing wall*.
Loads	Forces or other actions that result from the weight of all building materials, occupants and their possessions, environmental effects, differential movement, and restrained dimensional changes. Permanent loads are those in which variations over time are rare or of small magnitude. All other loads are variable loads.
Local government	Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments, regional or interstate government entity, or agency or instrumentality of a local government; any Tribal Nation or authorized Tribal organization; and any rural community, unincorporated town or village, or other public entity.
Local Hazard Mitigation Plan (LHMP)	Study that assesses hazard vulnerabilities and identifies mitigation actions that jurisdictions will pursue to reduce the level of injury, property damage, and community disruption that might otherwise result from such events.
Local Responsibility Area (LRA)	Lands in which the financial responsibility of preventing and suppressing fires is primarily the responsibility of the local jurisdiction.
Lowest adjacent grade (LAG)	Elevation of the lowest natural or re-graded ground surface, or structural fill, that abuts the walls of a building. See *Highest adjacent grade*.
Lowest floor	Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.

Lowest horizontal structural member	In an elevated building, the lowest beam, *joist*, or other horizontal member that supports the building. *Grade beams* installed to support vertical foundation members where they enter the ground are not considered lowest horizontal structural members.
Ma	Millions of years before present.
Macroburst	A strong downdraft over 2.5 miles in diameter that can cause damaging winds lasting 5 to 20 minutes. Formed by an area of significantly rain-cooled air that after hitting ground levels spreads out in all directions.
Magnitude	A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.
Main shock	The biggest earthquake in a sequence of earthquakes that occur fairly close in time and space. Smaller shocks before the main shock are called foreshocks; smaller shocks that occur after the main shock are called aftershocks.
Major earthquake	Capable of widespread, heavy damage up to 50+ miles from epicenter; generally near magnitude range 6.5 to 7.0 or greater, but can be less, depending on rupture mechanism, depth of earthquake, location relative to urban centers, etc.
Manufactured home	Under the *National Flood Insurance Program*, a *structure*, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle."
Marsh	Wetland dominated by herbaceous or non-woody plants often developing in shallow ponds or depressions, river margins, tidal areas, and estuaries.
Masonry	Built-up construction of combination of building units or materials of clay, shale, concrete, glass, gypsum, stone, or other
Mass casualty	Incident in which the number of victims exceeds the capability of the emergency management system to manage the incident effectively.
Material Safety Data Sheet (MSDS)	See Safety Data Sheet (SDS)
Maximum Considered Earthquake (MCE)	Starting with the 2006 International Building Code, a probabilistic analysis used for seismic design that calculates the earthquake size that would generate ground motions with a 2% probability of being exceeded in 50 years (approximately equivalent to a 2,500-year return period).
Maximum Contaminant Level (MCL)	Federal drinking water standard: "the maximum permissible level of a contaminant in water which is delivered to any user of a public water system (Code of Federal Regulations, Title 40, Part 141.2).
Maximum Magnitude Earthquake (M_{max})	The highest magnitude earthquake a fault is capable of producing based on physical limitations, such as the length of the fault or fault segment.
Maximum Probable Earthquake (MPE)	The design size of the earthquake expected to occur within a time frame of interest, for example within 30 years or 100 years, depending on the purpose, lifetime or importance of the facility. Magnitude/frequency relationships are based on historic seismicity, fault slip rates, or mathematical models. The more critical the facility, the longer the time period considered.

Mean sea level (MSL)	Average height of the sea for all stages of the tide, usually determined from hourly height observations over a 19-year period on an open coast or in adjacent waters having free access to the sea. See *National Geodetic Vertical Datum*.
Mediterranean climate	The climate characteristic of the Mediterranean region and most of California, characterized by hot, dry summers, and cool, wet winters.
Metal roof panel	Interlocking metal sheet having a minimum installed weather exposure of 3 square feet per sheet.
Metal roof shingle	Interlocking metal sheet having an installed weather exposure less than 3 square feet per sheet.
Metamorphic rock	A rock whose original mineralogy, texture, or composition has been changed due to the effects of pressure, temperature, or the gain or loss of chemical components.
Microburst	A very localized zone of sinking air, less than 2.5 miles in diameter, producing damaging, straight-line, divergent winds at or near the ground surface lasting 2 to 5 minutes.
Microseismic	Pertaining to the faint earth tremors or small earthquakes (microseisms) that are part of the dominant background seismic noise signal on Earth caused by natural phenomena.
Mitigation	Any action taken to reduce or permanently eliminate the long-term risk to life and property from natural hazards.
Mitigation directorate	Component of *Federal Emergency Management Agency* directly responsible for administering the flood hazard identification and *floodplain management* aspects of the *National Flood Insurance Program*.
Mitigation plan	A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the state and includes a description of actions to minimize future vulnerability to hazards.
Mobile homes	Prefabricated housing units that are placed on isolated piers, jackstands, or masonry block foundations (usually without any positive anchorage). Sometimes also referred to as manufactured homes.
Moderate earthquake	Capable of causing considerable to severe damage, generally in the range of Magnitude 5.0 to 6.0 (Modified Mercalli Intensity <VI), but highly dependent on rupture mechanism, depth of earthquake, and location relative to urban center, etc.
Modified Mercalli Intensity	A qualitative measure of the size of an earthquake based on people's description of how strongly the earthquake was felt, and the damage it caused to the built environment. The scale has 12 divisions, ranging from I (felt by only a very few people) to XII (total damage).
Moment magnitude (seismic moment, M_w)	A measure of earthquake size that is based on the amount of energy released when a fault ruptures. Considered the most meaningful and thus preferred measure of earthquake size.
Monsoon	A seasonal reversing wind that is accompanied by precipitation. In North America, the monsoon occurs between late June and early September; starts in Mexico and spreads northward into Arizona, New Mexico, West Texas, Nevada, Utah, Colorado and eastern California.

Mutual Aid Agreement	A reciprocal aid agreement between two or more agencies that defines what resources each will provide to the other in response to certain predetermined types of emergencies. Mutual aid response is provided upon request.
National Fire Protection Association (NFPA)	A group that issues fire and safety standards for industry and emergency responders.
National Fire Incident Reporting System (NFIRS)	A database of fire incident reports compiled at the local fire department level. NFIRS was an outgrowth of the 1974 National Fire Prevention and Control Act, Public Law 93–498. The U.S. Fire Administration (USFA), an entity of the Department of Homeland Security, developed NFIRS as a means of assessing the nature and scope of the fire problem in the United States.
National Flood Insurance Program (NFIP)	Federal program created by Congress in 1968 that makes *flood* insurance available in communities that enact and enforce satisfactory *floodplain management regulations*.
National Geodetic Vertical Datum of 1929 (NGVD)	Datum established in 1929 historically used as a basis for measuring flood, ground, and structural elevations, previously referred to as Sea Level Datum or *Mean Sea Level*. The *Base Flood Elevations* shown on most of the *Flood Insurance Rate Maps* issued by the *Federal Emergency Management Agency* are referenced to NGVD or, more recently, to the *North American Vertical Datum*.
National Weather Service (NWS)	Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and state entities in preparing weather and flood warning plans.
Natural attenuation	Reduction in mass or concentration of a compound in groundwater over time or distance from the source of constituents of concern due to naturally occurring physical, chemical, and biological processes, such as biodegradation, dispersion, dilution, adsorption, and volatilization.
Naturally decay-resistant wood	Wood whose composition provides it with some measure of resistance to decay and attack by insects, without preservative treatment (e.g., heartwood of cedar, black locust, black walnut, and redwood).
Near-field earthquake	Used to describe a local earthquake within approximately a few fault zone widths of the causative fault which is characterized by high frequency waveforms that are destructive to above-ground utilities and short period structures (less than about two or three stories).
New construction	For the purpose of determining flood insurance rates under the *National Flood Insurance Program*, *structures* for which the start of construction commenced on or after the effective date of the initial *Flood Insurance Rate Map* or after December 31, 1974, whichever is later, including any subsequent improvements to such structures. (See *Post-FIRM structure*.) For *floodplain management* purposes, new construction means *structures* for which the *start of construction* commenced on or after the effective date of a *floodplain management regulation* adopted by a community and includes any subsequent improvements to such structures.
Nitrite and nitrate	Nitrogen-oxygen combinations that occur in several organic and inorganic compounds. High concentrations of nitrites in drinking water can pose serious health hazards, especially to infants.

Non-coastal A zone	The portion of the *Special Flood Hazard Area* in which the principal source of *flooding* is runoff from rainfall, snowmelt, or a combination of both. In non-coastal A zones, *flood* waters may move slowly or rapidly, but waves are usually not a significant threat to buildings. See *A zone* and *coastal A zone*. (Note: the *National Flood Insurance Program* regulations do not differentiate between non-coastal A zones and *coastal A zones*.)
Non-load-bearing wall	Wall that does not support vertical loads other than its own weight. See *Load-bearing wall*.
Nor'easter	An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.
North American Vertical Datum (NAVD)	Datum used as a basis for measuring flood, ground, and structural elevations. NAVD is used in many recent *Flood Insurance Studies* rather than the *National Geodetic Vertical Datum*.
Objective	A measurable step to take to achieve a strategy.
Oblique-slip fault	A fault that combines some strike-slip (horizontal) motion with some dip-slip (vertical) motion.
Oblique – reverse fault	A fault that combines some strike-slip motion with some dip-slip motion in which the upper block, above the fault plane, moves up over the lower block.
Offset ridge	A ridge that is discontinuous on account of faulting.
Offset stream	A stream displaced laterally or vertically by faulting
One hundred (100)-year flood	See *Base flood*.
Oriented strand board (OSB)	Mat-formed wood structural panel product composed of thin rectangular wood strands or wafers arranged in oriented layers and bonded with waterproof adhesive.
Outflow	Follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures.
Paleoseismic	Pertaining to an earthquake or earth vibration that happened decades, centuries, or millennia ago.
Pandemic	An epidemic of infectious disease that has spread through human populations across a large region, multiple continents, or worldwide.
Paralic	Marine and non-marine deposits, typically interfingered, that generally occur on the landward side of a coastline, or in an area sporadically invaded by sea water.
Particulate matter	Particles or solids or liquids in the air. Typically reported as PM_{10}-consisting of fine particles that are 10 micrometers or less in diameter- and $PM_{2.5}$-particles that are 2.5 micrometers or less in diameter.
Peak flood	The highest discharge or stage value of a flood.
Peak Ground Acceleration (PGA)	The greatest amplitude of acceleration measured for a single frequency on an earthquake accelerogram. The maximum horizontal ground motion generated by an earthquake. The measure of this motion is the acceleration of gravity (equal to 32 feet per second squared, or 980 centimeter per second squared), and generally expressed as a percentage of gravity.
Pedogenic	Pertaining to soil formation.

Perched groundwater	Unconfined groundwater separated from an underlying main body of ground water by an unsaturated zone.
Peak flood	The highest discharge or stage value of a flood.
Perchlorates	Negatively charged molecules highly persistent in the environment that can displace the iodide molecule in the thyroid gland, leaving to hypothyroidism in adults, and impaired development in infants.
Perennial stream	A stream that flows continuously throughout the year.
Planimetric	Describes maps that indicate only human-made features like buildings.
Planning	The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.
Playa	Term used in the Southwestern US to describe a flat-floored, typically unvegetated area composed of thin, stratified sheets of fine clay, silt or sand that represent the bottom or central part of a shallow, completely closed or undrained desert lake basin where water accumulates after a rainstorm and quickly evaporates, leaving behind deposits of soluble salts.
Pleistocene	Geologic epoch that lasted from about 2.58 million years ago to 11,700 years ago, spanning the most recent period of repeated glaciations. See Holocene and Quaternary entries also.
Plutonic	Pertaining to igneous rocks formed at great depth.
Plywood	Wood structural panel composed of plies of wood veneer arranged in cross-aligned layers. The plies are bonded with an adhesive that cures on application of heat and pressure.
Polyfluoroalkyl substances (PFAs)	Group of compounds containing carbon to fluorine chemical bonds that are manufactured and used to enhance the repellency of water, grease, and soil in consumer products. These chemicals are very stable and resistant to environmental degradation, and readily absorbed but not readily eliminated from the human body. Long-term exposure can cause harmful health effects to a developing fetus or infant, suppress the immune system, disrupt thyroid function, increase liver weight, and lead to cancer.
Pore pressure	The stress transmitted by the fluid that fills the voids between particles of a soil or rock mass.
Post foundation	Foundation consisting of vertical support members set in holes and backfilled with compacted material. Posts are usually made of wood and usually must be braced. Posts are also known as columns, but columns are usually made of concrete or masonry.
Post-FIRM structure	For purposes of determining insurance rates under the *National Flood Insurance Program*, structures for which the *start of construction* commenced on or after the effective date of an initial *Flood Insurance Rate Map* or after December 31, 1974, whichever is later, including any subsequent improvements to such structures. This term should not be confused with the term *new construction* as it is used in *floodplain management*.
Pounding	The crashing of buildings next to each other as they sway and deflect in response to strong ground shaking. This can result in significant damage to the structures, especially if the floors are at different elevations, such that a reinforced floor hits the columns of an adjacent building.
Precast concrete	Structural concrete element cast elsewhere than its final position in the structure. See *Cast-in-place concrete*.

Pre-Holocene fault	A fault that last ruptured the ground surface more than 11,700 years ago.
Preparedness	Actions that strengthen the capability of government, people, and communities to respond to disasters.
Prescribed fire	A fire ignited under known conditions of fuel, weather, and topography to achieve specific objectives.
Pressure-treated wood	Wood impregnated under pressure with compounds that reduce the susceptibility of the wood to flame spread or to deterioration caused by fungi, insects, or marine borers.
Primary fault rupture	Fissuring and displacement of the ground surface along a fault that breaks in an earthquake.
Probabilistic seismic hazard analysis (PSHA)	An analytical method used to quantify the rate (or probability) of exceeding various ground-motion levels at a site (or a map of sites) given all possible earthquakes.
Probability of occurrence	A statistical measure of the likelihood that a hazard event will occur. Generally based on past hazard events and a forecast of events that could occur in the future.
Project	A development application involving zone changes, variances, conditional use permits, tentative parcel maps, tentative tract maps, and plan amendments.
Public Safety Power Shutoff (PSPS)	An intentional shutdown of electrical power in an area because of hazardous weather conditions which could contribute to the possibility of wildfires.
Quaternary	The second period of the Cenozoic era, consisting of the Pleistocene and Holocene epochs; covers the last approximately two million years.
Rain shadow	A reduction in precipitation in an area on the leeward side of a mountain or range of mountains, caused by the release of moisture on the windward side.
Recovery	Restoring, redeveloping and revitalizing the health, social, economic, natural and environmental fabric of a community during and following a disaster.
Recurrence interval	The time between earthquakes of a given magnitude, or within a given magnitude range, on a specific fault or within a specific area. More generally, a measure based on the probability that a given hazard event will be equaled or exceeded in any given year based on past occurrences (called the return period).
Reinforced concrete	Structural concrete reinforced with steel bars.
Remedial action	Long-term responses at sites in the National Priorities List (NPL) with the objective of permanently and significantly reducing the risk associated with the past release of hazardous substances at these sites.
Remote shutoff	Valve that can be used to shut off the flow of a substance or chemical from a location away from the spill or break.
Removal action	Short-term responses, often to address emergency situations that require a prompt response, such as the finding of abandoned drums containing hazardous materials or soils contaminated with a substance that poses an acute risk to human health or the environment.

Repetitive loss property	A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1000 each have been paid within any 10-year period since 1978.
Replacement value	The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.
Reportable quantity	A term used by the EPA and the Department of Transportation (DOT) to denote a quantity of chemicals that require some kind of action, such as reporting an inventory or reporting an accident involving a certain amount of chemicals.
Representative Concentration Pathways (RCPs)	Greenhouse gas concentration trajectories adopted by the Intergovernmental Panel on Climate Change that represent different scenarios based on whether or not emissions are curtailed and mitigated. The RCP numbers (2.6, 4.5…8.5) refer to the range of radiative forcing values in the year 2100 that affect global warming and climate change. Radiative forcing is the change in the net radiative flux [energy measured in watts per square meter ($W\ m-2$)] at the tropopause or top of atmosphere due to a change in an external driver of climate change such as a change in the concentration of carbon dioxide or changes in solar energy output. A low RCP number represents an aggressive reduction of emissions that in turn resolves into a lower temperature increase in 2100 relative to pre-industrial worldwide temperatures.
Resilience	The capacity of people, organizations, or systems to adapt to changing conditions and withstand and/or rapidly recover from disruption due to an emergency.
Resonance	Amplification of ground motion frequencies within bands matching the natural frequency of a structure and often causing partial or complete structural collapse; effects may demonstrate minor damage to single-story residential structures while adjacent 3- or 4-story buildings may collapse because of corresponding frequencies, or vice versa.
Response spectra	The range of potentially damaging frequencies of a given earthquake applied to a specific site and for a particular building or structure.
Response time	The time that elapses between the moment a 911 call is placed to the emergency dispatch center and the time that a first-responder arrives on scene. Response time includes dispatch time, turnout time (the time it takes firefighters to travel to the fire station, don their personal protection equipment, and prepare the apparatus), and travel time.
Retrofit	Any change made to an existing structure to reduce or eliminate damage to that structure from flooding, *erosion*, high winds, earthquakes, or other hazards
Revetment	Facing of stone, cement, sandbags, or other materials placed on an earthen wall or embankment to protect it from *erosion* or *scour* caused by *flood* waters or wave action.
Richter scale	A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935. Seismologists no longer use this magnitude scale because of limitations in how it measures large earthquakes, and prefer instead to use moment magnitude as a measure of the energy released during an earthquake.

Ridgetop shattering	An earthquake-induced type of ground failure that occurs along at or along the top of ridges, forming linear, fault-like fissures, and leaving the area looking like it was plowed.
Right-lateral fault	A strike-slip fault across which a viewer would see the block on the opposite side of the fault move to the right.
Riprap	Broken stone, cut stone blocks, or rubble that is placed on slopes to protect them from *erosion* or *scour* caused by *flood* waters or wave action.
Risk	The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
Risk assessment	Process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards.
Risk ranking	Process to score and rank hazards based on the probability that they will occur and the impact that they will have if they do occur.
Riverine	Of or produced by a river.
Rockfall	Free-falling to tumbling mass of bedrock that has broken off steep canyon walls or cliffs.
Rogue wave	Unusually large and unpredictable surface wave that can be damaging to ships and coastal structures. What causes rogue waves to form is not completely understood, but recent modeling suggests that linear superposition can cause a wave to draw energy from other nearby waves and briefly become very large. Also referred to as freak waves, monster waves, killer waves, extreme waves and abnormal waves; these names allude to how these waves are unusual and dangerous.
Roof deck	Flat or sloped roof surface not including its supporting members or vertical supports.
Rotational landslide	Landslide that occurs along a curved or spoon-shaped surface. Back-tilting may occur near the scarp (top) of the landslide and there is often a toe of displaced material at the base. Rotational slides often occur because the internal strength of the material is overcome by its own weight.
Runway Protection Zone (RPZ)	Trapezoidal-shaped areas at ground level off the end of an airport runway that serves to enhance the protection of people and property on the ground in the event an aircraft lands or crashes beyond the runway end. The dimensions of RPZs vary depending upon the type of landing approach that is available (visual, non-precision, precision) and the characteristics of the aircraft (size, weight, approach speed).
Safety Data Sheet (SDS)	Information sheets for employees that provide specific information about a chemical that they may come in contact at their place of work, with attention to health effects, handling, and emergency procedures.
Sand boil	An accumulation of sand resembling a miniature volcano or low volcanic mound produced by the expulsion of liquefied sand to the sediment surface. Also called sand blows, and sand volcanoes.

Sandstone	A medium-grained, clastic sedimentary rock composed of abundant rounded or angular fragments of sand size set in a fine-grained matrix and more or less firmly united by a cementing material.
Santa Ana (or Santana) wind	Strong, typically extremely dry offshore winds that characteristically blow through southern California and northern Baja California in late fall and winter. They typically originate in the Great Basin or upper Mojave Desert, and can be either hot or cold. The winds tend to funnel down the valleys and canyons, where gusts can attain speeds of 60 to 90 miles per hour (mph). Several devastating wildfires in southern California have been associated with Santa Ana winds.
Saturated	Said of the condition in which the interstices of a material are filled with a liquid, usually water.
Scale	A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.
Scarp	A steep slope. A line of cliffs produced by faulting or by erosion. The term is an abbreviated form of escarpment.
Schist	A metamorphic rock characterized by a preferred orientation in grains resulting in the rock's ability to be split into thin flakes or slabs.
Scour	Removal of soil or fill material by the flow of floodwaters. The term is frequently used to describe storm-induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.
Sea level rise (SLR)	The rise in global mean sea level due to the added water from melting glaciers and the thermal expansion of seawater as a result of higher water temperatures.
Secondary fault rupture	Ground surface displacements along faults other than the main traces of active regional faults.
Sediment	Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, ice, or that accumulates by other natural agents, such as chemical precipitation from solution, and that forms in layers on the Earth's surface in a loose, unconsolidated form.
Sedimentary rock	Type of rock composed of material deposited at the Earth's surface or at the bottom of bodies of water by the actions of water, wind, gravity, or ice. Sedimentary rocks generally differ from sediment in that the individual particles have been partially or fully cemented together by clay, silica, calcium carbonate or some other material, giving the rock strength.
Seiche	A free or standing-wave oscillation of the surface of water in an enclosed or semi-enclosed basin (such as a lake, bay, or harbor), that is initiated chiefly by local changes in atmospheric pressure, aided by winds, tidal currents, and earthquakes, and that continues, pendulum-fashion, for a time after cessation of the originating force.
Seismic moment	A measure of the size of an earthquake that is associated with the amount of energy released (the force that was necessary to overcome the friction along the fault plane), the area of the fault rupture, and the average amount of slip.
Seismicity	Describes the likelihood of an area being subject to earthquakes.
Seismogenic	Capable of producing earthquake activity.

Seismograph	An instrument that detects, magnifies, and records vibrations of the Earth, especially earthquakes. The resulting record is a seismogram.
Sensitivity	In regards to climate change, it refers to characteristics of a population or system that are dependent on specific environmental conditions, and the degree to which the population or system will likely be affected by climate change (e.g., temperature or hydrological requirements).
Shear wall	*Load-bearing wall* or *non-load-bearing wall* that transfers in-plane lateral forces from lateral *loads* acting on a structure to its foundation.
Sheet flow	An overland flow or downslope movement of water taking the form of a thin, continuous film over relatively smooth soil or rock surfaces, and not concentrated into channels larger than rills.
Shutter ridge	That portion of an offset ridge that blocks or "shutters" the adjacent canyon.
Significant hazard dam	Dam that if it fails can cause economic loss, environmental damage, or disruption of lifeline facilities, or that can impact other concerns, but not necessarily cause the loss of life.
Sidehill fill	A wedge of artificial fill typically placed on the side of a natural slope to create a roadway or a level building pad.
Silt	A rock fragment or detrital particle smaller than a very fine sand grain and larger than coarse clay, having a diameter in the range of 1/256 to 1/16 mm (4-62 microns, or 0.00016-0.0025 in.). An indurated silt having the texture and composition of shale but lacking its fine lamination is called a siltstone.
Single Event Noise Exposure Level (SENEL)	The sound level produced by a single aircraft at a particular measuring point, recorded during the duration of that event.
Single-ply membrane	Roofing membrane that is field-applied with one layer of membrane material (either homogeneous or composite) rather than multiple layers.
Slip rate	The speed at which a fault is moving, typically expressed in millimeters per year (mm/yr), and generally estimated by measuring the amount of offset that has occurred in a given, known amount of time.
Slope creep	Deformation and movement of the outer soil or rock that covers a slope due to the forces of gravity overcoming the shear strength of the material.
Slope ratio	Refers to the angle or gradient of a slope as the ratio of horizontal units to vertical units. For example, in a 2:1 slope, for every two horizontal units, there is a vertical rise of one unit (equal to a slope angle, from the horizontal, of 26.6 degrees).
Slopewash	The movement of soil and rock down a slope by rain.
Slump	A landslide characterized by a shearing and rotary movement of a generally independent mass of rock or earth along a curved slip surface.
Social vulnerability index (SVI)	A measure established by the Centers for Disease Control and Prevention and adopted by FEMA to rate the ability of a community to respond to natural and human-caused disasters that is based on social factors such as poverty, age, level of education, access to a vehicle and smart phone, etc. These values are assigned at the county, city and census tract level and range from 0 (low) to 1 (high).

Soft-story building	Building with a story, generally the ground or first floor, lacking adequate strength or toughness due to too few shear walls. Examples of this type of structure include apartments above glass-fronted stores, and buildings perched atop parking garages.
Soil horizon	A layer of soil that is distinguishable from adjacent layers by characteristic physical properties such as structure, color, or texture.
Special Flood Hazard Area (SFHA)	Under the *National Flood Insurance Program*, an area having special *flood*, mudslide (i.e., mudflow) and/or flood-related erosion hazards, and shown on a Flood Hazard Boundary Map or *Flood Insurance Rate Map* as Zone A, AO, A1-A30, AE, A99, AH, V, V1-V30, VE, M or E.
Stafford Act	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.
Stakeholder	Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation efforts.
Standardized Emergency Management System (SEMS)	(Government Code § 8607). The group of principles developed for coordinating state and local emergency response in California. SEMS provides for organization of a multiple-level emergency response, and is intended to structure and facilitate the flow of emergency information and resources within and between the organizational levels--the field response, local government, operational areas, regions and the state management level. SEMS incorporates by reference: the Incident Command System (ICS); multi-agency or inter-agency coordination; the State's Mutual Aid Program; and Operational Areas.
Start of construction	Under the *National Flood Insurance Program*, date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a *substantial improvement*, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.
State Coordinating Agency	Under the *National Flood Insurance Program*, the agency of the state government, or other office designated by the Governor of the state or by state statute to assist in the implementation of the *National Flood Insurance Program* in that state.

State Hazard Mitigation Officer (SHMO)	The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.
State Responsibility Area (SRA)	Per California Public Resources Code 4125-4127, the lands in which the State has primary financial responsibility for preventing and suppressing fires.
Stillwater elevation	Projected elevation that flood waters would assume, referenced to the *National Geodetic Vertical Datum*, *North American Vertical Datum*, or other datum, in the absence of waves resulting from wind or seismic effects.
Storage capacity	Dam storage measured in acre-feet or decameters, including dead storage.
Strandline	Shoreline, especially one above current sea level.
Strike-slip fault	A fault with a vertical to sub-vertical fault surface that displays evidence of horizontal and opposite displacement.
Structural concrete	All concrete used for structural purposes, including *plain concrete* and *reinforced concrete*.
Structural engineer	A licensed civil engineer certified by the State as qualified to design and supervise the construction of engineered structures.
Structural fill	Fill compacted to a specified density to provide structural support or protection to a *structure*. See *Fill*.
Structure	Something constructed, such as a building, or part of one. For *floodplain management* purposes under the *National flood Insurance Program*, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home. For insurance coverage purposes under the NFIP, structure means a walled and roofed building, other than a gas or liquid storage tank, that is principally above ground and affixed to a permanent site, as well as a *manufactured home* on a permanent foundation. For the latter purpose, the term includes a building while in the course of construction, alteration, or repair, but does not include building materials or supplies intended for use in such construction, alteration, or repair, unless such materials or supplies are within an enclosed building on the premises.
Subdrain	An underground pipe or network of piping used to remove water from areas that collect or retain surface water or groundwater. A subdrain system is typically installed behind concrete or masonry walls built to retain a vertical slope face (retaining wall), to prevent the buildup of hydrostatic pressure behind the wall, which would in time make it fail.
Subsidence	The sudden sinking or gradual downward settling of the Earth's surface with little or no horizontal motion.
Superfund Amendments and Reauthorization Act (SARA)	Law that regulates a number of environmental issues, predominantly for the chemical inventory reporting by industry to the local community.
Surficial failure	Type of slope failure that impacts the near-surface soil and weathered rock face, typically in response to the effects of gravity and precipitation.

Substantial damage	Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage.
Substantial improvement	Under the *National Flood Insurance Program*, any reconstruction, rehabilitation, addition, or other improvement of a *structure*, the cost of which equals or exceeds 50 percent of the market value of the structure before the *start of construction* of the improvement. This term includes structures, which have incurred *substantial damage*, regardless of the actual repair work performed. The term does not, however, include either (1) any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions, or (2) any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."
Super typhoon	A typhoon with maximum sustained winds of 150 mph or more.
Surface faulting	The differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.
Surface fault rupture	Offset of the ground surface when a fault rupture extends to the Earth's surface.
Surficial failure	Type of slope failure that impacts the near-surface soil and weathered rock face, typically in response to the effects of gravity and precipitation.
Surge	See *Storm surge*.
Sustainability	Strategy for improving the quality of life while preserving the environmental potential for the future. Refers to the preservation of resources, including physical, social, economic, environmental, historical, and cultural, for the benefit of future generations.
Swale	In hillside terrace, a shallow drainage channel, typically with a rounded depression or "hollow" at the head.
Talus	The cone-shaped accumulation of angular fragments of rock or soil at the base of a cliff that has experienced rockfalls.
Target fire hazard	A facility or structure within a fire department's jurisdiction that if it caught fire, it could overwhelm the fire department's fire response capabilities. Target hazards typically include industrial buildings, facilities that use, store or manufacture hazardous materials, high-occupancy facilities, and structures that house sensitive populations, like schools and hospitals.
Tectonic plate	Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.
Teletsunami	Tsunami that originates from a distant source, generally defined as more than 1,000 km (620 miles) away or at least three-hours travel across the ocean from its source to the area of interest. Teletsunamis are usually caused by earthquakes of magnitudes higher than 7.5.

Thirty (30)-year erosion setback	A state or local requirement that prohibits new construction and certain improvements and repairs to existing coastal buildings located in an area expected to be lost to *shoreline retreat* over a 30-year period. The inland extent of the area is equal to 30 times the average annual long-term recession rate at a site, measured from a reference feature.
Thrust fault	A fault, with a relatively shallow dip, in which the upper block, above the fault plane, moves up over the lower block.
Thunderstorm	A weather condition that develops when warm, moist air meets a cold front, producing strong winds, and sometimes tornadoes and hail.
Topographic	Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include human-made features.
Topple	A type of gross slope failure that involves the forward rotation and movement of a mass of rock, earth or debris out of a slope. This kind of slope failure generally occurs around an axis (or point) at or near the base of the block of rock.
Tornado	A violently rotating column of air extending from a thunderstorm to the ground.
Transform system	A system in which faults of plate-boundary dimensions transform into another plate-boundary structure when it ends.
Translational landslide	Landslide where the downslope movement of material occurs along a distinctly planar surface, such as a bedding plane, joint or fault.
Transpression	In crustal deformation, an intermediate stage between compression and strike-slip motion; it occurs in zones with oblique compression.
Tropical cyclone	A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.
Tropical depression	A tropical cyclone with maximum sustained winds of less than 39 mph.
Tropical disturbance	Tropical cyclone that maintains its identity for at least 24 hours and is marked by moving thunderstorms and with slight or no rotary circulation at the water surface. Winds are not strong. It is a common phenomenon in the tropics and is the first discernable stage in the development of a *hurricane*.
Tropical storm	A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.
Tsunami	Great sea wave produced by a submarine earthquake, landslide, or volcanic eruption.
Turbidite	Deep marine geologic deposit characterized by a fining-upward sequence, from pebble conglomerate at the bottom to fine-grained shale at the top. These sediments are transported and deposited by low density flows or turbidity currents. Turbidites typically exhibit several fining-upward intervals, each representative of one flow event.
Typhoon	A special category of tropical cyclone peculiar to the western North Pacific Basin, frequently affecting areas in the vicinity of Guam and the North Mariana Islands. Typhoons whose maximum sustained winds attain or exceed 150 mph are called super typhoons.
Unconfined aquifer	Aquifer in which the upper surface of the saturated zone is free to rise and fall.

Unconsolidated sediments	A deposit that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth.
Underground Storage Tank (UST)	Tank, commonly used to store gasoline, diesel or other chemical, that is buried under the ground.
Undermining	Process whereby the vertical component of erosion or scour exceeds the depth of the base of a building foundation or the level below which the bearing strength of at the foundation is compromised.
Unreinforced Masonry (URM) Structure	Structures in which there is no steel reinforcement within the masonry walls. The definition of an unreinforced masonry building can vary among jurisdictions. Some cities classify unreinforced infill walls within a reinforced frame as a URM while others classify unreinforced exterior veneers on to a wood frame as URMs.
Uplift	Hydrostatic pressure caused by water under a building. It can be strong enough lift a building off its foundation, especially when the building is not properly anchored to its foundation.
Upper bound earthquake	The ground motion with a 10% chance of exceedance in 100 years, with a statistical return period of 949 years.
Variance	Under the *National Flood Insurance Program*, grant of relief by a community from the terms of a *floodplain management regulation*.
Violation	Under the *National Flood Insurance Program*, the failure of a structure or other development to be fully compliant with the community's *floodplain management regulations*. A *structure* or other *development* without the elevation certificate, other certifications, or other evidence of compliance required in Sections 60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4), or (e)(5) of the NFIP regulations is presumed to be in violation until such time as that documentation is provided.
Volcanic rocks	Rocks formed from lava erupted from a volcano. They are very common in the oceans, and at plate boundaries.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.
Vulnerability assessment	The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.
V zone	Under the *National Flood Insurance Program*, these are coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of being flooded over the life of a 30-year mortgage, and as a result, property owners in the V zone are required to buy flood insurance. No base elevations are shown within these zones.
Watershed	A topographically defined region draining into a particular water course.
Waterspout	Tornado that forms over water.

Water surface elevation	Under the *National Flood Insurance Program*, the height, in relation to the *National Geodetic Vertical Datum* of 1929 (or other datum, where specified), of *floods* of various magnitudes and frequencies in the *floodplains* of coastal or riverine areas.
Water table	The upper surface of groundwater saturation of pores and fractures in rock or surficial earth materials.
Water year	The 12-month period from October 1 through September 30 of the following year.
Wave	Ridge, deformation, or undulation of the water surface.
Wave crest elevation	Elevation of the crest of a wave.
Wave height	Vertical distance between the wave crest and wave trough.
Wave runup	Rush of wave water up a slope or structure.
Wave runup depth	Vertical distance between the maximum wave runup elevation and the eroded ground elevation.
Wave runup elevation	Elevation, referenced to the *National Geodetic Vertical Datum* or other datum, reached by *wave runup*.
Weather	The short-term state of the air or atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness, or any other meteorological phenomena.
Wildfire	An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.
Wildland-urban interface area (WUI)	The area where wildland approaches or interfaces with the urban environment. Important in fire hazard studies where wildland fires have the potential to impact the built environment.
X zone	Under the *National Flood Insurance Program*, areas where the *flood* hazard is less than that in the *Special Flood Hazard Area*. Shaded X zones shown on recent *Flood Insurance Rate Maps* (B zones on older maps) designate areas subject to inundation by the *500-year flood*. Un-shaded X zones (C zones on older *Flood Insurance Rate Maps*) designate areas where the annual probability of flooding is less than 0.2 percent.
Zone	A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.
Zoning ordinance	Ordinance that designates allowable land use and intensities for a local jurisdiction.

APPENDIX F: LOS ANGELES COUNTY, CA AREA DISASTERS SINCE 1950

Disaster Name	Disaster #	Year	CA Counties (or Cities) Declared	State Proclamation or Federal Declaration Date	# of Deaths	# of Injuries	Cost of Damage (see notes at end)
Floods	OCD 50-01	1950	Statewide	11/21/1950	9		$32.2 million
Flood and Erosion	DR-15	1954	Statewide	02/05/1954	-	-	Not available
Fire, Flood, and Erosion	DR-28	1954	Los Angeles, San Bernardino	02/05/1954	-	-	Not available
Floods	DR-47	1955	Statewide	12/22/55	74	-	$200 million
Fires	DR-65	1956	Los Angeles (Malibu area), Ventura	12/29/1956	1	Several hundred	$70 million
Fires	CDO 58-01	1958	Los Angeles	01/03/1958	1	23	Not available
Storms & Flooding	DR-82	1958	Statewide	04/02/1958	13	several	$24 million
Potential Flood Damage and Landsides as a Result of Fires	CDO 59-01	1959	Los Angeles	01/08/1959	-	-	Not available
Major and Widespread Fires	N/A	1960	Los Angeles, San Bernardino	07/21-22/1960		12	$10 million
Bel Air Fires	DR-119	1961	Los Angeles	11/16/1961		103	$50-$100 million
Flood and Rainstorm	DR-122	1962	Los Angeles, Ventura	02/16/1962 02/23/1962 03/06/1962	-	-	Not available
Severe storms and Flooding	DR-138	1962	Statewide	10/24/1962	-	-	Not available
Severe storms, Heavy rains and Flooding	DR-145	1963	Statewide	02/25/1963	-	-	Not available
Baldwin Hills Dam Failure	DR-161	1963	Los Angeles	12/16/1963	5	27	$5.2 million
Abnormally Heavy and Continuous Rainfall	N/A	1963	Northern California (boundaries of San Luis Obispo, Ventura, Los Angeles, and San Bernardino counties to the Oregon State Line	2/14/1964			Not Available
Major Widespread Fires (Weldon Fire)	N/A	1964	Los Angeles	03/16/1964	-	-	$2 million
Storms	N/A	1964	Los Angeles	04/03/1964			$1.6 million
Seismic Sea Wave (Tsunami – Alaska EQ)	DR-169	1964	Statewide	04/01/1964	13	-	$20 million
Watts Riots	N/A	1965	Los Angeles	08/14/1965	34	1,032	$445 million
Flooding and Landslides Caused by Heavy Rains	N/A	1965	Los Angeles (Burbank, Los Angeles)	01/05/1965	-	-	Not available
Slide Damage	N/A	1965	Los Angeles (City of Los Angeles, Pacific Palisades area)	06/21/1965	-	-	$6.5 million
Major and Widespread Fires	N/A	1967	Los Angeles, Orange, San Diego, Ventura	01/07/1967	-	-	$11.3 million
Santa Barbara Major Oil Spill	N/A	1969	Coastal Areas of Southern California	-	-	-	Not available
1969 Storms	DR-253	1969	Los Angeles, San Luis Obispo, Fresno, Inyo, Riverside, San Bernardino, Santa Barbara, Tulare, Ventura, Amador, El Dorado, Kern, Kings, Madera, Modoc, Mono, Monterey, Orange, Placer,	1/23/69, 1/25,69, 1/28/69, 1/29/69, 2/8/69, 2/10/69, 2/16/69, 3/12/69 1/26/1969 (Fed)	47	161	$300 million

Disaster Name	Disaster #	Year	CA Counties (or Cities) Declared	State Proclamation or Federal Declaration Date	# of Deaths	# of Injuries	Cost of Damage (see notes at end)
			Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Tuolumne, Mariposa, Merced, Calaveras, San Benito, Sierra, Contra Costa, Humboldt, Mendocino, Sonoma, Plumas, Tehama, Yuba, Butte, Marin, Yolo				
Slide Damage Caused by Heavy Rains and Storms	N/A	1970	Los Angeles (City of Los Angeles)	03/10/1970	-	-	$8.5 million
Statewide Fires	DR-295	1970	City of Oakland, and Los Angeles, Ventura, San Diego, Kern, San Bernardino, Monterey, Riverside counties	9/24/70, 9/28/70, 10/1/70, 10/2/70, 10/20/70, 11/14/70 09/29/1970 (Fed)	19	-	$223.6 million
San Fernando Earthquake	DR-299	1971	Los Angeles	02/09/1971 (State & Fed)	58	2,000	$484 million
Exotic Newcastle Disease Epidemic	N/A	1972	Los Angeles, Orange, Riverside, San Bernardino, San Diego, Ventura, Santa Barbara	4/10/1972 05/22/1972	-	-	$10 million
Fires	N/A	1973	Los Angeles	07/16/1973	-	-	$1.3 million
Gasoline Purchasing Problems	N/A	1974	Alameda, Contra Costa, Los Angeles, Orange, Riverside, San Mateo, Solano, Santa Clara, Ventura	02/28/1974 03/04/1974 03/10/1974	-	-	Not available
Fires	N/A	1975	Los Angeles	11/24/1975	-	-	$19.5 million
Drought	N/A	1976	Alpine, Calaveras, Colusa, Fresno, Glenn, Madera, Merced, San Diego, San Joaquin, Solano, Stanislaus, Sutter, Tuolumne, Alameda, Butte, Contra Costa, Kings, Los Angeles, Riverside, San Luis Obispo, Tulare, Yolo, Amador, Monterey, Napa, Nevada, San Benito, San Bernardino, Tehama, San Mateo, Marin	02/09/1976 02/13/1976 02/24/1976 03/26/1976 07/06/1976	-	-	$2.7 billion
1978 Los Angeles Fire	EM-3067	1978	Los Angeles (City of Los Angeles-Pacific Palisades, Malibu)	10/24/1978	1	-	$61.3 million
Storms	DR-547	1978	Inyo, Mono, San Diego, San Luis Obispo, Kings, Monterey, Kern, Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, Tulare, Ventura	03/09/1978 02/27/1978 02/13/1978	14	21	$117.8 million
Gasoline Shortage Emergency	N/A	1979	Alameda, Contra Costa, Los Angeles, Marin, Monterey, Orange, Riverside, San Francisco, San Diego, Santa Clara, Santa Cruz, San Mateo, Ventura, San Bernardino, Sonoma, Contra Costa, Los Angeles, Orange, Santa Clara	05/8/1979 01/13/1979	-	-	Not available
Fires	N/A	1979	Santa Barbara, Ventura, Los Angeles, El Dorado	09/28/1979 09/21/1979 09/20/1979	-	-	$10 million
1980 Winter Storms	DR-615	1980	Santa Barbara, Los Angeles, Orange, Riverside, Ventura, San Bernardino, San Diego	02/21/1980 02/07/1980	-	-	Not available
Southern California Fires	DR-635	1980	San Bernardino, Los Angeles, Orange, Riverside	11/18/1980	-	-	$64.8 million
Mediterranean Fruit Fly Infestation	N/A	1981	Contra Costa, Los Angeles, San Benito, Stanislaus, Santa Cruz, San Mateo	08/08/1981 09/25/1981	-	-	$22 million
Dayton Hills Fire	N/A	1982	Los Angeles, Orange, Ventura	10/10/1982	-	-	$19.3 million
1982-83 Winter Storms and	DR-677 82-18	1982	Contra Costa, San Joaquin, Sacramento, Marin, San Mateo,	12/08/1982 03/21/1983	-	-	$523.6 million

Disaster Name	Disaster #	Year	CA Counties (or Cities) Declared	State Proclamation or Federal Declaration Date	# of Deaths	# of Injuries	Cost of Damage (see notes at end)
Floods			Los Angeles, San Diego, Alameda, Orange, San Benito, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sonoma, Ventura, Trinity, Colusa, Lake, Mendocino, Monterey, San Luis Obispo, Solano, Yolo, Butte, Glenn, Kern, Kings, San Bernardino, Sutter, Tehama, Merced, Del Norte, Fresno, Madera, Napa, Placer, Riverside, Stanislaus, Tulare, Humboldt, Mariposa, Nevada, Yuba	02/09/1983 (Fed)			
Mexican Fruit Fly	N/A	1983	Los Angeles	11/4/1983	-	-	Not available
High Winds	83-01	1983	Yuba, Los Angeles	03/1983	-	-	Not available
1983 Floods	83-05	1983	Los Angeles	03/1983	-	-	Not available
Statewide Fires	DR-739	1985	San Diego, San Luis Obispo, Monterey, Santa Clara, Santa Cruz, Ventura, (and City of Los Angeles)	07/01/1985 07/11/1985 07/18/1985 (Fed)	3	470	$64.8 million
Plane Crash	N/A	1986	Los Angeles (Cerritos)	08/31/1986	82	2	Not available
Mediterranean Fruit Fly	N/A	1987	Los Angeles	08/25/1987	-	-	Not available
Whittier Earthquake	DR-799 87-01	1987	Los Angeles (Monterey Park, Whittier), Orange	10/02/1987 10/05/1987 10/07/1987 (Fed)	9	200+	$358 million
Coastal Storms	DR-812 87-04	1988	Los Angeles, Orange, San Diego, Ventura	01/21/1988 02/05/1988 (Fed)	-	-	Not available
Mediterranean Fruit Fly	N/A	1988	Los Angeles	07/21/1988	-	-	Not available
Fire and Wind Driven Waves	N/A	1988	Los Angeles (Redondo Beach)	06/15/1988	-	-	$25 million
Fires	87-07	1988	Los Angeles	05/1988	-	-	Not available
Fires/ High Winds	88-03	1988	Los Angeles	12/09/1988	0	2	$12.4 million
Mediterranean Fruit Fly	N/A	1989	Los Angeles	08/09/1989			Not available
Upland Earthquake	89-07	1990	Los Angeles, San Bernardino	03/9/1990 03/13/1990	0	38	$12 million
Mexican Fruit Fly	N/A	1990	Los Angeles, San Diego	05/14/1990	-	-	Not available
Santa Barbara Fires	DR-872 89-08	1990	Los Angeles, Santa Barbara, Riverside, San Bernardino	06/28/1990 06/29/1990 06/30/1990 (Fed)	3	89	$300 million
Freeze	DR-894	1990	Santa Cruz, Fresno, Glenn, imperial, Kern, Mendocino, Monterey, Riverside, San Benito, San Bernardino, San Diego, San Mateo, Santa Barbara, Santa Clara, Solano, Sonoma, Tulare, Ventura, Alameda, Butte, Colusa, Los Angeles, Madera, Marin, Merced, Napa, San Joaquin, San Luis Obispo, Sutter, Yolo, Yuba, Stanislaus, Tehama	12/19/90 01/18/1991 02/11/1991 (Fed)	-	-	$852.4 million
Sierra Madre Earthquake	91-04	1991	Los Angeles	07/05/1991	1	30	$33.5 million
1992 Winter Storms	DR-935 92-01	1992	Los Angeles, Ventura, City of Los Angeles, Kern, Orange, San Bernardino	02/12/1992 02/19/1992 02/25/1992 (Fed)	5		$123.2 million
Los Angeles Civil Unrest (Riots)	DR-942 92-03	1992	Los Angeles (City of Los Angeles)	04/29/1992 05/22/1992 (Fed)	53	2,383	>$1 billion
Landers/Big Bear Earthquakes	DR-947 92-04	1992	Riverside, San Bernardino, Los Angeles	06/28/1992 06/28/1992 (Fed)	1	402	$15.6 million
1992 Late Winter	DR-979	1992	Alpine, Los Angeles, Humboldt,	01/7/1993	20	10	$600 million

Disaster Name	Disaster #	Year	CA Counties (or Cities) Declared	State Proclamation or Federal Declaration Date	# of Deaths	# of Injuries	Cost of Damage (see notes at end)
Storms	93-01		Napa, Santa Barbara, Culver City, City of Los Angeles, Contra Costa, Mendocino, Sonoma, Fresno, imperial, Madera, Monterey, San Bernardino, Sierra, Tehama, Trinity, Tulare, Modoc, Orange, Riverside, Lassen, Siskiyou, Plumas, San Diego	02/19/1993 01/15/1993			
Southern California Firestorms	DR-1005 93-05	1993	Los Angeles, Ventura, San Diego, Orange, Riverside, San Bernardino	10/27/1993 10/28/1993 10/28/1993 (Fed)	4	162	$83 million
Northridge Earthquake	DR-1008 94-01	1994	Los Angeles, Ventura, Orange	01/17/1994 01/24/1994 01/17/1994 (Fed)	57	11,846	$6.1 billion
Severe Winter Storms	DR-1044 95-01 95-02	1995	Los Angeles, Orange, Humboldt, Lake, Sonoma, Butte, Colusa, Contra Costa, Del Norte, Glenn, Kern, Lassen, Mendocino, Modoc, Monterey, Napa, placer, Plumas, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Tehama, Ventura, Yolo, Yuba, Alpine, Amador, Nevada, Riverside, Sacramento, San Bernardino, San Mateo, Shasta, Sutter, Trinity, San Diego, Alameda, Marin, Fresno, Kings, El Dorado, Madera, Solano, Siskiyou	01/06/1995 03/14/1995 01/10/1995 (Fed)	11	NA	$741.4 million
Late Winter Storms (Southern California)	DR-1046 95-04	1995	Imperial, Inyo, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Ventura	03/12/1995 03/14/1995 03/12/1995 (Fed)	17	NA	$1.1 billion
Southern California Firestorms	EM-3120 96-04	1996	Los Angeles, Orange, San Diego, Ventura (City of Santa Buenaventura)	01/01/1996 10/22/1996		5	$12.6 million
El Niño Floods	DR-1203 98-01	1998	Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Fresno, Glenn, Humboldt, Kern, Kings, Lake, Los Angeles, Marin, Mendocino, Merced, Monterey, Napa, Orange, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Ventura, Yolo, Yuba		17	NA	$550 million
Windstorms	2000-02	2000	Los Angeles	04/01/2000	-	-	$78,081
2001 March Storms & Floods	2001-01	2001	Los Angeles, San Luis Obispo, Santa Barbara	03/01/2001	-	-	$9.4 million
Williams Fire	2002-01 FM-2464	2002	Los Angeles	09/23/2002 10/10/2002	-	-	$6 million
Copper Fire	FM-2417	2002	Los Angeles	06/06/2002	-	-	$2,927,981
Leona Fire	FM-2462	2002	Los Angeles	09/03/2002	-	-	$2,410,655
Pacific Fire	FM-2466	2003	Los Angeles	01/07/2003 (Fed)	-	-	$2,017,043
Southern California Wildfires	DR-1498 2003-03	2003	Ventura, Los Angeles, San Bernardino, Riverside, San Diego	10/24/2003 10/26/2003 10/27/2003 (Fed)	24	246	$177.5 million
Verdale Fire	FM-2502	2003	Los Angeles, Ventura	10/25/2003 (Fed)	-	-	Not available
Flash Flooding	2003-04	2003	Los Angeles	11/14/2003	-	-	$903,275
Pine Fire	FM-2528	2004	Los Angeles	07/14/2004 (Fed)	-	-	$9,028,675
Foothill Fire	FM-2534	2004	Los Angeles	07/18/2004 (Fed)	-	-	$4,319,501

Disaster Name	Disaster #	Year	CA Counties (or Cities) Declared	State Proclamation or Federal Declaration Date	# of Deaths	# of Injuries	Cost of Damage (see notes at end)
Crown Fire	FM-2535	2004	Los Angeles	07/21/2004 (Fed)	-	-	$2,604,924
Southern California Severe Storms	DR-1577 2005-01	2005	Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Ventura	1/12/2005 02/04/2005 (Fed)	28	8	$573.1 million
Floods	DR-1585 2005-02	2005	Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Ventura	02/01/2005 04/14/2005 (Fed)	9		$198.7 million
Hurricane Katrina Evacuations (Economic impact)	EM-3248	2005	Statewide	07/25/2005 (Fed)			$763,576
Topanga Fire	FM-2583	2005	Los Angeles, Ventura	09/28/2005 (Fed)	-	-	$19,787,415
Severe Freeze	DR-1689 2007-02	2007	Statewide	01/12/2007 - 01/26/2007 03/13/2007 (Fed)	65 (US)	220 (US)	$1.3 billion
Catalina Island Fire	FM-2694	2007	Los Angeles	05/10/2007 (Fed)	-	-	Not available
Griffith Park Fire	FM-2691 2007-04	2007	Los Angeles (City of Los Angeles)	05/17/2007 05/08/2007 (Fed)	-	-	$2,508,441
Canyon fire	FM-2708	2007	Los Angeles	07/08/2007 (Fed)	-	-	$517,152
I-5 Major Collision Fire	2007-13	2007	Los Angeles (City of Los Angeles)	10/14/2007	-	-	$66,465
Forest Fires	DR-1731 2007-14 EM-3279	2007	Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura counties	10/23/2007 10/21/2007 (Fed)	10	139	$198.6 million
Santa Anita Fire	FM-2763 2008-09	2008	Los Angeles	04/27/2008 04/27/2008 (Fed)	-	-	Not available
Marek Fire	FM-2788	2008	Los Angeles	10/12/2008 (Fed)	2	NA	$6,060,351
Sesnon Fire	FM-2789	2008	Los Angeles, Ventura	10/13/2008 (Fed)	1	30	$12.6 million
Wildfires, including Sayre Fire	DR-1810 FM-2792 2008-11	2008	Los Angeles, Orange, Riverside, and Santa Barbara	11/18/2008 11/18/2008 (Fed)	>28	>5	$95-$164 billion (est)
PV Fire	FM-2828	2009	Los Angeles	08/28/2009	0	0	$317,175
Station Fire	FM-2830 2009-05	2009	Los Angeles	08/28/2009	2	23	$19,053,328
Wildfires	2009-05	2009	Los Angeles	08/28/2009	-	6	$9,286,724
Flooding	DR-1884 2010-02	2010	Imperial, Siskiyou, Los Angeles, Riverside, San Bernardino and Calaveras	01/21/2010 - 01/27/2010 03/08/2010 (Fed)	2		$50.6 million
Crown Fire	FM-2851	2010	Los Angeles	07/29/2010 (Fed)	0	0	$6,565,808
Wildfires	2010-06	2010	Los Angeles	08/07/2010	0	0	Not available
Powerhouse Fire	FM-5025	2013	North Los Angeles County, within the Angeles National Forest	06/02/2013	0	10	$2,023,801
Drought (drinking water shortage)	2014-03	2014	All 58 counties	09/18/2014	-	-	>$810 million
Colby Fire	FM-5051	2014	Los Angeles (near Morris Reservoir north of Glendora, within the Angeles National Forest)	01/16/2014	-	-	1,952 acres burned; 7 residences damaged, 5 destroyed. 1 outbuilding damaged, 10 destroyed.
Wildfires	DR-4240 2015-03	2015	All 58 counties	08/27/2015 09/22/2015 (Fed)	-	-	$242,803,440 + $2,401,287
Storms, floods (various) Tropical Storm Dolores	DR-4206 2015-04	2015	San Diego Kern	01/27/205 (Fed) 7/19/2015	-	-	Not available Not available
Hurricane Marie	2015-02	2014	Los Angeles (Avalon)	-	1	NA	$20 million (CA)
Aliso Canyon natural gas leak			Los Angeles	10/23/2015	-	-	Not available
Tree Mortality	2015-05	2015	Statewide	10/30/2015	0	0	Not available
Old Fire	FM-5124	2016	Los Angeles	06/05/2016			$1,923,392

Disaster Name	Disaster #	Year	CA Counties (or Cities) Declared	State Proclamation or Federal Declaration Date	# of Deaths	# of Injuries	Cost of Damage (see notes at end)
Fish Fire	FM-5129	2016	Los Angeles	06/21/2016	0	0	$1,394,208
Sage Fire	FM-5132	2016	Los Angeles	07/09/2016	0	0	$1,993,954
Sand Fire	FM-5135	2016	Los Angeles	07/23/2016	2	0	$5,128,119
Late Jan-Feb Storms (Flooding)	DR-4305 2017-02	2017	Alameda, Calaveras, Colusa, Contra Costa, El Dorado, Inyo, Kern, Los Angeles, Mendocino, Modoc, Mono, Napa, Orange, Riverside, Sacramento, San Diego, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Trinity, Tuolumne, Yolo	02/10/2017 03/16/2017 (Fed)	5	NA	$80,972,695 (elsewhere reported as >$2 Billion)
La Tuna Fire	FM-5201	2017	Los Angeles	09/03/2017 09/02/2017 (Fed)	0	0	$10,232,240.78
Creek Fire	FM-5225, 2017-12	2017	Los Angeles	12/05/2017 12/05/2017 (Fed)	0	3	$18,522,443
Rye Fire	FM-5226, 2017-12	2017	Los Angeles	12/05/2017 12/05/2017 (Fed)	0	1	$10,037,011
Skirball Fire	FM-5227, 2017-12	2017	Los Angeles	12/07/2017 12/07/2017 (Fed)	0	3	$6,858,306
December 2017 California Wildfires	EM-3396 DR-4353	2017	Los Angeles, Riverside, San Diego, Santa Barbara, Ventura	12/07/2017 12/08/2017 (Fed)	2	16	>$3.5 billion
December 2017 California Wildfires & Debris Flows	DR-4353 2017-12 FM-5224	2017-2018	Santa Barbara, Ventura, Los Angeles, San Diego, Santa Barbara, Ventura	12/05/2017 (FM-5224) 12/07/2017 01/02/2018 (SR-4353)	21	NA	$432,850,634.74
Debris & Mudflows	2018-02	2018	Los Angeles County (Burbank)	-	0	0	$3,867,458
Wildfires, Mud and Debris Flows	FM-5278 FM-5279 FM-5280 DR-4407 2018-09 EM-3409	2018	Butte, Los Angeles, Ventura	11/08/2018 11/8/2018 (Fed, Camp and Hill) 11/09/2018 (Fed Woolsey) 11/12/2018 (DR-4407)	88 (includes Camp Fire in Butte Co.)	NA	$2,222,192,556
Mid-February storms	DR-4331 2019-02	2019	Calaveras, Colusa, Los Angeles, Marin, Mariposa, Mendocino, Modoc, Monterey, Napa, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Shasta, Trinity	05/01/2019 05/01/2019 (Fed)	2	NA	$67,576,405
Saddleridge Fire	2020-02 FM-5296	2019	Los Angeles	10/11/2019 10/19/2019 (Fed)	1	8	$16,064,704.23
Tick Fire	FM-5296	2019	Los Angeles	10/24/2019	0	0	$7,393,070.69
Getty Fire	FM-5297	2019	Los Angeles	10/27 & 11/22/2019 10/28/2019 (Fed)	0	0	$9,118,156.54
COVID-19 Pandemic	EM-3428 DR-4482 2020-01	2020	Statewide	03/04/2020 03/13/2020 (EM-3428) 03/22/2020 (DR-4482)	110,810 (as of 04/05/2025)	-	$13,958,966,199
Bobcat Fire	CA20-3	2020	Los Angeles	09/25/2020	0	>6	>$100 million
Drought		2021	All 58 counties	10/19/2021	229 (US)	NA	$10.3 billion (US)
Winter Storms (Dec. 2021)	CA22-3	2021	Alameda, Amador, Calaveras, El Dorado, Humboldt, Lake, Los Angeles, Marin, Monterey, Napa, Nevada, Orange, Placer, Sacramento, San Bernardino, San Luis Obispo, San Mateo Santa Cruz, Sierra Yuba	12/30/2021 01/08/2022	>22	NA	$1.3 billion
Route Fire Aug. 2022	CA22-9		Los Angeles	11/19/2022	0	7	Not available
Extreme Temp Response		2022	Statewide	08/31/2022	>395	NA	$7.7 billion (est)

Disaster Name	Disaster #	Year	CA Counties (or Cities) Declared	State Proclamation or Federal Declaration Date	# of Deaths	# of Injuries	Cost of Damage (see notes at end)
Tropical Storm Kay	CA22-10	2022	Imperial, Inyo, Los Angeles, Riverside, and San Bernardino	09/16/2022	5	NA	$63.5 million
Severe winter storms Dec. 27, 2022-Jan. 2023)	CA23-1	2022-2023	All 58 counties	01/04/2023	22 (through March 2023)	NA	$4.8 billion including storms through March 2023
Severe winter storms (February-March 2023)	CA23-3	2023	Amador, Kern, Los Angeles, Madera, Mariposa, Mono, Nevada, San Bernardino, San Luis Obispo, Santa Barbara, Sierra, Sonoma, and Tulare	03/01/2023 03/08/2023 03/12/2023 03/14/2023 03/28/2023 04/20/2023 05/15/2023 06/16/2023	21	NA	>$3 billion
Tropical Storm Hilary (Aug. 20, 2023)	CA23-4 DR-4750	2023	Fresno, Imperial, Inyo, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Tulare, and Ventura	08/19/2023 08/20/2023	3 (2 in Mexico, 1 in CA)	NA	>$126 million (CA)
I-10 Bridge Fire (Nov. 2023)	CA24-1	2023	Los Angeles	11/11/2023	0	0	$6-10 million
Severe winter storms (Dec. 2023-Jan. 2024)	CA24-2 DR-4758	2023-2024	Los Angeles, San Diego, Ventura	01/23/2024 02/02/2024 02/19/2024 (Fed) 06/21/2024	21	NA	>$3 billion
Severe winter storms – atmospheric river (Feb. 2024)	CA-24-3 DR-4769	2024	Alameda, Butte, Glenn, Humboldt, Lake, Los Angeles, Marin, Mendocino, Monterey, Napa, Orange, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Sutter, Trinity and Ventura	06/21/2024	>9	NA	$9-11 billion
Storms (March)	CA24-4	2024	Alameda, Contra Costa, Del Norte, Los Angeles, Marin, Mendocino, Monterey, Napa, Nevada, Plumas, San Bernardino, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Trinity and Ventura	03/22/2024 06/21/2024	5	NA	Up to $11 billion
Bridge Fire (Sept 8, 2024)	FM-5537	2024	Los Angeles, San Bernardino	09/11/2024	0	8	$95-164 billion (est)
Franklin Fire	FM-5548	2024	Los Angeles (Malibu)	12/10/2024 (Fed)	0	0	$76-131 billion (est)
Fire and windstorm conditions (Jan. 7, 2025)	CA25-2 DR-4856 FM-5549 FM-5550 FM-5551	2025	Los Angeles (City of Los Angeles-Pacific Palisades, Malibu, Altadena, Pasadena), Ventura	01/07/2025 01/08/2025	30	NA	$250-275 billion (est)

This table was compiled from a variety of sources, with the cost estimates often varying from source to source. Typically, the dollar amounts shown in the last column reflect the highest figure found in the various sources reviewed, rounded.

Sources: California Governor's Office of Emergency Services (http://www.oes.ca.gov) and especially the 2023 California State Hazard Mitigation Plan, Volume 2, available from https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-2_01.09.2024-FINAL.pdf;
FEMA's interactive tool for historical disaster declarations by state, county, hazard and year (https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties); and
Wikipedia entries for dozens of historical wildfires and other disasters in California.

APPENDIX G: MAJOR DAMS IN LOS ANGELES COUNTY

Dam No.	National ID. No.	Name	Owner	Stream	Year Built	Capacity (Ac-ft)	Res. Area (acres)	Drainage Area (sq. miles)	Crest Elev. (ft)	Height (Ft)	Length (Ft)	Dam Type	Certified Status	Downstream Hazard	Condition Assessment	Reservoir Restrictions
1049-000	CA00881	10 MG Walteria	City of Torrance	Offstream	1953	31	1		282	40	1022	RECT	Certified	High	Satisfactory	No
1049-002	CA01193	18MG Walteria	City of Torrance	Offstream	1987	58	2	0.08	281.3	31	1287	RECT	Certified	High	Satisfactory	No
789-000	CA01406	Amargosa Creek	City of Palmdale	Amargosa Creek	1998	1187	93	23.6	3026.3	65	480	ERTH	Certified	Significant	Satisfactory	No
32-034	CA01150	Bailey Debris Basin	Los Angeles Co. Dept. of Public Works	Bailey Canyon Wash	1954	49	2.5	0.58	1167.6	43	585	ERTH	Certified	High	Satisfactory	No
32-000	CA00187	Big Dalton	Los Angeles Co. Dept. of Public Works	Big Dalton Wash	1929	1290	26	4.3	1718	153	480	MULA	Certified	Extremely	Satisfactory	No
32-030	CA01156	Big Dalton Debris Basin	Los Angeles Co. Dept. of Public Works	Big Dalton Wash	1960	208	10	7.33	1148	59	840	ERTH	Certified	High	Satisfactory	No
32-002	CA00188	Big Santa Anita	Los Angeles Co. Dept. of Public Works	Tributary Rio Hondo	1927	858	17	10.8	1328	225	612	VARA	Certified	Extremely	Satisfactory	No
32-006	CA00191	Big Tujunga No. 1	Los Angeles Co. Dept. of Public Works	Big Tujunga Creek	1931	5750	83	81.7	2320	220	505	VARA	Certified	Extremely	Satisfactory	No
32-025	CA0151	Blanchard Debris Basin	Los Angeles Co. Dept. of Public Works	Blanchard Canyon	1966	26	1	0.5	2065	35	925	ERTH	Certified	High	Satisfactory	No
6-031	CA00088	Bouquet Canyon (Bouquet Reservoir)	City of Los Angeles	Bouquet Creek	1934	36505	628	13.6	3008	190	1180	ERTH	Certified	Extremely High	Satisfactory	No
32-026	CA01152	Brand Debris Basin	Los Angeles Co. Dept. of Public Works	Brand Debris Basin	1965	42	3	1.03	903	45	400	ERTH	Certified	High	Satisfactory	No
5-000	CA00061	Brand Park	City of Glendale	Offstream	1930	32	1	0	970.6	99	230	ERTH	Certified	High	Satisfactory	No
1-058	CA00044	Castaic	California Dept. of Water Resources	Castaic Creek	1973	323700	2235	153.7	1535	340	5200	ERTH	Certified	Extremely	Satisfactory	No
1-071	CA00740	Century	California Dept. of Parks and Recreation	Malibu Creek	1913	70	7	68.1	661	44	149	CORA	Certified	Significant	Satisfactory	No
6-039	CA00093	Channel Diversion Dike	City of Los Angeles	Storm Drain Channel	1940	437	28	6.3	1193	42	390	ERTH	Certified/Inop	Low	Satisfactory	No
6-004	CA00067	Chatsworth	City of Los Angeles	Tributary to Los Angeles River	1918	9886	607	5.4	900	45	2700	HYDF	Certified	Extremely	Satisfactory	No
5-008	CA01078	Chevy Chase 1290	City of Glendale	Tributary to Sycamore Canyon	1940	17	1	0.01	1292	90	300	ERTH	Certified	High	Satisfactory	No
32-005	CA00190	Cogswell	Los Angeles Co. Dept. of Public Works	Wfk San Gabriel River	1935	8969	146	38.4	2412	266	585	ROCK	Certified	Extremely	Satisfactory	No
32-003	CA00189	Devils Gate	Los Angeles Co. Dept. of Public Works	Arroyo Seco	1920	2600	110	29.7	1075	108	252	GRAV	Certified	Extremely	Satisfactory	No
5-006	CA00064	Diederich Reservoir	City of Glendale	Offstream	1950	174	7	0	728	60	100	ERTH	Certified	Extremely	Satisfactory	No
6-016	CA00077	Drinkwater	City of Los Angeles	Offstream	1923	92	4	0.03	2060	105	448	ERTH	Certified	Significant	Satisfactory	No
6-005	CA00068	Dry Canyon	City of Los Angeles	Dry Canyon Creek	1912	1140	58	4.5	1520	66	780	HYDF	Certified	Extremely	Satisfactory	No
6-041	CA00094	Eagle Rock	City of Los Angeles	Offstream	1953	254	7	0	963.5	113	495	ERTH	Certified	Extremely	Satisfactory	No
5-009	CA01079	East Glorietta	City of Glendale	Tributary to Verdugo Canyon	1932	71	4		970	22	1730	RECT	Certified	High	Satisfactory	No
32-020	CA00201	Eaton Wash Debris Basin	Los Angeles Co. Dept. of Public Works	Eaton Wash	1936	721	54	9.47	902	63	1545	ERTH	Certified	Extremely	Satisfactory	No
6-049	CA01080	Elderberry Forebay	City of Los Angeles	Castaic Creek	1974	28400	781	81.6	1550	179	1935	ERTH	Certified	Low	Satisfactory	No
6-006	CA00069	Elysian	City of Los Angeles	Tributary to Los Angeles River	1943	167	6	0.08	466	71	480	ERTH	Certified	High	Satisfactory	No
6-007	CA00070	Encino	City of Los Angeles	Encino Creek	1924	9789	158	1.4	1088	168	1850	ERTH	Certified	Extremely	Satisfactory	No
6-008	CA00071	Fairmont	City of Los Angeles	Antelope Valley Creek	1912	7507	172	2.64	3043	121	4300	HYDF	Certified	Extremely	Satisfactory	No
6-053	CA1295	Fairmont #2	City of Los Angeles	Tributary to Antelope Valley Creek	1982	493	28	0.08	3040	24	4437	ERTH	Certified	Low	Satisfactory	No
35-006	CA00217	Garvey Reservoir	Metropolitan Water District	Tributary to Rio Hondo	1954	1610	38	0	580	160	5164	ERTH	Certified	Extremely	Satisfactory	No
5-007	CA00065	Glenoaks 968 Reservoir	City of Glendale	Offstream	1949	28	1	0	972	62	220	ERTH	Certified	High	Satisfactory	No
6-043	CA00096	Green Verdugo	City of Los Angeles	Tributary to Tujunga Wash	1953	99	3	0.04	1406	118	452	ERTH	Certified	High	Satisfactory	No
1061-000	CA00893	Greystone Reservoir	City of Beverly Hills	Offstream	1970	60	2		628	75	1140	RECT	Certified	Extremely	Satisfactory	No
		Hansen Dam	U.S. Army Corps of Engineers	Tujunga Wash	1940	25400	372	147.4	1060	97	10475	ERTH				
6-054	CA01448	Hansen Recreational Lake	City of Los Angeles	Offstream	1999	85	11	0.01	1060	50	3600	ERTH	Certified	Low	Satisfactory	No
57-002	CA00238	Harold Reservoir (Palmdale Lake)	Palmdale Water District	Tributary to Antelope Valley Creek	1891	3870	218	4.63	2824	30	2800	ERTH	Certified	High	Satisfactory	No
6-55	CA01510	Headworks Reservoir East	Los Angeles Co. Dept. of Public Works	Offstream	2016	165				32	2,095	RECT	Certified	Low	Satisfactory	No
6-56	CA01598	Headworks Reservoir West	Los Angeles Co. Dept. of Public Works	Offstream	2022	227				32	2,384	RECT	Certified	Low	Satisfactory	No
1-067	CA00053	J.W. Wisda	California Dept. of Parks and Recreation	Tributary to Topanga Canyon	1958	45	4	0.22	1140	50	350	ERTH	Certified/Inop	Low	Satisfactory	No
32-027	CA01153	La Tuna Debris Basin	Los Angeles Co. Dept. of Public Works	La Tuna Canyon	1960	207	11	5.3	1157	47	654	ERTH	Certified	Extremely	Satisfactory	No
32-022	CA00203	Laguna Regulating Basin	Los Angeles Co. Dept. of Public Works	Laguna Wash	1970	310	12	5.55	380	43	380	ERTH	Certified	Significant	Satisfactory	No
785-000	CA00742	Lindero	Private Entity – Lake Lindero HOA	Lindero Creek	1966	90	12	5	935	19	170	ERTH	Certified	Low	Satisfactory	No
32-028	CA01154	Little Dalton Debris Basin	Los Angeles Co. Dept. of Public Works	Little Dalton Canyon	1960	234	8	3.3	1200	71	543	ERTH	Certified	Extremely	Satisfactory	No
57-000	CA00237	Littlerock	Little Rock Creek Id	Littlerock Creek	1924	4600	126	63.7	3286	124	576	GRAV	Certified	Extremely High	Satisfactory	No
32-007	CA00192	Live Oak	Los Angeles Co. Dept. of Public Works	Live Oak Creek	1922	239	12	2.3	1506	76	303	GRAV	Certified	Extremely High	Satisfactory	No
35-013	CA01084	Live Oak Reservoir	Metropolitan Water District	Tributary to Marshall Creek	1975	2500	77	0.17	1574	105	3000	ERTH	Certified	Extremely High	Satisfactory	No
6-050	CA01081	Los Angeles Reservoir	City of Los Angeles	San Fernando Creek	1977	10000	175	9	1185	130	3415	ERTH	Certified	High	Satisfactory	No
	CA10020	Lopez Dam	U.S. Army Corps of Engineers	Pacoima Wash	1954	1248	63	34	1272.9	50	1330	ERTH				
6-014	CA00075	Lower Franklin	City of Los Angeles	Franklin Canyon	1922	920	22	1.12	590.4	103	500	HYDF	Certified	Extremely	Satisfactory	No
6-052	CA01188	Lower Franklin No. 2	City of Los Angeles	Franklin Canyon	1982	206	10	1.12	590	49	410	ERTH	Certified	Low	Satisfactory	No

Dam No.	National ID. No.	Name	Owner	Stream	Year Built	Capacity (Ac-ft)	Res. Area (acres)	Drainage Area (sq. miles)	Crest Elev. (ft)	Height (Ft)	Length (Ft)	Dam Type	Certified Status	Downstream Hazard	Condition Assessment	Reservoir Restrictions
6-015	CA00076	Lower San Fernando (Lower Van Norman Lake)	City of Los Angeles	San Fernando Creek	1918	9843	220	13.3	1115	125	1840	HYDF	Certified	Extremely High	Satisfactory	No
32-034	CA01161	Lower Sunset Debris Basin	Los Angeles Co. Dept. of Public Works	Sunset Canyon	1963	37	2	1.1	1056	86	379	ERTH	Certified	High	Satisfactory	No
6-048	CA00101	Lower Van Norman Bypass	City of Los Angeles	Offstream	1970	240	12	0.03	1166.2	78	600	ERTH	Certified	Low	Satisfactory	No
771-000	CA00739	Malibu Lake Club	Malibu Lake Mountain Club, Inc.	Malibu Creek	1923	500	55	64	727	44	190	CORA	Certified	High	Satisfactory	No
32-039	CA01385	Morgan Debris Basin	Los Angeles Co. Dept. of Public Works	Morgan Canyon Creek	1962	21	2	0.6	1169.9	37	380	ERTH	Certified	High	Satisfactory	No
32-040	CA00216	Morris	Los Angeles Co. Dept. of Public Works	San Gabriel River	1935	27500	420	210	1175	245	750	GRAV	Certified	Extremely	Satisfactory	No
19-003	CA00154	Morris S. Jones	Pasadena City Dept. of Water & Power		1952	153.3	6.3		948	49	1470	ERTH	Certified	Extremely	Satisfactory	No
6-017	CA00078	Mullholand (Hollywood Reservoir)	City of Los Angeles	Weid Canyon	1924	4036	82	1	756	195	933	GRAV	Certified	Extremely High	Satisfactory	No
32-008	CA00193	Pacoima	Los Angeles Co. Dept. of Public Works	Pacoima Creek	1929	3777	68	27.8	2015.8	365	640	VARA	Certified	Extremely	Satisfactory	No
35-004	CA00215	Palos Verdes Reservoir	Metropolitan Water District	Tributary to Los Angeles Harbor	1939	1100	27	1	330	82	2150	ERTH	Certified	Extremely	Satisfactory	No
786-000	CA00743	Potrero	Westlake Lake Management Assn.	Triunfo Canyon Creek	1967	1600	95	28.9	880	40	730	GRAV	Certified	High	Satisfactory	No
32-009	CA00194	Puddingstone	Los Angeles Co. Dept. of Public Works	Walnut Creek	1928	16342	490	33.1	982	147	2698	ERTH	Certified	Extremely	Satisfactory	No
32-016	CA00199	Puddingstone Diversion	Los Angeles Co. Dept. of Public Works	San Dimas Wash	1928	150	16	19.8	1168	34	825	ERTH	Certified	High	Satisfactory	No
1-066	CA00052	Pyramid	California Dept. of Water Resources	Piru Creek	1973	171196	1291	295	2606	386	1080	ERRK	Certified	Extremely	Satisfactory	No
4-006	CA00059	Reservoir No. 4	City of Burbank	Offstream	1955	34	1	0	908	38	210	RECT	Certified	Extremely	Satisfactory	No
4-007	CA00060	Reservoir No. 5	City of Burbank	Offstream	1949	77	3	0	906	36	870	RECT	Certified	Extremely	Satisfactory	No
1043-000	CA00876	Riviera Reservoir	City of Santa Monica Dept. of Public Works	Offstream	1962	76	2		349	40	1280	RECT	Certified	High	Satisfactory	No
32-021	CA00202	Rubio Debris Basin	Los Angeles Co. Dept. of Public Works	Rubio Creek	1944	44	3	1.71	1624.5	64	780	ERTH	Certified	High	Satisfactory	No
		San Antonio Dam	U.S. Army Corps of Engineers	San Antonio Creek	1956	11880	145	26.7	2238	130	3850	ERTH		High		
32-010	CA00195	San Dimas	Los Angeles Co. Dept. of Public Works	San Dimas Creek	1922	1534	36	15.9	1481	131	340	GRAV	Certified	Extremely	Satisfactory	No
32-019	CA00200	San Gabriel No. 1	Los Angeles Co. Dept. of Public Works	San Gabriel River	1938	44183	560	205	1481	320	1520	ERRK	Certified	Extremely	Satisfactory	No
32-029	CA01155	Santa Anita Debris Basin	Los Angeles Co. Dept. of Public Works	Santa Anita Wash	1960	116	9	12.5	796	56	955	ERTH	Certified	Low	Fair	Yes
		Santa Fe (Santa Fe Reservoir)	U.S. Army Corps of Engineers	San Gabriel River	1941-	32109	1256	236	496	92	23800	ERTH				
6-047	CA00100	Santa Ynez Canyon	City of Los Angeles	Tributary to Santa Ynez Canyon	1968	356	9	0.23	727	157	544	ERTH	Certified	Extremely	Satisfactory	No
32-012	CA00196	Sawpit	Los Angeles Co. Dept. of Public Works	Sawpit Creek	1927	406	9	3.27	1378	150	527	CORA	Certified	Extremely	Satisfactory	No
32-031	CA01157	Sawpit Debris Basin	Los Angeles Co. Dept. of Public Works	Sawpit Wash	1955	152	6	2.87	1000	82	520	ERTH	Not Certified	Extremely	Fair	Yes
32-036	CA01172	Schoolhouse Debris Basin	Los Angeles Co. Dept. of Public Works	Mansfield Channel	1962	19	1	0.28	1491.3	38	265	ERTH	Certified	High	Satisfactory	No
		Sepulveda (Sepulveda Flood Control Basin)	U.S. Army Corps of Engineers	Los Angeles River	1941	17425	46764	152	710	57	15444	ERTH				
32-013	CA00197	Sierra Madre	Los Angeles Co. Dept. of Public Works	Lower Santa Anita Creek	1928	51	1	0.77	1179	69	200	CORA	Certified	High	Satisfactory	No
32-032	CA01158	Sierra Madre Villa	Los Angeles Co. Dept. of Public Works	Sierra Madre Canyon	1958	109	8	1.5	1102.5	50	906	ERTH	Certified	Extremely	Satisfactory	No
6-051	CA00081	Silver Lake	City of Los Angeles	Tributary to Ballona Creek	1976	2020	77	0.12	463	43	760	ERTH	Certified	Extremely	Satisfactory	No
32-041	CA01469	Stevenson Ranch	Los Angeles Co. Dept. of Public Works	Pico Canyon Creek	2004	105	4.75	5.1	1386.5	54	280	ERTH	Certified	High	Satisfactory	No
6-025	CA00083	Stone Canyon	City of Los Angeles	Stone Canyon Creek	1924	10372	138	1.4	878	188	1150	ERTH	Certified	Extremely	Satisfactory	No
32-033	CA01160	Stough Debris Basin	Los Angeles Co. Dept. of Public Works	Stough Canyon	1961	6	3	1.7	1044	46	567	ERTH	Certified	Extremely	Satisfactory	No
104-027	CA00445	Thompson (Middle Ranch Reservoir)	Southern California Edison Co.	Middle Canyon	1925	1010	54	8.6	677	114	445	ERTH	Certified	High	Satisfactory	No
32-015	CA00198	Thompson Creek	Los Angeles Co. Dept. of Public Works	Thompson Creek	1928	543	345	3.46	1648	66	1500	ERTH	Certified	Extremely	Satisfactory	No
6-029	CA00087	Upper Hollywood	City of Los Angeles	Weid Canyon	1933	196	8	0.37	763	87	368	ERTH	Certified	Low	Satisfactory	No
6-028	CA00086	Upper San Fernando	City of Los Angeles	San Fernando Creek	1921	1848	78	0.53	1219	82	1740	HYDF	Certified	Low	Satisfactory	No
6-044	CA00097	Upper Stone Canyon	City of Los Angeles	Stone Canyon Creek	1954	425	14	0.66	936.5	111	740	ERTH	Certified	Low	Satisfactory	No
1073-000	CA00904	Westlake Reservoir	Las Virgenes Municipal Water District	Three Springs Creek	1972	9200	156	0.9	1056	158	1400	ERTH	Certified	Extremely	Satisfactory	No
35-011	CA00222	Weymouth Memorial Reservoir	Metropolitan Water District	Offstream	1966	151	8	0	1080	18	2400	RECT	Certified	Extremely	Satisfactory	No
		Whittier Narrows	U.S. Army Corps of Engineers	San Gabriel River	1957	49143	63512	554	239	56	16960	ERTH				
18-002	CA00153	Whittier Reservoir No. 4	City of Whittier Water District	Tributary to San Gabriel River	1931	32	1	0.08	464	55	190	ERTH	Certified/Inop	Low	Satisfactory	No
32-035	CA01162	Wilson Debris Basin	Los Angeles Co. Dept. of Public Works	Wilson Canyon	1961	84	5	2.6	1543	50	666	ERTH	Certified	High	Satisfactory	No
104-026	CA00444	Wrigley Reservoir	Southern California Edison Co.	Hapress Creek	1930	62	2	0	1426	42	190	ERTH	Certified	Significant	Satisfactory	No
6-046	CA00099	Yarnell Debris Basin	City of Los Angeles	Tributary to Bull Canyon	1963	105	10	1.87	1220	42	1290	ERTH	Certified	Low	Satisfactory	No

Sources: California Division of Safety of Dams, Listing of California Jurisdictional Dams, from https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Division-of-Safety-of-Dams/Files/Publications/Dams-Within-Jurisdiction-of-the-State-of-California-Listed-Alphabetically-by-County-September-2022.pdf; https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_1110-2-240.pdf; https://www.spl.usace.army.mil/Missions/Asset-Management/Hansen-Dam/; https://www.spl.usace.army.mil/Missions/Asset-Management/Lopez-Dam/; https://en.wikipedia.org/wiki/San_Antonio_Dam_(San_Bernardino_County)#cite_note-3

Notes: Dams shaded in blue are discussed in this report.

The dams owned by the U.S. Army Corps of Engineers are for the most part not included in the list of California Jurisdictional Dams, and their safety ratings are not available.

For the California Jurisdictional Dams, the following definitions or explanations apply:

Certified Status: **Certified** = Jurisdictional-sized dams that may safely impound water to the elevation specified on the Certificate of Approval; **Certified/Inop** = Jurisdictional-sized dams without water impounding capabilities under reasonable foreseeable conditions, taking into account the size of the drainage area; **Not certified** = Jurisdictional-sized dams that operate without a Certificate of Approval.

Downstream Hazard: **Low** = No probable loss of life and low economic and environmental losses; **Significant** = No probable loss of human life but can cause economic loss, environmental damage, impacts to critical facilities, or other significant impacts; **High** = Expected to cause loss of at least one human life; **Extremely High** = Expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more.
Condition Assessment: **Satisfactory** = No existing or potential dam safety deficiencies are recognized. Acceptable performance expected under all loading conditions (static, hydrologic, seismic) in accordance with the minimum applicable state or federal regulatory criteria or tolerable risk guidelines, and permanent risk reduction measures (reservoir restrictions, spillway modifications, operating procedures, etc.) have been implemented to eliminate identified deficiencies; **Fair** = No existing dam safety deficiencies are recognized for normal operating conditions, but a rare or extreme hydrologic and/or seismic event may result in a dam safety deficiency. Other circumstances may include lack of maintenance that requires attention to prevent developing safety concerns; maintenance conditions may exist that require remedial action greater than routine work and/or secondary studies or investigations; and/or interim or permanent risk reduction measures may be under consideration. **Poor** = A dam safety deficiency is recognized for normal operating conditions which may realistically occur. Remedial action is necessary. May also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Investigations and studies are necessary. Other circumstances may include that dam has multiple deficiencies or a significant deficiency that requires remedial work; lack of maintenance (erosion, sinkholes, settlement, cracking, unwanted vegetation, animal burrows, inoperable outlet gates) has affected the integrity or operation of the dam under normal operational conditions and requires remedial action to resolve; critical design information or a review of the dam's performance history has identified a question that can only be answered by review of the design and construction history for the dam. Uncertainty arises when there is no design and/or construction documentation available for review and additional analysis is needed to better understand the risk associated with operation under normal operational conditions; interim or permanent risk reduction measures may be under consideration. Unsatisfactory = A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Typical circumstances include: a critical component of the dam has deteriorated to unacceptable condition or has failed; a safety inspection indicates major structural distress (excessive uncontrolled seepage, cracks, slides, sinkholes, severe deterioration, etc.), advanced deterioration, or operational deficiencies which could lead to failure of the dam or its appurtenant structures under normal operating conditions; reservoir restrictions or other interim risk reduction measures are required; a partial or complete reservoir drawdown may be mandated by the state or federal regulatory agency. **Not rated** = The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated.
Reservoir Restrictions: State Division of Dam Safety may direct or order a dam owner to operate the reservoir to a specified water surface elevation level that is lower than the maximum storage level. In addition, owners may self-impose a restriction as a result of an owner-initiated study that identifies a dam safety issue. Reservoir restrictions are typically imposed for deficiencies of the dam, spillway, low-level outlet, or other appurtenances with respect to dam safety.

APPENDIX H: PLATES

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NOTE:

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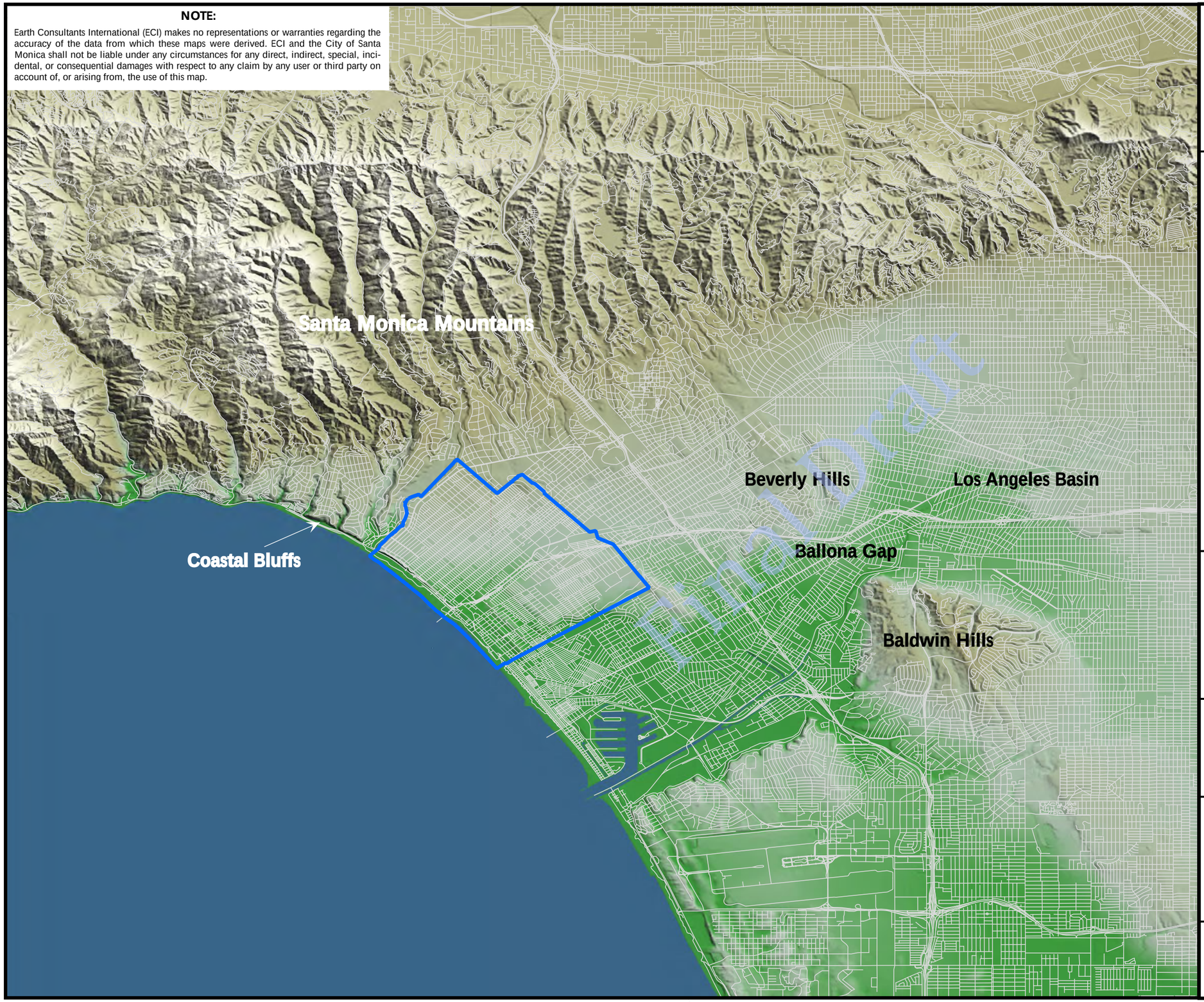
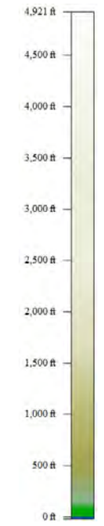


Physiographic Map

of Santa Monica, California and Surrounding Areas

Showing Some of the Features Discussed in the Text

Explanation



Elevation in Feet above Mean Sea Level

City of Santa Monica Boundary

N
W E
S

0 5,000 10,000

Feet

Scale: 1:70,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Source: USGS 10m Digital Elevation Model

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City of Santa Monica

Project Number: 4306
Date: 2025

Plate H-1

Roads In and Near
Santa Monica, California

Explanation

- Santa Monica City Boundary
- Freeway
- Major Street

N
W E
S

0 2,500 5,000
feet

Scale: 1:24,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019 and Google Satellite.

Sources: Modified from City of Santa Monica

Earth Consultants International

Project Number: 4306
Date: 2025

City of Santa Monica

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Plate H-2

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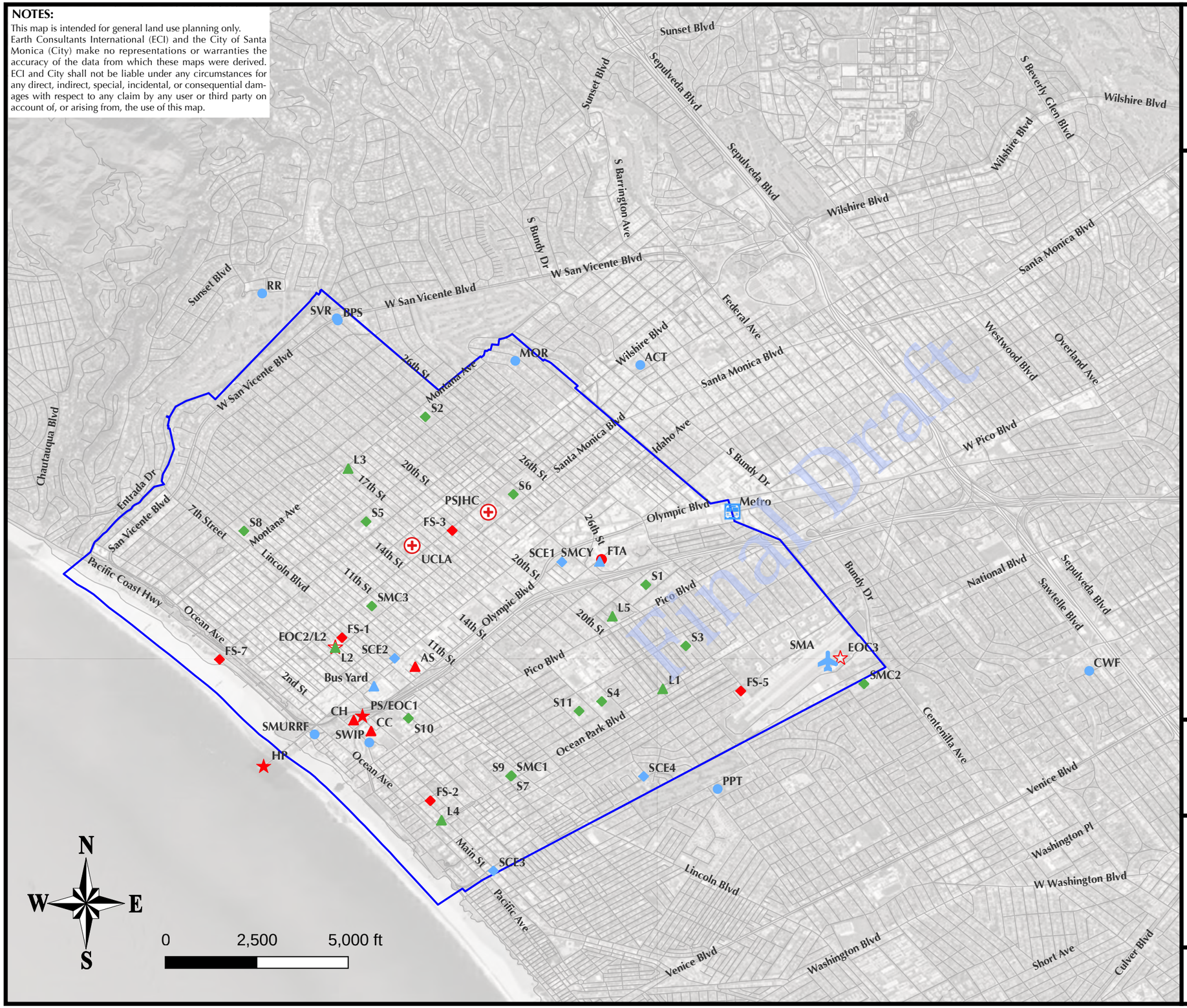

Essential / Critical Facilities, Schools and Libraries

Santa Monica, California

Explanation

Facilities Essential to Government and Healthcare Response

- Hospital/ Medical Center
- Police Station, Fire Administration & Primary Emergency Operations Center
- Secondary Emergency Operations Center
- Government Building
- Fire Station
- Fire Training Academy

Facilities Critical to Utility and Transportation Operations

- Southern California Edison
- City Property
- Water Tank or Reservoir
- Santa Monica Airport
- Metro Facility

Public Schools K-12, Community College Primary Campuses, and Libraries

- School
- Library

- Santa Monica City Boundary

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Sources: Modified from Data Provided by the City of Santa Monica.

Earth Consultants International

City of Santa Monica

Project Number: 4306
Date: 2025

Plate H-3

NOTES:

This map is intended for general land use planning only. Information on this map is not sufficient to serve as a substitute for detailed geologic investigations of individual sites, nor does it satisfy the evaluation requirements set forth in geologic hazard regulations. This map may not show all faults that have the potential for surface fault rupture, either within the Earthquake Fault Zones (EFZs) or outside their boundaries. The faults shown are the basis for establishing the boundaries of the EFZs.

The identification and location of these faults by the State are based on the best available data at the time the maps were created. However, the quality of the data used is varied. Traces were depicted as accurately as possible at a map scale of 1:24,000. In zoomed-in maps like this one, the location of the fault may be off by tens of feet relative to the original 1:24,000-scale map.

Thus, fault lines on the map are used solely to approximate the fault location. The width and location of the faults should not be used in lieu of site-specific investigations, evaluation, and design. Detailed geologic investigations, including trenching studies, may make it possible to refine the location and activity status of a fault.

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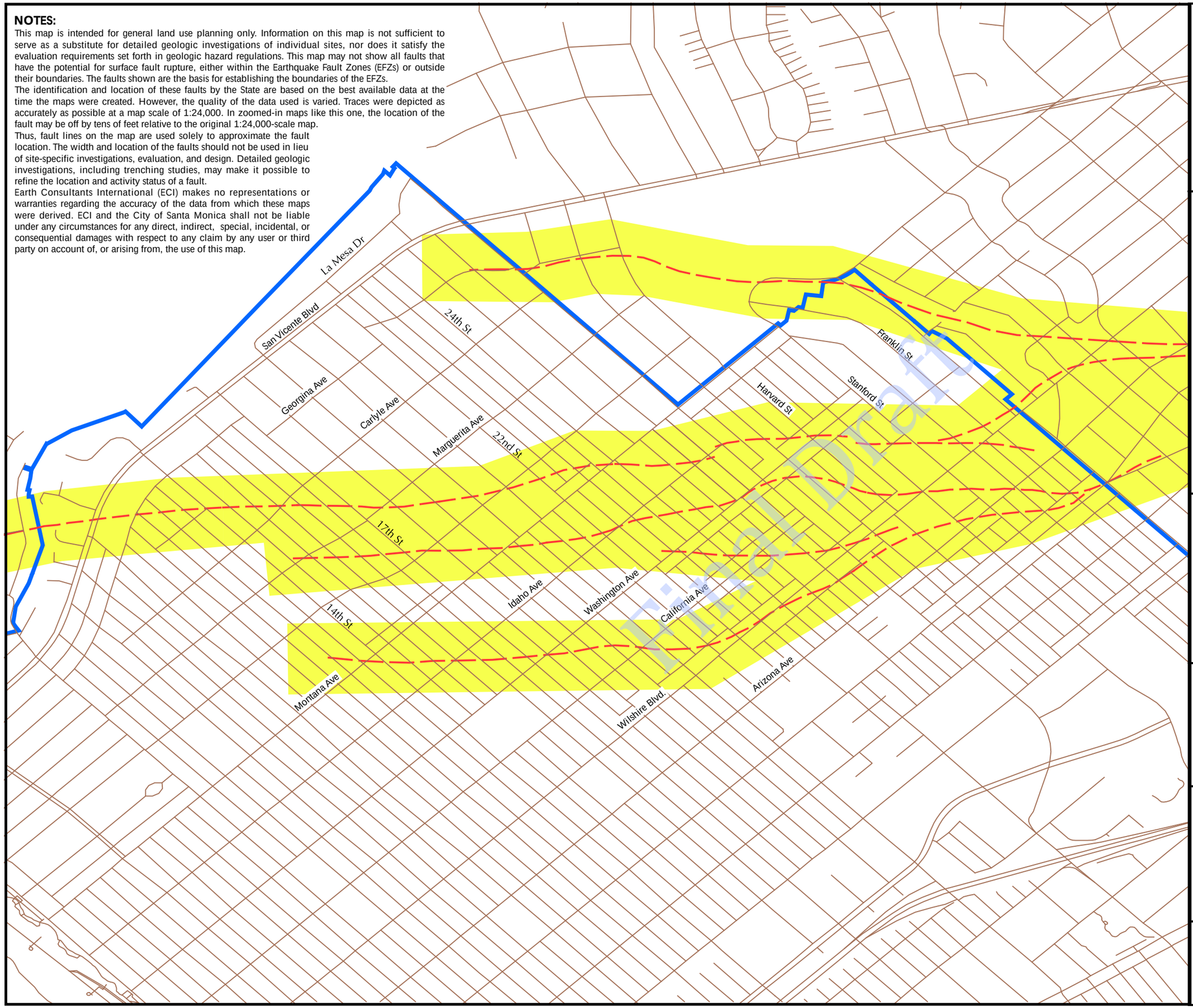

Earthquake Fault Zones of Required Investigation In and Near Santa Monica, California

Explanation

Alquist-Priolo Earthquake Fault; dashed where location is approximate. These are fault traces considered to be Holocene-active (meaning that they have displaced the ground surface in the last 11,700 years, during the Holocene epoch).

Alquist-Priolo Earthquake Fault Zone. Site-specific investigations are required for certain developments within these zones and, if the potential for the hazard is found to exist, plans to mitigate the hazard must be provided prior to the City, or the appropriate regulatory agency, issuing a permit for construction.

Santa Monica City Boundary

N W E S

0 1,000 2,000

Feet

Scale: 1:10,000

Sources: Alquist-Priolo Earthquake Fault Zones mapped by the California Geological Survey (CGS); Official Maps for Beverly Hills and Topanga Quadrangles issued on January 2018.

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

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City of Santa Monica

Project Number: 4306
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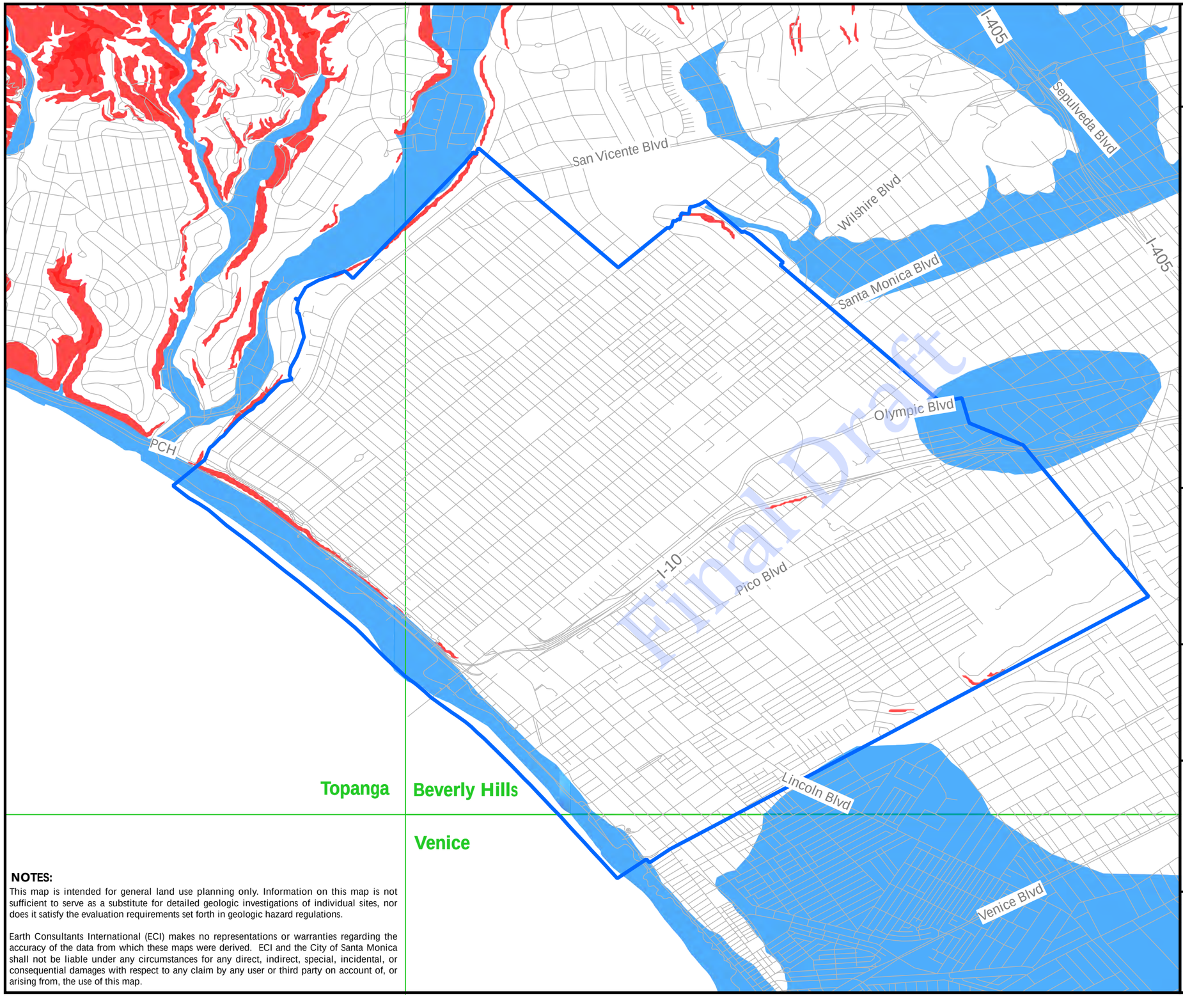
Plate H-4

Seismic Hazard Zones Map

Santa Monica, California



EXPLANATION

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources code Section 2693c would be required.

Areas where historic occurrence of landslide movement, or local topographic, geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources code Section 2693c would be required.

Quadrangle boundary

Santa Monica City Boundary

N
W E
S

0 2,000 4,000

Feet

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Sources: California Department of Conservation, California Geological Survey: Seismic Hazard Zones, Beverly Hills (2002), Topanga (1997), and Venice (1999) Quadrangles.

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City of Santa Monica

Project Number: 4306
Date: 2025

NOTES:

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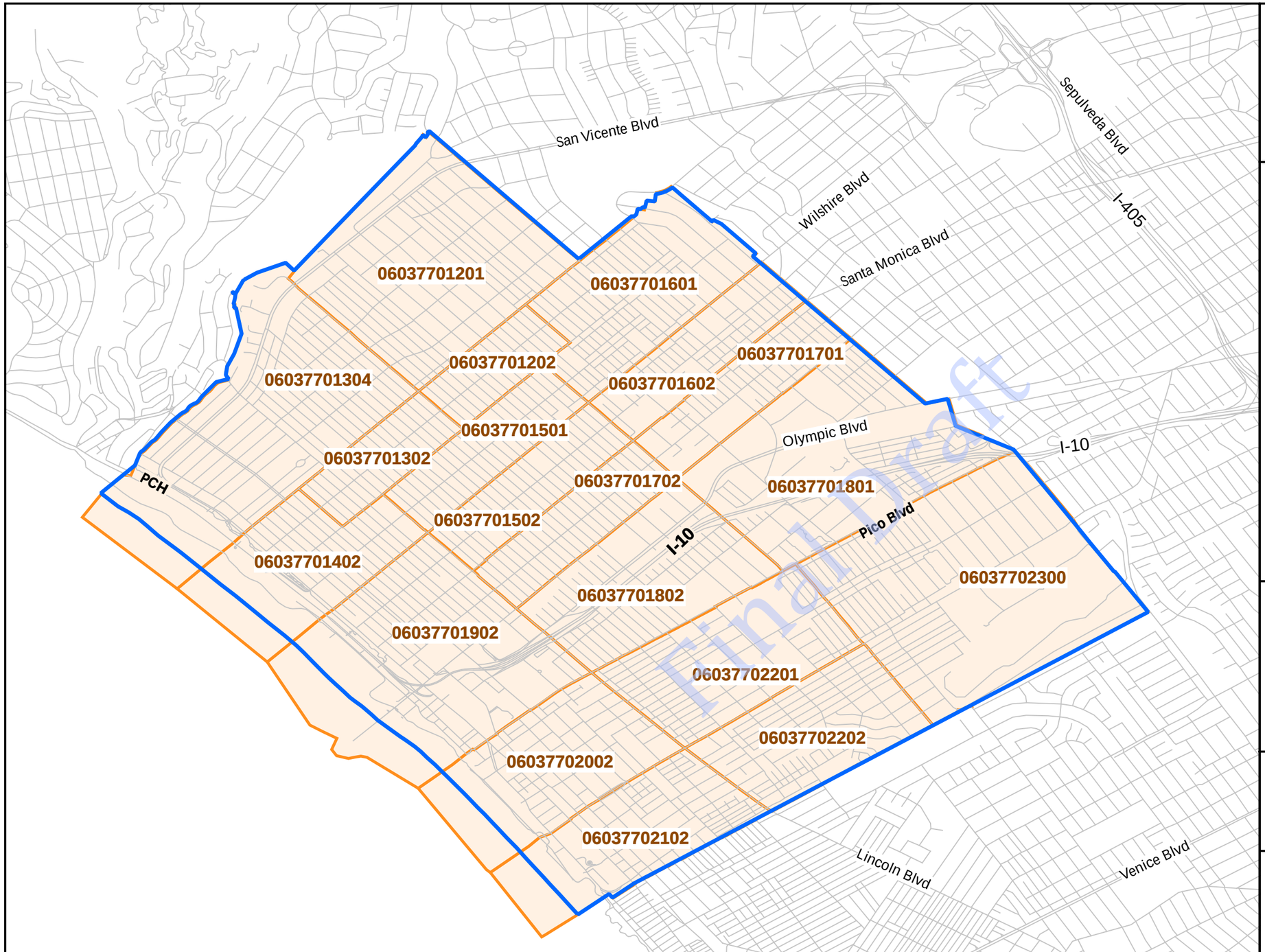
Plate H-5

Census Tracts used in the HazUS Analyses

Santa Monica, California



Explanation

06037702300 — Census Tract Boundaries with Census Tract Number

Santa Monica City Boundary

N

W E

S

2,000 0 2,000

feet

Scale: 1:24,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019 and Google Satillite.

Sources: Modified from 2020 Census Tract Data

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Date: 2025

Plate H-6

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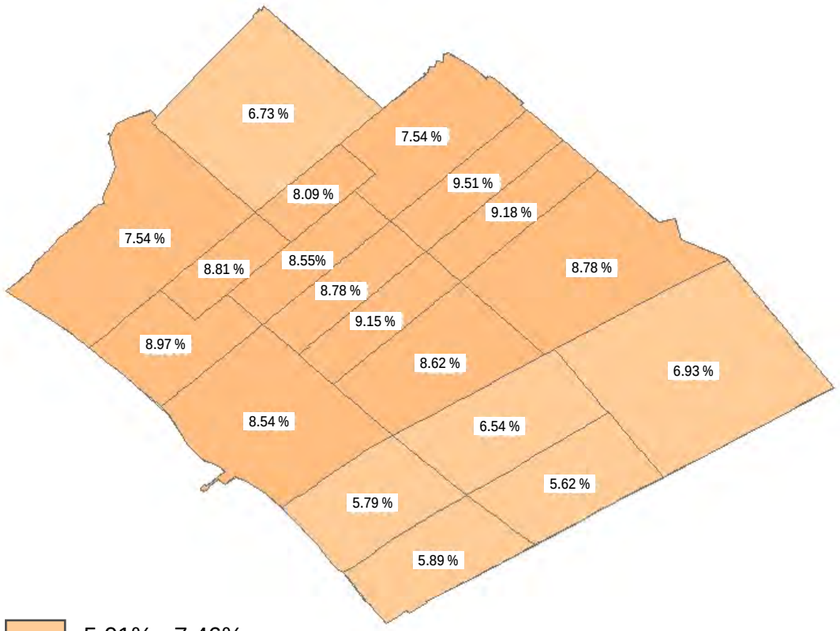
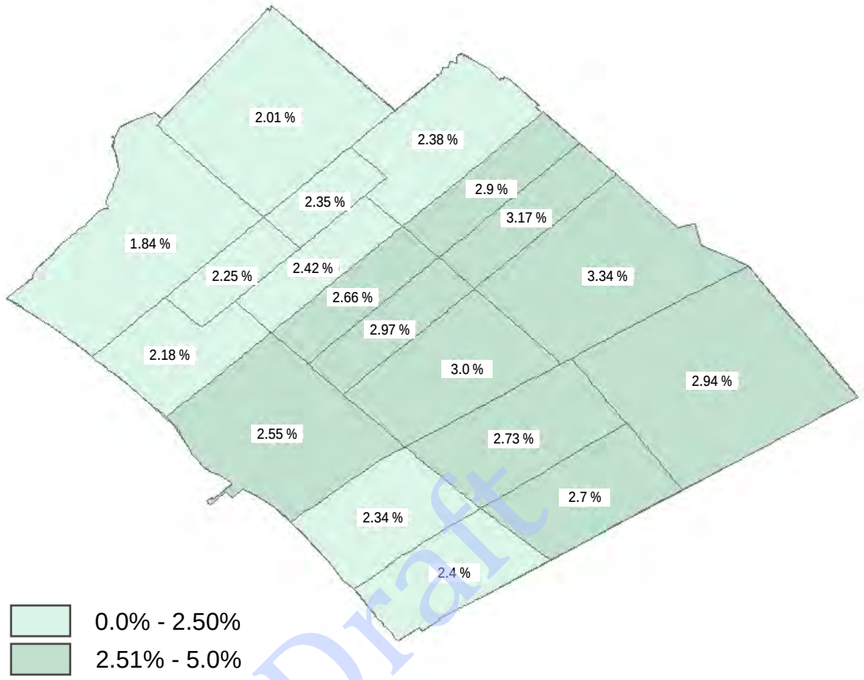
Total Residential Building-Related Losses as a Percentage of Total Residential Building Exposure Based on Four Large (M>7) Earthquake Scenarios

Santa Monica, California

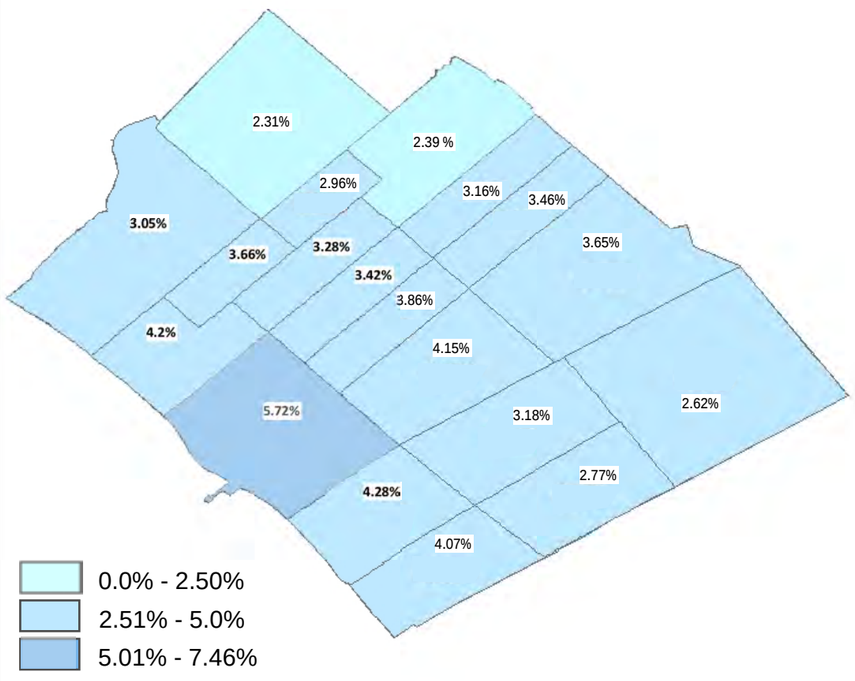
M7.4 Santa Monica Earthquake Scenario



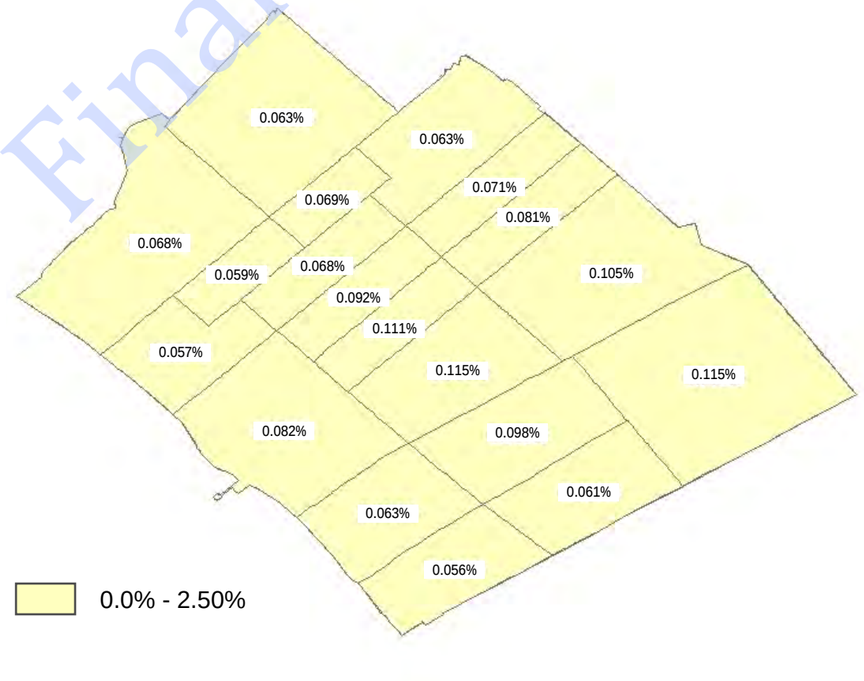
M7.2 Newport-Inglewood Earthquake Scenario



M7.7 Palos Verdes Earthquake Scenario



M7.8 San Andreas ShakeOut Earthquake Scenario



These maps for Santa Monica were created from the results obtained from running four separate earthquake scenario analyses using FEMA's Hazus (Version 6.0) Loss Estimation Methodology software, with the results presented at the census-tract level.

Hazus calculates building-related losses using functions that relate the intensity of an earthquake to the degree of damage for different types of buildings, with the losses presented in U.S. dollars. The building inventory data is based on the 2022 National Structure Inventory, which includes building counts, values, and square footage at the census block and tract levels. Building losses are broken into two categories: (1) direct building losses and (2) business interruption losses, with building losses including both structural and non-structural components.

These maps present the estimated total building-related losses for residential structures at the census tract level as a percentage of the estimated total exposure of residential structures in that census tract. Both the losses and the exposure values are in U.S. dollars.

Darker shades represent higher total residential building losses as a percentage of the total residential building inventory for each census tract.

For additional information, refer to Section 6 - Earthquakes.

Earth Consultants International

City of Santa Monica

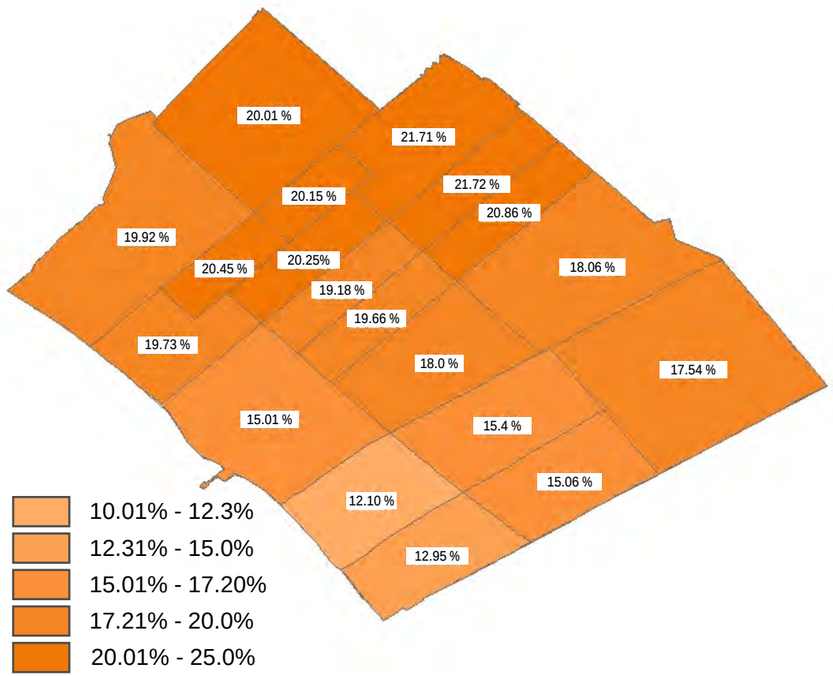
Project Number: 4306
Date: 2025

Plate H-7

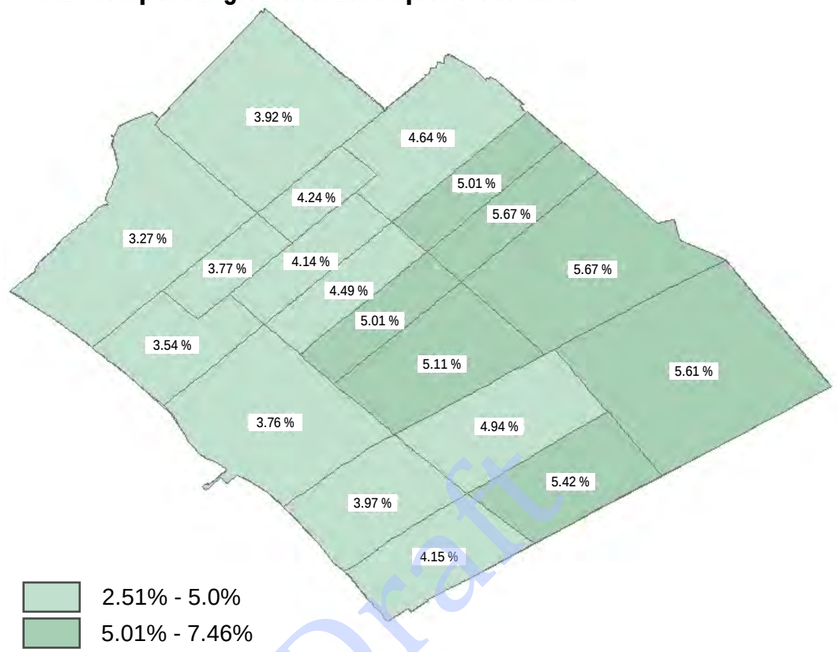
Total Commercial Building-Related Losses as a Percentage of Total Commercial Building Exposure Based on Four Large (M>7) Earthquake Scenarios

Santa Monica, California

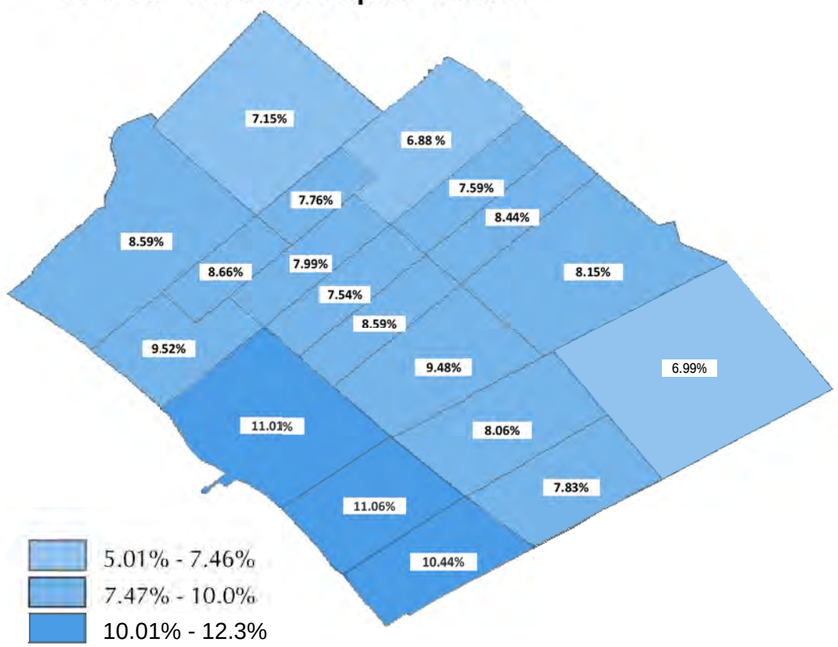
M7.4 Santa Monica Earthquake Scenario



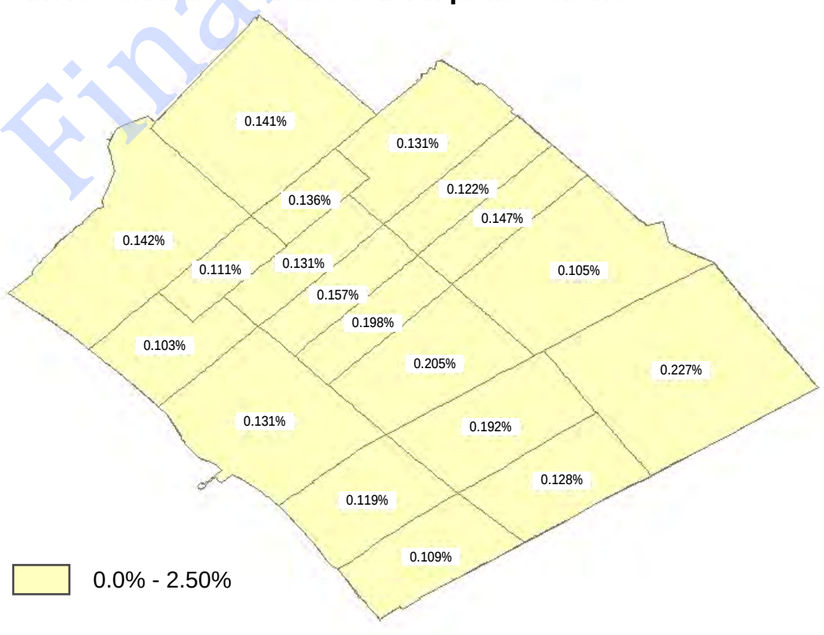
M7.2 Newport-Inglewood Earthquake Scenario



M7.7 Palos Verdes Earthquake Scenario



M7.8 San Andreas ShakeOut Earthquake Scenario



These maps for Santa Monica were created from the results obtained from running four separate earthquake scenario analyses using FEMA's Hazus (Version 6.0) Loss Estimation Methodology software, with the results presented at the census-tract level.

Hazus calculates building-related losses using functions that relate the intensity of an earthquake to the degree of damage for different types of buildings, with the losses presented in U.S. dollars. The building inventory data is based on the 2022 National Structure Inventory, which includes building counts, values, and square footage at the census block and tract levels. Building losses are broken into two categories: (1) direct building losses and (2) business interruption losses, with building losses including both structural and non-structural components.

These maps present the estimated total building-related losses for commercial structures at the census tract level as a percentage of the estimated total exposure of commercial structures in that census tract. Both the losses and the exposure values are in U.S. dollars.

Darker shades represent higher total commercial building losses as a percentage of the total commercial building inventory for each census tract.

For additional information, refer to Section 6 - Earthquakes.

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City of Santa Monica

Project Number: 4306
Date: 2025

Plate H-8

Tsunami Hazards Map

Santa Monica, California

Explanation

City of Santa Monica Boundary

Los Angeles County Tsunami Hazard Area

(California Department of Conservation, Los Angeles County, Tsunami Hazard Areas, https://www.conservation.ca.gov/cgs/tsunami/maps/los-angeles)

NOTE: This map is intended for general land use planning only. Information on this map is not sufficient to serve as a substitute for detailed geologic investigations of individual sites, nor does it satisfy the evaluation requirements set forth in geologic hazard regulations. Earth Consultants International (ECI) makes no representations or warranties regarding the accuracy of the data from which these maps were derived. ECI and the City of Santa Monica shall not be liable under any circumstances for any direct, indirect, special, incidental, or consequential damages with respect to any claim by any user or third party on account of, or arising from, the use of this map.

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Project Number: 4306
Date: 2025

Plate H-9

N

2,000 0 2,000 ft

Projection and Scale: WGS84, 1:18,000
Basemap Source: Google Earth Satellite Imagery and Roads

Flood Hazard Map
Santa Monica, California

Explanation

FEMA Flood Insurance Rate Zones

High Risk Areas (Special Flood Hazard Areas)

A Zone A: The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.

AE Zone AE: The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone, either at cross section locations or as static whole-foot elevations that apply throughout the zone.

AH Zone AH: The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.

AO Zone AO: The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.

VE Zone VE: The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

Other Areas of Flood Hazard

X Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.

X Unshaded Zone X: Areas of minimal flood hazard.

Santa Monica City Boundary

N W E S

0 2,000 4,000

Feet

Scale: 1:24,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Sources: Federal Emergency Management Agency, downloaded 2/2023, Los Angeles County and City of Santa Monica

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Plate H-10

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* See FEMA Flood Insurance Rate Maps and FEMA Flood Insurance Study for Los Angeles County for Base Flood Elevations.

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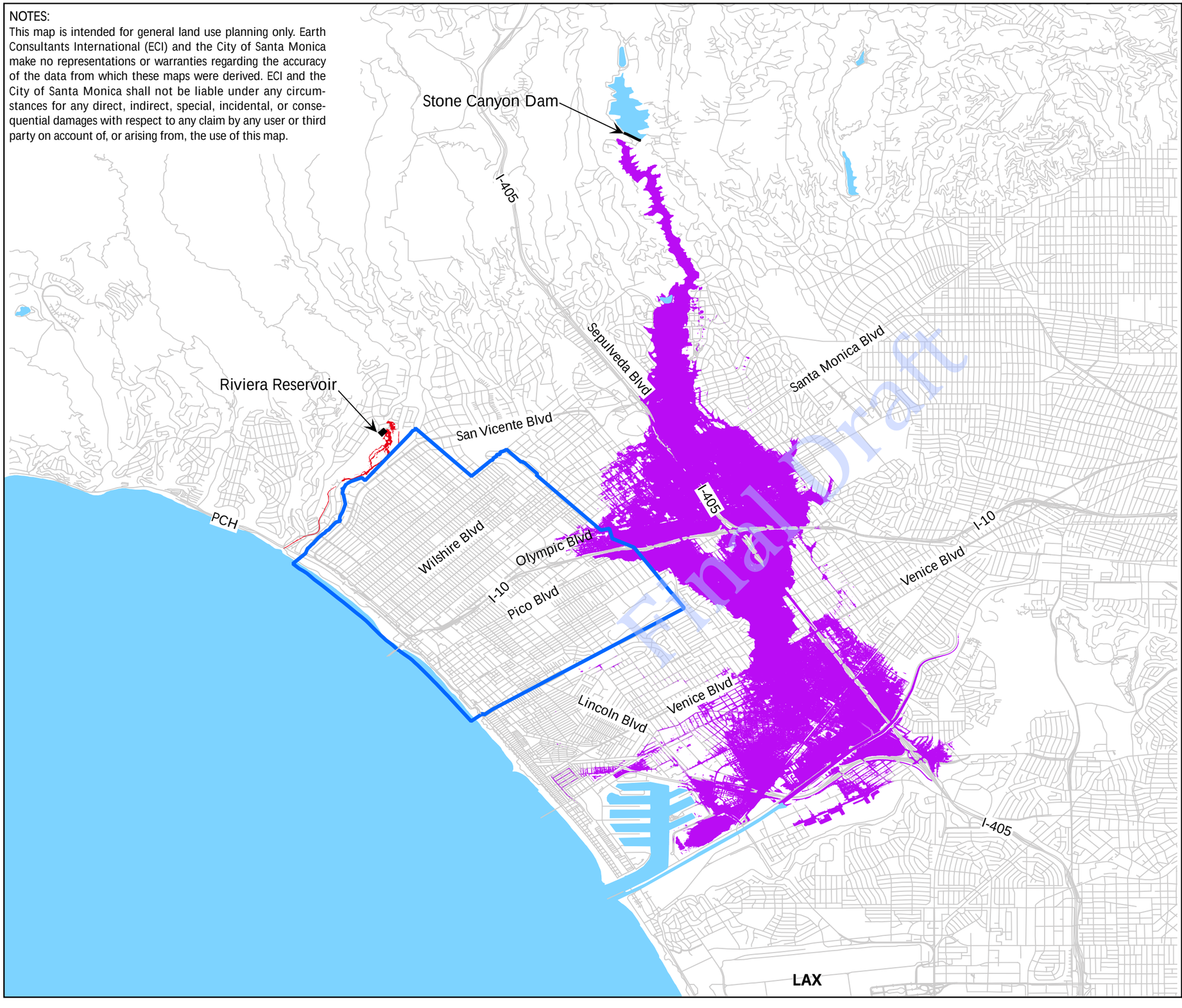

Dam Inundation Map

Santa Monica, California

Explanation

- Stone Canyon Dam Inundation Limits
- Riviera Dam Inundation Limits
- Lake or open water
- Santa Monica City Boundary

N
W E
S

0 5,000 10,000
Feet

Scale: 1:50,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Sources: Modified from https://fmds.water.ca.gov/maps/damim. Riviera Dam Inundation Limits file generated 10/31/2019, Stone Canyon Dam Inundation Limits file generated 5/1/2019.

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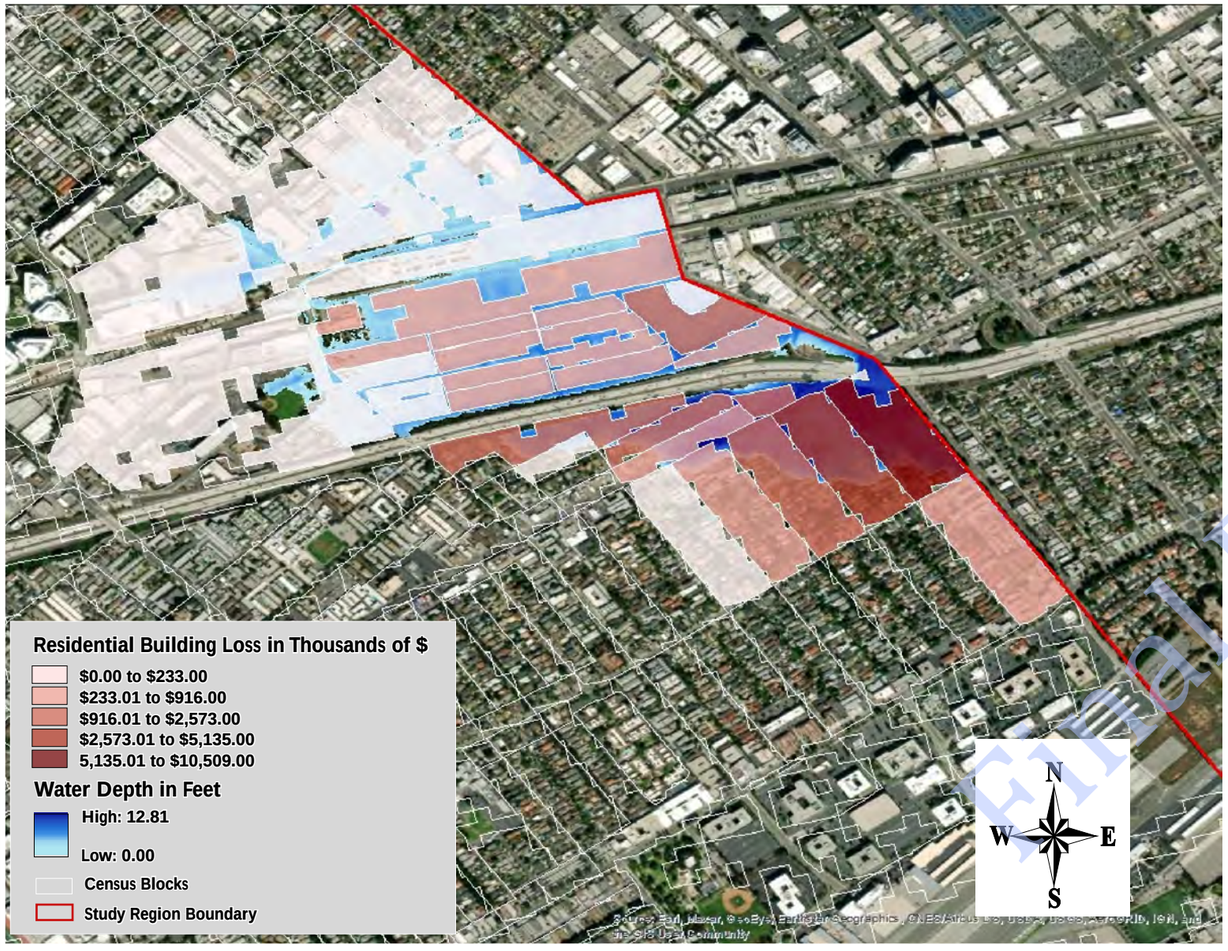
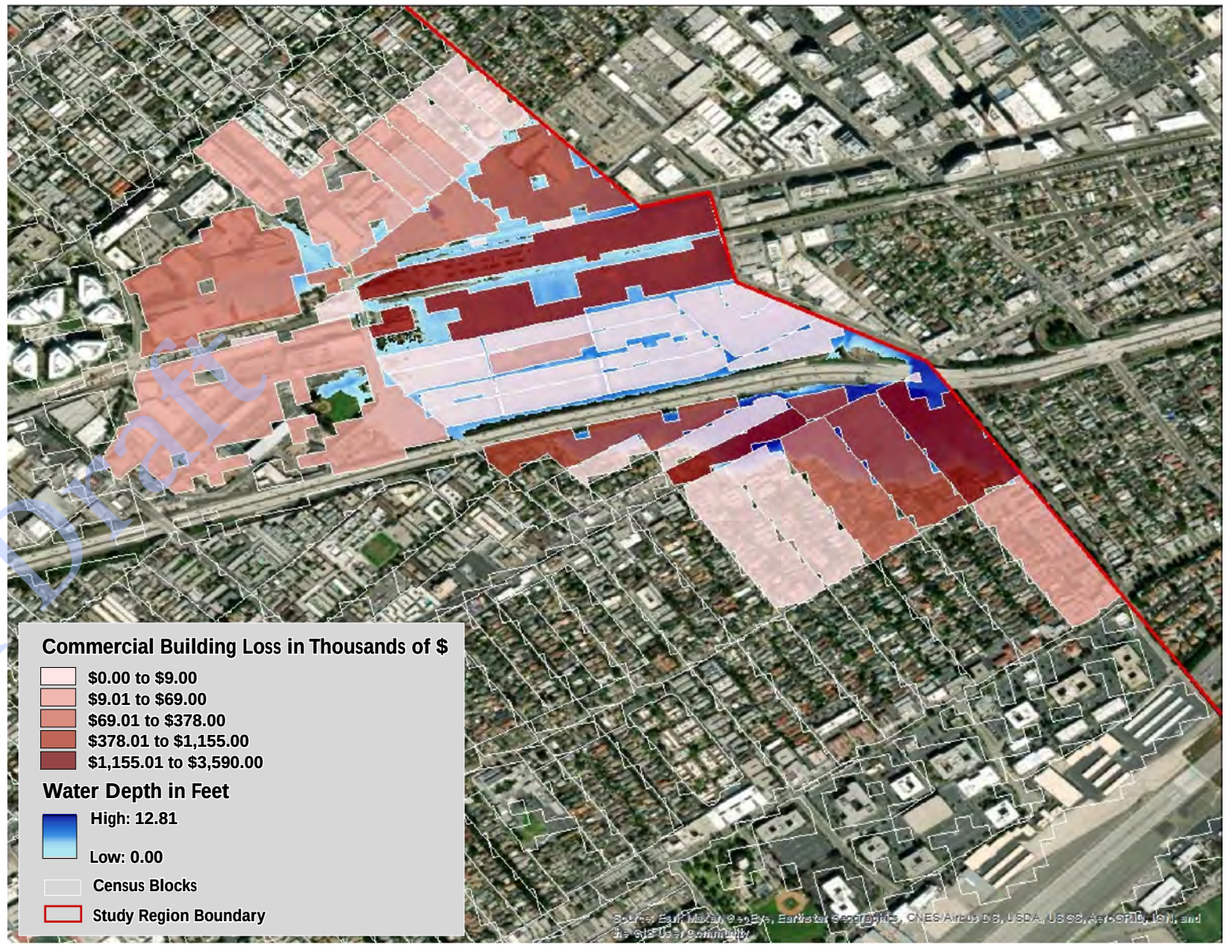
City of Santa Monica

Project Number: 4306
Date: 2025

Plate H-11

Residential and Commercial Building Losses in Santa Monica as a Result of a Hypothetical Failure of Stone Canyon Dam





Note that the same color distribution means significantly different dollar amounts depending on building type (residential vs. commercial).
Based on a "user-supplied" HazUS flood model analysis that considered the flooded area and water depths calculated by Genterra Consultants, Inc. (2019)
for a "sunny day" dam failure scenario for Stone Canyon Dam.

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Date: 2025

Anticipated Damage in Santa Monica as a Result of a Stone Canyon Dam Failure Scenario

Plate H-12

Geologic Map

of Santa Monica, California and Vicinity

For Geologic Unit Descriptions see Plate H-13b

Symbols

- Approximate Contact between Geologic Units
- Fault; solid where location known, dashed where approximate, dotted where concealed. (For more information refer to Figures 6-13 and 6-14).
- Santa Monica City Boundary

N W E S

0 2000 4000

Feet

Scale: 1:24,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Sources: Modified from Campbell et al., 2014 and Saucedo et al., 2016.

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City of Santa Monica

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Date: 2025

Plate H-13a

NOTES:

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Geologic Unit Descriptions

Modern Surficial Deposits

Historical and late Holocene deposits generally underlying the coastal areas, as well as farther inland, where stream channels once flowed, depositing sediments eroded from the mountains onto the low-lying flat regions to the south. Includes artificial fill.

Af — Artificial fill and areas surrounding the Clay Pits and Landfills where shallow fills, debris, and disturbed ground are anticipated. Includes compacted fill related to major roads.

Afc — Approximate limits of Former Clay Pits and Landfills; debris and potentially explosive gases may occur in these areas.

Qa — Alluvium (late Holocene)) — Unconsolidated sands, silts, and clays that have accumulated on canyon floors.

Qb — Beach deposits (Historical and late Holocene) — light gray to tan, loose, fine- and medium-grained sand forming a narrow strandline along the western edge of the city; typically slope gently towards the ocean.

Qe — Eolian deposits (late Holocene) — Loose, fine- to medium- grained sand, silty sand and silt. The deposition of these sediments forms temporary dunes against beach-facing cliffs.

Qf — Alluvial fan deposits (Holocene)— Sediments ranging in size from boulders to silt. Aside from on active and recently active alluvial fans, these deposits can be found in the headward sections of channels.

Young Surficial Deposits

Holocene and latest Pleistocene (?) sedimentary deposits including landslide deposits and young alluvium.

Qls — Landslide deposits (Holocene and late Pleistocene?) — Detritus from bedrock and surficial materials deposited by landslide processes. The deposits range from relatively coherent large blocks to disaggregated small fragments. Only large landslides are shown on Plate H-13a. Typically comprised of adjacent bedrock units shown on map. Qls/Tm means landslide comprised of Modelo Formation materials.

Qya — Young alluvium, undivided (Holocene and latest Pleistocene) — Predominately friable, unconsolidated, gravel-rich fluvial silt, sand, and gravel deposited in the floodplain at the base of the Santa Monica Mountains. These sediments can be found in stream beds and alluvial fans as well. Upper sections of these deposits are locally capped by slightly to moderately developed soils.

Old Surficial Deposits

Late to middle Pleistocene non-marine and possible marine (or paralic) sedimentary deposits.

Qoa — Old alluvium undivided — Unconsolidated to moderately consolidated (indurated) gravel, sand and silt deposited on flood plains. Deposits have been uplifted or removed from their sedimentation source. Surfaces have been dissected and show signs of pedogenic (soil) development. Preserved paleo-surfaces are indicated by the presence of a moderately to well-developed “B” soil horizon.

Qof — Old fan deposits, undivided — Slightly to moderately consolidated silt, sand and gravel deposited in alluvial fans. Deposits have been uplifted or removed from their sedimentation source. Fluvial deposits present within the fan deposits consist of subangular to rounded gravels, with Santa Monica slate being the most common lithology. Fan deposits can exhibit signs of pedogenic development by the presence of moderately to well-developed soils.

Qom — Old shallow marine deposits on wave-cut surface — Unconsolidated, but locally calcite-cemented, sand, silty sand and gravel. Typically overlie wave-cut bedrock platforms located at two or more elevations above present-day sea level. Paleo-surfaces indicated by soil development. Late Pleistocene molluscan fauna fossils are found locally within this unit.

Sedimentary and Volcanic Bedrock Units (exposed to the north and northwest of the city)

Several different bedrock types and lithologies crop out in the Santa Monica Mountains to the north of the city of Santa Monica. Ages of these units vary as well, ranging from Pliocene (~2.6 million years old) to late Cretaceous (~150 million years old). These bedrock units are not present at the surface within city limits, but clasts and grains eroded from these units comprise the bulk of the alluvial deposits in the foothills, alluvial fan surfaces and alluvial deposits that mantle the city. Only the formational units that crop out in the area included in Plate H-13a are included here.

QTp — Pico Formation (Pliocene) — Soft, olive gray, marine clayey siltstone and sandy siltstone with very fine-grained sandstone interbeds. Siltstone beds often contain fossils of foraminifera and well cemented-invertebrate shells.

Tm — Modelo Formation, undivided (late Miocene) — Thinly bedded, gray to brown mudstone, shale or siltstone. Interbeds of very fine- to coarse-grained sandstone are present as well. While the thickness of these sections of sandstone can be prominent, the sections are not laterally continuous.

Ti — Intrusive rocks, undivided (middle Miocene) — Dikes, sills and irregularly shaped intrusive bodies of diabase, basalt and andesite; commonly pervasively altered and easily eroded, undercutting slopes and thus commonly associated with the toes of landslides. In the western Santa Monica Mountains, related to the Conejo Volcanics (see description of the Topanga Group below).

Ttc — Topanga Group, undivided (middle Miocene) — Volcanic and sedimentary rocks. More specifically, these various deposits can be split up into three different subunits. The lowest stratigraphic subunit, sometimes referred to as the Lower Topanga Formation or the Topanga Canyon Formation, consists of near-shore marine, shoreline deposits, along with sandstone and siltstone that were deposited in an estuary-like environment. Intrusions associated with the overlying subunit cut through these deposits. The middle subunit, which has been referred to as the Middle Topanga Formation or the Conejo Volcanics, consists predominately of basaltic and andesitic extrusive volcanics that were typically deposited in a marine environment. Above these volcanics is a deep marine facies that includes submarine turbidite sandstone with shale interbeds. This upper section of the Topanga Group has been referred to as the Upper Topanga Formation and the Calabasas Formation.

Ts — Sespe Formation, undivided (early Miocene, Oligocene, and late Eocene) — A nonmarine “red bed” sequence of sandstone, pebbly sandstone, varicolored mudstone, and pebble-cobble conglomerate; sandstone beds commonly very thick to massive, with strong internal cross lamination; and rare thin interbeds varicolored reddish, greenish and grayish mudstone.

Kt — Tuna Canyon Formation, undivided (late Cretaceous) — Marine deposits that consist of bedded sandstone, siltstone, and conglomerate. Ammonite and foraminifera fossils are often found in this formation. The Tuna Canyon Formation has been subdivided into four informal members; three of these have been mapped in the area covered on Plate H-3a. From youngest to oldest these include:

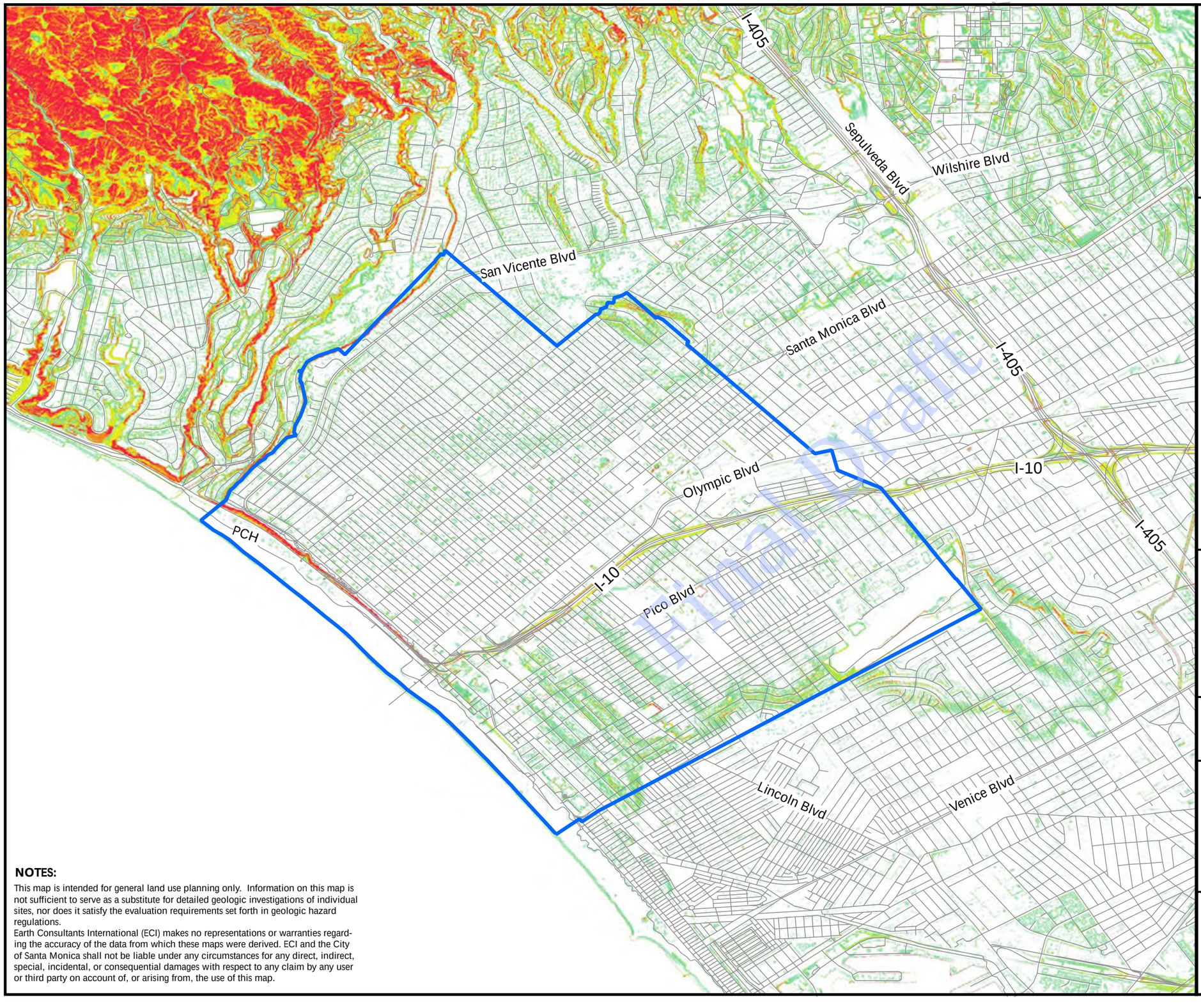
Ktc — Kce - informal member “c” consists of greenish-gray shale with coarse-grained sandstone interbeds in the upper part.

Ktd — Ktd - informal member “d” consists of fine-grained, thick-bedded, fossiliferous sandstone.

Kte — Kte - informal member “e” consists predominantly of pebble-cobble conglomerate and minor sandstone.

Slope Distribution Map

Santa Monica, California



Explanation

Slope (in degrees)

- 0 to 10
- 10 to 26
- 26 to 40
- 40 and greater

City of Santa Monica Boundary

N
W E
S

0 2,500 5,000

Feet

Scale: 1:25,000

Base Map: USGS Topographic Map from Sure!MAPS RASTER (1997)

Source: Derived from 2002/2003 IfSAR data for Southern California: 3m Digital Elevation Model (NAVD88)

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Date: 2025

Plate H-14

NOTES:

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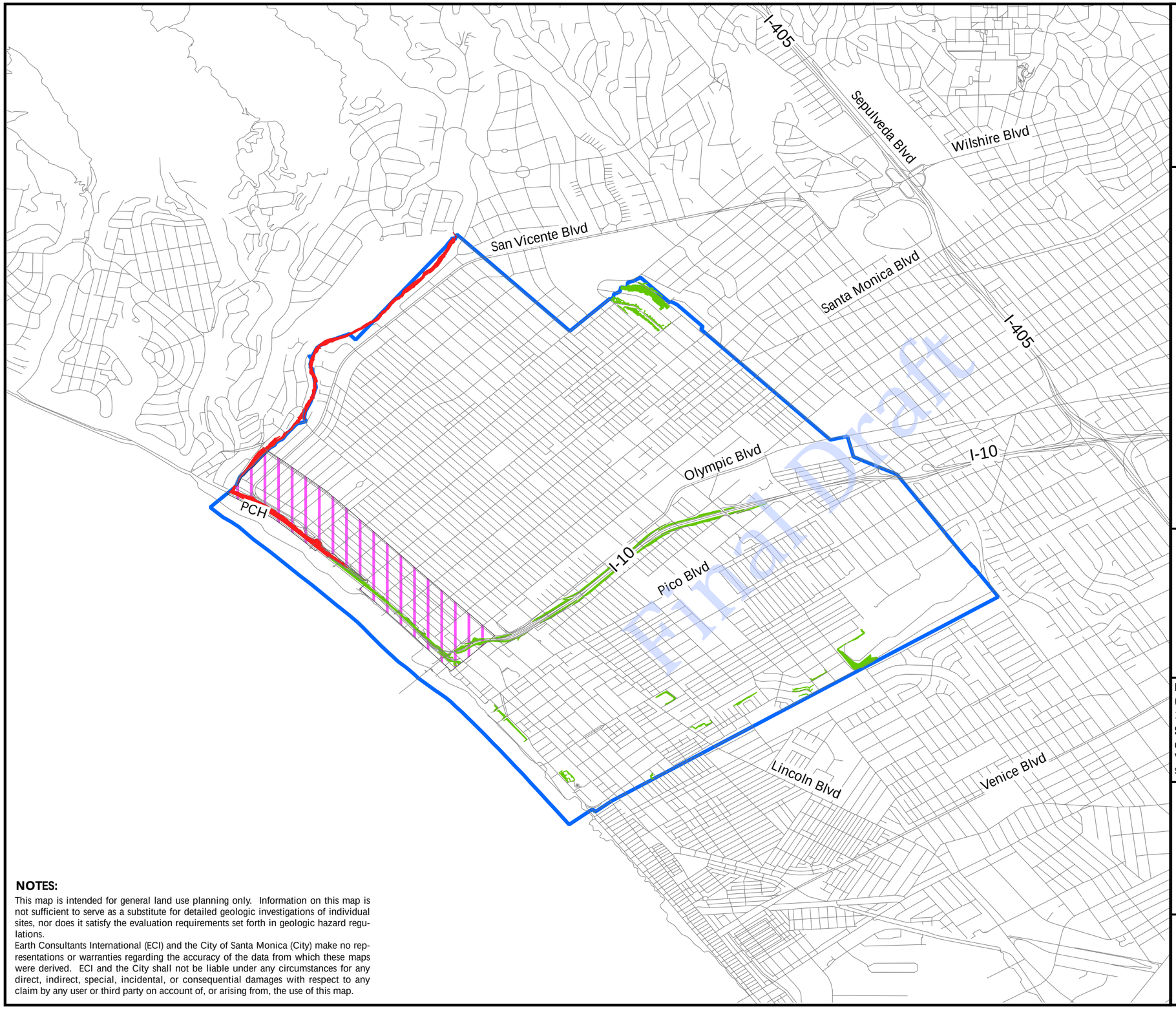
Slope Instability Map

Santa Monica, California



Explanation

Gross Slope Instability Area - Steep slopes more than 50 feet high that could slide or topple in response to intense precipitation, strong ground shaking, coastal or stream erosion at or near their base, or as a result of human activity.

Surficial Slope Instability Area - Slopes generally less than 50 feet high, with sections steeper than 26 degrees (see Plate H-14), that could fail surficially (see text) as a result of intense or continuous rainfall, overwatering, and/or burrowing animal or human activity. Many backyard areas that meet these criteria are not included here.

City-defined Area of Runoff Consideration: Area where runoff is to be diverted away from the coastal bluffs, to decrease erosion.

City of Santa Monica Boundary

N
W E
S

0 2,500 5,000

Feet

Scale: 1:25,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Sources: Slope data derived from LA County 2016 lidar and City-provided topographic data, combined with a "drive-by" visual analysis of slopes using the GoogleEarth Street View function. For a description of the geologic hazards addressed herein and additional sources, refer to the text.

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City of Santa Monica

Project Number: 4306
Date: 2025

Plate H-15

NOTES:

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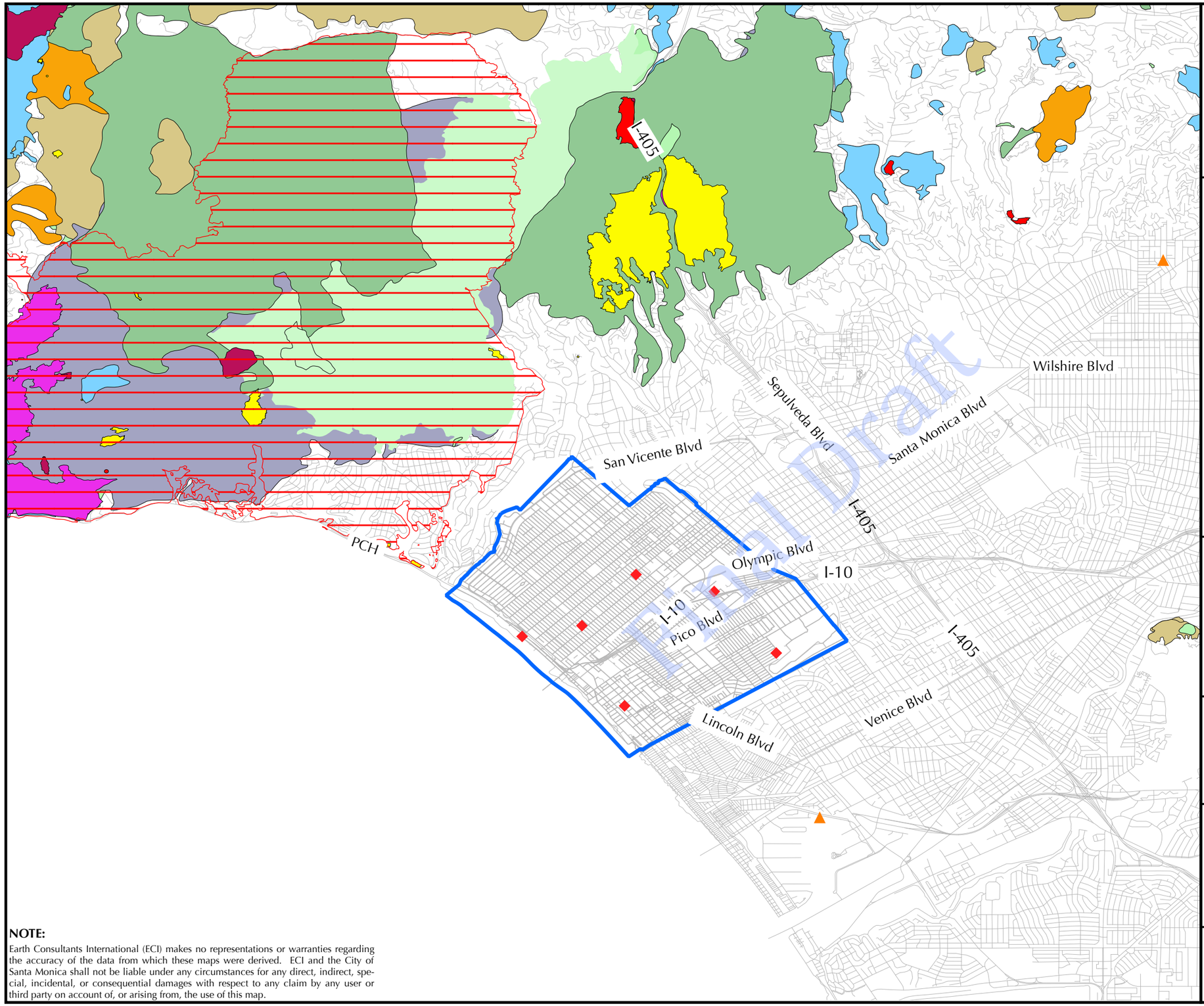
Historical Wildland Fires (1930-2025)

Near Santa Monica, California



Explanation

Year of Last Burn

- 1920 - 1930
- 1930 - 1940
- 1940 - 1950
- 1950 - 1960
- 1960 - 1970
- 1970 - 1980
- 1980 - 1990
- 1990 - 2000
- 2000 - 2010
- 2010 - 2020
- 2025 Palisades Fire
- Fire Stations in Santa Monica
- CAL FIRE Facilities for Wildland Fire Protection
- Santa Monica City Boundary

N W E S

0 5000 10000

feet

Scale: 1:50,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Source: California Fire and Resource Assessment Program (FRAP) @ http://frap.fire.ca.gov/mapping/gis-data

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Date: 2025

Plate H-16

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Fire Hazard Severity Zones In and Near Santa Monica, California

Explanation

California Fire Hazard Severity Zones (FHSZ)

- Very High Hazard in a Local Responsibility Area
- High Hazard in a Local Responsibility Area
- Moderate Hazard in a Local Responsibility Area
- Fire Stations in Santa Monica
- CAL FIRE Facilities for Wildland Fire Protection
- City of Santa Monica Boundary

N
W E
S

0 5,000 10,000
feet

Scale: 1:40,000

Base Map: Extracted from CloudMade data, derived from OpenStreetMap community (www.openstreetmap.org) and downloaded from MapCruzin (www.mapcruzin.com) on 1/08/2019.

Sources: Modified from California Department of Forestry and Fire Protection (CAL FIRE); https://egis.fire.ca.gov/FHSZ/

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Date: 2025

Plate H-17

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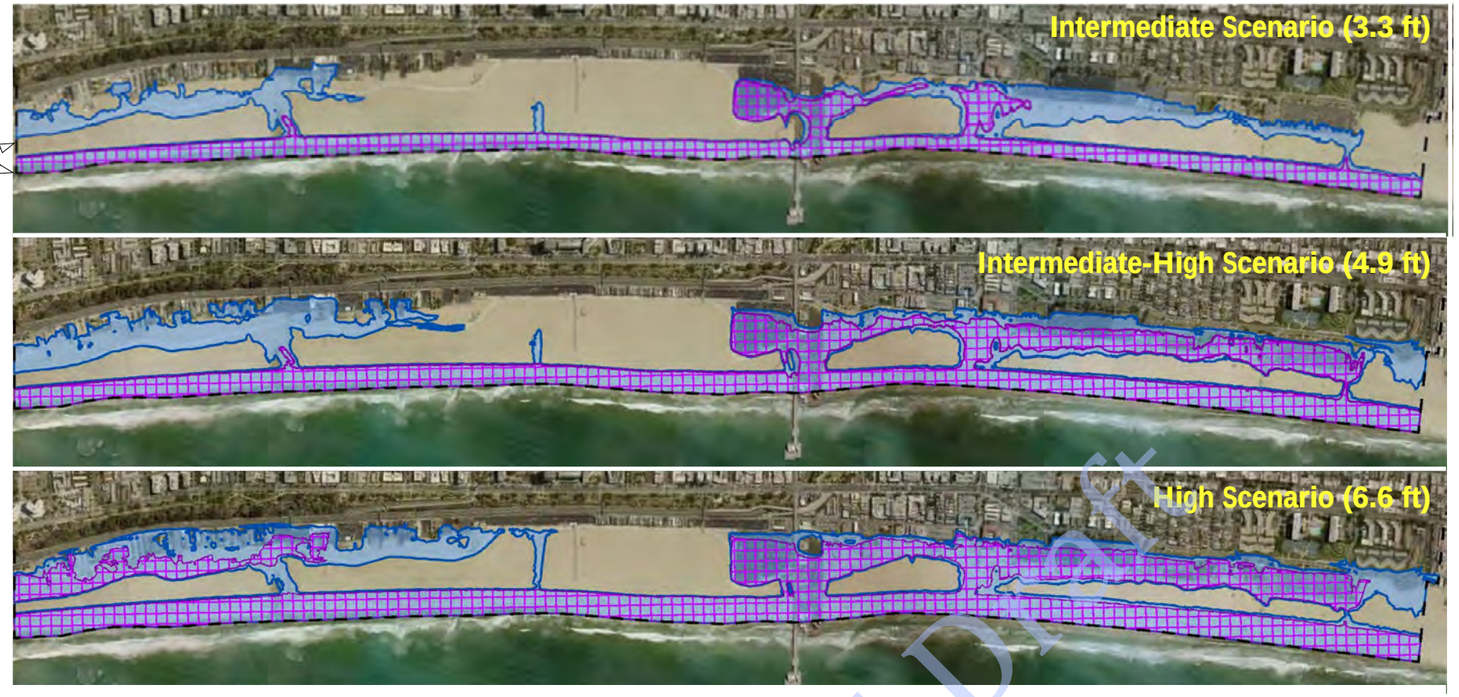
Santa Monica Coastline

City Boundary



Flood Extent by 2100 Under Three Sea-Level Rise Scenarios

Annual Storm Flooding

100-Year Storm Flooding

Annual Storm Flooding Extent by 2100

Intermediate Scenario (3.3 ft)

Intermediate-High Scenario (4.9 ft)

High Scenario (6.6 ft)

100-Year Storm Flooding Extent by 2100

Intermediate Scenario (3.3 ft)

Intermediate-High Scenario (4.9 ft)

High Scenario (6.6 ft)

Sources:
Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson , NCEAS, NLS OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, County of Los Angeles, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS.

Earth Consultants International

City of Santa Monica

Project Number: 4306 Date: 2025

Sea-Level Rise Forecasts Through 2100 for Santa Monica

Plate H-18

Hazardous Materials Sites
Santa Monica, California

Explanation

Hazardous Materials Sites

- Waste Discharge Requirements Site: Sites regulated by the DWR Program that discharge domestic or municipal wastewater, food-processing related wastewater, and industrial wastewater.
- Toxic Release Inventory (TRI) Site
- Resource Conservation and Recovery Act (RCRA) Large Quantity Generator (LQG) of hazardous waste
- Non-RCRA Large Quantity Generator of hazardous waste. These sites produce, store or transport wastes that cause no harm to human or environmental health.
- Leaking Underground Storage Tank (LUST) Site - Open cases
- Permitted Underground Storage Tank (UST) Site
- Cleanup Program Site - Open cases
- Land Disposal Site - now closed (refer to Figure 9-2 and Plates H-13a & 13b)

Flood Zones and Faults

- A: Zone A: The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
- AE: Zone AE: Flood insurance rate zone that corresponds to the 1% annual chance floodplains
- VE: Zone VE: Flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains
- Alquist-Priolo Zoned Faults

Selected Critical Facilities and Infrastructure

- Hospitals
- Fire Stations (HazMat unit at Station 5)
- Crude Oil Pipeline
- Roads
- City of Santa Monica Boundary

Sources: https://www.epa.gov/toxics-release-inventory-tri-program; https://siteportal.calepa.ca.gov/nsite/map/help; https://www.santamonica.gov/programs/certified-unified-program-agency-cupa; https://geotracker.waterboards.ca.gov/); City of Santa Monica CUPA.

NOTE: This map is intended for general land use planning only. Information on this map is not sufficient to serve as a substitute for detailed investigations of individual sites, nor does it satisfy the evaluation requirements set forth in geologic hazard regulations. Earth Consultants International (ECI) makes no representations or warranties regarding the accuracy of the data from which these maps were derived. ECI and the City of Santa Monica shall not be liable under any circumstances for any direct, indirect, special, incidental, or consequential damages with respect to any claim by any user or third party on account of, or arising from, the use of this map.

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Project Number: 4306
Date: 2025

Plate H-19

N
2,000 0 2,000 ft

Projection and Scale: WGS84, 1:18,000
Basemap Source: Google Earth Satellite Imagery and Roads

APPENDIX I: REFERENCES

Allen, M.R., Dube, O.P., Solecki, W., Aragón-Durand, F., Cramer, W., Humphreys, S., Kainuma, M., Kala, J., Mahowald, N., Mulugetta, Y., Perez, R., Wairiu, M., and Zickfeld, K., 2018, Framing and Context; *in* Masson-Delmotte, V., Zhai, P., Pörtner, H.-O., Roberts, D., Skea, J., Shukla, P.R., Pirani, A., Moufouma-Okia, W., Péan, C., Pidcock, R., Connors, S., Matthews, J.B.R., Chen, Y., Zhou, X., Gomis, M.I., Lonnoy, E., Maycock, T., Tignor, M. and Waterfield, T. (editors), Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty: Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 49-92, doi:10.1017/9781009157940.003.

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APPENDIX J: ADOPTION

City of Santa Monica, California
2025 Local Hazards Mitigation Plan
City Council Adoption Resolution