City of Orange
Local Hazard Mitigation Plan

December 2025

Orange City Fire Department
EMERGENCY MANAGEMENT DIVISION
1176 E. CHAPMAN AVE, ORANGE CA 92866

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SECTION 1: INTRODUCTION

The City of Orange (City) has prepared this update to its Local Hazard Mitigation Plan (LHMP) in order to assess the natural, technological, and human-caused risks to the City to reduce the potential impact of the hazards by creating mitigation strategies (Projects). The 2025 LHMP represents the City's commitment to create a safer, more resilient, community by taking actions to reduce risk and by committing resources to lessen the effects of hazards on the people and property of the City of Orange.

This plan complies with the Federal Disaster Mitigation Act (2000), Federal Register 44 CFR Parts 201 and 206, which modified the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding a new section, 322 - Mitigation Planning. This law, as of November 1, 2004, requires local governments to develop and submit hazard mitigation plans as a condition of receiving Hazard Mitigation Grant Program (HMGP) and other mitigation project grants. The Fire Department has coordinated preparation of the LHMP in cooperation with other City departments, community stakeholders, partner agencies, and members of the public.

This introduction to the LHMP provides a brief description of hazard mitigation planning, local mitigation plan requirements, and an outline of the 2025 LHMP. There is also an overview of Federal Emergency Management Agency (FEMA) programs and grants related to hazard mitigation.

1.1 Hazard Mitigation Planning

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. In general, hazard mitigation is done to minimize the impact of a hazard event before they occur, with the goal of reducing losses from future disasters. The purpose of mitigation planning is for local governments to identify the hazards that impact them; to identify actions and activities to reduce losses from those hazards; and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources.

For the City of Orange, hazard mitigation planning is a process in which the City will:

- Identify and profile hazards that affect the local area
- Analyze the population and facilities at risk from those hazards
- Develop a mitigation strategy and actions to lessen or reduce the impact of the hazards profiled
- Implement the strategy and actions that may involve planning, policy changes, programs, projects, and other activities

The City's implementation of mitigation actions, which may be short-term or long-term strategies, is the primary objective of the planning process. This type of planning will supplement the City's comprehensive emergency management program.

1.2 Local Mitigation Planning Requirements

Hazard mitigation planning is governed by the Stafford Act, as amended by the Disaster Mitigation Act of 2000 (DMA 2000), and by federal regulations implementing the Stafford Act. DMA 2000 revised the Stafford Act to require state, local, and tribal governments to develop and submit to FEMA a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the jurisdiction. Plan approval by FEMA is a prerequisite to receiving federal hazard mitigation grant funds.

FEMA promulgated 44 CFR Part 201, the federal regulations governing the planning process, plan content, and the process for obtaining approval of the plan from FEMA to implement the mitigation planning requirements of the Stafford Act. The planning requirements set forth in the CFR are identified throughout this plan mirroring the order of the FEMA Regulation Checklist in the Local Mitigation Plan Review Tool.

Federal law and the State of California's requirements for hazard mitigation plans require coverage of only natural hazards. The City's 2016 Hazard Mitigation Plan does not include technological and human- caused hazards. For the 2025 plan, the planning team decided to cover both natural and technological/human-caused hazards, including a description and analysis of each hazard.

FEMA has produced a Local Mitigation Plan Review Tool, which has been tailored by Region IX as an appendix to the Local Mitigation Planning Handbook (2023), to demonstrate how the mitigation plan meets the regulation in 44 CFR § 201.6 and offers State and FEMA Mitigation Planners an opportunity to provide feedback to the jurisdiction. The Plan Review Tool has a regulation checklist that provides a summary of FEMA's evaluation of whether the plan has addressed all requirements. Local planners can also use the checklist prior to submitting the plan for approval to ensure they have addressed all the requirements. The Local Mitigation Plan Review Tool Regulation Checklist is provided in **Appendix A** of this document.

1.3 Hazard Mitigation Plan Description

The 2025 LHMP consists of the sections and appendices described below:

Table 1-1: Plan Sections, Appendices, and Descriptions	
Section 1: Introduction	Section 1 includes an introduction to hazard mitigation planning, lists the LHMP planning requirements, provides a description of the plan, and discusses grants related to hazard mitigation.
Section 2: Hazard Mitigation Planning Organization and Process	Section 2 describes the planning process for the 2025 LHMP, including an overview of how the LHMP was prepared, identification of the LHMP planning team, involvement of outside agencies and communities, the inclusion of related plans, reports, and information, and stakeholder and public outreach activities.
Section 3: Planning Area Description	Section 3 includes a description of the natural and built state of the City, including climate, geography, demographics, land use, and economic conditions.
Section 4: Hazard Identification	Section 4 provides a list of the hazards identified in the 2025 LHMP, a profile of each hazard and hazard summary, and a risk assessment of the planning area.
Section 5: Risk Assessment	Section 5 identifies the City's risk to each identified hazard by evaluating potential impacts to infrastructure and the built environment.
Section 6: Capabilities Assessment	Section 6 identifies and evaluates the resources available to the City for hazard mitigation within the City.
Section 7: Mitigation Strategy	Section 7 identifies and evaluates the current, ongoing, and completed mitigation projects and programs in the City and lists mitigation strategies for reducing potential losses.
Section 8: Plan Implementation and Maintenance	Section 6 describes procedures for updating the LHMP to keep it current and for continued public engagement in the planning process.
Appendix A	Appendix A contains the FEMA Local Mitigation Plan Review Tool, which documents the City's compliance with the local hazard mitigation plan requirements of 44 CFR Part 201.
Appendix B	Appendix B contains documentation of the planning process for the planning team, including invitations, attendee lists, meetings minutes, presentations, emails, etc.
Appendix C	Appendix C contains documentation of the planning process, including surveys, social media outreach and opportunity for comment for the stakeholders and public, and other stakeholder/public outreach efforts.
Appendix D	Appendix D lists acronyms and abbreviations used in the 2025 LHMP.

1.4 Assembly Bill 2140

The California Disaster Assistance Act limits the state share for any eligible project to no more than 75% of total state eligible costs, except that the state share shall be up to 100% of total state eligible costs connected with certain events. AB 2140 prohibits the state share for any eligible project from exceeding 75% of total state eligible costs unless the local agency is located within a city, county, or city and county that has adopted a local hazard mitigation plan in accordance with the federal DMA 2000 as part of the safety element of its general plan, in which case the Legislature may provide for a state share of local costs that exceeds 75% of total state eligible costs.

The California Government Code, Sections 8685.9 and 65302.6, allow for the State Legislature to provide for a state share of local costs that exceeds 75% of total state eligible costs where the local agency is located within a city, county, or city and county that has adopted a local hazard mitigation plan in accordance with the federal Disaster Mitigation Act of 2000 (P.L.106-390) as part of the safety element of its general plan adopted pursuant to subdivision (g) of Section 65302.

1.5 Grant Programs with Mitigation Plan Requirements

Currently, three FEMA grant programs provide funding to local entities that have a FEMA-approved local hazard mitigation plan meeting federal hazard mitigation plan requirements. One of the grant programs is authorized under the Stafford Act. The remaining two programs are authorized under the National Flood Insurance Act.

1.5.1 Stafford Act Grant Programs

Funding is provided to state, local, and tribal governments that have an approved Hazard Mitigation Plan through the following programs.

Hazard Mitigation Grant Program (HMGP)

The HMGP provides grants to implement long-term hazard mitigation measures after declaration of a major disaster. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. To qualify for HMGP funding, projects must provide a long-term solution to a problem and the project's potential savings must exceed the cost of implementing the project.

HMGP funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The amount of funding available for the HMGP under a particular disaster declaration is limited. Under the program, the federal government may provide a state or tribe with up to 20% of the

total disaster grants awarded by FEMA and may provide up to 75% of the cost of projects approved under the program.

1.5.2 National Flood Insurance Act Programs

Flood Mitigation Assistance Grant Program

The goal of the Flood Mitigation Assistance (FMA) Grant Program is to reduce or eliminate flood insurance claims under the National Flood Insurance Program (NFIP). This program places emphasis on mitigating repetitive loss (RL) properties. The primary source of funding for the FMA program is the National Flood Insurance Fund. Grant funding is available for planning, project, and technical assistance. Project grants are awarded to local entities to apply mitigation measures to reduce flood losses to properties insured under the NFIP. The cost- share for this grant is 75% federal and 25% nonfederal. However, a cost-share of 90% federal and 10% nonfederal is available in certain situations to mitigate severe repetitive loss (SRL) properties.

Repetitive Flood Claims Program

The Repetitive Flood Claims (RFC) Program provides funding to reduce or eliminate the long-term risk of flood damage to residential and non-residential structures insured under the NFIP. Structures considered for mitigation must have had one or more claim payments for flood damage. All RFC grants are eligible for up to 100% federal assistance.

SECTION 2: PLANNING PROCESS

The requirements for documentation of the LHMP planning process are described below. This section summarizes the planning area's hazard mitigation planning efforts in 2025. In addition, the section describes public and stakeholder outreach efforts as part of the LHMP planning process. The section also summarizes the review and incorporation of existing plans, studies, and reports used to develop the LHMP. Documentation of the 2025 LHMP planning process for the Hazard Mitigation Planning Team is provided in **Appendix B**, and documentation of the process for the public and stakeholders involvement is found in **Appendix C**. These appendices document the planning meetings and outreach and include meeting agendas, presentation, minutes, social media materials and other documentation used to conduct the planning process.

The planning process began with the City establishing the planning team and emailing stakeholders within the planning area to invite them to participate in the process. The City also posted a notice on its website announcing the planning process that contained a mechanism to provide input and feedback.

2.1 Plan History

The 2025 LHMP is an update of the 2016 Plan. It addresses and consolidates hazards analyzed in the previous plan and adds new hazards such as Tree Mortality and Cyber-Attack. The 2025 LHMP incorporates various mitigation actions listed in the 2016 version as they are ongoing and still relevant; and adds new mitigation measures.

2.2 Plan Purpose and Authority

The purpose of the LHMP is to identify natural and human-caused hazards that impact the City, to assess the vulnerability and risk posed by those hazards to City-wide human and structural assets, to develop strategies for mitigation of those identified hazards, to present future maintenance procedures for the plan, and to document the planning process. The Plan is prepared in compliance with DMA 2000 requirements and represents an updated LHMP.

The requirements for adopting this LHMP by all local governing bodies, as set forth in the Stafford Act and as amended by DMA 2000 and its implementing regulations, are described below. The local planning requirements are documented throughout the LHMP and in **Appendix A**, *FEMA Local Mitigation Plan Review Tool*.

Funding for the development of the Plan was provided by the Hazard Mitigation Grant Program. Tandem Solutions was retained by the City to provide consulting services in guiding the planning process and plan development.

2.3 Planning Process Description

In February 2025, the planning process for the 2025 LHMP began. Select staff from various departments in the City, and other stakeholders were invited to join the Hazard Mitigation Planning Team to develop the 2025 LHMP. Documentation of participant outreach is located in **Appendix B**. A list of members of the Planning Team is located in **Table 2-1.**

Email solicitations were sent to stakeholders and cities surrounding Orange, requesting participation in the LHMP planning process. Documentation of the emails is contained in **Appendix B**.

2.4 Planning Team

Members of the LHMP planning team are listed in **Table 2-1** below.

Table 2-1: LHMP Planning Team

Department or Agency	Member Name	Key Role
City Attorney's Department	Nathalie Adourian	Planning Team Member
Community Services	Robert Ambriz Jr.	Planning Team Member
Community Services	Aida Cuevas	Planning Team Member
Water Division	Jose Diaz	Planning Team Member
Fire Department	Stephen Fan	Planning Team Member
Risk Management	Janet Flores	Planning Team Member
Water Division	Rick Hurtado	Planning Team Member
Police Department	Adam Jevec	Planning Team Member
Public Works	Matthew Lorenzen	Planning Team Member
Community Development	Anna Pehoushek	Planning Team Member
Information Technology	Steven Scardina	Planning Team Member
Human Resources	Shelby Alley	Planning Team Member
City Manager's Department	Charlene Cheng	Planning Team Member
Fire Department	Megan Berumen	City Project Manager
Fire Department	Robert Prendergast	Planning Team Member
Fire Department	Douglas Yates	Planning Team Member
Tandem Solutions	Francisco Soto	Consultant Project Manager

2.5 Planning Team Activities

Three meetings were held with the planning team: representatives from the City held the responsibility of chairing the planning team. The City project manager reviewed all documents and sent out meeting notices via Microsoft Outlook email. **Appendix B** documents the LHMP planning activities. The planning team's responsibility included providing feedback on hazards that affect the planning area, reviewing drafts of the plan, and participating in developing mitigation activities. Table 2-2 provides a summary of the planning meetings.

Table 2-2: Planning Activities

Date	Activity	Purpose
February 10, 2025	Project Kick-off/Planning Meeting	Introduce core Planning Team members, review the project management plan, and review the planning process and timeline.
March 4, 2025	LHMP Planning Team	Describe the regulatory issues of LHMP, the value of them, and the LHMP planning process. Review hazards and potential impacts.
May 7, 2025	LHMP Planning Team	Review potential hazards and select those that pose risks. Use CPRI. Review status of 2016 mitigation activities and update status. Review data-collection-sheet inputs, begin to develop potential mitigation activities. Request information for hazard analysis and potential losses. Review risk assessment and potential losses. Develop draft mitigation goals and actions. Review past plan mitigation activities

2.6 Other Jurisdictions Agency/Organizational Participation

External organizations participated in planning process. They were invited via an Microsoft Outlook email to participate in the planning team and provide input during the plan development process. Stakeholders provided input on past hazards that have affected the planning area, organizational specific changes, and input to hazard analysis. **Appendix C** documents their engagement. **Table 2-3** lists the organizations and attendees.

Table 2-3: Organization Participation

Organization	Staff
Chapman University	Ricardo Gonzalez
Rady's Children Hospital of Orange County	Christopher Riccardi

UCI Health	John Case
Chamber of Commerce	Connie Benson
Orange County Transportation Authority	Nick Boonmag
Orange County Fire Authority	Kyle Kuzma
Orange County Health Care Coalition	Chad Cossey
Orange County Sheriff – Emergency Management Division	Christian Maurice Hobbs
Orange County Social Services Agency	Ethan Brown
Irvine Company	Jennifer Le
Red Cross – Orange County	Monica Ruzich
Water Emergency Response Team of Orange County	Gabby Landeros
City of Westminster	Anna Burton
City of Costa Mesa	Delcie Hynes

Copies of the draft LHMP were provided to the City Planning Team and distributed to the public for their review. Comments received from these partners are incorporated in the final draft of the LHMP and are documented in **Appendix C**.

2.7 Community Engagement

Once the planning process commenced, the City provided public notification through its website, press releases, and social media accounts. Additionally, the City conducted an online survey to solicit input on the hazards that the city faces and the types of mitigation activities the City should undertake. The draft LHMP was placed on the City website; and hard copies were posted at City Hall and city libraries for public review and comment. Finally, notification of the draft LHMP review and adoption by the City Council was advertised as required by the Brown Act.

The public survey input from the 53 responders was used to select hazards and rank their priority. Earthquake and Wildfire were ranked as the top two hazards by the public. This input was also used to inform the Calculated Priority Risk Index (CPRI) in **Table 4-4**. Finally, survey input was used to select mitigation actions. Input from publicly posting the draft LHMP was used to refine the Plan and to prepare it for submission for review. **Appendix C** contains a full description of the process for and documentation of community outreach efforts and public participation.

On March 19, 2025, the City posted information about the LHMP update process on its website and social media channels; and invited the public to take a Hazard Mitigation Survey to gather information about the public's knowledge of hazards in the City and their level of preparedness.

2.8 Incorporation into Other Planning Mechanisms

The LHMP planning process provided the City with an opportunity to review and expand on policies contained in its capital improvement plan (CIP) and other plans. The City views the CIP and the hazard mitigation plan as complementary documents that work together to reduce risk exposure to the residents of its service area. Many of the ongoing recommendations identified in the LHMP are programs or projects that are in the CIP.

The City's 2026 hazard identification, risk assessment, plan recommendations and mitigation actions will be integrated into the following planning mechanisms.

- **City of Orange Emergency Operations Plan** – Hazards identified in this LHMP will be incorporated into the EOP. Additionally, the City will incorporate training and exercises based on scenarios identified in the LHMP to improve preparedness.
- **Capital Improvement Plan (CIP)** – Mitigation Actions identified in the LHMP will be incorporated into future iterations of the CIP.
- **Risk and Resilience Assessment** – Hazards identified in the LHMP will be incorporated into the City's Risk and Resilience Assessment to help inform the scenarios that can impact the City's water system.
- **Community Rating System (CRS)** – The City will Integrate LHMP strategies into the CRS to improve floodplain management and potentially lower flood insurance premiums for residents.

Incorporating action items and processes from the 2026 LHMP into various planning documents will be completed as other plans are updated, and new plans are developed. These efforts may coincide with the Plan Maintenance Method and Schedule activities listed in **Section 7**.

The community will integrate the Local Hazard Mitigation Plan (LHMP) into existing planning mechanisms, policies, and programs to ensure mitigation strategies are incorporated into day-to-day decision-making. Following adoption by the local governing body, the LHMP will be referenced and incorporated into relevant plans such as the General Plan, Emergency Operations Plan, Capital Improvement Program, and other community planning documents. Local departments including Planning, Public Works, Fire and Emergency Management will coordinate to align mitigation actions with ongoing projects, infrastructure improvements, and regulatory updates. Mitigation actions identified in the LHMP will guide project prioritization and funding requests, including applications for mitigation grants through the Federal Emergency Management Agency.

2.9 Review of Existing Plans, Reports, Technical Documents, and Data

In updating the LHMP, the Planning Team used various resource documents and references. **Table 2-4** contains a comprehensive list of guidance, policy tools, existing plans, and authorities incorporated to create the 2025 LHMP.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan

Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
California State Hazard Mitigation Plan (2023) https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf	Technical and Planning Resource	Provides the State of California's Hazard Mitigation Plan for 2023-2028. Describes hazards that informed the hazard analysis and risk assessment portion of this LHMP.
County of Orange and Orange County Fire Authority Local Hazard Mitigation Plan (2021) https://www.ocsheriff.gov/sites/ocsd/files/2022-03/2021%20County%20of%20Orange%20and%20Orange%20County%20Fire%20Authority%20Local%20Hazard%20Mitigation%20Plan.pdf	Technical and Planning Resource	Describes hazards that informed the hazard analysis and risk assessment sections of this LHMP.
California Energy Commission (2018). California's Fourth Climate Change Assessment https://www.energy.ca.gov/data-reports/reports/californias-fourth-climate-change-assessment	Technical and Planning Resource	Describes monitoring, analysis, and modeling of climate as well as efforts designed to reduce emissions.
FEMA Dam Safety https://www.fema.gov/emergency-managers/risk-management/dam-safety	Technical Resource	Database used in the dam failure hazard profiling. Used in the risk assessment.
National Weather Service https://www.weather.gov/	Technical Resource	Source for hazard information, data sets, and historical event records. Used in the risk assessment.
United States Geological Survey Earthquake Hazards Program https://www.usgs.gov/programs/earthquake-hazards	Technical Data	Source for geological hazard data and incident data. Used in the risk assessment.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan		
Referenced Document or Technical Source	**Resource Type**	**Description of Reference and Its Use**
Western Regional Climate Center https://wrcc.dri.edu/	Website Data	Online resource for climate data used in climate discussion.
California Department of Conservation https://www.conservation.ca.gov/cgs/geohazards	Technical and Planning Resource	Identifies significant geologic hazards that exist, or are likely to exist, so that informed land use and emergency response planning decisions can be made.
California Department of Water Resources https://water.ca.gov/Programs/All-Programs/Division-of-Safety-of-Dams/Inundation-Maps https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2	Technical and Planning Resource	Provides information on dam safety, a list of dams within California and dam inundation maps for dams in the planning area.
Federal Emergency Management Agency	Technical and Planning Resource	Resource for LHMP guidance (How-To series), floodplain and flood-related NFIP data (mapping, repetitive loss, NFIP statistics), and historic hazard incidents. Used in the risk assessment and mitigation strategy.
Cybersecurity & Infrastructure Security Agency https://www.cisa.gov/	Technical and Planning Resource	Resource for cybersecurity and cyberattack guidance, especially regarding critical infrastructure and public utilities. Describes historical cybersecurity incidents and lessons learned. Used in the risk assessment and mitigation strategy.
National Centers for Environmental Information https://www.ncdc.noaa.gov/data-access	Technical Resource	Online resource for weather-related data and historic hazard event data. Used in the risk assessment.
National Integrated Drought Information System (2025) https://www.drought.gov/drought/	Technical Resource	Source for drought-related projections and conditions. Used in the risk assessment.
California Energy Commission (2018). California's Fourth Climate Change Assessment https://www.energy.ca.gov/data-reports/reports/californias-fourth-climate-change-assessment	Technical and Planning Resource	Describes monitoring, analysis, and modeling of climate as well as efforts designed to reduce emissions.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan		
Referenced Document or Technical Source	**Resource Type**	**Description of Reference and Its Use**
California Governor's Office of Emergency Services http://myhazards.caloes.ca.gov/	Technical and Planning Resource	Provides a tool for the general public to discover hazards in their area (earthquake, flood, fire, and tsunami) and learn steps to reduce personal risk.

SECTION 3: COMMUNITY PROFILE

3.1 Location

The City of Orange is in the north-central portion of Orange County, approximately 32 miles southeast of Los Angeles. The city is predominately flat with hills surrounding the City to the north and east. The Santa Ana River generally forms the western boundary, and Santiago Creek traverses the city from the northeast to the southwest. The City of Orange is primarily urban, with the largest land-use being residential. **Figure 3-1** provides a map of the City's boundary.

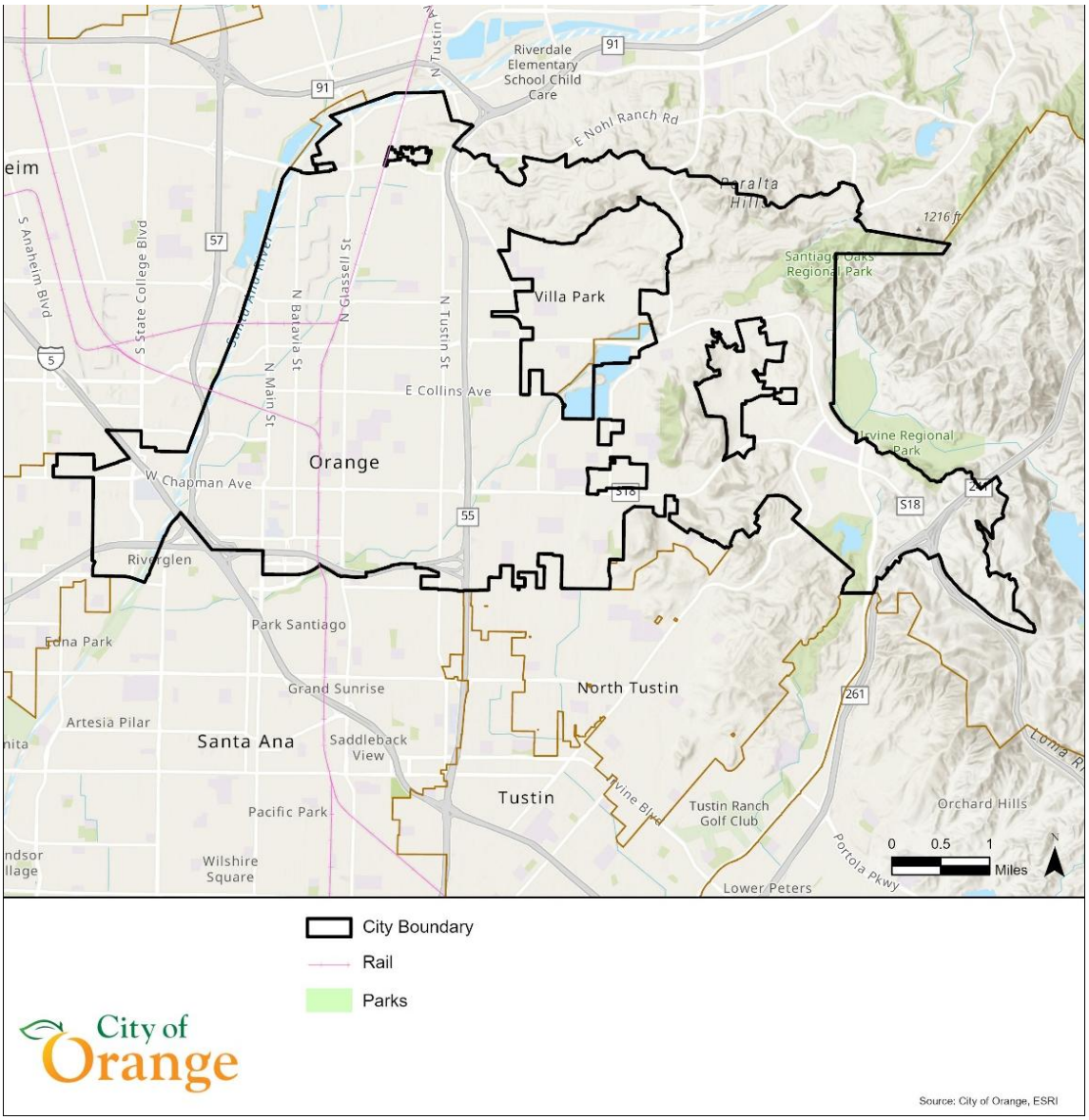


Figure 3-1: City of Orange Boundary Map

3.2 Community Overview

The City of Orange is located in north-central Orange County, California, approximately 32 miles southeast of Los Angeles (33.7878°N, 117.8531°W). It is bordered by Anaheim to the west, Santa Ana to the south, Tustin to the southeast, and Villa Park to the east. Covering about 25 square miles, the city has a flat terrain with elevations of 100–400 feet, surrounded by hills to the north and east, including the Peralta Hills, which contribute to landslide and wildfire risks (Sections 4.5.5 and 4.5.7).

The Santa Ana River forms the western boundary, and Santiago Creek flows from northeast to southwest through residential and commercial areas. Both waterways pose flood risks during heavy rainfall (Section 4.5.6). Proximity to the Peralta Hills and El Modena Faults increases seismic vulnerability (Section 4.5.4), and hills to the north and east place parts of the city in the wildland-urban interface, elevating wildfire risks (Section 4.5.5)

Orange is connected to the surrounding region through a complex network of freeways; through Metrolink, a heavy rail commuter system; and through bus transit provided by the Orange County Transportation Authority (OCTA). Shopping centers in Orange include two regional malls. The Outlets at Orange is an open-air retail and entertainment center located on City Drive. The Village at Orange is located on Tustin Street and provides more traditional retail shopping facilities. Various shopping centers exist throughout the city.

The City of Orange is home to Chapman University located in the northern portion of Old Towne, and Santiago Canyon College, located on east Chapman Avenue, just west of Jamboree. Orange Unified School District has grades K-12 which includes several elementary schools, middle schools, and high schools. Numerous private and preschools are located within the city.

Orange is home to a diverse network of hospitals and medical centers that provide comprehensive healthcare services to residents and visitors alike. The City has 1 comprehensive pediatric emergency receiving center, Rady Children's Health, and 2 emergency receiving centers with one of those centers being a level 1 trauma receiving center (UCI Health). St. Joseph's Hospital and Rady Children's Health are located at Main Street and La Veta Avenue; UCI Health, located at Chapman Avenue, and The City Drive; Chapman Global Medical Center, located at Chapman Avenue, east of the 55 Freeway.

The City of Orange consists of a wide range of neighborhoods including Old Towne, the Presidential Tracts, El Modena, the Alphabet Streets, the Eichler Tracts, and Maybury Ranch to name a few. Each neighborhood has a distinctive character and personality ranging from the 1960s home designed by world-renowned developer Joseph Eichler to El Modena's Latino essence to Old Towne's Historic District, displaying an abundance of late 19th and early 20th century architectural styles. The city is mostly comprised of single-family homes with the majority built from 1960 to 1969. Housing in Orange has grown steadily throughout the decades and is projected to reach a total of 51,145 housing units by 2035, a 5,900 increase from 2015.

Figure 3-1 (City of Orange Boundary Map) shows the city's boundaries, the Santa Ana River, Santiago Creek, major roads (e.g., State Route 55, Interstate 5), and hazard-prone areas. These transportation corridors can become congested during hazard events (Section 3.2). The map aids in understanding flood, seismic, and wildfire vulnerabilities. Orange is primarily urban, with residential areas as the dominant land use, followed by commercial and institutional zones. This location informs the risk assessments and mitigation actions in Sections 4 and 7 to protect residents and infrastructure.

Special Events

Throughout the year, the City of Orange hosts a variety of special events that draw residents and visitors alike. Some of the most notable include:

- **Car Show**: A community event where custom and classic vehicles are showcased throughout the Plaza, attracting over 15,000 spectators to the charming Downtown Plaza in Old Towne Orange.
- **Concerts in the Park:** During summer evenings, Hart Park comes alive with free outdoor concerts, offering a variety of music genres for all ages.
- **May Parade:** A beloved tradition, the May Parade winds through the streets of Old Towne, showcasing floats, marching bands, and local organizations.
- **Street Fair:** Held annually over Labor Day weekend in the historic Old Towne Plaza, this event features food, music, and crafts from cultures around the world.
- **Tree Lighting Event:** Every year, the City hosts the Annual Tree Lighting Ceremony and Candlelight Choir Procession.
- **Veterans Day Tribute at the Field of Valor:** A community event where large numbers of American flags are displayed, each dedicated to a veteran, active-duty service member, or fallen hero, creating a powerful visual tribute to service and sacrifice.

Rush Hour

According to Avrek, rush hour periods in Orange generally align with the broader patterns seen throughout the Orange County metropolitan area. The most congested times are:

- Morning Rush Hour: 7:00 AM – 10:00 AM
- Evening Rush Hour: 4:00 PM – 7:00 PM

The City of Orange is intersected by several significant roadways and freeways, which become bottlenecks during rush hour. During these hours, arterial streets, freeways, and

intersections experience heightened traffic volumes as commuters travel to and from work, school, and other destinations.

3.3 Geology

The geology of the City of Orange is characterized by diverse formations, reflecting its rich geological history. The area sits on a foundation primarily composed of sedimentary rocks, which have been shaped over millions of years through various geological processes. The surrounding hills are remnants of ancient volcanic activity, contributing to the region's varied topography. Additionally, the city's location near the boundary of the Pacific and North American tectonic plates makes it susceptible to seismic activity, with fault lines running through and near the area. These geological features have significantly influenced the development and land use patterns within the city.

3.4 Climate

Orange enjoys a Mediterranean climate characterized by warm, dry summers and mild, wet winters. The city experiences an average annual temperature of around 70°F (21°C). Summer temperatures often reach the high 80s°F (30s°C), while winter temperatures rarely drop below 40°F (4°C). The region receives most of its rainfall between November and March, with an annual average of about 14 inches (356 mm). The moderate climate supports a variety of outdoor activities year-round and contributes to the lush vegetation.

3.5 History

Members of the Tongva and Juaneño/Luiseño ethnic group long inhabited this area. After the 1769 expedition of Gaspar de Portolà, an expedition out of San Blas, Nayarit, Mexico, led by Father Junípero Serra, named the area Vallejo de Santa Ana (Valley of Saint Anne). On November 1, 1776, Mission San Juan Capistrano became the area's first permanent European settlement in Alta California, New Spain.

In 1801, the Spanish empire granted 62,500 acres (253 km2) to José Antonio Yorba, which he named Rancho San Antonio. Yorba's great rancho included the lands where the cities of Olive, Orange, Villa Park, Santa Ana, Tustin, Costa Mesa and Newport Beach stand today. Smaller ranchos evolved from this large rancho, including the Rancho Santiago de Santa Ana.

Don Juan Pablo Grijalva, a retired known Spanish soldier and the area's first landowner, was granted permission in 1809 by the Spanish colonial government to establish a rancho in "the place of the Arroyo de Santiago." After the Mexican–American war, Alta California was ceded to the United States by Mexico with the signing of the Treaty of Guadalupe Hidalgo in 1848, and though many Californians lost titles to their lands in the aftermath, Grijalva's descendants retained ownership through marriages to Anglo-Americans.

Since at least 1864, Los Angeles attorneys Alfred Chapman and Andrew Glassell together and separately, held about 5,400 acres along both sides of the Santiago Creek. Glassell also had a 4,000-acre parcel where Costa Mesa is today. Water was the key factor for the location of their town site, which was bordered by Almond Avenue on the south, Lemon Street on the west, Glassell Street on the east, & Maple Avenue on the north. Glassell needed a spot he could irrigate, bringing water down from the Santa Ana Canyon and the quality of the soil may have influenced his choice. Originally the community was named Richland, but in 1873 Richland got a new name. In the book, "Orange, The City 'Around The Plaza" by local historian Phil Brigandi, it states, "In 1873 the town had grown large enough to require a post office, so an application was sent to Washington. It was refused, however, as there was already a Richland, California in Sacramento County. Undaunted, the Richlanders proposed a new name – Orange."

3.6 Government

The City of Orange operates under a council-manager form of government, which blends political leadership from elected officials with professional management provided by an appointed city manager. The city council consists of the mayor and six council members, all of whom are elected by the city's residents. The council is responsible for setting policies, adopting ordinances, and ensuring the city's overall welfare.

The city manager, appointed by the council, acts as the chief executive officer, overseeing the daily operations of the city, implementing council decisions, and managing municipal staff. This structure ensures that the administrative functions are carried out efficiently while maintaining accountability to the public through the elected council.

3.7 Economy

The economy of the City of Orange is diverse and robust, with significant contributions from various sectors such as healthcare, education, retail, and technology. The city is home to several major medical centers, including UCI Health, Rady Children's Health, and St. Joseph Hospital, which provide extensive employment opportunities and attract a large number of healthcare professionals to the region.

Education also plays a critical role in the local economy, with Chapman University being one of the largest employers in the city. The university not only offers numerous jobs but also fosters innovation and entrepreneurship through its various programs and initiatives. Additionally, the presence of educational institutions supports local businesses, from bookstores to cafes, catering to the needs of students and faculty.

Retail is another vital component of Orange's economy, with the Outlets at Orange and the historic Plaza area serving as major shopping destinations. These retail centers draw visitors from surrounding areas, boosting local revenue and supporting a wide range of businesses, from large national chains to small, independent shops.

3.8 Demographics

Based on the most recent data, the City of Orange has a diverse and vibrant population. The city is home to approximately 140,000 residents, with a balanced blend of different age groups. The median age is around 37 years, reflecting a community that includes young professionals, families, and older adults.

The racial and ethnic composition of Orange is diverse, with a significant portion of the population identifying as White (not Hispanic), followed by Hispanic or Latino, Asians, African Americans, and other ethnic groups. The top two languages spoken in the City are English and Spanish.

Education and income levels in Orange are relatively high, with a substantial number of residents holding a bachelor's degree or higher. The median household income is above the national average, indicative of the city's strong economic foundation and the presence of well-paying jobs in sectors such as healthcare, education, and technology.

Housing in Orange is varied, ranging from historic homes in the Plaza area to modern apartments and suburban neighborhoods. The city strives to maintain a balance between growth and preserving its historic charm, ensuring a high quality of life for its residents.

Tables 3-1, **3-2**, **3-3** provide an overview of the City's population, ethnicity, education levels, health, and economic data from the 2023 American Community Survey:

Table 3-1: City of Orange Population and Median House Value

Population and Median House Value	Percent of Population
Total Population	138, 337
Males	50.7%
Females	49.3%
Persons under 5 years, July 1, 2023	5.6%
Persons under 18 years, July 1, 2023	21.0%
Persons 65 years and over, July 1, 2023	14.8%
Median House Value	$900,700

Table 3-2: Orange Race and Ethnicity

Race and Ethnicity	Percent of Population
White (non-Hispanic)	53.6%
Hispanic or Latino (of any race)	40.0%
Two or More Races	18.1%
Asian	13.1%

Table 3-2: Orange Race and Ethnicity	
Race and Ethnicity	**Percent of Population**
Black	1.6%
American Indian	1.3%
Pacific Islander	0.4%

Table 3-3: Orange Education, Health, and Economy	
Education, Health, and Economy	**Percent of Population**
High School Graduate	88.1%
Bachelor's Degree	40.1%
With a disability, under age 65 years, percent, 2019-2023	5.7%
In civilian labor force, total, percent of population age 16 years+, 2019-2023	66.8%
Median household income (in 2023 dollars), 2019-2023	116,945
Persons in poverty, percent	9.2%
Veterans, 2019-2023	3,971 or 2.8%

3.9 Land Use

Land use in the City of Orange is carefully planned to balance residential, commercial, and recreational spaces, maintaining the city's unique character while accommodating growth. The city is known for its well-preserved historic districts, particularly the Old Towne Orange Historic District, which features buildings dating back to the early 20th century. This area is a focal point for both residents and visitors, offering a charming blend of antique shops, dining establishments, and cultural attractions.

Residential areas in Orange vary from quaint, single-family homes to modern apartment complexes. The city prioritizes green spaces and parks, providing residents with ample opportunities for outdoor activities and community gatherings. Santiago Oaks Regional Park and Irvine Regional Park are among the popular spots for hiking, picnicking, and enjoying nature.

Commercial development is strategically located to support local businesses while minimizing traffic congestion and preserving the city's aesthetic appeal. The city council and planning commission work closely with developers to ensure that new projects align with the community's vision and sustainability goals. This collaborative approach has led to the successful integration of new shopping centers, office buildings, and mixed-use developments that cater to the needs of the growing population.

Industrial zones are primarily situated on the outskirts of the city, limiting any potential disruption to residential neighborhoods. These areas house a variety of manufacturing and tech companies, contributing to the local economy and providing job opportunities for residents.

Public transportation and infrastructure improvements are also key components of Orange's land use strategy. The city's commitment to enhancing mobility includes expanding bike lanes, improving public transit options, and ensuring pedestrian-friendly streetscapes. These efforts aim to reduce traffic congestion, lower emissions, and promote a healthier, more connected community. **Figure 3-2, City Land Use Map,** is for informational purposes only. The City's official Zoning Map is on file in the Planning Division, City Hall, City of Orange.

3.10 Changes in Development

Changes in development in the City of Orange reflect a dynamic and forward-thinking approach to urban planning. In recent years, the city has undertaken several initiatives to accommodate its growing population while preserving its historical and cultural heritage.

One significant change has been the increased focus on sustainable development. Orange has implemented policies that encourage the use of green building materials, energy-efficient designs, and renewable energy sources in new construction projects. This commitment to sustainability is evident in the city's support for LEED-certified buildings and solar panel installations, which not only reduce environmental impact but also lower energy costs for residents and businesses.

This hazard mitigation plan update assumes that some new development over the performance period occurred in hazard areas. All new development would have been regulated pursuant to local programs and codes, such as the International Building Code and flood damage prevention requirements of the National Flood Insurance Program (NFIP). Therefore, it is assumed that hazard vulnerability did not measurably increase, even if exposure did.

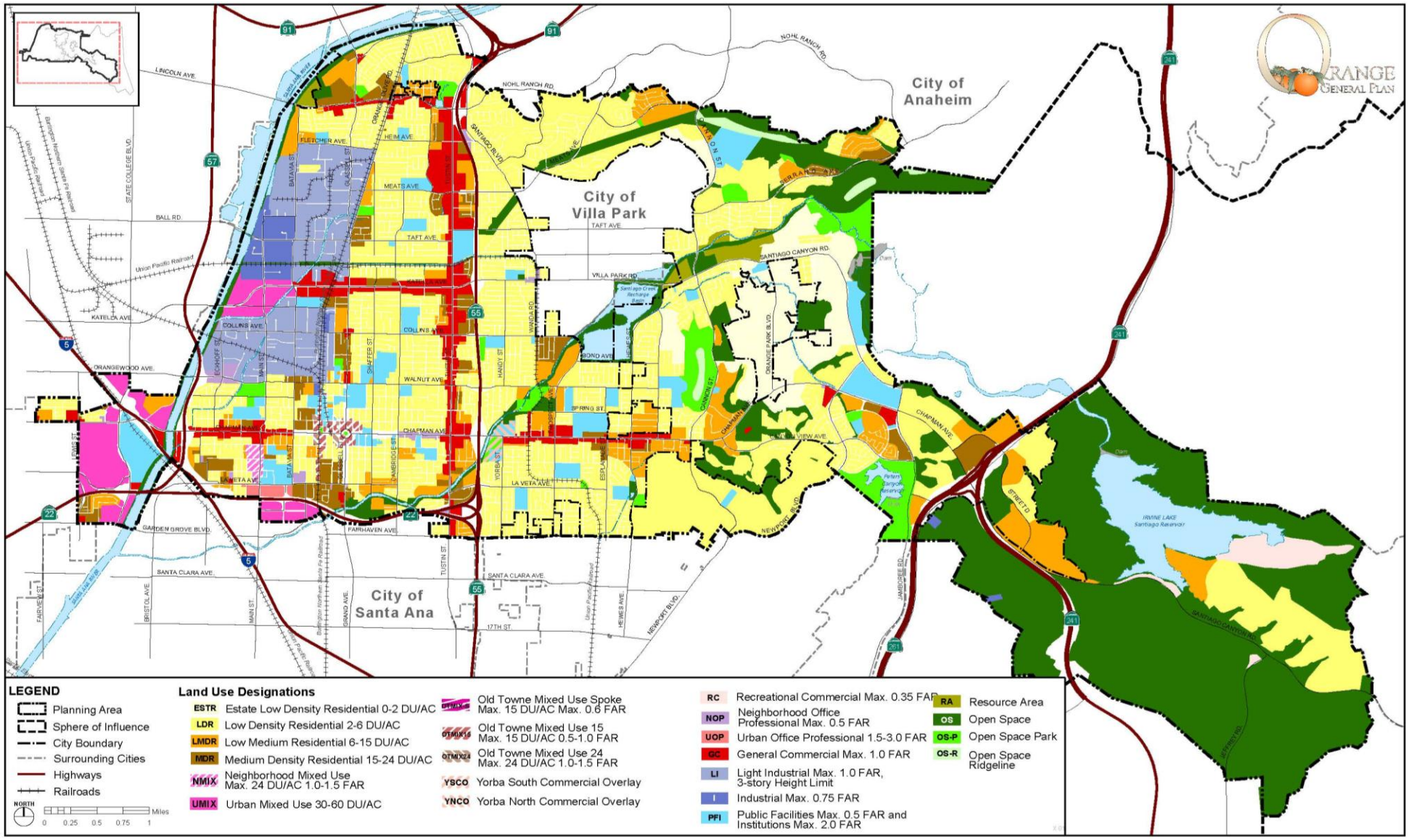


Figure 3-2: City of Orange Land Use Map

SECTION 4: HAZARD IDENTIFICATION

This section of the LHMP includes hazard profiles for each hazard identified by the HMPC that poses a threat to the City.

4.1 Hazard Analysis

A hazard analysis consists of identifying, screening, and profiling each hazard. The hazard analysis encompasses natural, human-caused, and technological hazards. Natural hazards result from unexpected or uncontrollable natural events of significant size and destructive power. Human-caused hazards result from human activity and encompass technological hazards. Technological hazards are accidental or result from events with unintended consequences (for example, accidental release of hazardous materials).

The goal of mitigation is to reduce the future impacts of hazards, including loss of life, property damage, disruption to the local economy, and the expenditure of public and private funds for recovery. Hazard identification was conducted as part of the planning process. For the 2025 LHMP, the potential risk for each hazard was rated using the Critical Priority Risk Index (CPRI). The CPRI examines four criteria for each hazard (probability, magnitude/severity, warning time, and duration). **Table 4-5** provides the results of the CPRI which were used to both select applicable hazards to include in the LHMP and to determine risk.

4.2 Disaster Proclamation History and Process

Since 1969, Orange County has been included in 39 Disaster Declarations. (Table 4-1). While the greatest recurring threat is wildfire, the risk of catastrophic earthquake is ever-present. Since the LHMP was last revised in 2016, Orange County has been included in 13 disaster declarations for major winter storms, flooding, pandemic, and wildfires.

Table 4-1: Disaster Declarations for Orange County

Disaster Number	(Fiscal) Year	Incident Type	Incident Title
DR-253-CA	1969	Flood	SEVERE STORMS & FLOODING
DR-547-CA	1978	Flood	COASTAL STORMS, MUDSLIDES & FLOODING
DR-566-CA	1979	Flood	LANDSLIDES
DR-615-CA	1980	Flood	SEVERE STORMS, MUDSLIDES & FLOODING
DR-635-CA	1981	Fire	BRUSH & TIMBER FIRES
DR-657-CA	1982	Fire	URBAN FIRE

Table 4-1: Disaster Declarations for Orange County

Disaster Number	(Fiscal) Year	Incident Type	Incident Title
DR-677-CA	1983	Coastal Storm	COASTAL STORMS, FLOODS, SLIDES & TORNADOES
DR-812-CA	1988	Flood	SEVERE STORMS, HIGH TIDES & FLOODING
DR-799-CA	1988	Earthquake	EARTHQUAKE & AFTERSHOCKS
DR-935-CA	1992	Flood	RAIN/SNOW/WIND STORMS, FLOODING, MUDSLIDES
DR-979-CA	1993	Flood	SEVERE WINTER STORM, MUD & LAND SLIDES, & FLOODING
DR-1008-CA	1994	Earthquake	NORTHRIDGE EARTHQUAKE
DR-1005-CA	1994	Fire	FIRES, MUD/LANDSLIDES, FLOODING, SOIL EROSION
DR-1046-CA	1995	Severe Storm	SEVERE WINTER STORMS, FLOODING LANDSLIDES, MUD FLOW
DR-1044-CA	1995	Severe Storm	SEVERE WINTER STORMS, FLOODING, LANDSLIDES, MUD FLOWS
DR-1203-CA	1998	Severe Storm	SEVERE WINTER STORMS AND FLOODING
FM-2405-CA	2002	Fire	ANTONIO FIRE
DR-1585-CA	2005	Severe Storm	SEVERE STORMS, FLOODING, LANDSLIDES, AND MUD AND DEBRIS FLOWS
DR-1577-CA	2005	Severe Storm	SEVERE STORMS, FLOODING, DEBRIS FLOWS, AND MUDSLIDES
FM-2630-CA	2006	Fire	SIERRA FIRE
FM-2683-CA	2007	Fire	241 FIRE
DR-1731-CA	2008	Fire	WILDFIRES, FLOODING, MUD FLOWS, AND DEBRIS FLOWS
FM-2737-CA	2008	Fire	SANTIAGO FIRE
FM-2792-CA	2009	Fire	FREEWAY FIRE COMPLEX
DR-1810-CA	2009	Fire	WILDFIRES
DR-1952-CA	2011	Flood	SEVERE WINTER STORMS, FLOODING, AND DEBRIS AND MUD FLOWS
FM-5213-CA	2017	Fire	CANYON FIRE
DR-4305-CA	2017	Flood	SEVERE WINTER STORMS, FLOODING, AND MUDSLIDES
FM-5223-CA	2018	Fire	CANYON 2 FIRE

Table 4-1: Disaster Declarations for Orange County

Disaster Number	(Fiscal) Year	Incident Type	Incident Title
DR-4344-CA	2018	Fire	WILDFIRES
DR-4482-CA	2020	Biological	COVID-19 PANDEMIC
FM-5383-CA	2021	Fire	BOND FIRE
FM-5381-CA	2021	Fire	BLUE RIDGE FIRE
FM-5380-CA	2021	Fire	SILVERADO FIRE
FM-5439-CA	2022	Fire	COASTAL FIRE
DR-4683-CA	2022-2023	Flood	SEVERE WINTER STORMS, FLOODING, LANDSLIDES, AND MUDSLIDES
DR-4699-CA	2023	Flood	SEVERE WINTER STORMS, FLOODING, LANDSLIDES, AND MUDSLIDES
FM-5538-CA	2024	Fire	AIRPORT FIRE
DR-4769-CA	2024	Flood	SEVERE WINTER STORMS, FLOODING, AND MUDSLIDES

4.3 Hazard Identification

A list of all the hazards that had the potential to occur in the City was presented to stakeholders in the first planning team meeting and to the general public through a survey. The list of hazards was derived from the previous LHMP, the Emergency Operations Plan, the Orange County Local Hazard Mitigation Plan, and the 2023 California State Hazard Mitigation Plan. The 2016 LHMP contained the following hazards:

- Seismic Hazards
- Wildland Fires / Urban Fires
- Extreme Heat
- Drought
- Severe Weather (wind/rain/lightening)
- Hazardous Materials
- Landslides / Expansive Soil / Erosion
- Flood
- Terrorism
- Dam Failure
- Epidemic and Vector Borne Disease

FEMA guidance identifies several hazards that communities should evaluate for inclusion in a hazard mitigation plan. Communities may also consider additional hazards for their plans. The HMPC reviewed all the hazards in **Table 4-2**, excluding those that do not pose a threat or are not a significant concern to Orange.

Table 4-2 lists the hazards considered and explains the reasoning for inclusion/exclusion. For context, this table also shows if a hazard is recommended for consideration by FEMA,

if it is included in the 2023 California State Hazard Mitigation Plan (SHMP), and if it is included in the County of Orange Local Hazard Mitigation Plan (OC HMP).

Table 4-2: Hazard Evaluation for Orange LHMP

Hazard	Recommended for Consideration by Regulatory and Partner Agencies	Included in City of Orange 2025 LHMP?	Provide a Reason for Inclusion or Exclusion
Agricultural Pests	SHMP	No	There are no large agricultural areas in the community, the HMPC did not identify this as a hazard of concern for the City.
Air Pollution	SHMP	No	Air pollution is a state and regional issue that is addressed through plans and regulations administered by the South Coast Air Quality Management District and/or California Air Resources Board. Since the City does not regulate these resources, the HMPC did not identify this as a hazard of concern that could be addressed in this plan.
Aircraft Incident	SHMP	No	John Wayne Airport is an Orange County owned airport located 9 miles South of central Orange. Given the lack of control the City has over this asset and few past incidents associated with aircraft incidents have occurred, the HMPC determined that this hazard should not be included in the plan.
Aquatic Invasive Species	SHMP	No	There are no aquatic invasive species in Orange that could endanger the community.
Avalanche	FEMA guidance SHMP	No	Orange is not located within potential avalanche zones.
Civil Disturbance or Riot	SHMP	No	Historically, protests have impacted surrounding jurisdictions but have not affected Orange. For this reason, the HMPC did not identify this as a hazard of concern.

Table 4-2: Hazard Evaluation for Orange LHMP			
Hazard	**Recommended for Consideration by Regulatory and Partner Agencies**	**Included in City of Orange 2025 LHMP?**	**Provide a Reason for Inclusion or Exclusion**
Climate Change	SHMP OC HMP	Yes	Climate change is discussed as a function of each relevant hazard and is mentioned throughout the Plan. Orange has been impacted and will continue to see impacts of climate change
Coastal Flooding and Storm	FEMA guidance SHMP OC LHMP	No	Orange is not located along the coast of California.
Cyber Threats	SHMP	Yes	With the increase in cyber threats occurring throughout California and the nation, the HMPC is concerned about the potential effects on vital records, communications, and infrastructure systems.
Dam Failure	FEMA guidance SHMP OC LHMP	Yes	There are several dams that can potentially inundate the City. The HMPC identified dam failure as a hazard of concern.
Drought	SHMP OC LHMP	Yes	While the HMPC is confident in the current hydrologic infrastructure to supply water for the City, drought can potentially impact the operations of Orange.
Loss of Power	SHMP	Yes	Orange is at risk of power outages and has experienced them annually. The City works directly with Southern California Edison to mitigate potential impacts. The HMPC identified loss of power as a hazard of concern.
Epidemic, Pandemic, Vector-Borne Disease	SHMP OC LHMP	Yes	The City like all of Orange County, experienced significant effects from previous pandemics. The HMPC identified Infectious Diseases as a hazard of concern in the City of Orange.

Table 4-2: Hazard Evaluation for Orange LHMP			
Hazard	**Recommended for Consideration by Regulatory and Partner Agencies**	**Included in City of Orange 2025 LHMP?**	**Provide a Reason for Inclusion or Exclusion**
Erosion	FEMA guidance SHMP OC LHMP	Yes	Erosion continues to be a problem for the City. Particularly around the winter season where storms can erode mountain sides. HMPC identified erosion as a hazard of concern for the City.
Expansive Soil	FEMA guidance OC LHMP	No	Expansive soils were not identified by the HMPC as a hazard of concern. While they could exist, the City requires compliance with the California Building Code, which is intended to mitigate hazards associated with this condition.
Extreme Cold	FEMA guidance SHMP	No	Temperatures in the City do not reach a level that would be considered a danger to public safety. Due to this, the HMPC did not identify this as a hazard of concern.
Extreme Heat	FEMA guidance SHMP OC LHMP	Yes	Extreme Heat conditions have occurred frequently in Orange and is expected to be a recurring event. Extreme heat was identified by the HMPC as a hazard of concern.
Fault Rupture	FEMA guidance SHMP OC LHMP	Yes	There are several faults that can impact Orange and cause major damage. The HMPC identifies fault rupture as a hazard of concern.
Flooding	FEMA guidance SHMP OC LHMP	Yes	Flooding presents a significant challenge for Orange, affecting its environment, infrastructure, and community. The effects of climate change have only exacerbated the issue. The HMPC identified flooding as a hazard of concern included in the Flooding profile.
Fracking	SHMP	No	Fracking does not occur in the City.
Hail	FEMA guidance	No	Hail that is severe enough to pose a threat to people and property is too rare in Orange to be included.

Table 4-2: Hazard Evaluation for Orange LHMP			
Hazard	**Recommended for Consideration by Regulatory and Partner Agencies**	**Included in City of Orange 2025 LHMP?**	**Provide a Reason for Inclusion or Exclusion**
Hazardous Materials Release	SHMP OC LHMP	Yes	The presence of uses for storing, manufacturing, disposing, and transporting hazardous materials was not identified as a concern for the HMPC.
Hurricane	FEMA guidance SHMP	No	Historically, hurricanes do not occur in Orange. Although Tropical Stom Hillary impacted the City in August 2023, no significant damage from Hillary was reported in Orange.
Infrastructure Failure	SHMP	Yes	Infrastructure failure can pose a threat to people and property in Orange. The HMPC believed that aging infrastructure can lead to infrastructure failure.
Landslide	FEMA guidance SHMP OC LHMP	Yes	Landslides associated with earthquakes and storms can occur in the hilly sections of Orange.
Levee Failure	SHMP	No	Orange does not have levees in its jurisdiction.
Lightning	FEMA guidance OC LHMP	No	Although lightning does occasionally occur in Orange, it does not pose a significant threat to people or property.
Liquefaction	FEMA guidance SHMP OC LHMP	Yes	Orange has areas with loose, unconsolidated sediments, which can be prone to liquefaction during strong seismic events. The HMPC identified liquefaction as a hazard of concern.
Methane Containing Soils	SBC HMP	No	The City does not have methane- containing soils that pose a threat to the public health and safety of residents and businesses. The HMPC did not identify this as a hazard of concern to the City.

Table 4-2: Hazard Evaluation for Orange LHMP			
Hazard	**Recommended for Consideration by Regulatory and Partner Agencies**	**Included in City of Orange 2025 LHMP?**	**Provide a Reason for Inclusion or Exclusion**
Natural Gas Pipeline Hazards	SHMP	No	The City does have a network of natural gas pipelines throughout the City, but have not experienced a significant number of incidents as a result of them. The HMPC did not identify this as a hazard of concern to the City.
Oil Spills	SHMP	No	There is no history of oil drilling and extraction within the City. Based on this, the HMPC did not identify this as a hazard of concern to the City.
Radiological Accidents	SHMP	No	There are no known major sources of radiation in Orange or the immediate surrounding area that could pose a serious threat to the community.
Sea-level Rise	FEMA guidance SHMP	No	The City is not located along the coast. The HMPC did not identify this as a hazard of concern for the City
Seiche	FEMA guidance SHMP	No	There are no major bodies of water in Orange that could be subjected to seiche.
Seismic Shaking	FEMA guidance SHMP	Yes	Orange is in a seismically active area where shaking can be severe enough to damage property or cause loss of life. For this reason, the HMPC determined it should be addressed in this plan.
Severe Wind	FEMA guidance	Yes	Severe Weather includes discussions regarding, severe wind, which are weather-related hazards that are most common in Orange.
Severe Weather and Storms	FEMA guidance SHMP OC LHMP	Yes	Severe Weather includes discussions regarding, severe wind, and rain, and extreme heat which are weather-related hazards that are most common in Orange.
Storm Surge	FEMA guidance	No	Orange is not a coastal community that experiences storm surge annually. The HMPC did not identify this as a hazard of concern to the City.

Table 4-2: Hazard Evaluation for Orange LHMP			
Hazard	**Recommended for Consideration by Regulatory and Partner Agencies**	**Included in City of Orange 2025 LHMP?**	**Provide a Reason for Inclusion or Exclusion**
Subsidence	FEMA guidance	Yes	Orange's underlying geology includes sedimentary rocks and tectonic activity, which can contribute to ground movement. Subsidence is not discussed as a stand-alone hazard but rather is a function of the Seismic Hazard profile.
Terrorism	SHMP OC LHMP	Yes	The HMPC was concerned about terrorism incidents posing a threat to public safety.
Thunderstorm	SHMP	No	Thunderstorms that cause damage and endanger public safety are rare in the Southern California region. The HMPC did not identify this as a hazard of concern.
Transportation Accidents	SHMP	No	Orange does not have a rail or bus system that would cause a significant number a accidents. The HMPC did not identify transportation accidents as a hazard of concern.
Tornadoes	FEMA guidance SHMP OCLHMP	No	No tornadoes are known to have occurred in Orange. The HMPC did not identify this as a hazard of concern.
Tree Mortality	SHMP	Yes	The HMPC did identify this as a hazard of concern.
Tsunami	FEMA guidance SHMP	No	Orange is not a coastal community. The HMPC did not identify this as a hazard of concern to the City.
Urban Fire	SHMP OC LHMP	Yes	Orange has an urban population that can be impacted by fire. The HMPC identified urban fires as a risk to property and life in Orange.
Volcano	SHMP	No	There are no volcanoes near Orange. The HMPC did not identify this as a hazard of concern to the City
Wildland Fire	FEMA guidance SHMP OC LHMP	Yes	Portions of the City are in the very high fire danger zone as determined by Cal Fire. The HMPC identified wildland fire as a hazard of concern.

Proposed 2025 City of Orange Hazards

Table 4-3: Hazard Profiles in 2025 Plan	
Hazard Type	**Sub-Categories**
Climate Change	Discussed as a standalone hazard and in all Hazard Categories
Dam Failure	
Drought	
Earthquake/Geologic Hazards	• Seismic Shaking • Subsidence • Fault Rupture • Liquefaction
Fire	• Urban Fire • Wildland Fire
Flooding	
Landslide	• Erosion
Pandemic	
Severe Weather	• Severe Wind • Extreme Heat • Winter Storm
Tree Mortality	
Human-Caused Hazards	• Power Outage • Cyber Attack • Hazardous Materials • Terrorism • Infrastructure Failure

4.4 Hazard Risk Rating

For the 2025 LHMP, the risk for each potential hazard was rated using the CPRI. The CPRI examines four criteria for each hazard (probability, magnitude/severity, warning time, and duration) (**Table 4-4**). For each hazard, an index value is assigned for each CPRI category from "0" to "4", with "0" being the least hazardous and "4" being the most hazardous situation. This value is then assigned a weighting factor, and the result is a hazard ranking score (**Table 4-5**).

Table 4-4: Calculated Priority Risk Index				
CPRI Category	**Degree of Risk Chart**			**Assigned Weight**
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001.	1	45%
	Possible	Rare occurrences with at least one (1) documented or anecdotal historic event. Annual probability of between 0.01 and 0.001.	2	
	Likely	Occasional occurrence with at least two (2) or more documented historical events. Annual probability of between 0.1 and 0.01.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability of greater than 0.1.	4	
Magnitude - Severity	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid, and there are no deaths. Negligible quality of life lost. Shut down of critical facilities for less than 24 hours.	1	30%
	Limited	Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries and illnesses do not result in permanent disability, and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructures). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month.	3	

Table 4-4: Calculated Priority Risk Index				
CPRI Category	**Degree of Risk Chart**			**Assigned Weight**
	Level ID	Description	Index Value	
	Catastrophic	Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month.	4	
Warning Time	> than 24 hours	Population receives greater than 24 hours of warning.	1	15%
	12 to 24 hours	Population receives between 12-24 hours of warning.	2	
	6 to 12 hours	Population receives between 6-12 hours of warning.	3	
	< than 6 hours	Population receives less than 6 hours of warning.	4	
Duration	< than 6 hours	Disaster event will last less than 6 hours.	1	10%
	6 to 24 hours	Disaster event will last between 6-24 hours.	2	
	24 hours to 1 week	Disaster event will last between 24 hours and 1 week.	3	
	> than 1 week	Disaster event will last more than 1 week.	4	

The results of the CPRI are contained in **Table 4-5** below:

Table 4-5: Hazard Ranking Results of the CPRI									
2025 Proposed Hazards	**Probability**	**Weighted 45%**	**Magnitude Severity**	**Weighted 30%**	**Warning Time**	**Weighted 15%**	**Duration**	**Weighted 10%**	**CPRI Ranking**
Climate Change	4	1.8	2	.60	1	.15	4	.40	**2.95**
Cyber Attack	2	.90	4	1.20	4	.60	4	.40	**3.10**
Dam Failure	1	.45	3	.90	3	.45	2	.20	**2.00**
Drought	3	1.35	2	.60	1	.15	4	.40	**2.50**
Earthquake	3	1.35	4	1.20	4	.60	4	.40	**3.55**

Table 4-5: Hazard Ranking Results of the CPRI

2025 Proposed Hazards	Probability	Weighted 45%	Magnitude Severity	Weighted 30%	Warning Time	Weighted 15%	Duration	Weighted 10%	CPRI Ranking
Extreme Weather	3	1.35	2	.60	1	.15	3	.30	2.40
Fire (Wild/Urban)	3	1.35	3	.90	4	.60	3	.30	3.15
Flooding	3	1.35	2	.60	2	.30	2	.20	2.45
Hazardous Materials	3	1.35	3	.90	4	.60	2	.20	3.05
Landslide	2	0.90	2	.60	4	.60	1	.10	2.20
Pandemic	2	0.90	4	1.20	2	.30	4	.40	2.80
Power Outage	3	1.35	3	.90	4	.60	2	.20	3.05
Erosion	3	1.35	2	.60	1	.15	3	.30	2.40
Terrorism	3	1.35	4	1.20	4	.60	2	.20	3.35
Tree Mortality	2	.90	1	.30	4.	.60	4	.40	2.20

CPRI Hazard Risk Scoring

Risk Level	Severe	High	Moderate	Low
Rank Score	3.5 – 4.0	3.0 – 3.4	2 – 2.9	1 – 1.9

Power failure and infrastructure failure has the most immediate and disruptive impacts on the city due to potential interruption of public safety systems and water service to customers.

4.5 Hazard Profiles

The hazards that were identified by the planning team that can potentially impact the City are profiled below. Each hazard profile includes a description of the type, location, extent, previous occurrences, regulatory environment, probability of future event, and Impacts of climate change within the profile. Maps and graphs are used in this plan to display hazard identification data.

The 2025 LHMP lists 11 primary hazards that affect the planning area based on historical information, the presence of the hazard, and the likelihood of future occurrences of the hazard. Hazard profiles serve as the basis for hazard assessment.

4.5.1 Climate Change

Hazard Description

The earth's climate is changing. The State has warmed about 2°F in the last century. Heat waves are becoming more common throughout the southwestern United States, and snow is melting earlier in spring. In the coming decades, changing climate is likely to decrease the Colorado River's water flow, threaten livestock's health, increase the frequency and intensity of wildfires, and convert some rangelands to the desert.

The U.S. Environmental Protection Agency (EPA) describes climate change as "any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, which occur over several decades or longer."

Many people confuse climate change with global warming, the recent and ongoing rise in global average temperatures near Earth's surface. However, global warming represents only one aspect of climate change. Earth's average temperature has risen by 1.4°F over the past century and is projected to rise another 2.0°F to 11.5°F over the next hundred years. Rising global temperatures have been accompanied by changes in weather and climate. Many places have seen changes in rainfall, resulting in more floods, droughts, or intense rain, as well as more frequent and severe heat waves. The planet's oceans and glaciers have also experienced changes, with every glacier and permanent icefield in the State of California receding or melting entirely. Oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising. The effects of these indicators include:

- **Greenhouse Gases:** Human activities have increased the emissions of greenhouse gases. As a result of the increase in emissions, the average concentrations of heat-trapping gases in the atmosphere are also increasing.
- **Weather and Climate:** Average U.S. and global temperatures are increasing while weather and climate attributes, such as precipitation, drought and tropical cyclone activity, are changing.
- **Oceans:** Average oceanic temperatures are increasing. Sea levels are rising worldwide due to thermal expansion and increases from ice melting, and waters are becoming more acidic.
- **Snow and Ice:** Glaciers in the U.S. and worldwide are generally shrinking, while snowfall and snow cover in the U.S. have decreased overall. The extent of the Arctic Sea ice is declining.
- **Health and Society:** Warmer temperatures and later fall frosts allow ragweed plants to produce pollen later into the year, potentially prolonging allergy season. The length of ragweed pollen season has increased at 10 out of 11 locations studied in the central U.S. and Canada since 1995. The change becomes more pronounced from south to north.

- **Ecosystems:** Many areas are experiencing earlier spring events, such as peak stream runoff and flower blooms. Bird migration patterns are changing, and wildfire zone size has increased.

History

Climate change has occurred throughout the planet's history due to variations in the earth's inclination to the sun, volcanic activity, and other factors such as asteroid impacts and the amount of solar radiation reaching the earth's surface rises and falls. The planet's temperature correlates to the amount of solar radiation arriving at the surface and the climate with it.

In relatively recent history, the last glacial period, popularly known as the Ice Age, occurred from c. 110,000 to 12,000 years ago. This most recent glacial period is part of a larger pattern of glacial and interglacial periods known as the Quaternary glaciation (c. 2,588,000 years ago to present). From this point of view, scientists consider this "ice age" to be merely the latest glaciation event in a much larger ice age that dates back over two (2) million years and is still ongoing.

During this last glacial period, there were several changes between glacier advance and retreat. The Last Glacial Maximum, the maximum extent of glaciation within the last glacial period, was approximately 22,000 years ago. While the general pattern of global cooling and glacier advance was similar, local differences in the development of glacier advance and retreat make it difficult to compare the details from continent to continent. Generally, temperature variation and glaciation patterns have lagged in atmospheric carbon dioxide (CO_2) content. **Figure 4-1** depicts global variations during the past 400,000 years as a correlation between temperature and atmospheric CO_2 content in part per million.

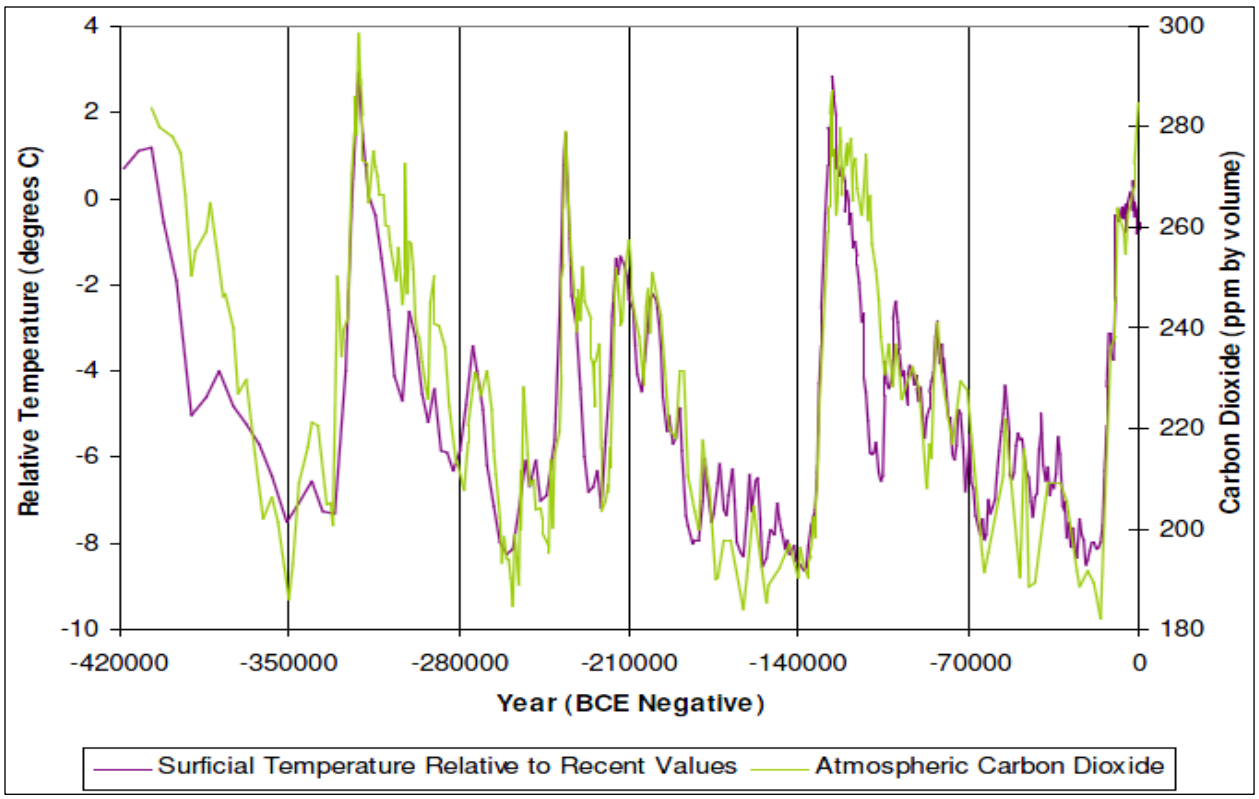


Figure 4-1: Temperature and Atmospheric CO2 Variation Past 400,000 Years

For 22,000 years, the planet has slowly warmed, and the glaciers retreated to high northern latitudes and mountains. In the last several decades of this period, human activity has likely led to a rapid increase in atmospheric CO_2 and a matching rise in global temperature. The result has been that climate change may be accelerating. **Figure 4-2** provides a graphical depiction of the recent history of temperature rise.

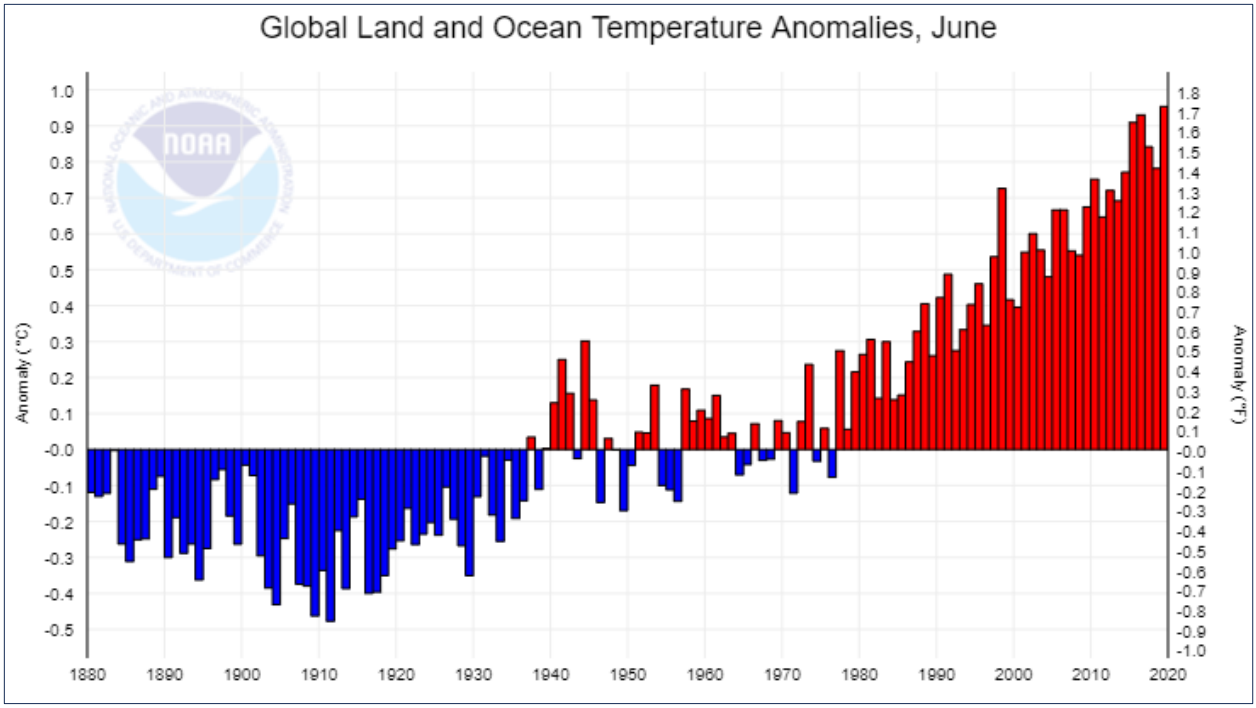


Figure 4-2: Temperature Rise Since 1880

Location

Warming and climate change are occurring globally with wide variations based on location and latitude. The polar regions have experienced particularly rapid changes in climate with increased ice melt and more sea-ice-free days. Climate change by its very definition is a global phenomenon, and so it is expected to affect the entire City.

Extent

Climate change is likely to affect the entire earth's population. More widespread drought and associated crop failure, movement of invasive species, more frequent wildfires, increased energy emergencies, and more intense climate events such as storms and extreme heat will occur throughout Orange County.

Specific Likely Impacts On California

Increasing droughts and higher temperatures will affect California's top agricultural products, including cattle, dairy, and vegetables. Hot temperatures threaten the health of cows and cause them to eat less, grow more slowly, and produce less milk. Livestock operations could also be impaired by fire, the lack of water, and changes in the landscape from grassland to woody shrubs, more typical of a desert. Reduced water availability would also create challenges for irrigated farms, which account for two-thirds of the water used in the state.

Wildfires, changing landscapes, higher temperatures, and drought are likely to increase the

severity, frequency, and extent of wildfires which could harm property, livelihoods, and human health. On average, more than 2% of the land in California has burned per decade since 1984. Wildfire smoke can reduce air quality and increase medical visits for chest pains, respiratory problems, and heart problems. The combination of more fires and drier conditions may expand deserts and otherwise change parts of California's landscape. Many plants and animals living in arid lands are already near the limits of what they can tolerate. A warmer and drier climate would generally extend deserts to higher elevations and expand their geographic ranges.

A dryer, hotter climate with more frequent droughts, combined with urban and agricultural water demands may result in lower water tables as aquifers are depleted faster than they are replenished.

In some cases, native vegetation may persist and delay or prevent the expansion of the desert. In other cases, fires or livestock grazing may accelerate the conversion of grassland to desert in response to a changing climate. For similar reasons, some forests may change to deserts or grassland.

Warmer and drier conditions make forests more susceptible to pests. Drought reduces the ability of trees to defend against attacks from pests such as bark beetles which have infested 100,000s of acres in California. Temperature controls the life cycle and winter mortality rates of many pests. With higher winter temperatures, some pests can persist year-round, and new pests and diseases may become established.

Hot days can be unhealthy, even dangerous. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor. High air temperatures can cause heat stroke and dehydration and affect people's cardiovascular, respiratory, and nervous systems. Higher temperatures are amplified in urban settings where paved and other surfaces tend to store heat. Construction crews may have to increasingly operate on altered time schedules to avoid the heat of the day.

Rising temperatures can increase the formation of ground-level ozone, a key component of smog. Ozone has various health effects, aggravates lung diseases such as asthma, and increases the risk of premature death from heart or lung disease. The U.S. EPA and the California Air Resources Board have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will be more difficult.

Probability of Future Events

Climate change is an ongoing, long-term hazard. The effects of increased CO_2 in the atmosphere will increase and persist for hundreds or thousands of years. It is likely (75% Chance) that Orange will be affected by the result of climate change every year.

Regulatory Context

The State of California has stepped into a leadership role in planning for reducing greenhouse gas emissions and adapting to the potential impacts of climate change. Key

laws, regulations, and policies helping to reduce Greenhouse Gas (GHG) emissions include:

The California Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32 and Senate Bill [SB] 32): AB 32 is the primary legislation that has driven GHG regulation and analysis in California between 2006 and 2016 by instructing the California Air Resource Board (CARB) to develop and enforce regulations for reporting and verifying statewide GHG emissions. The heart of the bill is the requirement that statewide GHG emissions be reduced to 1990 levels by 2020. Based on CARB's calculations of emissions levels, California must reduce GHG emissions by approximately 15% below 2005 levels to achieve this goal. In September 2016, the Governor signed SB 32, which builds upon the statewide targets for 2020 by establishing a longer-term target so that "statewide greenhouse gas emissions are reduced to 40% below the 1990 levels by 2030." The bill further authorized CARB to adopt regulations to achieve the maximum technologically feasible and cost-effective greenhouse gas emissions reductions.

California Executive Orders S-3-05 (2005) and B-30-15 (2015): These two executive orders highlight longer-term GHG emissions reduction targets for the state, though such targets have not yet been adopted by the legislature and signed into law. Specifically, Executive Order (EO) S-3-05 seeks to achieve a reduction of GHG emissions of 80% below 1990 levels by 2050, consistent with the scientific consensus that developed regions will need to reduce emissions at least 80% below 1990 levels to limit global warming to 2.0°C. Executive Order B-30-15 seeks to establish an interim target between the 2020 target established through AB 32 and the long-term targets in EO S-3-05, to achieve a reduction of GHG emissions of 40% below 1990 levels by 2030.

CEQA and Greenhouse Gas Emissions (Senate Bill 97): In 2007, the Natural Resources Agency was directed by the legislature to prepare amendments to the California Environmental Quality Act (CEQA) Guidelines, providing direction to lead agencies on how to analyze and mitigate greenhouse gas emissions.

Senate Bill 379 (2015) Planning and Zoning Law: This legislation requires that the next revision of a jurisdiction's local hazard mitigation plan on or after January 1, 2017, or, if the local jurisdiction has not adopted a local hazard mitigation plan, beginning on or before January 1, 2022, include a review and update of the safety element to address climate adaptation and resiliency strategies applicable to that city or county. The bill would require the update to include a set of goals, policies, and objectives based on a vulnerability assessment, identifying the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts.

California has also prepared programs and guidance for local governments to consider identifying hazards and adapting to a changing climate.

California Climate Adaptation Strategy: Executive Order S-13-08: In 2008, the Governor signed EO S-13-08, which directed the California Natural Resources Agency to lead a statewide effort to develop a climate adaptation strategy. Published in 2009, the statewide plan describes climate trends and the potential impacts of climate change on key sectors,

and it outlines short- and long-term actions that state and local governments can take to address future climate impacts.

California Adaptation Planning Guide (APG): Published in 2012, this statewide resource serves as a guide to local governments to identify, evaluate, and plan for the range of unavoidable consequences their community may face in the future due to climate change. The APG includes a step-by-step process for conducting a vulnerability assessment and identifying potential adaptation strategies.

4.5.1.1 City Response to Climate Change

Communities and governments worldwide are working to address, evaluate and prepare for climate changes that are likely to impact communities in coming decades. Generally, climate change discussions encompass two separate but inter-related considerations: mitigation and adaptation. The term "mitigation" can be confusing because its meaning changes across disciplines:

- Mitigation in emergency management—as generally addressed in this hazard mitigation plan— is typically defined as the effort to reduce loss of life and property by lessening the impact of disasters.
- Mitigation in climate change discussions is defined as a human intervention to reduce impacts on the climate system. It includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.

Adaptation refers to adjustments in natural or human systems in response to actual or anticipated effects of climate change. These adjustments may moderate harm or exploit beneficial opportunities. Mitigation and adaptation are related, as the world's ability to reduce greenhouse gas emissions will affect the degree of adaptation that will be necessary. Some initiatives and actions can both reduce greenhouse gas emissions and support adaptation to future conditions.

Societies across the world need to adapt to climate change. Farmers are altering crops and agricultural methods to deal with changing rainfall and rising temperature; architects and engineers are redesigning buildings; planners are looking at managing water supplies to deal with droughts or flooding.

Adaptive capacity goes beyond human systems. Some ecosystems can adapt to change and buffer surrounding areas from the impacts of change. Forests can bind soils and hold large volumes of water, releasing it through the year; floodplains can absorb water during peak flows; coastal ecosystems can attenuate waves and reduce erosion. Other ecosystem services—such as food provision, timber, materials, medicines, and recreation—can provide buffers in the face of changing conditions.

4.5.2 Dam Failure

Hazard Description

Dams and reservoirs of jurisdictional size are defined in the California Water Code Sections 6000 through 6008. The Santa Ana River is controlled by a network of dams and flood control measures. This network of carefully planned dams has protected the City of Orange from any serious flooding events. The natural water cycle and flow are significantly altered to protect the adjacent communities from flood damage and to better use local water resources for urban and agricultural water supplies. The network of dams and flood control measures have been effective in controlling flood waters in Orange County and the surrounding region; however, a major earthquake could cause sudden failure of one of these facilities, resulting in major damage. As a result, the city can be exposed to property damage and public safety hazards from overbank flooding of the Santa Ana River or failure of the Peters Canyon, Prado, Santiago, or Villa Park Dams.

Location

Currently there are 44 dams and reservoirs within or immediately adjacent to Orange County. There are three dams that could impact the City of Orange: Santiago Dam, Villa Park Dam, Peters Canyon Dam, and Prado Dam. While all three dams could affect the city if they were to fail at near capacity, the Santiago and Villa Park Dam are the greatest threat.

Santiago Dam

Santiago Dam was built in 1933, is owned by Serrano and Irvine Ranch Water Districts and is located in the Santa Ana Mountains in eastern Orange County west of Black Star Canyon and north of Santiago Canyon Road in the City of Silverado. It is a roller compacted earth and rockfill structure with a 25,000 acre-feet capacity reservoir (Irvine Lake). Irvine Lake is the reservoir formed behind the dam and is the largest man-made lake in Orange County. The dam is designed to contain up to a 50-year flood and withstand a 500-year flood.

Villa Park Dam

Villa Park Dam built in 1963 is owned by the County of Orange. The Villa Park Dam is an embankment dam on Santiago Creek in Orange, California. Along with the upstream Santiago Dam, the Villa Park dam serves primarily for flood control for the cities of Villa Park, Orange, Tustin and Santa Ana and also regulates the inflow of Santiago Creek into the Santa Ana River.

Villa Park Dam is a flood control dam located downstream from Santiago Dam. It is an earth fill structure with a capacity of 15,600 acre-feet and is owned by the Orange County Flood Control District. The failure of the Santiago Dam could also result in a failure of the Villa Park Dam. Floodwaters from Villa Park Reservoir would affect approximately the same area west of the Costa Mesa Freeway as floodwaters originating from Santiago Reservoir.

However, flood waves would reach urbanized areas faster as only those ports of Old Towne south of La Veta Avenue may be inundated.

Prado Dam

Prado Dam built in 1941 is owned by the Army Corps of Engineers and is located in the City of Corona. The City lies within the Prado Reservoir inundation zone, meaning that if Prado Dam fails, large portions of the city would be at risk to inundation. However, the amount and duration of inundation would be based on the amount of water held in the reservoir at the time of the incident. In the event of Prado Dam failure, floodwaters would flow through the Santa Ana Canyon on its way to the Pacific Ocean. Recent modifications made to Prado Dam have upgraded the facility to ensure that it will withstand a 7.5 magnitude earthquake.

Peters Canyon Dam

Peters Canyon Dam is an earth-filled structure owned by Orange County and has a capacity of 626 acre-feet at the spillway pipe elevation of 537 feet mean sea level. Water stored varies from 200 acre-feet to 600 acre-feet depending on seasonal rain amounts. The dam is located approximately 3 miles westerly of Santiago Dam, near the upper part of the Peters Canyon watershed. Irvine constructed an earth-fill dam, 50 foot high with 700 acre-feet of capacity. Its purpose is to regulate the draft from Santiago Dam (Irvine Lake) to lower reservoirs. Distribution to southerly Irvine Ranch was via underground pipeline for one mile to the "High Line Canal. The open channel then carried the flow by gravity several miles easterly across the ranch.

History

Table 4-6 identifies dam failure events in Southern California from 1928 through 1963 (the most recent occurrence).

Table 4-6: Historical Dam Failure Events, Southern California

Date	Disaster Declaration #	Dam	Impacts
March 12, 1928	N/A	St. Francis Dam (located 40 miles NW of City of L.A.)	Up to 600 deaths
December 14, 1963	DR-161	Baldwin Hills Reservoir (located in City of Los Angeles)	5 deaths; 277 homes destroyed

While dam failures are infrequent in Southern California, one of the most notable dam failures occurred on December 14, 1963. The 155-foot-high Baldwin Hills Dam gave way and sent 360 million gallons of water in a 50-foot-high wall cascading onto the community below, killing five persons, destroying 277 homes, and damaging 50 million dollars (1963 dollars) in property. Luckily, early warning and prompt action by dam personnel and the

police prevented more lives from being lost. During construction of the Baldwin Hills Dam in 1950, geologists found that two faults ran through the reservoir and the earthen dam. One of the faults was thought to be active, so special drains were constructed underneath the reservoir to allow water, which might percolate through the fault to exit safely. The dam was built near a large oil field, and the extraction of oil caused the ground to subside, causing slippage between the two faults. The slippage was minimal (only a couple of centimeters), but it was enough to rupture the lining of the reservoir. The special drains quickly clogged up with sand and water, and the 65 million gallons of water quickly cut an opening under and through the dam itself.

Extent

Villa Park, Prado Dam, and Peters Canyon Dams are classified as High Hazard Dams DSOD uses a scale for defining the intensity or potential severity of dam failure solely based on potential downstream impacts to life and property. . This scale has four (4) categories (description below) which include the Federal categories.

- **Low:** No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner's property.
- **Significant:** No probable loss of human life, but it can cause economic loss, environmental damage, impacts to critical facilities, or other significant impacts.
- **High:** Expected to cause the 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.

Probability of Future Occurrence

Based on the dam failure inundation maps, we can conclude that a large portion of the city is vulnerable to dam failure. The largest impact on the community from dam failure is the loss of life and property. Based on the low frequency of dam failure events occurring annually, It is unlikely (10% chance) that a dam failure event will affect the City annually.

Impacts of Climate Change

Severe weather such as more powerful rainstorms are likely to occur because of climate change. Atmospheric rivers which can create flooding throughout California may occur more frequently due to warmer weather and more moisture in storm systems. Climate change has the potential to cause more frequent and more heavy precipitation incidents. The results could be additional flows into with the potential for overtopping or other dam failure mechanisms.

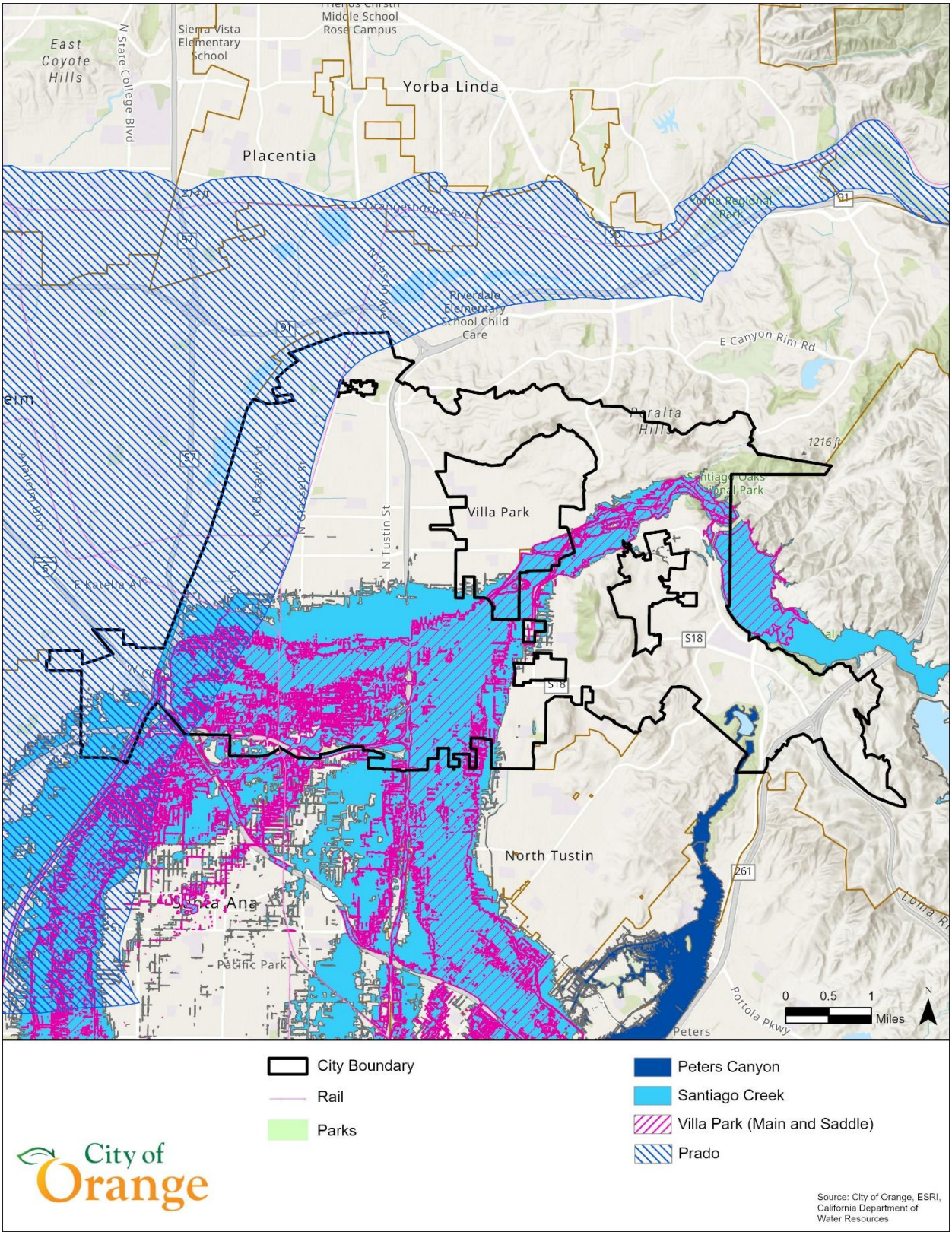


Figure 4-3: City of Orange Dam Inundation Zones

4.5.3 Drought

Hazard Description

Drought is a normal part of every climate on the planet, including areas of high and low rainfall. It is different from normal aridity, which is a permanent characteristic of the climate in areas of low rainfall. Drought is the result of a natural decline in the expected precipitation over an extended period, typically one or more seasons in length. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity.

Drought is a complex natural hazard which is reflected in the following four definitions commonly used to describe it:

- Meteorological drought is defined solely by the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- Hydrological drought is related to the effects of precipitation shortfalls on stream-flows and reservoir, lake, and groundwater levels.
- Agricultural drought is defined principally in terms of naturally occurring soil moisture deficiencies relative to water demands of plant life, usually arid crops.
- Socioeconomic drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of a weather-related supply shortfall. It may also be called a water management drought.

A drought's severity depends on numerous factors, including duration, intensity, geographic extent, and regional water supply demands by humans and vegetation. Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses challenges in terms of comprehensive risk assessments.

Drought differs from other natural hazards in three ways. First, the onset and end of a drought are difficult to determine due to the slow accumulation and lingering effects of an event after its apparent end. Second, the lack of an exact and universally accepted definition adds to the confusion of its existence and severity. Third, in contrast with other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

Droughts may cause a shortage of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline, and the number and severity of wildfires may increase. During drought conditions, water volumes in rivers, lakes, and reservoirs decrease, which may lead to higher concentrations of

pollutants and contaminants in the remaining water. This concentration effect is due to less dilution of salt, chemicals, and minerals. Warmer water temperatures during drought can also promote the growth of harmful algal blooms and bacteria that produce toxic compounds, further degrading water quality. Lower water availability can also impact water treatment infrastructure due to increase demand and operational challenges.

Location

When a drought is in effect, the entire City is affected.

History

Since record-keeping began, California and the western region of the U.S. have experienced several multi-year drought conditions. The City experienced severe drought from April 2007 through December 2009 and severe to exceptional drought from February 2013 through January 2017. A severe to exceptional drought began in 2020 and ended during the winter of 2022-2023. Source: U.S. Drought Monitor.

The following maps show the extent of drought conditions in California from February 2025, 2020, and 2015. They also include a chart showing the history of drought conditions in California from 2001 through early 2025.

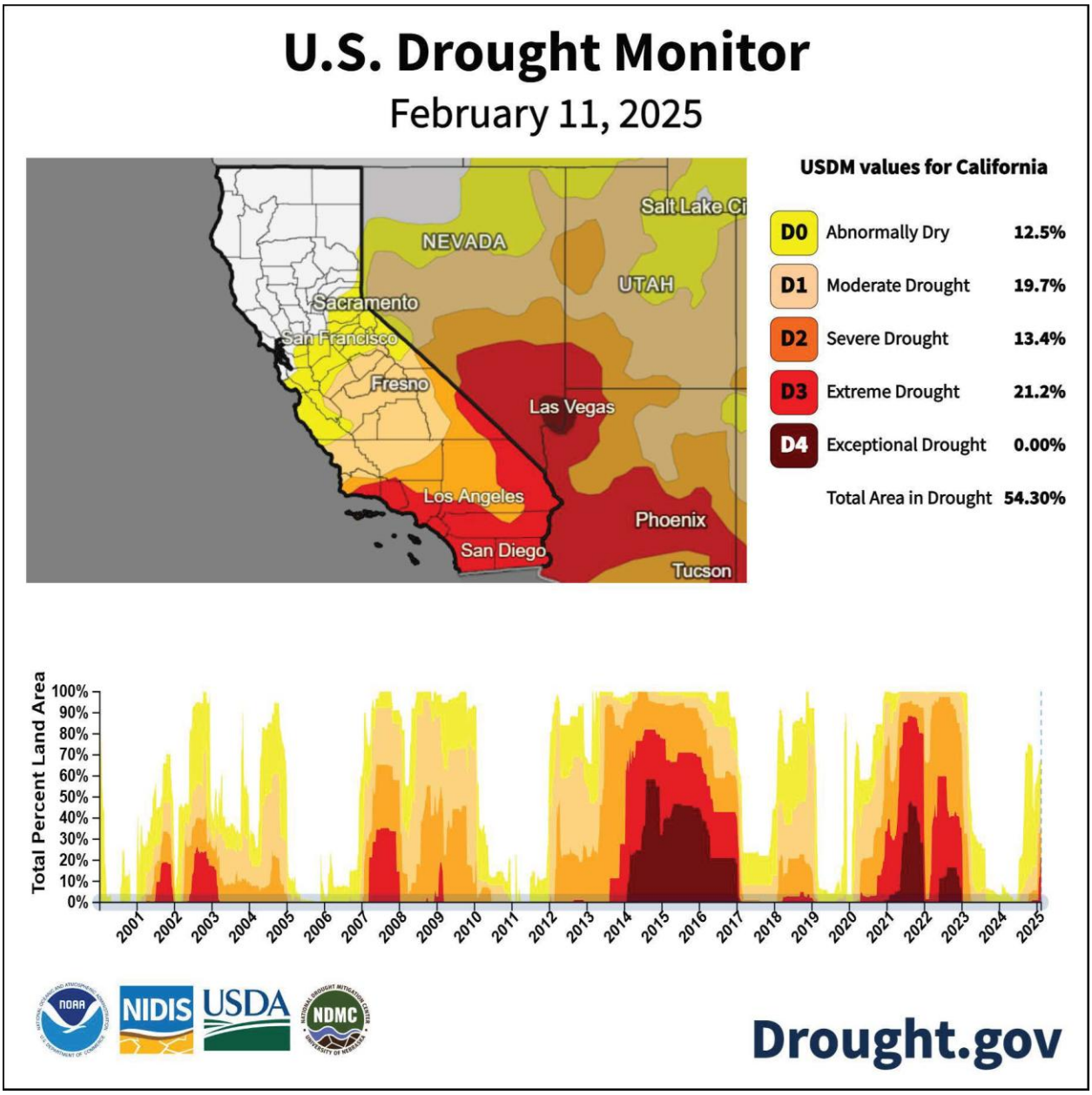


Figure 4-4: California Drought Monitor February 2025

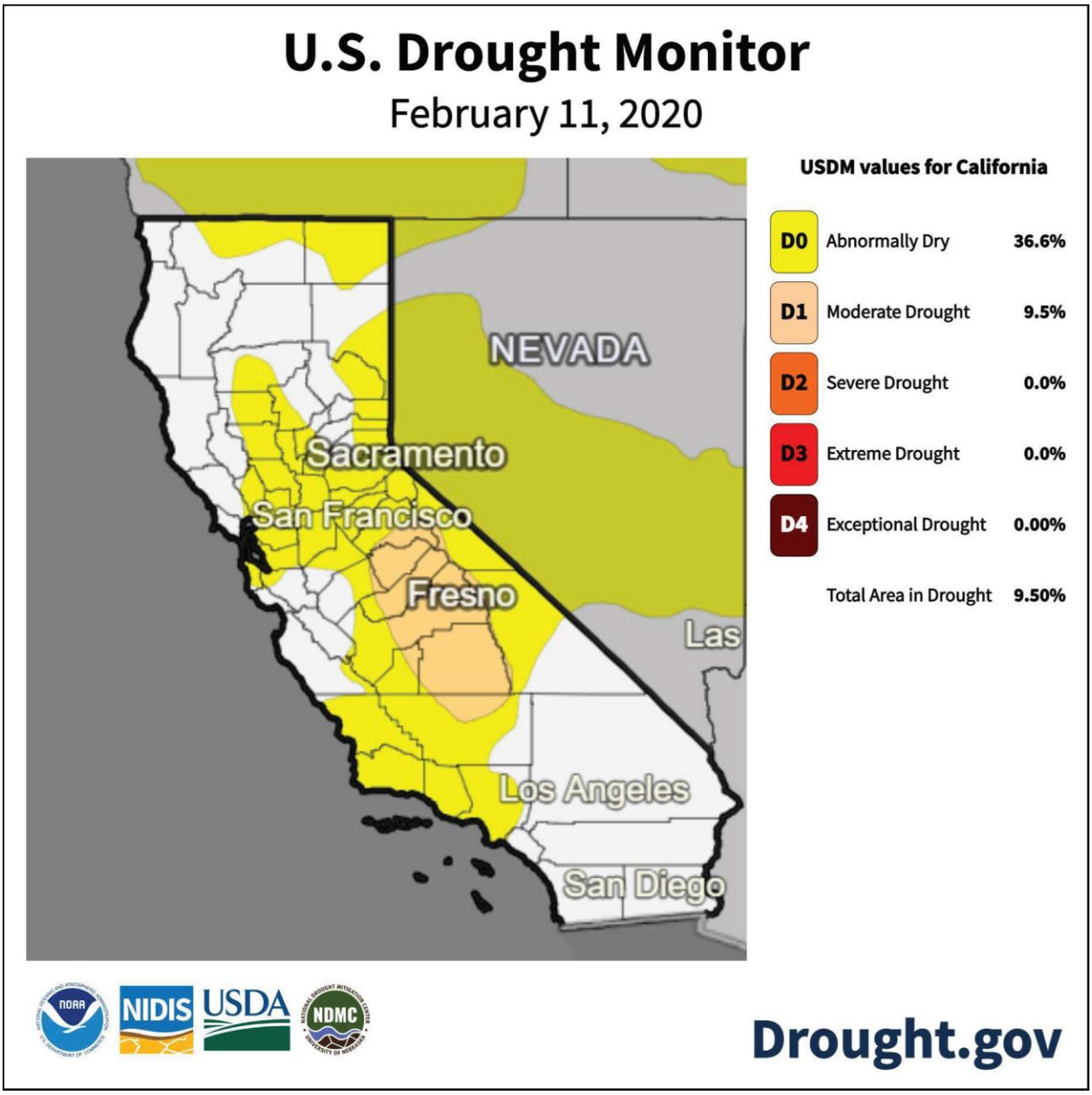


Figure 4-5: California Drought Monitor February 2020

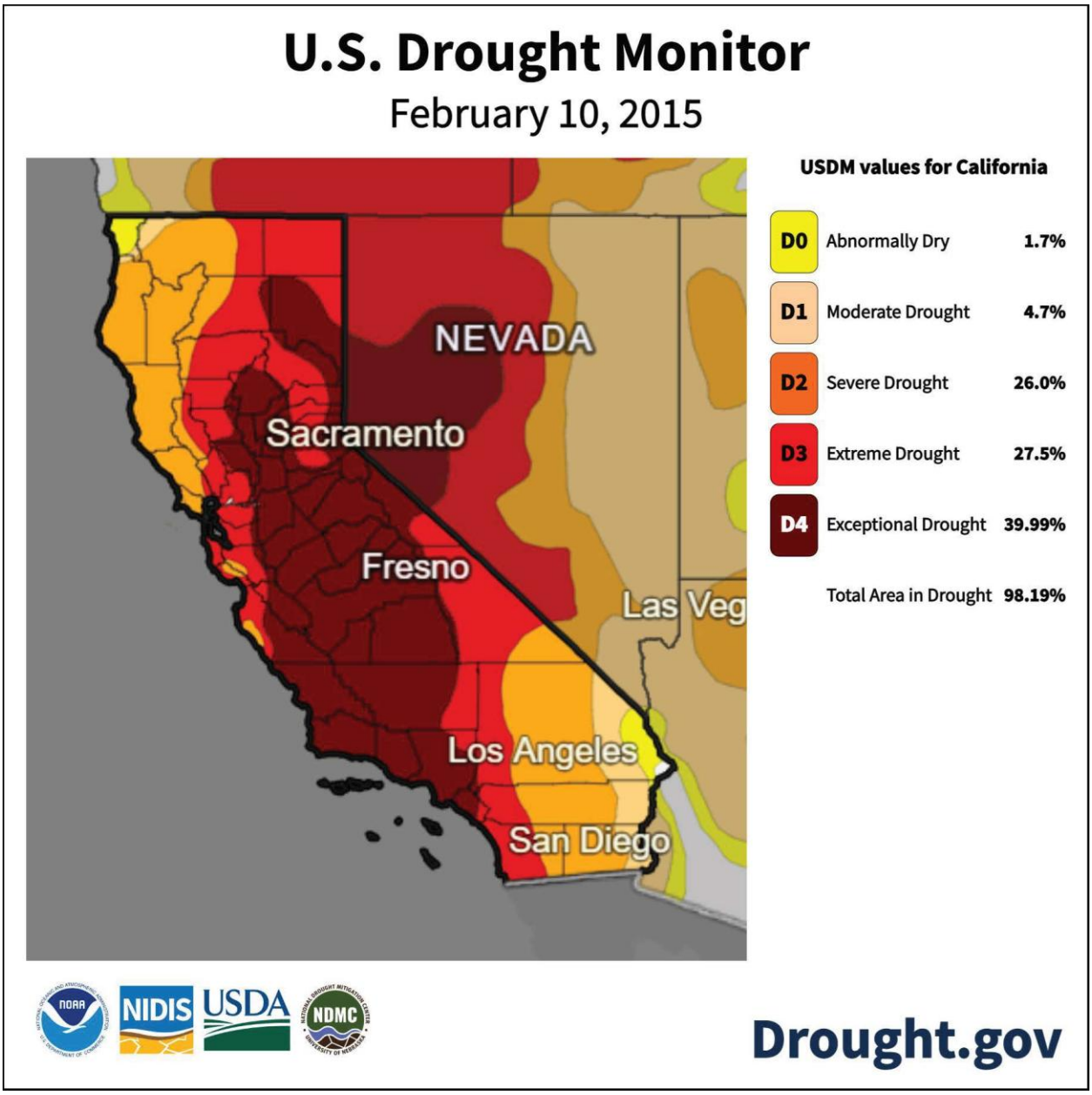


Figure 4-6: California Drought Monitor February 2015

Extent

The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning. The NIDIS maintains the U.S. Drought Portal, a centralized, web-based access point to several drought-related resources, including the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO).

The primary indicators for these maps for the Western U.S. are the Palmer Hydrologic Drought Index and the 60-month Palmer Z-index. The Palmer Drought Severity Index

(PSDI) is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. However, the Palmer Index is not considered consistent enough to characterize the risk of drought on a nationwide basis. Commonly used drought severity classifications are depicted in **Figure 4-7**.

Drought Severity Classification

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Short and Long-term Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	0-2

Figure 4-7: Commonly Used Drought Severity Classifications

Probability of Future Events

Drought in California is a common occurrence that can last for multiple years. It is often associated with the El Nino Southern Oscillation (ENSO), when La Nina conditions result in decrease winter precipitation. The regional climate is characterized by a distinct dry season (approximately May to September) and wet season (approximately October to April) defined by a few large precipitation events, though additional peaks in precipitation can occur. It is likely, (75%) that the City will experience a drought within the next 5 years.

Impact of Climate Change

Climate change is already profoundly impacting California's water resources, as evidenced by changes in snowpack, sea level, and river flows. These changes are expected to continue, and more precipitation will likely fall as rain instead of snow. This potential change in weather patterns will add additional challenges to water supply reliability.

The mountain snowpack provides as much as a third of California's water supply by

accumulating snow during wet winters and releasing it slowly during the spring and summer when the need is the greatest. Warmer temperatures will cause snow to melt faster and earlier, making it more difficult to store and use.

By the end of this century, the Sierra snowpack is projected to experience a 48% to 65% loss from the historical April 1st average. This loss of snowpack means less water will be available for Californians.

Climate change is also expected to result in more variable weather patterns throughout California. More variability can lead to longer and more severe droughts. In addition, rising sea levels will continue to threaten the Sacramento-San Joaquin Delta, the heart of the California water supply system and the source of water for 25 million Californians and millions of acres of prime farmland.

Regulatory Context

The State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Boards) protect water quality and allocate surface water rights. The Legislature created the State Water Board in 1967. The mission of the Water Board is to ensure the highest reasonable quality for waters of the State while allocating those waters to achieve the optimum balance of beneficial uses. The joint authority of water allocation and water quality protection enables the Water Board to provide comprehensive protection for California's waters. Regional Boards are semi-autonomous and have broad responsibilities within the framework of State regulatory guidance. The Department of Water Resources manages water usage, including water delivery to two-thirds of California's population through the State Water Project.

4.5.4 Earthquake/Geological Hazards

Hazard Description

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds.

Ground shaking caused by a strong earthquake is probably the most important seismic hazard that can be expected anywhere in the City and larger Southern California area. The amount of earthquake shaking at a site is associated with the earthquake magnitude; the type of earthquake fault; the distance between the site and the earthquake source; the geology of the site; and how the earthquake waves decrease or increase as they travel from their source to the site in question. Shaking from the earthquake intensifies with a greater magnitude and closer distance to the epicenter. Softer soils and topographic ridges can also amplify seismic ground motions.

Surface rupture is an offset of the ground surface when fault rupture extends to the Earth's surface. Fault rupture almost always follows preexisting faults, which are zones of weakness. Any structure built across the fault is at risk of being torn apart as the two sides of the fault slip past each other. Normal and reverse surface fault ruptures have vertical motion while strike-slip surface fault ruptures produce lateral offsets. Other natural hazards that may be caused by earthquakes include liquefaction, and subsidence.

The City is located in a high seismic risk zone. This region is one of the most seismically active in the world, marked by the number of large, damaging earthquakes that have occurred in the past. The following geologic hazards are associated with earthquakes and may be caused by seismic activity, increasing the resulting damage:

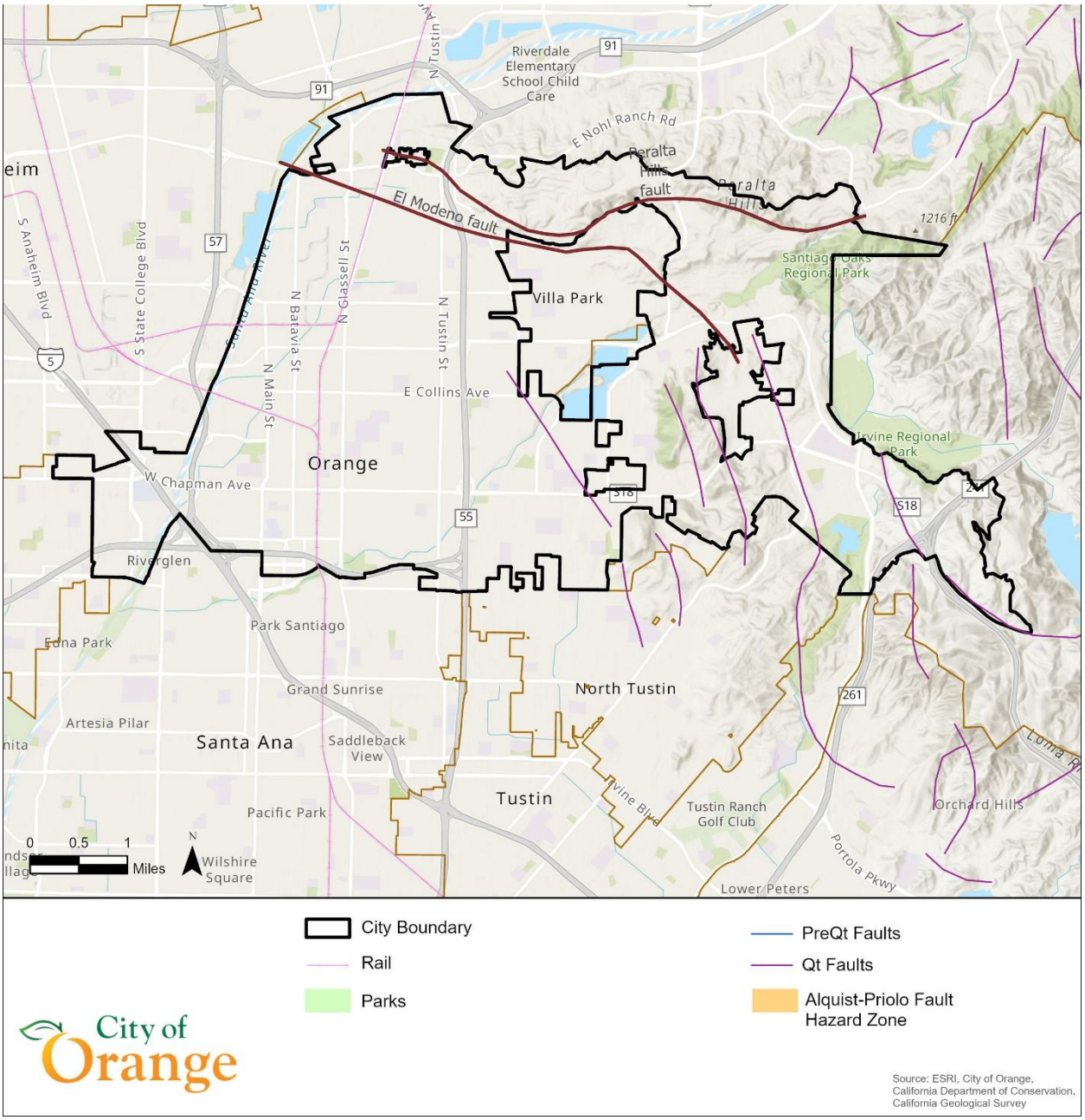


Figure 4-8: City of Orange Fault Locations

Liquefaction

Soil liquefaction is a phenomenon in which soil's strength and stiffness are reduced by earthquake shaking or other rapid loadings. Liquefaction and related phenomena have been responsible for tremendous amounts of damage in historical earthquakes around the world. Liquefaction can result in the settling and compacting of unconsolidated sediment in the event of a major earthquake. Liquefaction may increase as the ground acceleration and duration of shaking increase.

Areas subject to liquefaction in the City are shown in **Figure 4-9**.

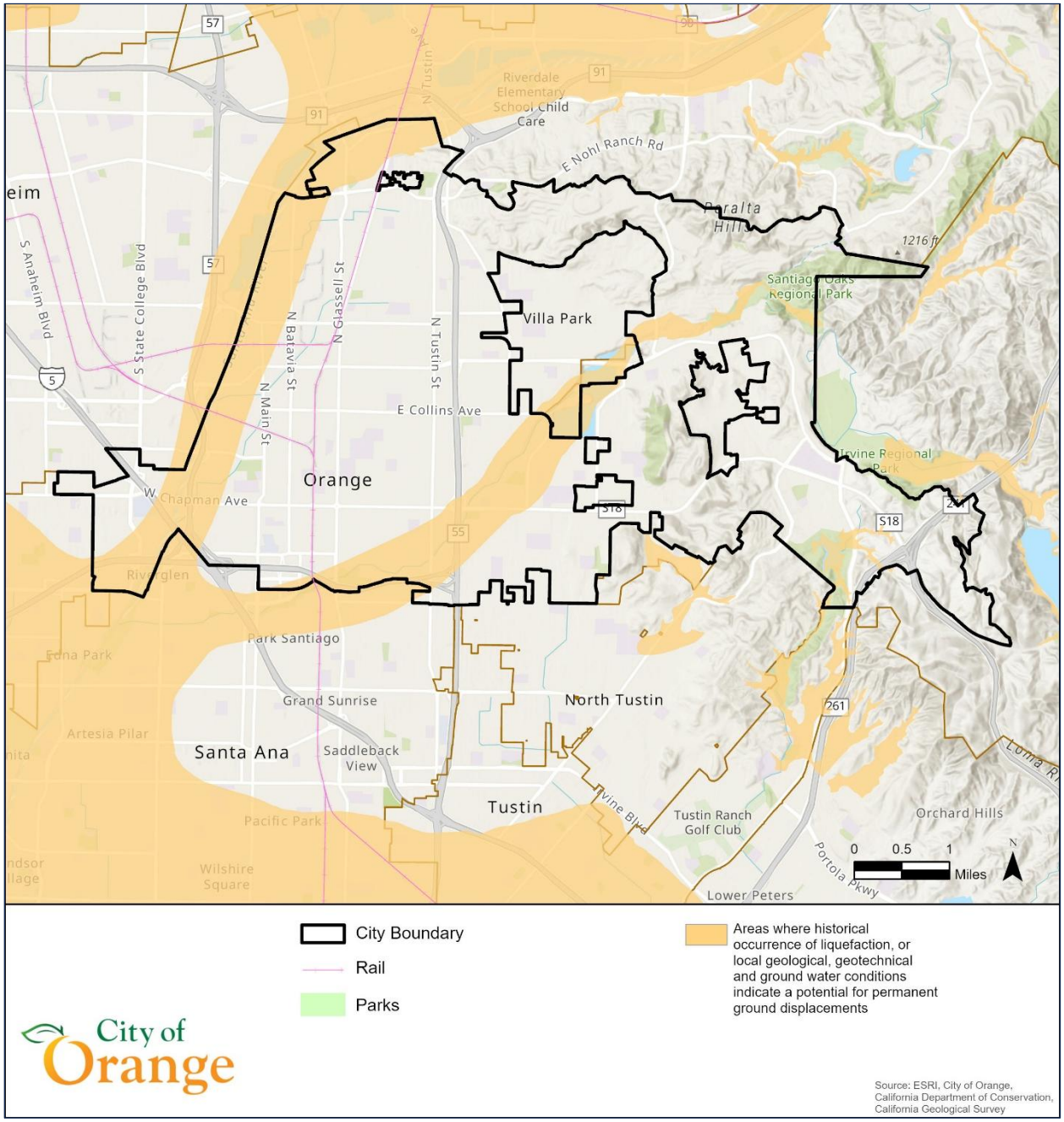


Figure 4-9: City of Orange Liquefaction Prone Areas

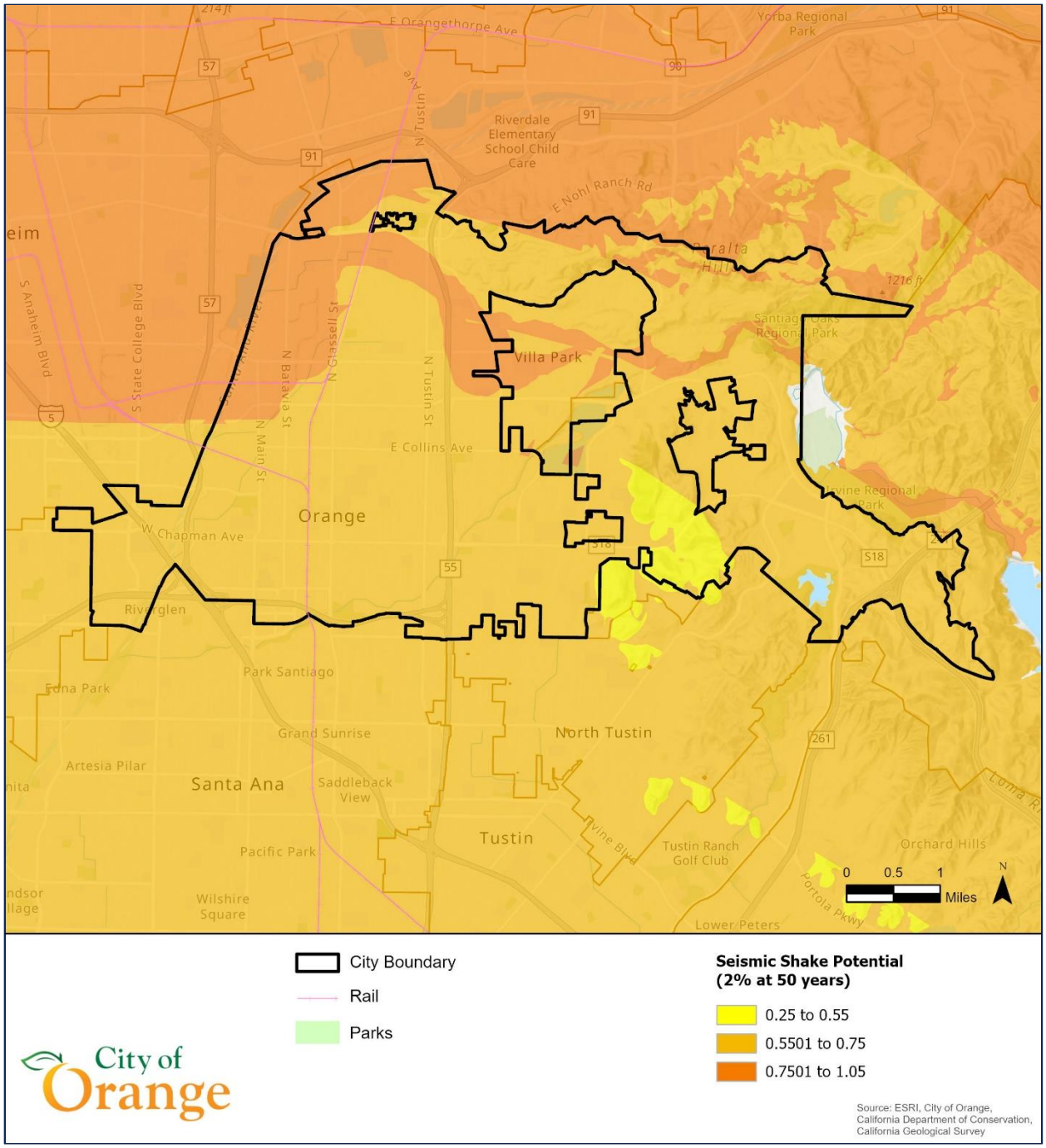


Figure 4-10: City of Orange Seismic Shake Potential

Subsidence

Subsidence is defined as the lowering of the land surface. Many different factors can cause the land surface to subside, such as a sinkhole or underground mine collapse, or during a major earthquake. Subsidence can also occur when large amounts of groundwater have been excessively withdrawn from an aquifer. The clay layers within the aquifer compact and settle, resulting in lowering the ground surface in the area from which the groundwater

is being pumped. Over time, as more water is removed from the area, the ground drops and creates a cone. Once the water has been removed from the sediment, it cannot be replaced.

Subsidence can occur in various ways during an earthquake. Movement that occurs along faults can be horizontal or vertical or have a component of both. As a result, a large area of land can subside drastically during an earthquake. Subsidence can also be caused during liquefaction. Liquefaction can result in the settling and compacting of unconsolidated sediment in the event of a major earthquake. This can result in the lowering of the land surface.

Location

The City of Orange planning area is traversed by two active faults: the Peralta Hills Fault and the El Modena Fault. The Peralta Hills Fault runs from the crossing of Lincoln Avenue over the Santa Ana River on the northwest, easterly along the base of the Peralta Hills and into the City of Villa Park, then southerly into the hills west of Peters Canyon Reservoir. The El Modena Fault runs from its intersection with the Peralta Hills Fault at the base of the Peralta Hills, southeasterly to Chapman Avenue. Both the Peralta Hills Fault and the El Modena Fault are classified as possibly active by the Southern California Earthquake Data Center. Displacements along these two faults are smaller than those along the more prominent regional faults, and the maximum probable earthquake magnitudes would be much less than those along the regional faults.

Faults outside the planning area that may cause destruction in the City include the San Andreas and Newport-Inglewood faults.

Figure 4-9 depicts the active faults and those deemed Pre-Quaternary (PQT). A Quaternary fault is one that has been recognized at the surface and that has moved in the past 1,600,000 years (1.6 million years). That places fault movement within the Quaternary Period, which covers the last 2.6 million years.

History

Southern California is one of the most seismically active areas in the U.S. The region has experienced at least nine earthquakes of Magnitude 6.5 or higher since 1812. Orange has not been included in any federal disaster declarations or state emergency proclamations related to earthquake/geological hazards. **Table 4-7** includes historical earthquakes recorded in Southern California greater than magnitude 5.5.

Table 4-7: Historical Earthquakes Recorded in Southern California

Date	Magnitude	Fault Name (Incident Name)
12/8/1812	7.5	San Andreas (Wrightwood Earthquake)
1/9/1857	7.9	San Andreas (Fort Tejon Earthquake)

4/21/1918	6.8	San Jacinto
11/4/1927	7.1	Unknown (Lompoc Earthquake)
5/18/1949	6.9	Imperial (Imperial Valley Earthquake)
7/21/1954	7.5	White Wolf
2/9/1971	6.5	San Fernando (San Fernando Earthquake)
1/17/1994	6.7	Northridge Thrust (Northridge Earthquake)
7/29/2008	5.5	Unknown (Chino Hills Earthquake)
7/5/2019	7.1	Garlock (Ridgecrest)

Extent

Two scales are used to measure the severity and intensity of an earthquake. The Modified Mercalli Intensity (MMI) Scale measures the ground shaking intensity in terms of acceleration, velocity, and displacement. The Moment Magnitude (Mw) Scale measures the severity of the earthquake by the amount of energy released at the source of the earthquake. The Mw scale, based on the concept of seismic moment, is uniformly applicable to all sizes of earthquakes. The extent of damage from an earthquake is determined by the magnitude of the earthquake, distance from the epicenter, and characteristics of surface geology. **Table 4-8** shows an approximate correlation between the Moment Magnitude (Mw) and the Modified Mercalli Intensity (MMI) Scale and its effects.

Table 4-8: Severity (Mw) and Intensity (MMI) Comparison

Magnitude (Mw)	MMI Scale: Intensity	Abbreviated MMI Scale: Effects	
1.0 - 3.0	I	I. Not felt except by a very few under especially favorable conditions.	
3.0 - 3.9	II – III	II. Felt only by a few persons at rest, especially on the upper floors of buildings.	III. Felt quite noticeably by persons indoors, especially on the upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.

Table 4-8: Severity (Mw) and Intensity (MMI) Comparison			
Magnitude (Mw)	**MMI Scale: Intensity**	**Abbreviated MMI Scale: Effects**	
4.0 - 4.9	IV – V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound—a sensation like heavy truck striking building. Standing motor cars rocked noticeably.	V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 - 5.9	VI – VII	VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster—damage slight.	VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 - 6.9	VIII – IX	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	X - XI	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
	XII	XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.	

Source: US Geological Survey (USGS): http://earthquake.usgs.gov/learn/topics/mag_vs_int.php

Probability of Future Events

Orange is in a seismically active area with many faults in the surrounding area and region-at-large. There will be an ever-present danger, of course, posed by any seismic shaking, which could potentially cause damage to buildings and/or infrastructure. It is almost inevitable that an earthquake will occur along one of the adjacent or regional fault lines and cause a major seismic event.

There is a strong likelihood that the City will experience a significant earthquake from one of the known major faults in the next 30 years. In 2015, the Working Group on California Earthquake Probabilities (WGCEP) issued its third Uniform California Earthquake Rupture Forecast (UCERF3), which determined within the next 30 years, the probabilities of earthquakes in Southern California are:

- 60% that an earthquake measuring magnitude 6.7
- 46% that an earthquake measuring magnitude 7
- 31% that an earthquake measuring magnitude 7.5

In addition to UCERF3 forecasts, which project the odds of a major earthquake on local and regional faults, the U.S. Geological Survey forecasts the severity of seismic shaking in different locations for various plausible earthquake scenarios.

Impact of Climate Change

Climate change is not expected to have any direct influence on the likelihood, size, and/or severity of any future seismic-related event. Landslides and other geological hazards can be more common with the impacts of climate change due to more extreme weather events causing greater water saturation of soils, such as during the 2023 atmospheric river events. More extreme El Niño weather events could also increase the amount of water dumped during each event despite the area becoming dryer on average.

4.5.5 Fire

Hazard Description

Wildfire

As defined in the California Fire Protection (CAL FIRE) 2010 Strategic Fire Plan, a wildfire event is an unwanted wildland fire including unauthorized human-caused fires, escaped wildfire use events, escaped prescribed wildfire projects, and all other wildfires.

Wildfire hazard is a significant and recurrent threat in the City and has the potential to destroy buildings, cause damage to vital infrastructure, injure people, and can result in loss of life, agricultural land, and animals. Wildfire season commences in early spring through late fall every year during the hotter, dryer months. Highly flammable vegetation and warm, dry summers create the potential for wildland fires in Orange. The risk of wildland fires is related to a combination of factors, including winds, temperatures, humidity levels, and fuel moisture content. Of these four factors, wind is the most crucial. Steep slopes also contribute to fire hazards by intensifying the effects of wind and making fire suppression difficult. Where there is easy public access to dry vegetation, fire hazards increase due to greater chance of human carelessness. High hazard areas include outlying residential parcels and open lands adjacent to residential areas. Such development has also moved the urban wildland interface (the area where human development meets undeveloped wildland) closer to higher-risk, wildfire hazard areas, increasing the number of people and buildings at risk as illustrated in **Figure 4-12:** Orange Fire Hazard Severity Zones.

Wildland Urban Interface (WUI) Fire

A WUI fire includes situations in which a wildland fire enters an area that is developed with structures and other human developments. In WUI fires, the fire is fueled by both naturally occurring vegetation and the urban structural elements themselves. According to the National Fire Plan issued by the U.S. Departments of Agriculture and Interior, the wildland-urban interface is defined as "…the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels."

The WUI fire can be subdivided into three categories (NWUIFPP, 1998): 1) classic wildland-urban interface; 2) the mixed wildland-urban interface; and 3) the occluded wildland-urban interface. The classic wildland-urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas. The mixed wildland-urban interface is characterized by isolated homes, subdivisions, and small communities situated predominantly in wildland settings. The occluded wildland- urban interface exists where islands of wildland vegetation occur inside a largely urbanized area. Generally, many of the areas at risk within the City fall into the classic wildland-urban interface category.

Certain conditions must be present for a wildfire hazard to occur; a large source of fuel must be present, the weather must be conducive (generally hot, dry, and windy), and fire

suppression sources must not be able to easily suppress and control the fire. The cause of a majority of wildfires is human-induced or lightning; however, once burning, wildfire behavior is based on three primary factors: 1) fuel; 2) topography; and 3) weather. Fuel will affect the potential size and behavior of a wildfire depending on the amount present, its burning qualities (e.g. level of moisture), and its horizontal and vertical continuity. Topography affects the movement of air, and thus the fire, over the ground surface.

The terrain can also change the speed at which the fire travels, and the ability of firefighters to reach and extinguish the fire. Weather as manifested in temperature, humidity and wind (both short and long term) affect the probability, severity, and duration of wildfires. Other factors that create concern are drought conditions and development (the build environment). Drought conditions bring on contributing concerns in that it can lead to relatively drier conditions and leave reservoirs and water tables lower; thus, creating hotter fires and less water to fight the fires. The expansion of the built environment into previously unoccupied areas introduces more people to the hazard and in some cases make response actions more challenging. Figure 4-13 depicts the City's Wildfire Urban Interface Perimeter.

Urban Fires

Although updated fire code requirements reduce urban fire risks in Orange, structures in older parts of the City, especially in Old Towne, were constructed prior to adoption of modern standards. Structures used for the transport, production, and handling of combustible equipment in the industrial areas also pose a credible urban fire threat. The Fire Department will participate in environmental review procedures to reduce urban fire risks in these areas and will help educate the public regarding fire prevention.

Location

The City is located along the foothills of the Peralta Hills. These hills are known for steep topography and extensive vegetation. The area is also intermittently impacted by Santa Ana winds, the hot, dry winds that blow across Southern California in the spring and late fall. Because of these characteristics, wildfire is a significant threat to the City. **Figure 4-12** below depicts the mapping within the City limits susceptible to wildfires

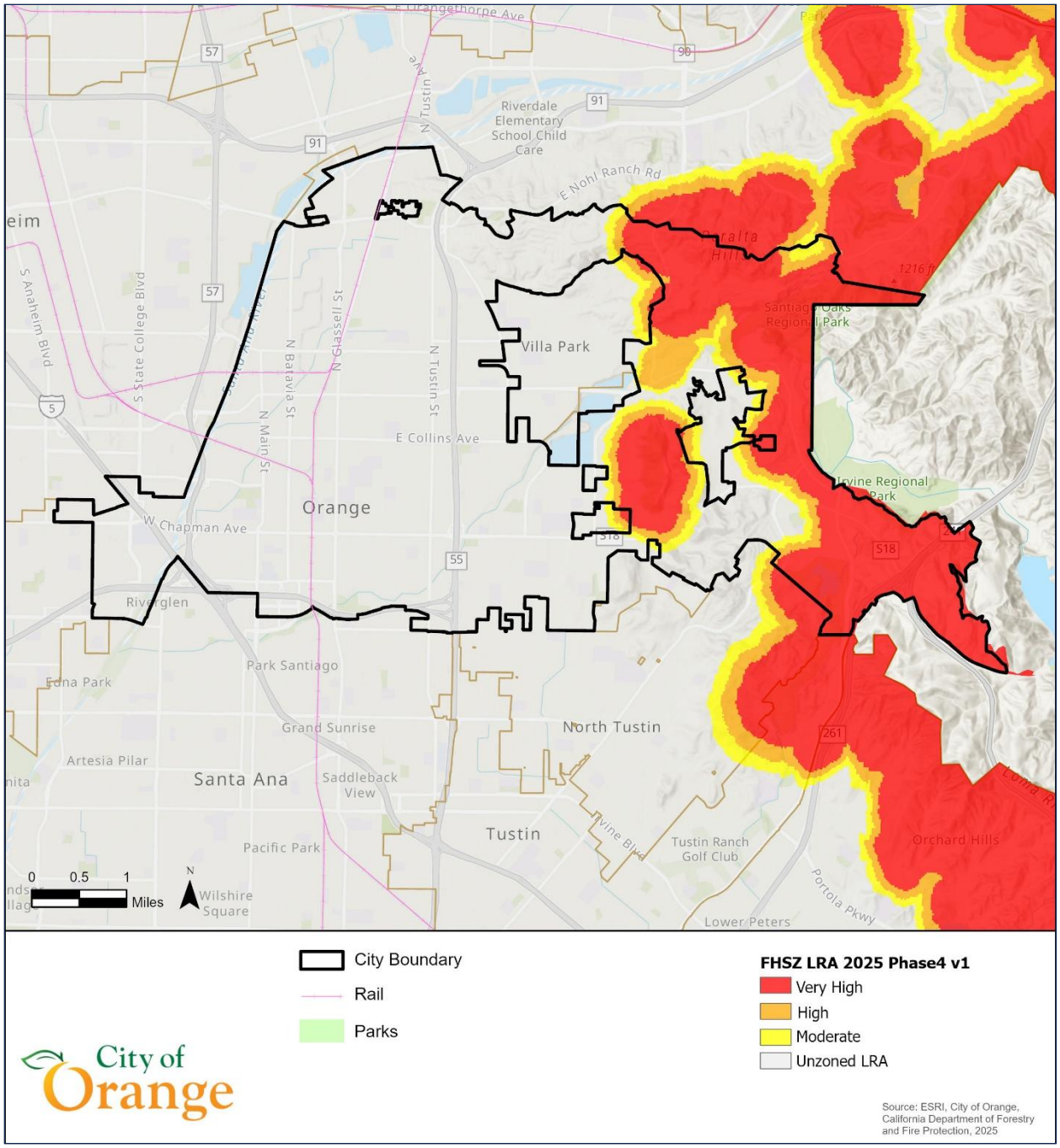


Figure 4-12: City of Orange Wildfire Hazard Zones

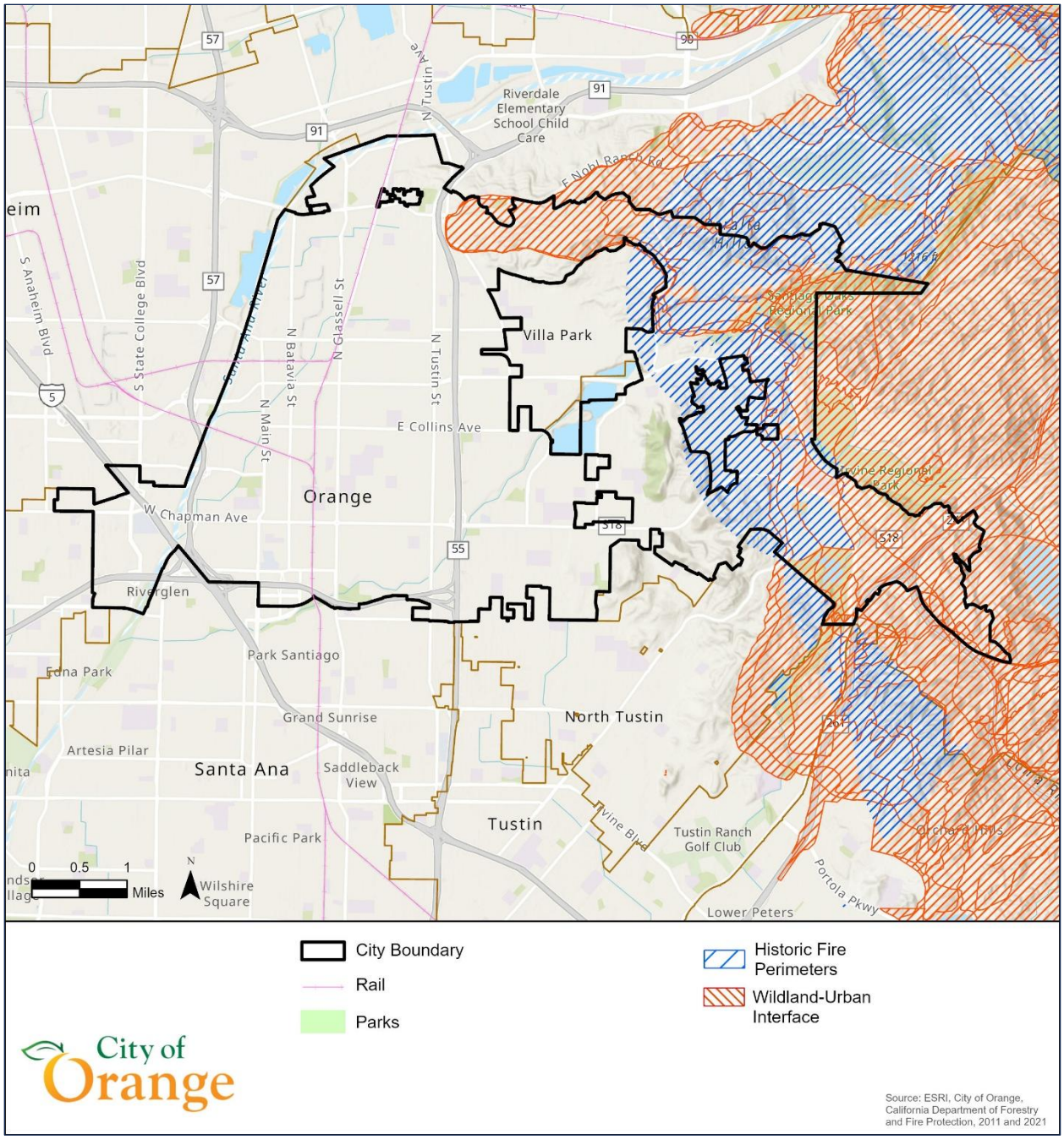


Figure 4-13: City of Orange Wildfire Urban Interface Perimeter

History

The City of Orange has not been included in any federal disaster declarations related to fire but has been included in a state emergency proclamation, as recently as 2024. Below is a list of the most notable fires that have occurred in Orange and Orange County. Other fires in neighboring counties that may have affected Orange County are not listed. Figures are total for the fires listed and include impacts in neighboring counties as well as Orange.

- In the 1982 Gypsum Canyon Fire, 17 homes were lost and 18,000 acres burned, leaving an estimated $16 million in damage.
- The Stagecoach Fire Ortega Fire, and the Laguna Fire in 1993 destroyed two homes and damaged seven others. The Santa Ana winds during the time of these fires were approximately 50-55 mph, making the fires difficult to contain.
- The Sierra Fire in February 2006 burned 11,000 acres.
- The Santiago Fire in October 2007 burned 28,400 acres and destroyed 24 structures.
- The 241 (Windy Ridge) Fire in 2007 burned 2036 acres.
- The Silverado Fire burned 968 acres in 2014.
- The Canyon 2 Fire in October 2017 burned 9217 acres, destroying 55 structures.
- The Holy Fire in August 2018 burned 23,136 acres, destroyed 19 structures, and injured three firefighters.
- The Silverado Fire in October 2020 burned 12,366 acres and caused the evacuation of 90,000 people. Five structures were destroyed and nine damaged. Two firefighters sustained injuries.
- The Blue Ridge and Airport Fire in October 2020 burned more than 13,694 acres and caused the evacuation of 30,000 people.
- The Bond Fire in December 2020 burned 6,686 acres. 31 structures were destroyed and 21 were damaged. Two firefighters were injured.
- The Coastal Fire in May 2022 burned 200 acres and destroyed 20 homes.
- The Airport Fire in October 2022 burned 23,526 acres and destroyed 160 structures. Two civilians and 20 firefighters were injured.

Urban Fire data for the years 2017–2024 show the occurrence of 15 major urban fires in the City, with no major injuries or fatalities.

Extent

The State Fire Marshal classifies wildfire hazard lands within state responsibility areas into fire hazard severity zones. Each zone shall embrace relatively homogeneous lands and shall be based on fuel loading, slope, fire weather, and other relevant factors present, including areas where winds have been identified by the department as a major cause of wildfire

spread. The State Fire Marshal shall identify areas in the state as moderate, high, and very high fire hazard severity zones based on consistent statewide criteria and based on the severity of fire hazard that is expected to prevail in those areas. Moderate, high, and very high fire hazard severity zones shall be based on fuel loading, slope, fire weather, and other relevant factors including areas where winds have been identified by the Office of the State Fire Marshal as a major cause of wildfire spread.

Probability of Future Occurrences

Many major wildland fires in and near the City of Orange have been associated with adverse weather conditions. In addition to winds, structural development within or adjacent to wildland exposures represents an extreme fire protection problem due to flying embers and combustible roof coverings. Do to the landscape, topography, and present conditions, it is likely (75%) that wildfire will occur annually.

Climate Change Considerations

According to the Union of Concerned Scientist, the number of large wildfires — defined as those covering more than 1,000 acres — is increasing throughout the Western United States. Over the past 12 years, every state in the Western U.S. has experienced an increase in the average number of large wildfires per year compared to the annual average from 1980 to 2000. Wildfire season is generally defined as the period between the year's first and last large wildfires. Local wildfire seasons vary by location but have almost universally become longer over the past 40 years. Temperatures are increasing much faster in the Western U.S. than for the planet as a whole. Since 1970, average annual temperatures in the Western U.S. have increased by 1.9° F, about twice the pace of the global average warming.

Climate Change is expected to increase the number and intensity of wildfires in the City of Orange.

Regulatory Context

The City of Orange adopted the 2022 State Fire Code and is pending adoption of the State's 2025 Fire Code, which includes a new Wildland Urban Interface (WUI) chapter. This new chapter outlines fire regulations applicable to buildings and development in WUI areas. The 2025 State Fire Code becomes effective in January 2026. These changes included multiple clauses specific to fire prevention and protection including requirements related to outdoor gas fired equipment, open fireplaces, and other restrictions. The ordinance also included requirements for new construction including surrounding vegetation.

4.5.5.1 City's Response to Wildfire

On November 5, 2024, Orange voters approved Measure AA with 61.18% of the vote. By approving Measure AA, Orange voters authorized the sale, possession, and discharge of Safe and Sane Fireworks in the City of Orange subject to reasonable rules and regulations of the City Council. To implement this program, the City Council adopted rules, regulations, and processes to carry out the Safe and Sane Fireworks program. Doing so has limited the sale and use of fireworks in high hazard fire zones. **Figure 4-14** depicts the "No Firework Area" in the City.

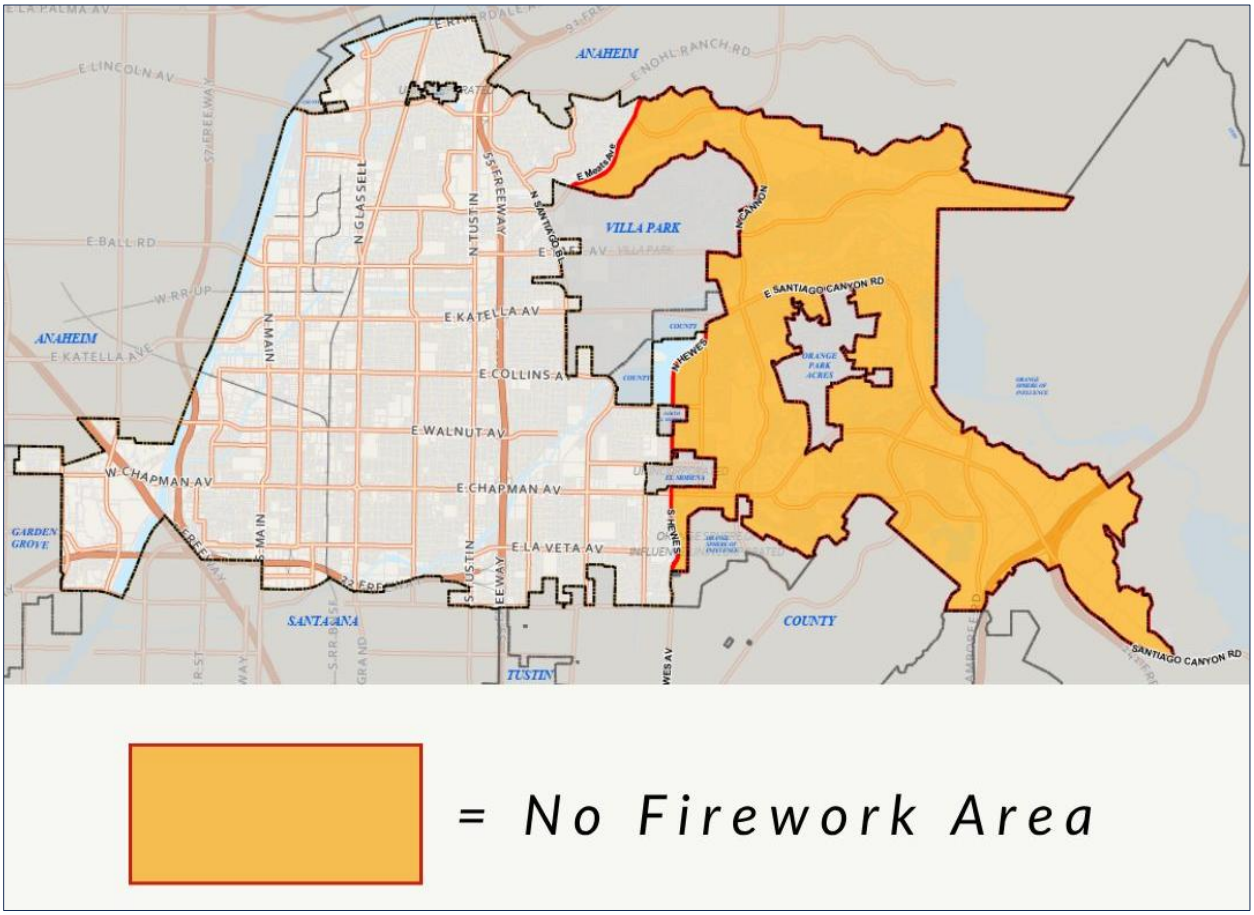


Figure 4-14: City of Orange Safe and Sane Fireworks Prohibited Areas

4.5.6 Flooding

Hazard Profile

Flooding is an overflowing of water onto land that is normally dry, due to rain, ocean waves, or the failure of a dam or levee. Floods are the most common of all weather-related natural disasters. They kill more people in the United States each year than tornados, hurricanes, or lightning. Areas near rivers or streams are at risk from floods during heavy rain or periods of upstream snowmelt. In urban areas, where buildings, highways, driveways, and parking lots reduce the ground's ability to absorb rainfall, the resulting increase in runoff can overwhelm constructed storm drain systems, resulting in flooding on nearby roads and buildings.

According to FEMA, there are several different types of floods and under some there are subtypes. The flooding types and subtypes include:

- Riverine Flooding
- Overbank (River/Stream) Flooding
- Flash Floods
- Dam and Levee Failure
- Mudflows
- Urban Drainage
- Coastal flooding and erosion
- Storm Surge

Location

The City of Orange is primarily located in a coastal alluvial plain, drainage stemming from the mountains to the north and east must cross through Orange to reach the coast. The major control of runoff is the Santa Ana River. This river is the largest single river in Southern California, draining an area of about 2,500 square miles. The City of Orange is protected from all but the most severe flooding by the Santa Ana River and major storm channels maintained by the Orange County Flood Control District. This includes a series of spreading/retarding basins. Typically, local streets are designed to carry excess water to storm drains which then drain into the Santa Ana River.

Irvine Lake, Villa Park Reservoir, and Peters Canyon Reservoir are artificial lakes constructed to provide water storage and flood control capabilities. The Santa Ana River, which forms the City's western boundary, is the major drainage course for the Santa Ana River basin. The river performs valuable flood control and groundwater recharge functions along its entire route. In recognition of the important role the river plays in providing groundwater recharge areas and adequate flood protection for Orange County, land use policy calls for open space uses along the river.

Santiago Creek flows from the Santa Ana Mountains through Orange and empties into the Santa Ana River in the City of Santa Ana. In addition to controlling floodwaters and recharging the groundwater basin, Santiago Creek has become a defining feature of the community, characterized by trails and recreational open space throughout portions of its

length within Orange. Community members identify with the creek, and the City seeks to incorporate natural characteristics of Santiago Creek in the design of adjacent future projects. The upper portions of Santiago Creek are characterized by large, abandoned mining pits. In particular, the pits near Bond Street serve valuable groundwater recharge purposes. Land use policy recognizes these uses by designating the creek and several surrounding properties such as Open Space or Open Space-Park. Figure 4-15 illustrates areas in the City that are susceptible to 100 and 500-year flooding.

The City of Orange like many cities, has areas that are subject to flooding. Flooding can present various challenges for the City of Orange, threatening transportation, property, and public safety. To address these risks, the City of Orange implements a range of proactive strategies, including upgrading and maintaining stormwater management systems like drains, culverts, and sewer lines to efficiently handle heavy rainfall. The City of Orange also prioritizes public education through information campaigns, signage in flood-prone areas, and the temporary closing of facilities that experience impacts of flooding.

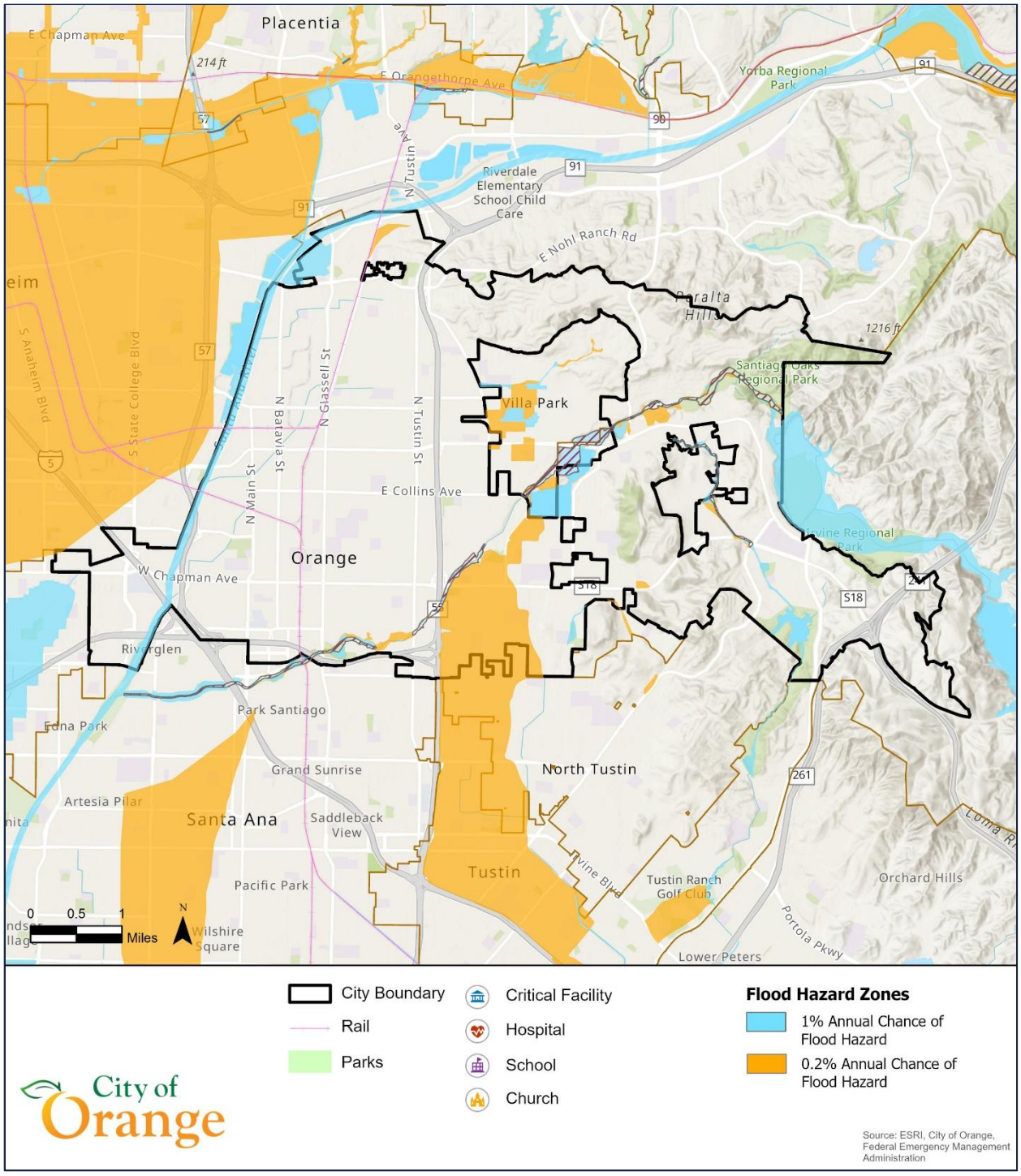


Figure 4-15: City of Orange 100/500 Year Flood Zones

History

California has a chronic and destructive flood history. Out of 72 federally declared disasters in the state between 1950 and 2000, half were flood related. Orange and other cities in Orange County have suffered from significant flooding events over the years. Many of these events have been catalysts to changing the way communities address flood conditions and mitigation of impacts. A significant flood in 1938 within the County is considered to be the catalyst for the construction of the Prado Dam, which is now part of the Army Corps of Engineers flood protection program along the main stem of the Santa Ana River.

A Proclamation of the Existence of a Local Emergency in the City of Orange, Resolution No. 5858, was proclaimed on Tuesday, March 1, 1983, as a result of heavy rains caused flood conditions in portions of the City of Orange. In Orange County, the event killed more than 30 people and damaged various structures.

Table 4-10 identifies past flood events affecting Orange County from 1950 through 2025.

Table 4-10: Orange County Flood Events

Year	Disaster Declaration #	Event	Deaths and/or Injuries
1950	OCD 50-01	Flooding	9 deaths
1955	DR-47	Flooding	74 deaths
1958	-	Severe storms	13 deaths, multiple injuries
1969	DR-253	Severe storms	47 deaths, 161 injuries
1978	DR-547	Coastal storms, mudslides, and flooding	14 deaths, 21 injuries
1980	DR-615	Severe storms, mudslides, and flooding	N/A
1982-83	DR-677	Coastal storms, floods, slides, and tornadoes	N/A
1988	DR-812	Severe storms, high tides, and flooding	N/A
1992	DR-935	Snowstorm, heavy rain, high winds, flooding, and mudslide	5 deaths
1992	DR-979	Severe storm, winter storm, mud & landslides, and flooding	20 deaths, 10 injuries
1993	DR-1005	Fires, mud & landslides, soil erosion, and flooding	4 deaths, 162 injuries 2

Table 4-10: Orange County Flood Events			
Year	**Disaster Declaration #**	**Event**	**Deaths and/or Injuries**
1995	DR-1044	Severe winter storms, flooding, landslides, and mud flows	11 deaths
1995	DR-1046	Severe winter storms, flooding, landslides, and mud flows	17 deaths
1997	97-04	Flooding	N/A
1998	DR-1203	Severe storms	17 deaths
2008	DR-1577, GP2005-01	Severe storms	N/A
2005	DR-1585	Severe storms, flooding, landslides, and mud and debris flows	N/A
2010	DR-1952	Severe storms	N/A
2023	DR 4683	Series of Pacific Storms	N/A
2023	DR 4699	Severe Winder Storm	N/A
2024	DR 4769	El Nino Driven Floods	N/A

Extent

Flood events are measured by their likelihood of occurrence. For instance, a 100-year flood is a flood that has a 1 in 100 (1.0 percent) chance of occurring in any given year. A 500-year flood is a flood that has a 1 in 500 (0.2 percent) chance of occurring in any given year. The 100-year flood has been designated as the benchmark for major flood events. Thus 100-year floods are referred to as “base floods.”

Floodplains are areas that are prone to flooding and often experience frequent flooding. While it is possible for areas outside of these designated floodplains to experience flooding, the most likely locations to experience future flooding are low-lying areas near bodies of water. FEMA is the governmental body responsible for designating which areas of the United States can be classified as floodplains.

The three (3) most common designations are:

- Special Flood Hazard Area: The area within a 100-year floodplain.
- Moderate Flood Hazard Area: The area outside the 100-year floodplain but within the 500-year floodplain.
- Minimum Flood Hazard Area: The area outside of the 500-year floodplain.

The Federal Emergency Management Agency (FEMA) provides detailed maps and categories to help communities understand and manage their flood risk. These floodplain designations are crucial for City planning, construction, insurance, and emergency preparedness. **Table 4-9** shows these detailed floodplain categories. FEMA classifies Orange under five (5) floodplain categories: A, AE, and X; the location of these floodplains can be seen on the FEMA Flood Hazard Zone Maps.

Table 4-9: FEMA Floodplain Categories

Category	Description
A	Within a 100-year floodplain, but the water height of the 100-year flood is not known.
A1-30 or AE	Within a 100-year floodplain and the water height of the 100-year flood is known.
AO	Within a 100-year floodplain, and the water height of the 100-year flood is between one and three feet (3 ft.) but not specifically known.
A99	Within a 100-year floodplain, it is protected by flood protection infrastructures such as dams or levees.
AH	Within a 100-year floodplain, and the water height of the 100-year flood is between one and three feet (3 ft.) and is specifically known.
AR	Within a 100-year floodplain, it is protected by flood protection infrastructure that is not currently effective but is being rebuilt to provide protection.
V	Within a 100-year floodplain for coastal floods, but the height of the flood is not known.
V1-30 or VE	Within a 100-year floodplain for coastal floods and the water height of the flood is known.
VO	Within a 100-year floodplain for shallow coastal floods with a height between one and three feet (3 ft.).
B	Within a 500-year floodplain, or within a 100-year floodplain with a water height less than one foot (found on older maps).
C	Outside of the 500-year floodplain (found on older maps).
X	Outside of the 500-year floodplain (found on newer maps).
X500	Within a 500-year floodplain or within a 100-year floodplain with a water height less than one foot (found on newer maps).
D	Within an area with a potential and undetermined flood hazard.
M	Within an area at risk of mudslides from a 100-year flood event.
N	Within an area at risk of mudslides from a 500-year flood event.
P	Within an area at risk of mudslides from a potential and undetermined flood event.
E	Within an area at risk of erosion from a 100-year flood event.

Probability of Future Occurrence

FEMA defines flood zones based on the probability of occurrence, expressed in a percentage of the chance of a flood of a specific extent occurring in any given year. For areas located within the 100-year flood zone, there is a 1% annual chance in a given year that this area will be inundated by flood waters. For areas located within the 500-year flood zone, this probability decreases to 0.2%. Due to the history of flooding events in the City, It is unlikely (10% chance) that a flood will impact the City of Orange annually.

Climate Change Considerations

Although Southern California is likely to experience a decrease in overall precipitation levels due to climate change, the region is also expected to see an increase in the number of extreme precipitation events. A meteorological phenomenon known as the "atmospheric river," a narrow stream of extremely moist air, is frequently responsible for the more intense storms that strike California. Atmospheric rivers generally deliver high levels of precipitation, up to 50% of the state's total precipitation in any given year.

Some recent studies indicate that atmospheric rivers may strengthen as a result of climate change. This is expected to lead to an increase in the number of storms caused by atmospheric rivers. Although there are no specific flooding projections for the City of Orange, flood events are expected to become more frequent, and it is possible that the areas subject to flooding could expand.

4.5.7 Landslide/Erosion

Hazard Description

Landslide and erosion hazards refer to the movement of soil, rock, and debris down slopes due to natural forces such as gravity, water saturation, and seismic activity. Landslides occur when the stability of a slope is compromised, often by heavy rainfall, flooding, or earthquakes, causing large masses of earth material to slide or flow downhill. Erosion, on the other hand, is the gradual wearing away of soil and rock from the earth's surface, typically caused by water, wind, or ice. Both hazards can lead to significant property damage, infrastructure disruption, and even loss of life, especially in areas with steep slopes, unstable soils, or where vegetation has been removed.

In regions like Orange County, landslides are most likely during and after periods of intense rainfall or following seismic events, as saturated soils lose cohesion and become prone to movement. Erosion can also increase landslide risk by destabilizing slopes and removing support from the base of hillsides. While landslides are relatively uncommon in Orange, they remain a concern due to the potential for sudden, destructive events that can threaten communities, roads, and utilities.

Some soil materials, such as clay minerals, can absorb water, resulting in a reduction of shear strength. The force of gravity can cause landslides when the shear strength of saturated clay is reduced below its minimum stability threshold. Earthquake-induced landslides of steep slopes can occur in either bedrock or soils. Areas at risk from landslides typically have steep slopes (15% or greater), unstable rock or soil characteristics, or other geologic evidence of instability.

Location

The City is located along the foothills of the Peralta Hills. These hills are known for steep topography which can be susceptible to landslides during periods of precipitation or earth movement. **Figure 4-16** illustrates the California Geological Survey Landslide Susceptibility Data in Orange.

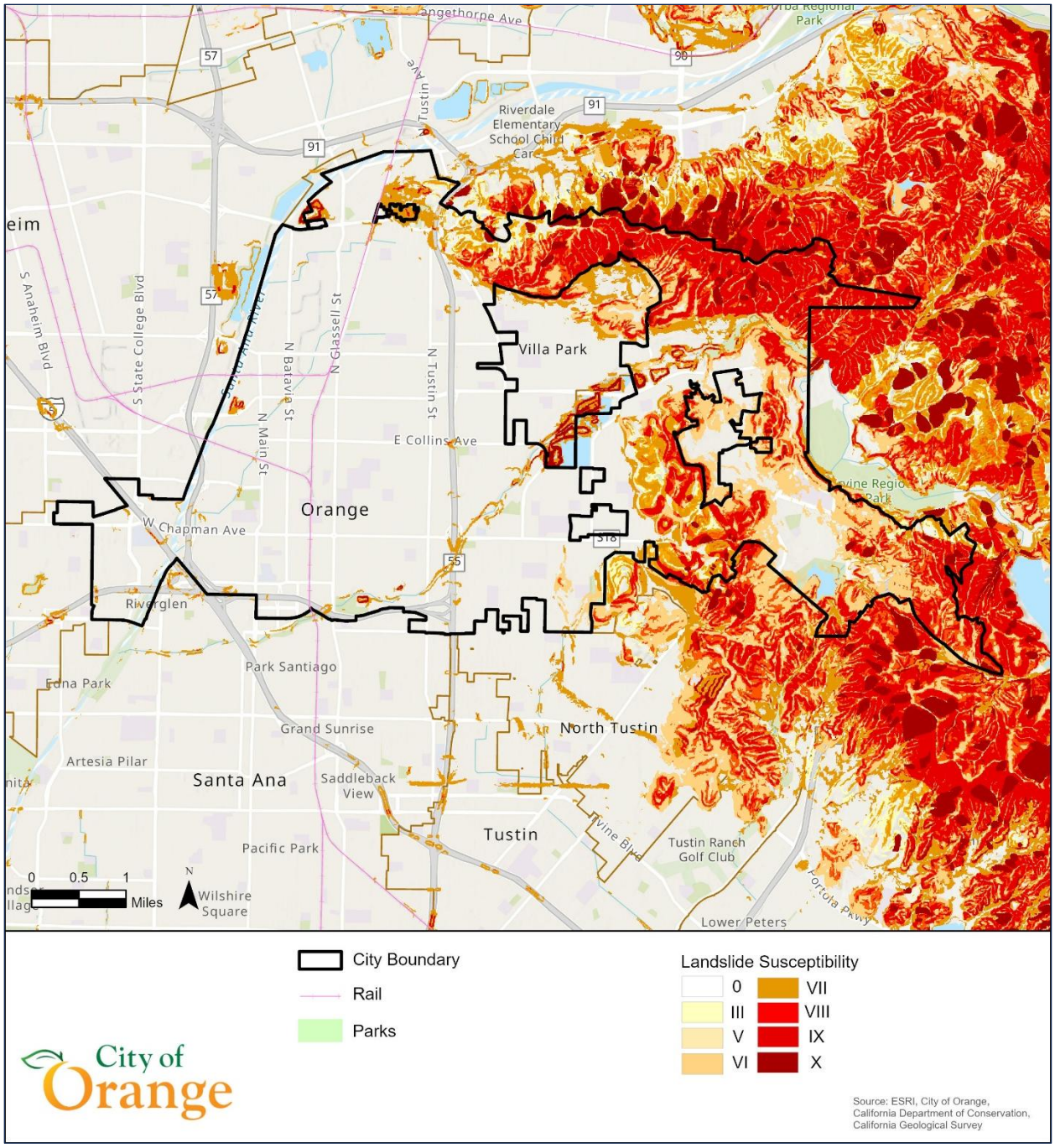


Figure 4-16: Landslide Susceptibility Areas

History

The Vista Royale Drive neighborhood experienced landslides in April 1999. The Vista Royale neighborhood was developed in the late 1980s in the foothills east of the Newport-Costa Mesa Freeway. The City of Orange proclaimed a local emergency April 6, 1999, due to earth movement in Vista Royale Drive, Resolution No. 9094. On May 10th, five homes within the area were evacuated in the Vista Royale area due to the necessity to discontinue water and sanitation service to these homes and the continuing land movement, Resolution No. 9113. On May 24, 1999, an evacuation was ordered to protect the health and safety of the residents in the area. Resolution No. 9131. The local emergency was terminated July 24, 2001.

Extent

Landslides are not common in Orange but can occur. They are most likely to occur during and immediately after storms when water saturation of the soil is at highest levels or during a significant earthquake.

There is no standardized classification for size or damage of landslides. The National Atmospheric and Space Administration (NASA) uses these definitions based on the exponential increase in the mass of the landslide:

- **Small:** Less than 10 cubic meters of debris. These minimally impact infrastructure, and roads though may still hold enough mass to kill a human.
- **Medium:** Between 10 and 1,000 cubic meters of debris. These can block roads for days, damage houses and facilities, and easily kill humans.
- **Large:** Between 1,000 and 100,000 cubic meters of debris. Often cover wide areas with substantial impact to roads and infrastructure, likely displacing people and causing tens to hundreds of casualties.
- **Very Large:** Between 100,000 and 1,000,000 cubic meters of debris. These landslides cover extremely large areas that can cover entire towns and neighborhoods.
- **Catastrophic:** Over 1,000,000 cubic meters of debris. Multiple towns, neighborhoods, and boroughs may be impacted or completely covered. Fatalities might be over 1,000.

A statewide analysis of landslide susceptibility was conducted by the California Geological Survey using a combination of regional rock strength and slope data to create classes of susceptibility (Figure 4-17).

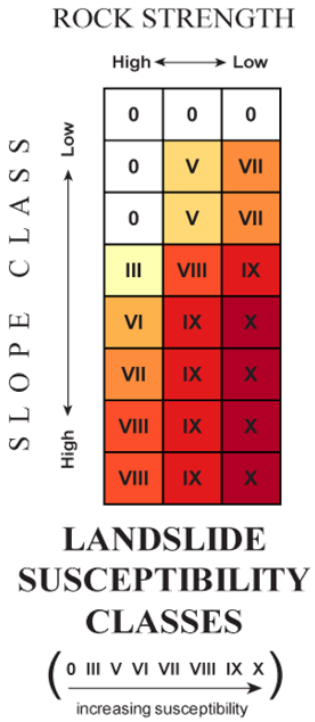


Figure 4-17: Landslide Susceptibility Areas

Probability of Future Occurrence

Although it is not a significant risk to the city, landslides can occur during periods of extreme weather or after a large earthquake. FEMA's risk index currently lists Orange County as Very High. In the City of Orange, there is a 10% chance that a landslide may occur withing the City annually.

4.5.8 Pandemic

Hazard Description

Widespread public health emergencies, referred to as pandemics, occur when a disease emerges to which the population has little immunity. Public health experts worry about a pandemic caused by a disease that spreads among species. Depending on the nature of such a disease, between 25 and 35 percent of the population can become ill. This level of disease activity would disrupt all aspects of society and severely affect the economy. The COVID-19 pandemic is well known, and the 20th century saw three significant pandemics, the most notable of which was the 1918 Spanish influenza pandemic that was responsible for 20 to 40 million deaths around the world.

Vaccines, antibiotics, and improved living conditions resulted in dramatic declines in communicable diseases in the latter part of the 20th Century. However, infectious diseases have become an increasing threat to all persons in Orange County due to a variety of factors such as:

- **Population growth** – Overcrowding, aging, migration
- **Methods of food production** – Large scale, wide distribution, importation
- **Environmental changes** – Drought, encroachment of humans in wild areas, global warming
- **Microbial adaptation** – Resistance to antibiotics, re-assortment of genetic material
- **Changes in health care** – Drugs causing immunosuppression, widespread use of antibiotics
- **Human behavior** – Travel, diet, sexual behavior, compromised immune systems

The Orange County Health Care Agency is responsible for public health in the County and City of Orange. The City will coordinate with the Orange County Health Care Agency during a public health emergency, whether in the City or throughout the county. The Orange County Health Care Agency will serve as the lead agency for a pandemic response in Orange to ensure that:

- Planning efforts are consistent throughout the county
- Official information is provided to cities in a timely manner
- Pharmaceutical distribution is conducted across the county

Outbreaks of infectious diseases following floods, tornados, earthquakes, and other disasters are common in the developing world but are rare in developed countries. Most post-disaster diseases are produced by poor sanitation, a lack of safe drinking water and contaminated food.

Below are the known risks to the City:

Corona Viruses /SARS

COVID-19 is spread by a coronavirus. Coronaviruses cause a large percentage of colds and upper respiratory infections. Severe acute respiratory syndrome (SARS) is a viral respiratory disease caused by a SARS-associated coronavirus. It was first identified at the end of February 2019 during an outbreak that emerged in China and spread to four other countries.

Influenza

Flu epidemics and pandemics occur routinely, typically in the fall and winter. Because flu seasons fluctuate in length and severity, a single estimate cannot be used to summarize influenza-associated deaths. The U.S. Centers for Disease Control and Prevention (CDC) estimates that from the 1976-1977 flu season to the 2006-2007 season, flu-associated deaths ranged from a low of about 3,000 to a high of about 49,000.

Insect/Tick-Borne Disease

Insects such as mosquitos and ticks can transmit a variety of diseases. Diseases that can be contracted through a tick bite include Lyme disease, Malaria, West Nile virus, Zika virus.

Plague

Plague is caused by the bacteria Yersinia pestis, a zoonotic bacterium usually found in small mammals and their fleas. Plague is transmitted between animals and humans by the bite of infected fleas, direct contact with infected tissues, and inhalation of infected respiratory droplets. There are two primary clinical forms of plague infection: bubonic and pneumonic. Bubonic plague is the most common form and is characterized by painful swollen lymph nodes or 'buboes.'

Plague can be a very severe disease in people, with a case-fatality ratio of 30% to 60% for the bubonic type and is always fatal for the pneumonic kind when left untreated.

Anthrax

Anthrax is a serious infectious disease caused by gram-positive, rod-shaped bacteria known as Bacillus anthracis. Although it is rare, people can get sick with anthrax if they come in contact with infected animals or contaminated animal products. Anthrax has the potential for and has been used as a biological weapon.

Hemorrhagic Fevers

Viral hemorrhagic fevers are a group of illnesses caused by several distinct families of viruses. In general, the term “viral hemorrhagic fever” is used to describe a severe multisystem syndrome. Characteristically, the overall vascular system is damaged, and the body’s ability to regulate itself is impaired. These symptoms are often accompanied by hemorrhage (bleeding); however, the bleeding is itself rarely life-threatening. While some

types of hemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease. Hemorrhagic fevers include Ebola and Yellow Fever.

Location

Pandemics occur worldwide. Smaller-scale public health incidents or epidemics may be localized, such as Zika and Measles. The entire City is susceptible to pandemics and local public health hazard incidents.

History

Orange County has been included in federal disaster declarations or state emergency proclamations related to Public Health Incidents. The most recent was the COVID-19 pandemic. The Orange County Health Alert Network issued the following recent public health alerts:

- **February 4, 2025** – OC Health Care Agency (HCA) issues a health alert for HIV, Syphilis and Hepatitis C among people experiencing homelessness.
- **December 6, 2024** – HCA issues alert because a traveler came back to Orange County with Measles.
- **November 26, 2024** – HCA identified the first case of Trichophyton Mentagrophytes in Orange County.
- **November 20, 2024** – HCA notified of seven confirmed cases of Legionnaire's Disease in Northwestern Westminster.
- **September 9, 2024** – 25 cases of Dengue Virus identified in Orange County.
- **August 28, 2024** – HCA announced that a resident of Huntington Beach has tested positive for West Nile Virus Infection.
- **May 10, 2024** – Local Outbreak of Hepatitis A among Persons Experiencing Homelessness
- **July 31, 2024** – HCA announces a case of Measles in an adult who traveled to Orange County.
- **May 16, 2024** – HCA announces a Ciprofloxacin-Resistant Neisseria Meningitidis.
- **April 9, 2024** – The CDC released an advisory related to the investigation and response to confirmed human infection with highly pathogenic avian influenza.
- **November 28, 2023** – OC Health Care Agency announced the increasing amount of cases of COVID-19, Respiratory Syncytial Virus, and Influenza disease.

Extent

The World Health Organization pandemic phases were developed in 1999 and revised in 2005. The phases are applicable to the entire world and provide a global framework to aid countries in pandemic preparedness and response planning. Phases 1-3 correlate with

preparedness, including capacity development and response planning activities, while Phases 4-6 clearly signal the need for response and mitigation efforts. Below is a description of each phase.

- **Phase 1:** no viruses circulating among animals have been reported to cause infections in humans.
- **Phase 2:** an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is therefore considered a potential pandemic threat.
- **Phase 3:** an animal or human-animal influenza virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. However, limited transmission under such restricted circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.
- **Phase 4:** is characterized by verified human-to-human transmission of an animal or human-animal influenza virus able to cause "community-level outbreaks". The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk of a pandemic. Any country that suspects or has verified such an event should urgently consult with WHO so that the situation can be jointly assessed and a decision made by the affected country if implementation of a rapid pandemic containment operation is warranted. Phase 4 indicates a significant increase in risk of a pandemic but does not necessarily mean that a pandemic is a forgone conclusion.
- **Phase 5:** is characterized by human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.

Probability of Future Occurrence

Although the timing of the outbreak of a pandemic or other public health emergency is difficult to predict, they will continue to occur continually and have a greater than 1% chance of occurring in any year.

Impacts of Climate Change

There are several ways that climate hazards aggravate infectious diseases, both directly and indirectly. These include the slow rise in temperature; changes in environmental conditions that increase the dispersal of disease vectors such as mosquitoes, rodents, and ticks; and the sudden appearance of extreme events such as floods, which contaminate drinking-water sources and trigger the displacement of humans and animals, which can carry and transmit pathogens. According to the CDC, Climate Change, together with other natural and human-made health stressors, influences human health and disease in numerous ways. Some existing health threats will intensify, and new health threats will emerge.

4.5.9 Severe Weather (Sever Wind, Extreme Heat, Winter Storm)

Hazard Description

Severe Wind

Windstorms are generally short-duration events involving straight-line winds or gusts of over 50–60 mph, strong enough to cause property damage. Damage from such winds accounts for half of all severe weather reports in the lower 48 states. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. The Beaufort Wind Scale (**Table 4-11)** provides terminology and a description of potential wind impacts at different levels.

The following types of damaging winds represent a hazard within the planning area:

- **Santa Ana Winds** – In Southern California, strong, dry, gusty winds known as Santa Ana winds form when air from a region of high pressure over the desert region of the southwestern U.S. flows westward toward low pressure areas off the California coast. As the wind flows over the Sierra Nevada and Santa Ana mountains, dropping from high elevation to sea level, it becomes compressed and heats up, and its relative humidity drops. Gaps in mountains form wind tunnels that strengthen these winds as they pour warm air east to west through the canyons. Santa Ana winds may occur year-round but are most common from September through March. A Santa Ana wind event can yield sustained winds of 40 miles per hour; isolated wind gusts of over 80 miles per hour have been recorded.
- **Downdrafts** – A downdraft is a small-scale column of air that rapidly sinks toward the ground.
- **Downbursts** – A downburst is a strong downdraft with horizontal dimensions larger than 2.5 miles, resulting in an outward burst or damaging winds on or near the ground. Downburst winds may sometimes produce damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- **Microbursts** – Microbursts are small, concentrated downbursts that produce an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only five to ten minutes, with maximum wind speeds up to 168 mph.
- **Tornados** – Tornados are formed by the turbulent mixing of layers of air with contrasting temperature, moisture, density, and wind flow. Tornados have occurred in the planning area but are not common.

Windstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, streetlights, and parks, and other damage. Wind speeds

as low as 32 mph can cause structural damage, and winds of 100 mph can destroy wood-frame structures. They can also cause direct losses to buildings, people, and vital equipment. There are direct consequences to the local economy resulting from windstorms and the associated physical damage and interrupted services.

Extreme Heat

In most of the United States, extreme heat is defined as a period (two to three days) of high heat and humidity with temperatures above 90°F. In extreme heat, evaporation is slowed, and the body must work extra hard to maintain a normal temperature, which can lead to death by overworking the human body. Extreme heat can cause heat exhaustion, in which the body becomes dehydrated, resulting in an imbalance of electrolytes. Without intervention, heat exhaustion can lead to collapse and heatstroke. Heatstroke occurs when perspiration cannot occur, and the body overheats. Without intervention, heatstroke can lead to confusion, coma, and death.

Extreme heat often results in the highest number of annual deaths among all weather-related hazards. Older adults, children, and sick or overweight individuals are at greater risk from extreme heat. According to the California Climate Adaptation Strategy, heat waves have claimed more lives in California than all other declared disaster events combined. It can take several days of oppressive heat for a heat wave to have a significant or quantifiable impact. Heat waves do not strike victims immediately, but their cumulative effects slowly cause harm to vulnerable populations.

Excessive heat is the primary weather-related cause of death in the United States, claiming over 100 lives each year. In a 30-year record of weather fatalities across the nation (1990-2019), excessive heat claimed more lives each year than floods, lightning, tornados, and hurricanes (Erdman 2021). Extreme heat events do not typically impact buildings; however, losses may be associated with the urban heat island effect and overheating of heating, ventilation, and air conditioning systems. These extreme heat events can lead to drought, impact water supplies, and lead to an increase in heat-related illnesses and deaths.

Legislation has been introduced in California to rate and name heat waves. The categorization would help communities take measures to reduce the number of heat-related fatalities (Washington Post 2021).

Winter Storm

During severe weather events such as rainfall and thunderstorms, rain can fall at such a high rate that it cannot drain away fast enough. The resulting heavy rain can cause flooding, leading to inundation and potential damage to buildings, road networks, public areas, utilities, and other critical pieces of infrastructure. In California, heavy rainfall events are often short, intense bursts of rain, but in some cases, heavy rain can persist for multiple days.

Location

Extreme weather events have the potential to happen anywhere in the planning area. Wind events are most damaging to areas where trees and power lines can be knocked down. Extreme heat events may be exacerbated in the City where reduced air flow, reduced vegetation, and temperatures that are several degrees higher than in surrounding less urbanized areas. Additionally, Extreme Heat can lead to loss of power in the planning area. Winter storms can impact the entire planning area, bringing heavy rain which can cause localized flooding.

History

Table 4-11 summarizes search results from the National Center for Environmental Information Storm Events Database for Orange County storm events over the 20-year period from 2002 through 2025. Based on these results, wind events are likely to happen every year, significant heat events occur multiple times a year. Orange has not been included in any federal disaster declarations or state emergency proclamations related to Extreme Weather.

Table 4-11: Orange County Severe Weather Events, January 2002 – August 2025

Event Types Include	Total Number of Events
High Wind, Thunderstorm Wind, Strong Wind, Tornado	423
Excessive Heat, Heat	10
Heavy Rain, Lightning, Winter storm	15

Extent

Windstorms

Generally, winds are measured using the Beaufort Wind Scale, developed in 1805, which categorizes wind events on a force scale from “0” to “12” using their speed and impacts. Any wind classified as force nine or above is generally considered a severe wind event. **Table 4-12** identifies the Beaufort Wind Scale, which classifies wind events in detail. The City of Orange has experienced category “9” winds but has the potential to experience category “11” winds.

Table 4-12: Beaufort Wind Scale

Force	Speed (mph)	Description
0	0 to 1	Calm: Smoke rises vertically

Table 4-12: Beaufort Wind Scale		
Force	Speed (mph)	Description
1	1 to 3	Light air: The direction of the wind is shown by smoke drift but not wind vanes.
2	4 to 7	Light breeze: Wind is felt on the face, leaves rustle, and wind vanes are moved.
3	8 to 12	Gentle breeze: Leaves and small twigs are in motion, and light flags are extended.
4	13 to 18	Moderate breeze: Dust and loose paper become airborne, and small branches are moved.
5	19 to 24	Fresh breeze: Small trees begin to sway
6	25 to 31	Strong breeze: Large branches are in motion, and using an umbrella becomes difficult.
7	32 to 38	High wind: Whole trees are in motion and walking against the wind can be hard.
8	39 to 46	Strong wind: Walking is difficult, and twigs break off trees.
9	47 to 54	Severe wind: Slight structural damage.
10	55 to 63	Storm: Trees are uprooted and considerable damage to structures.
11	63 to 72	Violent storm: Widespread damage.
12	73 and above	Hurricane: Devastating damage.

Source: https://www.weather.gov/mfl/beaufort

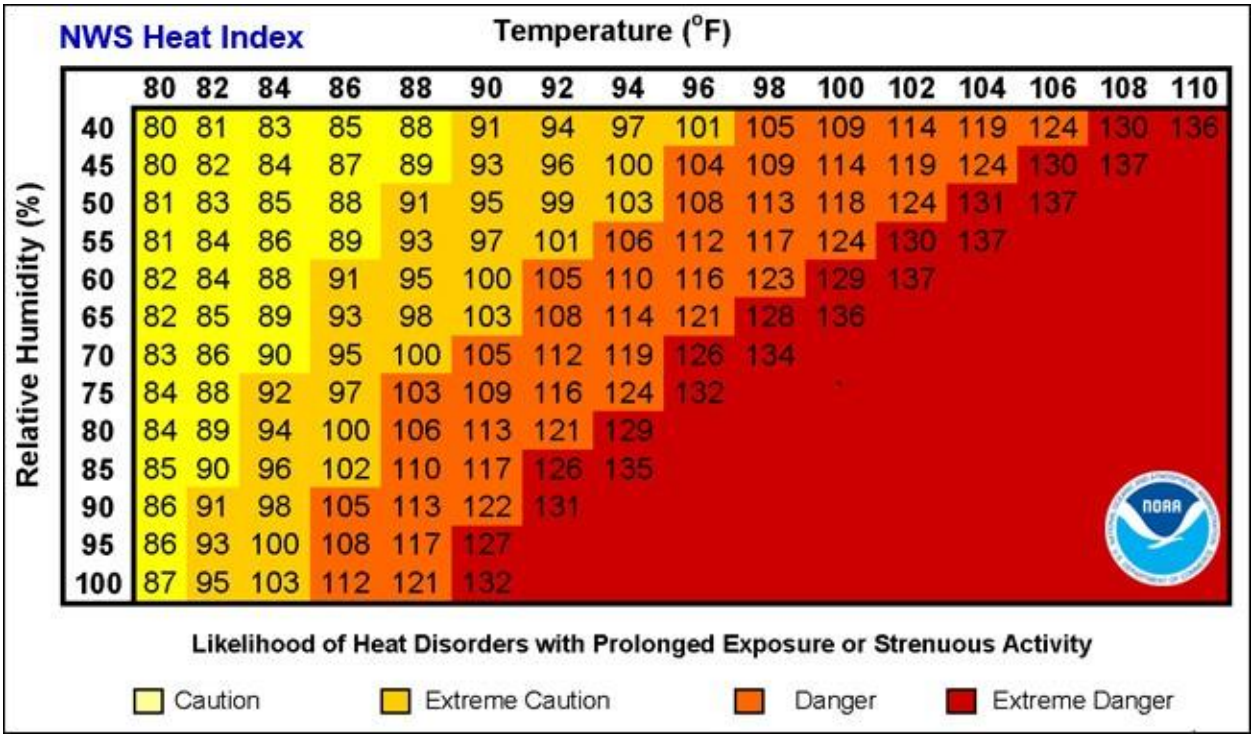
Extreme Heat

Extreme heat events will feel different from region to region since different areas have different historic high temperatures. For example, an extreme heat day on the coast will feel different than an extreme heat day in the High Desert. The reason for this is how humidity affects the perceived heat that people feel. Humid conditions will make a day feel hotter than non-humid conditions, even though the temperature may be the same. The difference between the perceived and actual temperatures is known as the "heat index." To illustrate the effect of the heat index, a 90-degree day with 50% humidity feels like 95°F, whereas a 90°F Day with 90% humidity feels like 122°F. **Figure 4-18** illustrates the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service Heat Index.

Extreme heat events are not limited to any part of the City. They occur with the same intensity and duration at the same time across all locations in Orange. For Orange, an extreme heat day involves a temperature that exceeds *100°F*. These thresholds are based on a 2% probability event. The City of Orange has experienced Heat Advisories but has the potential to experience Excessive Heat Watches do to climate change. Below are the

three related heat advisories released by the National Weather Service.

- **Extreme Heat Warning**—Take Action! An Extreme Heat Warning is issued when extremely dangerous heat conditions are expected or occurring. Avoid outdoor activities, especially during the heat of the day. If you must be outside, be sure to drink plenty of water and take frequent breaks in the shade. Stay indoors in an air-conditioned space as much as possible, including overnight. Check on family and neighbors.
- **Extreme Heat Watch**—Be Prepared! An Extreme Heat Watch is issued when conditions are favorable for an extreme heat event but its occurrence and timing is still uncertain. Plan to suspend all major outdoor activities if a warning is issued. If you do not have air conditioning, locate the nearest cooling shelter or discuss staying with nearby family or friends who have air conditioning.
- **Heat Advisory**—Take Action! A Heat Advisory is issued for dangerous heat conditions that are not expected to reach warning criteria. Consider postponing or rescheduling outdoor activities, especially during the heat of the day. If you must be outside, be sure to drink plenty of water and take frequent breaks in the shade. Stay in a cool place, especially during the heat of the day and evening.



Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Figure 4-18: NOAA's National Weather Service Heat Index

Winter Storm

California's precipitation varies from year to year, depending on how much moisture the state receives from atmospheric rivers. Atmospheric rivers are corridors along which wet

air travels from the tropics to continents. When the moisture arrives in California, it may precipitate as rain or snow. One of California's most known atmospheric rivers is the "Pineapple Express," which brings moist air from the ocean surrounding Hawaii to California. An immense amount of moisture may be transported along the atmospheric rivers that cross over California during certain years, leading to severe rain.

Another weather phenomenon influencing rainfall in southern California is "El Niño," officially referred to as the "Southern Oscillation" or "El Niño-Southern Oscillation (ENSO)." ENSO can cause increased rainfall, particularly during the winter months, caused by warming of the surface of the eastern tropical Pacific Ocean, leading to the evaporation of warm, moist air into the atmosphere. Winds bring this moisture to the eastern Pacific and the American continents, where it falls as rain. ENSO does not always lead to increased rainfall by default, but in general, it can increase the chances of winter with higher-than-usual precipitation.

Rain events are usually measured by the amount of precipitation that falls. **Table 4-13** categorizes rain events by the amount of precipitation per hour. The City of Orange experiences Heavy Rain Annually but has the potential to experience Heavy Showers.

Table 4-13: Measuring Heavy Rain Events

Rain Type	Description
Heavy Rain	More than 4 mm per hour but less than 8 mm per hour
Very Heavy Rain	Greater than 8 mm per hour
Moderate Shower	Greater than 2 mm, but less than 10 mm per hour
Heavy Shower	Greater than 10 mm per hour, but less than 50 mm per hour
Violent Shower	Greater than 50 mm per hour

Source: https://water.usgs.gov/edu/activity-howmuchrain-metric.html

Probability of Future Events

Based on history, extreme weather events, including Santa Ana winds or microburst tornadic activity can be expected, perhaps annually, across widespread areas of Orange County. In the U.S., average surface temperatures have risen more quickly since the late 1970s (0.36 to 0.55 degrees F per decade), with seven of the top 10 warmest years on record since 1998. This will lead to more days of extreme heat every year.

There is no indication that severe weather (Severe Wind, Extreme Heat, Winter Storm) will abate either in Orange or the greater region of Southern California in the future. While Orange may experience prolonged periods of dry or wet years, all expectations are that the probability Orange will experience a severe weather event (Severe Wind, Extreme Heat, Winter Storm) in the next year is likely (75% Chance) and is anticipated to increase

in the future.

Impact of Climate Change

Climate change is a key driver of severe weather events, including extreme heat and winter storms. Climate change has led to an increase in the earth's surface temperature which has caused hotter days and warmer nights. Winter storms have the possibility of becoming more frequent with the climate temperatures increasing, and the atmosphere becoming more convective.

4.5.10 Tree Mortality

Hazard Description

Between 2012 and 2019, California experienced an unprecedented drought. The drought, combined with the increased infestation of native bark beetles and record temperatures, contributed to the death of millions of trees across California. Dead or dying trees are subject to sudden unpredictable falling or dropping heavy limbs. This can happen anytime but is mor prevalent during high winds and/or saturation of soils from heavy or extended rainfall. Falling trees or limbs can cause injury or death, as well as damage to private and public structures, including power and communications line, posing secondary hazards to persons. Dead trees also pose fire hazards in both urban and wildland urban interface areas.

During severe weather or earthquake events, fallen trees or limbs may also block roadways impeding emergency vehicles, and/or emergency evacuations. Fallen trees may also block drainage channels causing local flooding during heavy rains.

The primary threats to trees are pests and disease. Common causes of tree mortality in southern California include Sudden Oak Death, Dutch Elm Disease and Fire Blight. Boring pests such as bark and wood boring beetles.

Benefits of Trees in Urban Areas

The urban forest provides multiple benefits to the urban environment and population. These include:

- **Economic**: Trees increase property values, and their maintenance provides jobs for landscapers and arborists. Shade trees reduce energy costs for cooling residential and commercial buildings in summer and can reduce winter heating costs by reducing wind chill. Shade trees can also help to extend the life of bituminous pavements in streets and parking lots.
- **Environmental**: Trees absorb carbon and other pollutants from the air, improving air quality.
- **Health**: By reducing pollutants in the ambient air trees contribute to making the air we breathe healthier. Tree canopies along streets and trails and in public parks encourage people to participate in outdoor recreation, improving physical health. And by creating pleasing environment, trees contribute to improved mental and emotional health.

Location

Orange is fortunate to have a vibrant urban forest of multiple tree varieties including Liquidambar, Southern Magnolia, and Canary Island Pine. The West Coast Arborist maintains a tree database which shows an inventory of neatly 25,000 trees in the City of

Orange. Locations include:

- Street Trees
- Parks, Trails and Public Open Space
- Private Property

History

The City has long recognized threats to tree mortality and in 1999 adopted a Street Tree Master Plan to provide guidance for the planting and removal of street trees. The City annually budgets funds to replant about 600 trees a year on public property, parks, and rights-of-way on an on-going basis.

Extent

There is no recognized scale to outline or comprehensively assess the impacts of tree mortality in the City of Orange. The absence of such a scale means that while threats to tree health are city-wide and affect both public and private property, the impacts are not systematically measured or categorized in an official manner within the city's available resources.

Regulatory Context

The City has adopted a Street Tree Ordinance and a Tree Preservation Ordinance as part of the City of Orange Municipal Code. The Street Tree Ordinance has clear specifications and requirements for the planting, removal and maintenance of trees and shrubs. The Tree Preservation Ordinance provides protection for healthy, mature trees on private property and provides criteria under which trees may be removed.

The City will also continue to enforce its Street Tree Ordinance and Tree Preservation Ordinance as part of the City of Orange Municipal Code. The Street Tree Ordinance has clear specifications and requirements for the planting, removal and maintenance of trees and shrubs. The Tree Preservation Ordinance provides protection for healthy, mature trees on private property and provides criteria under which trees may be removed. The Street Tree Master Plan, Street Tree Ordinance, and Tree Preservation Ordinance will help preserve and manage the City's urban forest and maintain the City's Tree City U.S.A. status.

Probability of Future Events

Tree mortality poses an on-going threat throughout California and including the City of Orange. Pests, disease, severe weather, vandalism, fires, and traffic accidents will continue to cause destruction of trees for the foreseeable future.

Impacts of Climate Change

Extended periods of drought increase damage to trees up to and including mortality. Extended periods of heavy rain may saturate soils weakening root structures. The warming climate also makes trees more vulnerable to attacks from insects, other pests, and disease.

4.5.11 Human Caused Hazards

Cyber Security Threats

Hazard Description

Cyberterrorism and cyberattacks are terms for cybersecurity threats that are often used interchangeably, though they are not the same. All cyberterrorism is a form of cyberattack, but not all cyberattacks are cyberterrorism.

Public and private computer systems can experience a variety of cyberattacks, from blanket malware infection to targeted attacks on system capabilities. Cyberattacks specifically seek to breach information technology security measures designed to protect an individual or organization. The initial attack is followed by more severe attacks to cause harm, steal data or for financial gain. Organizations are prone to different types of attacks that can be automated or targeted.

Any facility that relies on computers, computer systems and programs for their operations could be a target. Generally, attacks last minutes to days, but large-scale events and their impacts can last much longer. As information technology continues to grow in capability and interconnectivity, cyber threats become increasingly frequent and destructive. Cyber threats differ by motive, attack type and perpetrator profile. Motives range from the pursuit of financial gain to political or social aims. Cyber threats are difficult to identify and comprehend. Types of threats include using viruses to erase entire systems, breaking into systems and altering files, using someone's personal computer to attack others, or stealing confidential information. The spectrum of cyber risks is limitless, with threats having a wide range of effects on the individual, community, organizational, and national threat. Below are a list of the most common threats.

Ransomware

The FBI defines ransomware as a type of malicious software, or malware, which prevents you from accessing your computer files, systems, or networks and demands you pay a ransom for their return. Businesses should have a business continuity plan in case of a ransomware attack.

Cyberterrorism

The FBI is the lead federal agency for investigating cyberterrorism. In order for a cyberattack to be considered terrorism, the attack must be premeditated and politically motivated against information, computer systems, computer programs, or data. "Cyberterrorism may be carried out by state and non-state actors which have the capability to steal, alter, or destroy the nations sensitive data and, in the worst of cases, to manipulate from afar the process control systems that are meant to ensure the proper functioning of portions of the nations' critical infrastructure" (FBI, The Cyber Threat and the FBI's Cyber Program). Critical infrastructure and the nation are becoming more vulnerable to

cyberattacks as their dependency on computer networks and systems grows.

Location

Since computers are so ubiquitous, a cyber threat could appear in virtually any part of the City. In extreme circumstances, a threat could impact the entire City. Cyber threats vary in length and severity of impact. A minor threat could cause computer systems to slow down for a few minutes and not behave as responsively. On the other hand, a major cyber threat could cause a complete shutdown of critical systems, including

History

Cyberattacks on U.S. companies occur daily, and the quantity and quality of information being hacked, stolen, destroyed, or leaked is becoming an increasing problem for consumers, government entities, and businesses.

The following list is of recent cyber-attacks that affected government agencies:

- **May 13, 2024** – The City of St. Helena detected unauthorized activity on their network. Based on the investigation, it was determined that an unauthorized third party accessed materials on the network containing personal information, including names, contact information, date of birth, and limited medical information.
- **April 2023** – The San Bernardino County Sheriff's Office reported a security breach that encrypted its systems and reduced operations for over two weeks. A member of the Sheriff's Office clicked on a phished link and downloaded ransomware, disrupting emails and dispatch computers. The ransom cost $1.1 million in cryptocurrency.
- **February 8, 2021** – A hacker exploited a vulnerability in a desktop sharing platform to access a water utility's treatment plant industrial control system. The hacker increased the quantity of chemicals used in the water treatment process to a dangerous level. An employee of the utility noticed inconsistencies and immediately reduced the chemical levels to normal and notified the IT department.
- **December 11, 2021** – UKG Kronos was a victim of a ransomware attack that incapacitated Long Beach Fire Department Staffing Program, Telestaff, for approximately two months.
- **April 30, 2018** – In Pasadena, City employee email accounts were compromised through a phishing scheme. Hackers used access to accounts to send out fraudulent emails to City contacts. The City immediately disabled accounts and changed passwords of all City employees and advised residents and associates to take caution when opening emails from City.
- **November 22, 2017** – 500 Los Angeles Superior Court employees received fraudulent emails leading to fake websites asking for account credentials. Less than a dozen employees fell for the phishing scam. A 31-year-old Texas resident was found to be responsible for the hacking.

- **December 2016** – A virus locked the Los Angeles Community College District's computer network as well as its email and voicemail systems. After consulting with cyber-security experts and law enforcement, the District paid $28,000 cyber-ransom in bitcoin. The district had a cyber-security insurance policy to cover such attacks.

those used by banks, healthcare institutions, universities, major businesses, and City governments.

Extent

The Index of Cyber Security (**Figure 4-19**) can be referenced to understand the status of cyber threats, which identifies the measure of perceived risk. Since 2015, this index has trended upward and appears to have doubled in this timeframe.

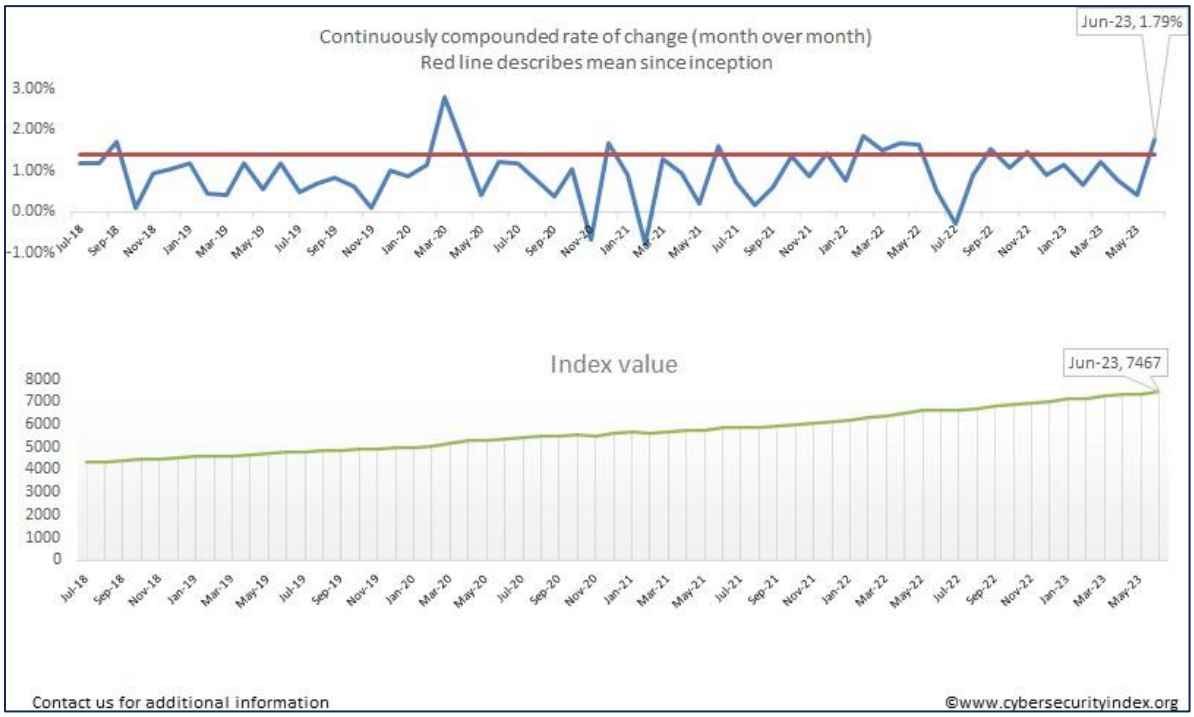


Figure 4-19: Index of Cyber Security

Cyber threats are not measured on any scale, but they can be assessed by determining the following:

- The type of incident (website defacement, denial of service, unauthorized surveillance)
- The use of malicious software
- The level of security countermeasures that failed to prevent the cyber threat.

- The duration of the cyber threat (a few hours, a few days, several weeks, etc.)

Possibility of Future Occurrence

Due to the integrated nature of technology into the everyday lives of Orange's residents, businesses, and government operations, it is possible that a cyber threat could emerge in the future. While no cyber threats are publicly known to have disrupted the City's normal operations in the past, the likelihood of a cyber threat affecting the residents, businesses, and/or governmental operations in the future is increasing.

Power Outage

Hazard Description

A power outage is the loss of the electricity supply to an area. In addition to natural hazards, power failure can result from a defect in a power station, damage to a power line or other part of the distribution system, a short circuit, or the overloading of electricity mains.

A power outage may be referred to as a blackout if power is lost completely or as a brownout if some power supply is retained, but the voltage level is below the minimum level specified for the system, and a short circuit indicates a loss of power for a short amount of time (usually seconds). Some brownouts, called voltage reductions, are made intentionally to prevent a full power outage.

Power outages may also be intentionally induced due to high power demand that exceeds supply or due to actions taken by utility companies to de-energize power lines when there is the possibility of energized power lines being downed during fire Red Flag warnings and causing fires.

Additionally, Southern California Edison, the City's electrical provider, can implement Public Safety Power Shutoffs (PSPS) as a precautionary measure implemented by utility companies to reduce the risk of wildfires during hazardous conditions, such as strong winds and high temperatures. Under these guidelines, utilities may proactively turn off electricity to certain areas when there is a significant threat that energized power lines could be downed and ignite fires. These shutoffs, while disruptive, are intended to protect public safety by preventing catastrophic events, especially in regions prone to wildfires. PSPS events can last from several hours to several days, depending on weather conditions and the time needed to inspect and restore power lines safely.

Location

Power outages can affect the entire City. It is most probable to affect certain portions of the City at a time. Those residents in the WUI area, are prone to experiencing PSPS events.

History

August 2020 saw the first California electricity providers institute rolling blackouts since 2001. Hundreds of thousands of people experienced brief power outages through the several evenings after the body that manages most of the state's electric utilities declared a Stage 3 emergency to help reduce stress on the larger grid. Electricity demand surged through the day as temperatures topped the triple digits in many parts of the state, and people cranked up fans and air-conditioning units to try to stay cool. The emergency order was rescinded before midnight, and power was fully restored to all affected households.

The 2011 Southwest blackout, sometimes referred to as the Great Blackout of 2011, was a widespread power outage that affected the San Diego–Tijuana area, southern Orange County, the Imperial Valley, Mexicali Valley, and Coachella Valley, and parts of Arizona. It occurred on Thursday, September 8, 2011, beginning at about 3:38 pm PDT and was the largest power failure in California history.

The 2000-2001 California electricity crisis brought to light many critical issues surrounding the State's power generation and distribution system, including its dependency on out-of-state resources. Although California has implemented effective energy conservation programs, the State continues to experience both population growth and weather cycles contributing to a heavy demand for power. The 2000 and 2001 blackouts occurred due to losses in transmission or generation and/or extremely severe temperatures that lead to heavy electric power consumption.

Extent

Power outages are typically measured by the number of customers without power. This number is two to three times lower than the number of people affected.

Probability of Future Occurrence

While the location, duration, and number of people affected cannot be predicted, power outages in the City service area are likely to occur on a continual basis with the likelihood of an incident greater than 25% in any year. The likelihood increases in areas where PSPS can occur.

Impact of Climate Change

Climate change may affect the number and severity of power outages. As hotter conditions result in more and longer Red Flag warnings and concomitant PSPS, more power outages will occur.

Regulatory Context

The California Public Utilities Commission (CPUC) plays a pivotal role in regulating privately-owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies. It ensures a safe, reliable utility service at reasonable rates and protects against fraud.

Hazardous Material Release – Pipeline Failure, Transportation Accidents, Oil Spills

Hazard Description

A hazardous material is any material that, due to its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released. Hazardous materials include but are not limited to hazardous substances, hazardous waste, and any material that a business or local implementing agency has a reasonable basis to believe would be injurious to the health and safety of people or would be harmful to the environment if released.

The LHMP does not focus on the hazards contained in everyday products but rather on the hazards associated with potential releases of hazardous substances from transportation corridors and fixed facilities within the City.

Exposure to hazardous materials can cause injury, illness, or death. Effects may be felt over seconds, minutes, or hours (short-term effects) or not emerge until days, weeks, or even years after exposure (long-term effects). Some substances are harmful after a single exposure of short duration, but others require long episodes of exposure or repeated exposure over time to cause harm.

Hazardous materials in the City service area primarily consist of paints, solvents, adhesives, gasoline, household cleaners, batteries, pesticides and herbicides. Public Works has various facilities that use chemicals that if not appropriately contained or during a natural hazard can potentially be released into the air. The toxicity of a specific substance is one important factor in determining the risk it poses, but other factors can be just as important, if not more so. Factors affecting the severity of hazardous material release include:

- Toxicity
- Quantity
- Dispersal characteristics
- Location of release in relation to population and sensitive environmental areas
- Efficacy of response and recovery actions

Mobile incidents include those that occur on a roadway or a railroad. These incident-related releases are dangerous because they can occur anywhere, including near human populations, critical facilities, or environmentally sensitive areas. Mobile incident-related releases can also be more difficult to mitigate because of the great area over which any given incident might occur and the potential distance of the incident site from response resources.

The release of hazardous substances from stationary sources can be caused by human error, equipment failure, intentional dumping, acts of terrorism, or natural phenomena. Earthquakes pose a particular risk because they can damage or destroy facilities containing

hazardous substances. The threat posed by a hazardous-material event can be amplified by restricted access, reduced fire suppression and spill containment capability, and cutoff of response personnel and equipment.

Location

The City, like many urban areas, has businesses that handle and store various hazardous materials essential for industrial, commercial, and public health applications. **Figure 4-20** contains an approximate location of each hazardous material location.

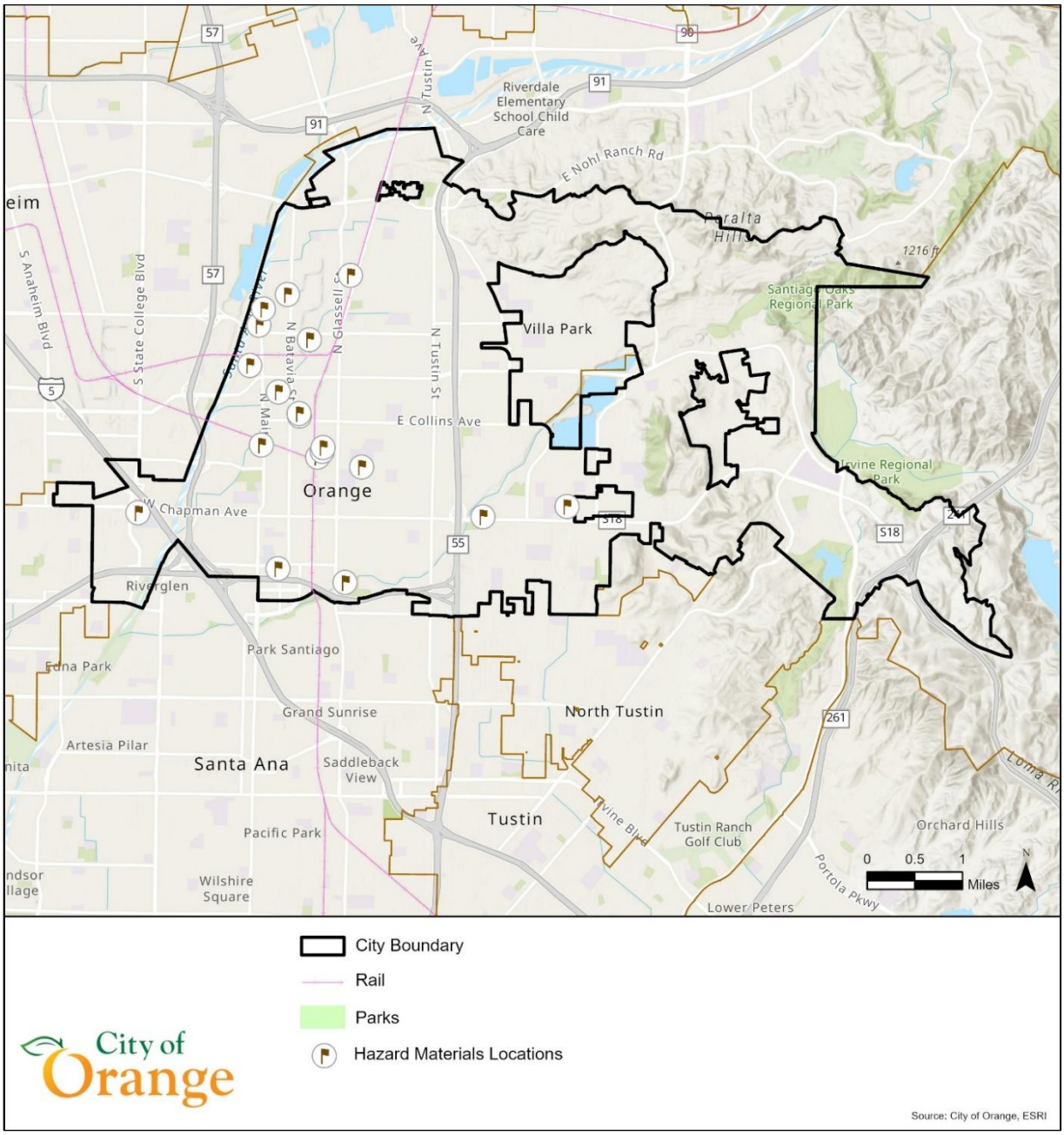


Figure 4-20: City of Orange Hazardous Materials Locations

History

Southern California, with its vast industrial landscape and densely populated urban areas, faces numerous environmental challenges, including the release of various hazardous materials. These releases can originate from industrial facilities, transportation accidents, and other sources, posing significant risks to public health and the environment. Below is a list of the most resent hazard materials released.

- **Aliso Canyon Gas Leak (2015-2016)** – The Aliso Canyon gas leak in Los Angeles County released massive amounts of methane, a potent greenhouse gas. The leak lasted several months, causing health problems for nearby residents and contributing to climate change.
- **Exide Technologies Plant (2013)** - The Exide Technologies battery recycling plant in Vernon was found to have released hazardous levels of lead and arsenic into the air and soil. This led to the plant's closure and extensive cleanup efforts to protect public health and the environment.
- **Refugio Oil Spill (2015)** - The Refugio Oil Spill off the coast of Santa Barbara impacted the region's environment. Thousands of gallons of crude oil spilled into the ocean, affecting marine life, coastal ecosystems, and local economies.

Extent

The extent of a hazardous material spill may vary from significant impacts causing injuries and evacuation to minor impacts requiring minimal cleanup. Hazardous materials releases can be harmful in the following ways:

- Chemical, biological, and radiological agents can cause significant health risks to those exposed to them; biological agents can be additionally dangerous if they are infectious. Flammable and explosive materials also present life safety concerns when exposed to heat.
- Oil spills can present an immediate fire hazard and can contaminate drinking water supplies. Any release of hazardous material requires a thorough and careful clean-up of the site and decontamination of those exposed. Clean-up and recovery are time and cost consuming.
- Delays caused by hazardous materials releases and the ensuing evacuation and cleanup processes could lead to significant economic losses due to traffic delays (mobile releases) or operational shut-down (fixed facilities).
- Overall, hazardous materials can cause death, serious injury, long-lasting health effects, and damage to buildings, the environment, homes, and other property.

Probability of Future Occurrence

Based on previous occurrences, the likelihood of small hazardous materials releases is high and can occur at any time anywhere in the City.

Regulatory Environment

To address the release of hazardous materials, Orange County has implemented several regulatory measures and public health initiatives. These efforts aim to minimize risks, ensure compliance with environmental laws, and promote community awareness.

- The South Coast Air Quality Management District (SCAQMD) is responsible for regulating air quality in the region. It sets emissions standards, monitors air pollution, and enforces regulations to reduce the release of hazardous air pollutants.
- The. Orange County Health Care Agency (HCA) works to protect public health by monitoring environmental hazards, conducting health assessments, and providing information to the community about potential risks and safety measures.
- The California Environmental Protection Agency (CalEPA) oversees environmental protection efforts statewide, including in Orange County. It enforces regulations related to hazardous waste, water quality, and toxic substances, and provides funding for cleanup and mitigation projects.

Terrorism

Hazard Description

Terrorism is the use or threat of force to achieve a particular social or political outcome. The goals of terrorism may sometimes be overturning a government, the reversal of a public policy, political prisoners' release, and other such motives. Acts of terror may overlap with acts of war or hate crimes. Generally, terrorism involves an attempt to kill or seriously harm people or disrupt civil society by destroying property or infrastructure, attacking government operations at all levels, interrupting essential public services, creating chaos, or a combination of some or all these goals. Firearms and explosives are the most common weapons used among terrorists. In extreme situations, terrorists may gain access to mass destruction weapons, including bioweapons, chemical agents, radioactive materials, or high-yield explosives. It should be noted that these events are infrequent. While incidents of terror caused by foreign individuals or groups receive significant media and public attention, most acts of terror in the U.S. have been caused by domestic terrorists.

Location

Acts of terrorism can occur anywhere, although public spaces and locations where many people congregate (parks, schools, places of worship, government facilities, shopping centers, and public gathering areas) are most common. Critical locations in Orange may include, shopping centers, governmental facilities (i.e., City Hall), colleges, medical facilities, parks, and large employers within the City. Acts of terrorism may be located at

the locations listed above; however, the perpetrators may also choose high-value targets such as electric-generating facilities, water treatment plants, dams or reservoirs, railroads, highways, and other facilities that could impact governmental operations and services.

History

The City has experienced two acts of terrorism/mass casualty incidents. One in March of 2021 and the other in December of 1997. The following acts of terrorism/mass casualty incident events have occurred in California and Orange County.:

- **August 2023** – On August 23, 2023, a Retired Ventura Police Sgt. John Snowling opened fire inside and outside the Cook's Corner bar, first targeting his estranged wife and then eight others.
- **March 2021** - On March 31, 2021, a mass shooting occurred at an office complex in Orange, California, United States. Four people were killed, including a child, and a fifth person was critically wounded
- **August 1999** – On August 10, 1999, an American white supremacist walked into the lobby of the Jewish Community Center in Granada Hills and opened fire with an Uzi sub machine gun, firing 70 bullets into the complex. The gunfire wounded five people.
- **December 1997** – In December 1997, a former employee returned to the Caltrans Maintenance Yard where he opened fire and killed 4 people and wounded 3 others.
- **July 2002** – A man opened fire at the ticket counter at Los Angeles International Airport, killing two people and injuring several others before being shot dead by security personnel.
- **May 2015** – Two Anaheim-based men were arrested at a Transportation Security Administration checkpoint at the Los Angeles International Airport who had reportedly sworn allegiance to the Islamic State of Iraq and Syria (ISIS). One of these men, Muhanad Badawi, was a student at Fullerton College.
- **December 2015** – A mass shooting and terrorist attack committed by a married couple who had reportedly sworn allegiance to ISIS killed 14 people at a medical facility in the City of San Bernardino.
- **April 2019** – The Poway synagogue shooting occurred on April 27, 2019, at Chabad of Poway synagogue in Poway, California on the last day of the Jewish Passover holiday, which fell on a Shabbat. Armed with an AR-15–style rifle, the gunman, fatally shot one woman and injured three other people, including the synagogue's rabbi.

Extent

Mass Casualty Incidents and acts of terrorism are typically measured by the fatalities, injuries, and destruction they cause, but there is no universally used scale for measuring these events.

Probability of Future Occurrence

Given that mass casualty incidents and acts of terrorism stem from a variety of factors: economics, societal pressures, mental health, global geopolitics, warfare, religion, etc. it is impossible to predict when and where an incident could occur. Community events, such as the street fair and car shows are particularly important. While important, it is anticipated that any future incidents would likely originate domestically and are less likely to attract the attention of international terrorist groups. Incidents of these types are more likely to be conducted by smaller organizations or individuals aligned with greater-known organizations, although the effects may be no less significant.

4.5.12 Infrastructure Failure (Building Collapse/Water System Failure)

Building Collapse

Hazard Description

A building collapse is the sudden structural failing, partially or entirely, of a building, threatening human life and health. When internal load-bearing structural elements fail, a building will collapse into itself, and exterior walls pulled into the falling structure. This scenario may be caused by construction activity, an earthquake or fire, and may result in a dense debris field with a small footprint. Alternatively, if an explosion or natural forces such as weather cause structural failure, the building may collapse in an outward direction, resulting in a less dense and more scattered debris field.

Location

The entire city has homes and structures that are capable of collapsing under extreme circumstances.

History

There have been no instances of building collapses in the City of Orange.

Extent

The severity of building collapse is influenced by the age and stability of the infrastructure. The City Planning Department regulates building codes and regulations to ensure safety and mitigate risks.

Probability of Future Event

Although there has not been a building collapse in the City of Orange. Aging infrastructure can lead to instability with the increase chance due to seismic hazards.

Water System Failure

Hazard Description

Water Systems failure is an undesirable or unintended event, occurrence, or situation involving the city's water infrastructure or the discontinuation or significant disruption of water services that could seriously compromise public safety. This infrastructure is a public utility infrastructure and, if compromised, would result in a temporary loss of essential function and/or services.

Location

The City has miles of water distribution lines and numerous facilities that treat and distribute potable water, which means a water infrastructure failure can happen anywhere in the City. Often these incidents are limited to a small, localized region City, but during a seismic event, it can potentially affect the entire City.

History

There has not been any long-term water system failure in the City.

Extent

The extent of a water system failure can vary significantly, from minor disruptions affecting small, localized regions to severe incidents that impact the entire city. In cases of minor failures, only a small portion of the water distribution network may be compromised, leading to temporary loss of service or reduced water pressure in isolated areas. However, during major events such as seismic activities, the entire water infrastructure could be at risk, resulting in widespread outages and significant disruptions to public safety and essential services. The severity of the impact is often influenced by the integrity of the aging water infrastructure, the preparedness of the city to handle such failures, and the speed at which the problem can be resolved. Failure to address these vulnerabilities can lead to long-term consequences for residents, businesses, and critical facilities that rely on a consistent water supply.

Probability of Future Event

Although there has not been a long-term water system failure in the City of Orange. Aging water infrastructure and the potential for terrorism and cyber-attack can increase the likelihood of this hazard impacting the City.

SECTION 5: RISK ASSESSMENT

5.1 Risk Assessment

A risk assessment involves evaluating vulnerable assets, describing potential impacts, and estimating losses for each hazard. The intention of a risk assessment is to help the community understand the greatest risks facing the City based on the hazard analysis. The risk assessment defines and quantifies vulne, buildings, critical facilities, and other assets at risk from hazards and is based on the best available data and the significance of the hazard. The risk assessment further examines the impact of the identified hazards on the City, determines which areas of the City are most vulnerable to each hazard, and estimates potential losses to City facilities for each hazard.

5.2 Populations At Risk

Residential population data for Orange was obtained from the State of California Department of Finance E-1 Population Estimates for Cities, Counties, and the State — January 1, 2022. The population is estimated to be 117,096. Everyone within the City limits is vulnerable to at least one of the hazards profiled in the plan. The level of risk to each hazard depends on the proximity from hazard zones. For example, the entire City is susceptible to the affects of earthquakes but only the east side of the city is susceptible to wildland fires.

5.3 Critical Facilities and Facilities of Concern

Critical facilities (CF) consist of properties and structures that play important roles in government operations and the services they provide to the community. Examples of CFs include local government offices and yards, community centers, public safety buildings like police and fire stations, and other properties a city has deemed essential for its operations. Critical Facilities may also serve dual roles if a city designates them as public assembly points during an emergency. Critical Facilities are often owned by the City, but some may also be owned and operated privately, such as some utilities and telecommunication infrastructure. Facilities of Concern (FOC) are similar to critical facilities; however, the City may not own them, or their purpose and function are not as important to the function of the City after a disaster. These facilities are identified to ensure the City understands their potential vulnerability to the hazards of concern.

The HMPC identified a total of 77 facilities (55 CFs and 22 FOC) in Orange. **Table 5-1** shows the number of CFs and FOC in each category, the total estimated replacement value for these facilities, and examples of the type of facility in each category. **Figure 5-1** shows the locations of the mapped CFs and FOC in Orange. It is important to note that water infrastructure, although included in the overall assessment, is not mapped in the LHMP for

security reasons.

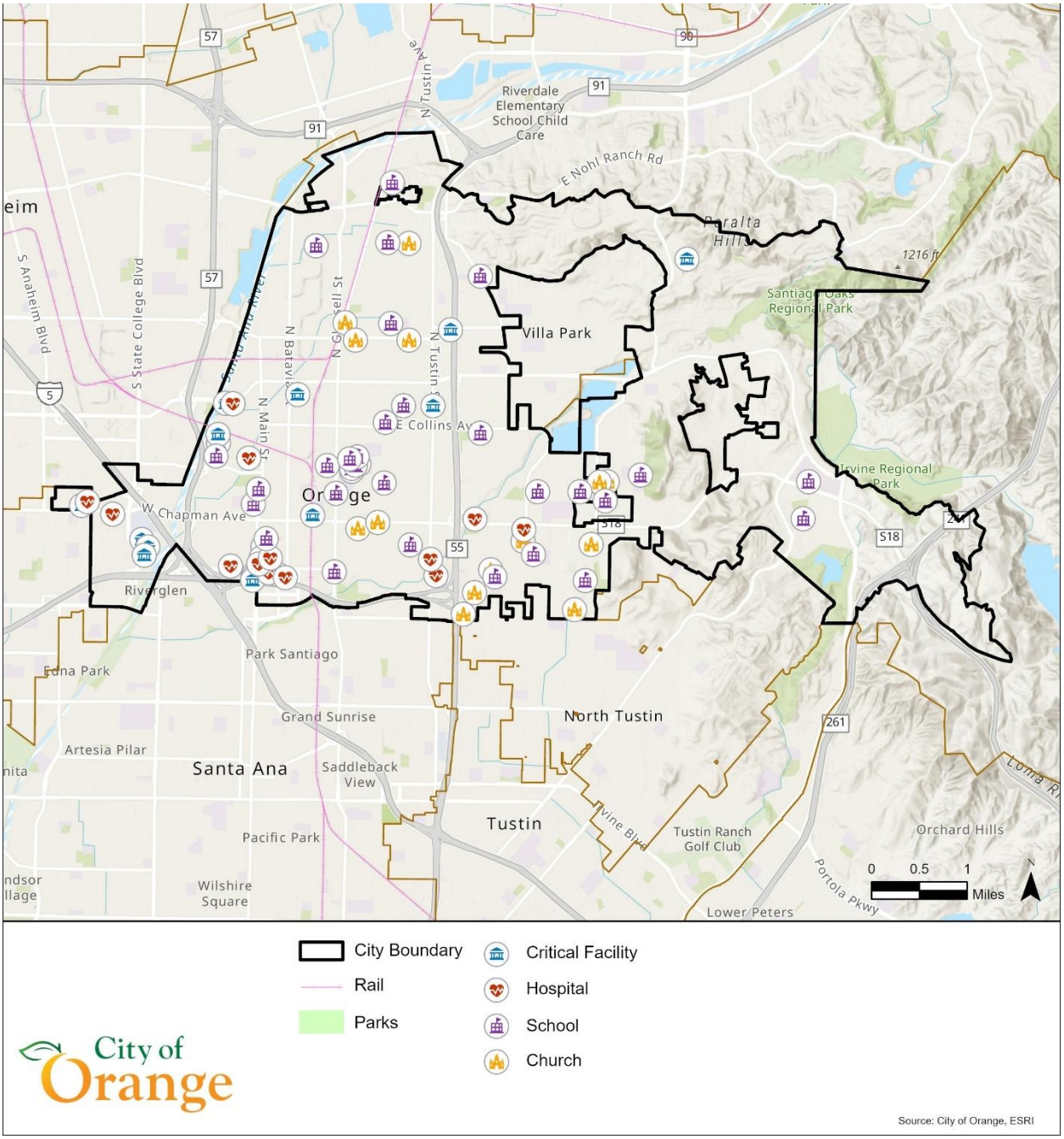


Figure 5-1: City of Orange Critical Facilities

The potential loss values identified in subsequent tables are based on the City's total insured value using the City's Insured Asset Inventory. It is intended to provide an estimate of the replacement cost if the property/structure is completely or severely damaged. The actual costs of repair could be smaller or larger than the provided estimate. Since the data comes from the City's Insured Asset Inventory, facilities not owned by the City will not

have a replacement value listed or be identified in the plan. Where this occurs, "N/A" has been used within the table.

Based on the available data provided by the City, a minimum of $237,597,614.00 worth of City-owned assets were analyzed. The total potential loss value of all City-owned and non-City-owned assets is much higher but is unknown due to data limitations.

The greatest potential for loss among City-owned assets comes from the Critical Facilities category, which includes but is not limited to government operation, city hall, police stations, and fire facilities throughout the City. The next critical facility category with the greatest potential for loss would be City owned community centers, parks, and libraries.

To better understand the magnitude of impacts, this plan identifies representative percentages of potential impact based on the total valuation of City assets. For planning purposes, we identified different tiers of impact that could occur. It is reasonable to assume that impacts would not exceed 50% of the total asset value city-wide during a single event. The following are parameters to help understand how much a proposed investment/improvement compares to the existing assets within the City:

- 1% Impact - $2,375,976.00
- 5% Impact – $11,879,880.00
- 10% Impact – $23,759,761.00
- 20% Impact - $47,519,522.00
- 50% Impact - $118,798,807.00

The possibility that all facilities will be completely damaged simultaneously is extremely rare. Based on the hazard, most impacts are anticipated to be isolated to certain locations. This estimate does not include the value of the City's underground infrastructure and surface drainage facilities. **Table 5-1** lists the number of facilities and their associated potential replacement values.

Table 5-1: Critical Facilities and Facilities of Concern in Orange

Category	# of Facilities - Critical	# of Facilities - Concern	Examples	Potential Loss
Government Operations, Emergency Operations	18	9	City Hall, City Hall Council Chambers, Corporate Yard, Fuel Storage Tanks, Police Facilities	$184,772,921.00
Water Infrastructure	28	0	Wells, Stations, Booster Stations, Pressure Reducing Systems, Water Treatment, Conveyance Systems	$24,022,124.00

Table 5-1: Critical Facilities and Facilities of Concern in Orange				
Category	**# of Facilities - Critical**	**# of Facilities - Concern**	**Examples**	**Potential Loss**
Recreational and Community Centers	9	13	Stadiums, Libraries, Parks, Community Centers, etc.	$28,802,569.00
Total	**55**	**22**	**---**	**$237,597,614.00**

* Potential loss data are estimates only, as replacement values for some facilities were not available. Actual losses may be greater than the estimate presented in this table.

5.4 Analysis of Potential Losses by Hazard

Climate Change

Physical Threat

Climate change introduces significant physical threats to infrastructure, particularly in reservoir-dependent regions. Alterations in precipitation patterns and increased instances of extreme weather events can lead to heightened risks of flooding, erosion, and sedimentation. Climate Change can place immense strain on reservoirs and surrounding structures, necessitating higher maintenance and adaptive design measures. Infrastructure such as intake systems, dams, and levees may experience accelerated wear and tear due to fluctuating water levels, while prolonged droughts can reduce water availability, undermining operations reliant on these systems. Effective planning and resilient engineering practices are crucial to mitigate these challenges and preserve functionality.

Social Threat

Climate change disproportionately affects marginalized communities. Those who lack access to resources, infrastructure, and support systems are at the greatest risk of experiencing its adverse effects. In urban settings, marginalized groups living in underprivileged neighborhoods are more likely to suffer from heatwaves and water shortages.

Changes in Population Patterns and Land Use and Development

Climate change is not expected to cause changes in populations patterns or development.

Dam Failure

Physical Threat

Various factors, such as the amount of water released, the distance between the dam failure site, and the topography of the surrounding land, will influence the extent to which physical assets in Orange are threatened. The Santiago, Villa Park, and Prado Dams have large storage capacities that could cause localized inundation in Orange if the reservoir waters are released due to a dam breach. **Table 5-2** identifies the physical assets in Orange that are threatened by the potential failure of the reservoirs. Based on this analysis, dam inundation would affect 6 CFs and 2 FOCs within the City, with the potential to cause approximately $95 million in damages, based on available information. **Figure 5-2** shows the location of the identified CFs and FOCs within these dam inundation zones.

Table 5-2: Critical Facilities and Facilities of Concern (Dam Failure)

Category	# of Facilities - Critical	# of Facilities - Concern	Potential Loss**
Government Operations	0	1	$32,427,589
Emergency Operations	6	0	$63,199,258
Recreational and Community Centers	0	1	$0
Total	**1**	**1**	**$95,626,847**

** Based on the City of Orange insured replacement values potential loss data are estimates only, as replacement values for some facilities were not available. Actual losses may be greater than the estimate presented in this table.

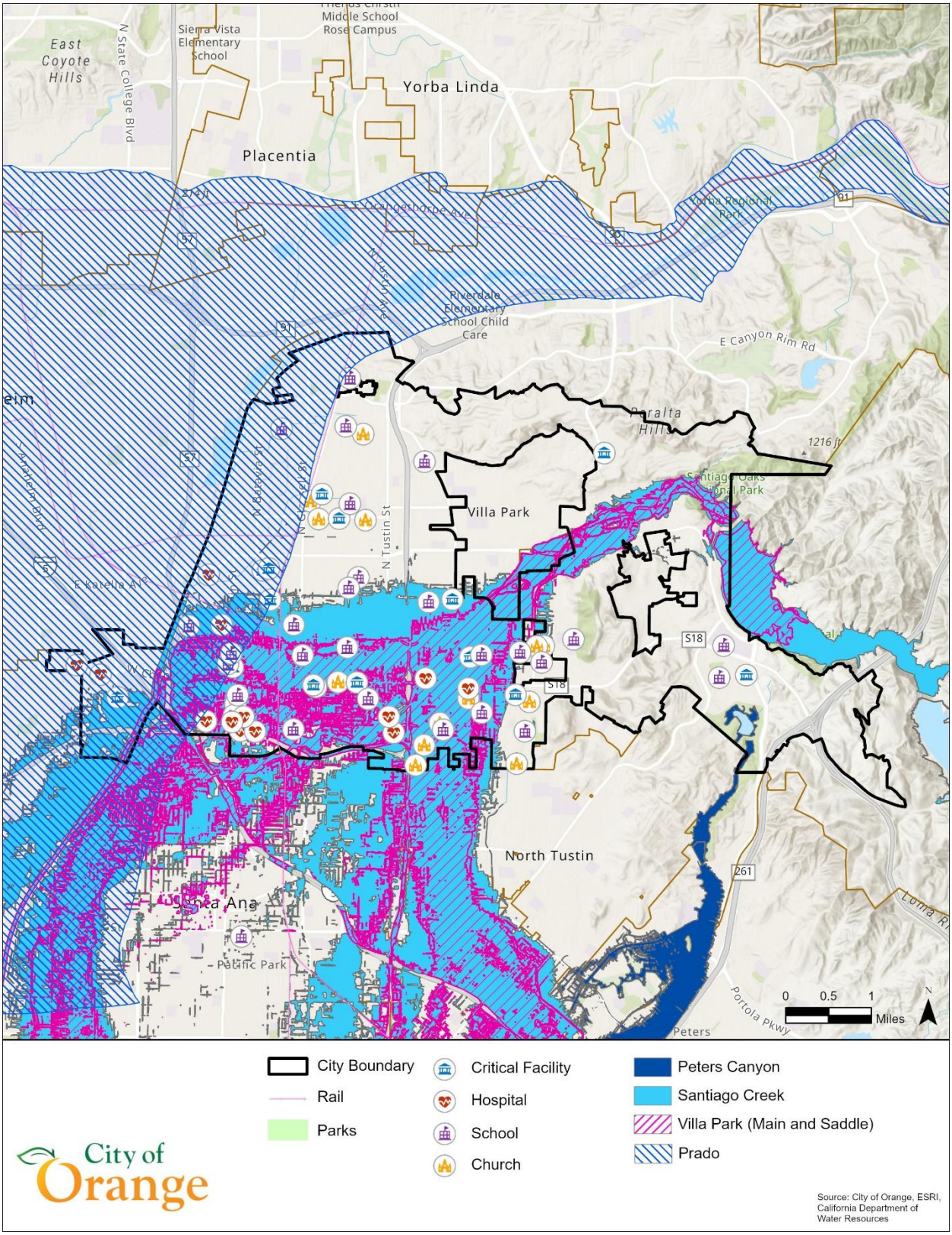


Figure 5-2: Critical Facilities and Facilities of Concern in Dam Inundation Zones

Social Threat

Dam failure hazards in the City would impact various downstream properties and the residents that live there. **Table 5-3** identifies these potential dam failure impacts caused by a dam failure. Failure of the dam would affect almost 20% of the population in the City of Orange.

Table 5-3: Dam Failure Threatened Populations

Threatened Population Metric	Dam Inundation Hazard	City
Population	85,000	117,096
Households	27,000	44,867
Acres	9600	16,512
Schools	15	26
Houses of Worship	8	13
Medical Centers	10	15

*Amounts are estimates based on the U.S Census only, as exact values for some statistics were not available. Actual amounts may be greater than the estimate presented in the table.

Other Threats

Dam failures are often triggered by other events (e.g., seismic shaking, intense rainstorms, etc.). There would most likely be service disruptions in Orange if this type of event occurred. Floodwaters could quickly inundate the city, disrupting utilities such as water, power, and other services (communications or transportation infrastructure). Residents may find street lighting and traffic signals are temporarily disabled. Debris carried by the rapid inundation may result in injury or death, destroyed structures and facilities.

Changes in Population Patterns and Land Use and Development

Population in the inundation zone may choose to move out of the City or out of the inundation area if the impacts of dam failure are great enough.

Dam failure is unlikely to affect land use and development because the development review process will take steps to mitigate or minimize flood-related impacts. Areas inundated within the City would not be significantly altered, requiring changes in land use and development patterns.

Drought

Physical Threat

Since the primary threat from drought is reduced water supply and availability, there are no foreseeable threats to any of the City's physical assets. It is possible that any water delivery infrastructure not used or used less than usual may fall into some degree of disrepair if maintenance is deferred. Lower water pressures may cause some aged water pipes to release rust particles into the water supply. Amenities within facilities, like water features and landscaping, could be affected by reduced watering. If dead or dying vegetation becomes a nuisance, the City may have to replace or retrofit locations affected.

Social Threat

Droughts are unlikely to cause serious social threats to households in Orange, though residents and business owners in the City may experience financial impacts associated with water conservation efforts. Those with less access to financial resources, such as low-income households or seniors, could be harder hit if higher water rates or additional fees are imposed during a severe drought event.

Other Threats

A typical drought is not anticipated to lead to any outages in service in Orange. However, an exceptional drought may lead to restricted water use for residents or businesses in the City. Trees that are not adequately adapted to lower irrigation levels could perish, altering the City's aesthetic appearance and long-term air quality. Any open spaces with extensive lawns may start to die, turning brown, which could discourage residents from using these parks and open spaces. In addition, long-term drought conditions can change and reduce soil's ability to absorb water. When this occurs, water runoff from these areas may increase, which could cause downstream flooding, debris flows and erosion in some areas.

Changes in Population Patterns and Land Use and Development

Droughts occur periodically (primarily during the Summer/Fall months) and generally do not affect populations to the degree that they would need to migrate in and out of the City. A drought in Orange is doubtful to have any significant effect on population patterns. It is unlikely that drought will affect land use and development because the development review process will take steps to mitigate or minimize the impacts and vulnerability of drought in Orange.

Earthquake/Geological Hazards

Physical Threat

Many physical assets in the City are estimated to experience the same seismic shaking intensity, ranging from 85 to 95% (shaking intensity in relation to the earth's gravity). Therefore, all facilities could be damaged during a significant seismic event, which would be extremely costly for the City. If all facilities were damaged at the same time during a seismic shaking event, it can be assumed that the City would incur a percentage of the maximum potential loss of its physical assets. Assuming 20% of the City's assets are impacted, this potential loss could amount to over $47 million. Underground physical assets, like pipelines or utilities, could be damaged if seismic shaking were strong enough to cause a rupture. In such a scenario, natural gas and water delivery service to Orange homes and businesses would be incapacitated until repairs are completed. **Table 5-4** displays these potential losses that could incur should shaking reach the described threshold. **Figure 5-3** displays the CFs and FOCs within the City's seismic shaking potential hazard zones.

Table 5-4: Critical Facilities and Facilities of Concern (Earthquake)

Category	# of Facilities - Critical	# of Facilities - Concern	Potential Loss**
Government Operations, Emergency Operations	18	9	$184,772,921.00
Water Infrastructure	28	0	$24,022,124.00
Recreational and Community Centers	9	13	$28,802,569.00
Total	**55**	**22**	**$237,597,614.00**

** Based on the City of Orange insured replacement values Potential loss data are estimates only, as replacement values for some facilities were not available. Actual losses may be greater than the estimate presented in this table.

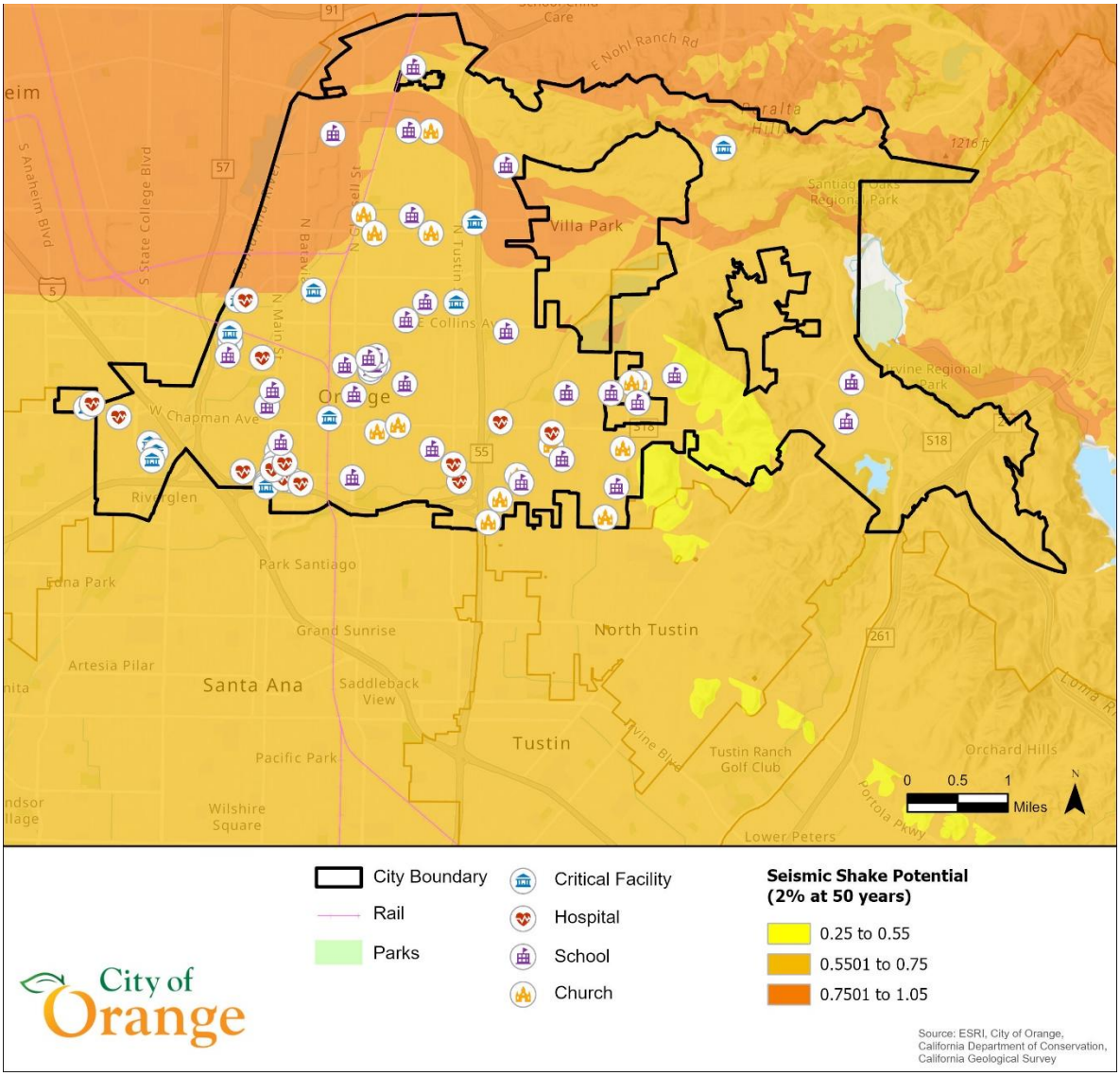


Figure 5-3: Seismic Hazard Area with City infrastructure

Social Threat

The risk of a seismic event is a danger to all groups in Orange though some are more threatened than others. Seniors, pregnant women, and persons with disabilities are more threatened by seismic shaking since they may have limited mobility and may be unable to reach shelter in time. Even if these groups are able to reach a shelter, they may find themselves trapped if furniture or building components have fallen around them. Renters and low-income communities are also more threatened by seismic shaking since these groups may live in homes that are not properly retrofitted to survive the stresses of a seismic event. These groups may not be able to absorb the costs associated with repairing their homes or looking for new housing should their existing one be too damaged for occupancy. **Table 5-5** displays the threatened populations in Orange associated the seismic shaking scenarios.

Table 5-5: Earthquake Threatened Populations		
Threatened Population Metric	**Earthquake Hazard**	**City**
Population	117,096	117,096
Households	44,867	44,867
Schools	26	26
Houses of Worship	13	13
Medical Centers	15	15

*Amounts are estimates based on the U.S Census only, as exact values for some statistics were not available. Actual amounts may be greater than the estimate presented in the table.

Other Threats

With early earthquake warning systems becoming operational, it can be expected that utilities will take advantage of these advance warnings to shut off gas and water to control any potential leaks following the seismic shaking. Authorities may have enough time to halt the use of infrastructure or move workers to safe locations away from hazardous conditions. Workers could cease their activity and take shelter until they can be safely evacuated. Therefore, all services could be non-operational during the shaking event and remain inactive until authorities are confident that it is safe to reactivate utilities and return employees to their workplaces. The length of this time would vary depending on the magnitude of the event. A significant earthquake would likely put utilities out of commission and halt any employment activity in the City for a few hours or several days. The City and the region would experience reduced economic activity during the outage period, which would not be felt for weeks, months, or years later. Structures such as telephone poles or power transmission towers felled by the shaking could block roadways and prevent emergency response teams from reaching victims or evacuees who need assistance.

Changes in Population Patterns and Land Use and Development

It is not anticipated that population patterns will change over the next 20 years. While this may also be true concerning land use and development, if a strong earthquake impacts the City, there is the potential that older structures may be impacted more severely than newer structures in the City.

Severe Weather (Severe Winds, Extreme Heat, Winter Storm)

Physical Threat

Severe Winds

Intense winds likely present the greatest threat to physical structures, particularly from trees or branches that fall on buildings/vehicles, causing substantial damage. Older structures that have deferred maintenance or have not been retrofitted for high wind conditions may suffer greater damage than newer/updated structures. Utility lines and wooden utility poles face an elevated threat from wind, as do buildings without reinforced roofs. Often utility poles and trees suffer impacts during high wind events if they occur after a significant rain event. During these events, saturated soils around the base of the tree/pole may be unable to hold up to the strains placed on them by strong winds causing it to fall over.

Trees, tree branches, and other objects have the potential to fall on powerlines and other electrical infrastructure during a severe windstorm, causing power outages throughout the City. Another physical threat of severe wind is wildfire impacts during the summer months. Severe winds can turn a routine wildfire into a destructive unstoppable wall of flames capable of burning thousands of acres.

Extreme Heat

Extremely high temperatures can cause roads to deform and buckle as the pavement expands in the heat, especially in areas that have not been maintained well. Power lines and other electrical grid components become less effective in higher temperatures and may be damaged due to stress during extreme heat events. Urban heat islands occur when natural land cover is replaced with concentrations of pavement, buildings, or other surfaces that absorb and retain heat. Buildings with dark pavement will absorb more heat than surfaces with vegetation or lighter materials that are better at reflecting the sun's energy. This urban heat island effect is strongest during the summer when solar radiation is strongest.

Winter Storm

Physical threats associated with winter storms are similar in nature to those identified in the Flooding discussion.

Social Threat

Severe Wind

Severe wind events can harm people throughout Orange but have a greater effect on the safety of people experiencing homelessness and those working outdoors. Populations that

work outside or have respiratory illnesses may be impacted by severe wind events as they can generate dust and other contaminants that can affect the health of residents and workers. Lower-income residents, who may not have the financial resources to purchase homes (or are renting homes) that are not built or retrofitted to withstand powerful winds, could also have difficulty recovering from wind events, that can cause damage to roofs, siding, and windows.

Extreme Heat

Whereas a heat event can be relatively harmless for those with a reliable means of staying hydrated and cool, the event can be deadly for others. Young children, the elderly, or people suffering from serious medical conditions are physiologically more vulnerable to heatstroke. Some senior citizens also take medicines that can make it harder for their bodies to maintain a safe internal temperature, creating an additional threat from extreme heat events. Young children may not be aware of the signs of dehydration or ways of protecting themselves from heatstroke.

People living in homelessness are at a high risk of health complications during heat waves, especially if they are unsheltered. According to the City of Orange homelessness count, in 2025, there were approximately 369 individuals experiencing homelessness in the City, with 33 of them unsheltered. This population is very vulnerable to heatstroke during a heatwave, especially if they cannot reach a cooling center.

Sudden spikes in heat can catch people by surprise. Stores can rapidly sell out of fans, air-conditioning units, or drinking water during a heatwave. Many lower-income households live in older, poorly insulated, and energy-inefficient housing and cannot afford to run their air conditioning, which can be further compounded by the threat of power outages due to heat/rolling blackouts. During these events, extreme heat impacts may affect larger portions of the City and populations that would not be viewed as vulnerable under normal circumstances.

Winter Storm

Social threats associated with winter storms are similar in nature to those identified in the Flood discussion below.

Other Threats

Severe Wind

Extreme wind events can worsen other risks, such as wildfires. Southern California Edison will continue to impose Public Safety Power Shutoffs to eliminate the potential for wildfires, but this can lead to prolonged power outages throughout the City.

Extreme Heat

Extreme Heat for any length of time can also affect other hazards and risks within the City.

For example, it can create a spike in electricity demand leading to power loss/failure, food insecurities, and a rise in vector-borne disease transmission. Coupled with extreme wind, it can cause or spread urban fires and jeopardize additional neighborhoods/communities.

Winter Storm

Other threats associated with winter storms are similar in nature to those identified in the Flood discussion below. Severe rain can lead to debris flows in wildfire affected areas of the City and cause significant property damage to areas of the City.

Changes in Population Patterns and Land Use and Development

Severe Wind

Severe winds occur periodically (primarily during the Fall months) and generally do not affect populations to the degree that they would need to migrate in and out of the City. It is unlikely that severe wind will affect land use and development because the development review process will take steps to mitigate or minimize the impacts of severe wind.

Extreme Heat

It is not anticipated that population patterns will change over the next 20 years. There could be minor changes in population patterns due to extreme heat if people cannot continue to live in older structures with limited insulation and older cooling units.

While it is unlikely that extreme heat will affect land use and development, it is possible that additional investment in older parts of the City will occur to modify structures to handle these conditions.

Winter Storm

Winter storms occur periodically (primarily during the winter months) and generally do not affect populations to the degree that they would need to migrate in and out of the City. However, in rare circumstances, there may be the need to evacuate households for a short period of time until the flooding from storms recedes.

Flooding

Physical Threat

Flooding impacts are not expected to be significant since the majority of the city is not in a 100/500-year flood zones. During a severe rainstorm, localized flooding can cause a substantial risk to Orange's transportation infrastructure. Roads, bridges, and highways can become impassable due to rising waters, cutting off access to essential services and disrupting daily commutes. Prolonged inundation weakens road surfaces and bridge supports, requiring expensive repairs or replacements. Homes and businesses are often the first casualties in flood-prone areas. Floodwaters can cause structural damage, mold growth, and loss of valuable assets, while also rendering properties uninhabitable or unusable for extended periods. This impacts not only individuals but also the local economy. Flooding can disrupt the functioning of water and wastewater systems, leading to contamination, service interruptions, and heightened health risks for the population.

Table 5-6: Critical Facilities and Facilities of Concern (100/500 Year Flood Zone)

Category	# of Facilities - Critical	# of Facilities - Concern	Potential Loss**
Government Operations	0	0	$0
Emergency Operations	0	0	$0
Recreational and Community Centers	0	0	$0
Total	0	0	$0

** Based on the City of Orange insured replacement values Potential loss data are estimates only, as replacement values for some facilities were not available. Actual losses may be greater than the estimate presented in this table.

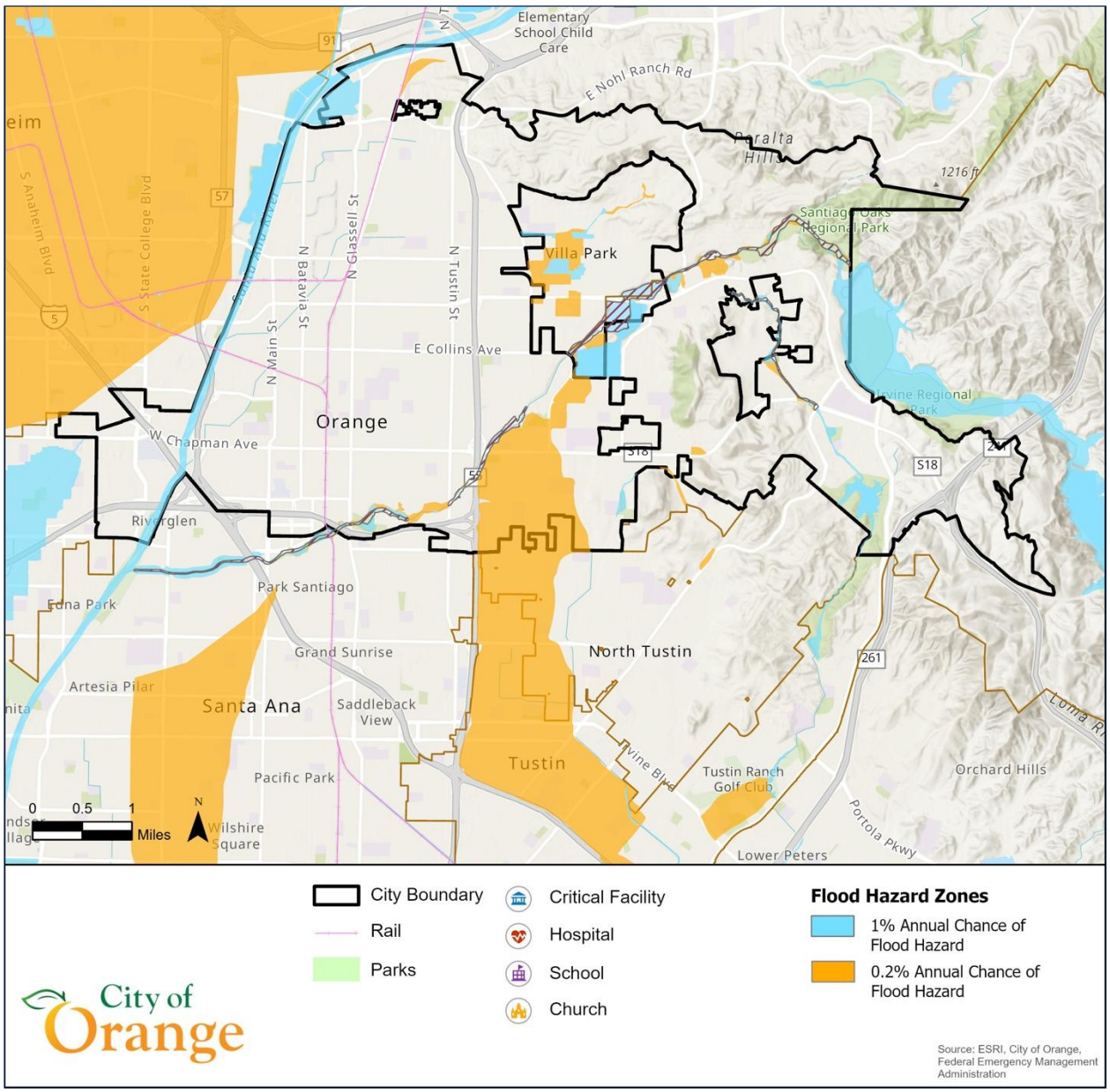


Figure 5-4: Critical Facilities and Facilities of Concern in FEMA Flood Zones

Social Threat

Floodwaters in both the 100-year zone and the 500-year zone are not anticipated to rise to a depth of more than one foot above the base flood elevation. If localized flooding was to occur, flooding of this type would likely inundate curb cuts and sidewalks to some extent. People who walk or bike as their primary form of transportation may encounter difficulties if they do not have access to an alternative means of transportation. Seniors, people with disabilities, and low-income persons are also likely to be impacted during these events.

Other Threats

Flooding may temporarily stop any type of transportation in the City. Debris from floodwaters can block roadways, hinder vehicle access, and potentially affect emergency response services. One foot of rushing water is enough to carry small vehicles, depending on the velocity. A severe flood situation may prevent people who own smaller vehicles from driving to work, leading to reduced economic activity. Severe flooding that causes serious damage to homes and businesses may also reduce economic activity until repair work is completed.

Changes in Population Patterns and Land Use and Development

It is unlikely that flooding will affect land use and development patterns in affected areas because the median income in impacted areas is higher than the City average. Additionally, the development review process ensures flood related impacts are mitigated or minimized.

Table 5-7: 100/500 Year Flood-Threatened Populations

Threatened Population Metric	Flood Hazard	City
Population	17,542	117,096
Households	4,393	44,867
Schools	5	26
Houses of Worship	4	13
Medical Centers	4	15

*Amounts are estimates based on the U.S Census only, as exact values for some statistics were not available. Actual amounts may be greater than the estimate presented in the table.

Fire

Physical Threat

Wildland Fire

Wildfires pose a significant physical threat to both city infrastructure and residential structures, especially in areas designated as High and Very High Fire Hazard Severity Zones within the Local Responsibility Area (LRA). City infrastructure such as utilities, transportation networks, and critical facilities are at risk of direct fire damage, which can disrupt essential services and hamper emergency response efforts. Residential structures, primarily homes located within these zones, face elevated risks of destruction or severe damage due to their proximity to flammable vegetation and the potential for rapid fire spread.

The threat is compounded in the Wildland Urban Interface (WUI), where homes and infrastructure are situated near or among wildland areas. In these regions, embers carried

by strong winds can ignite structures even if the main fire front is some distance away. Additionally, power lines interacting with overgrown trees can spark new fires, further endangering both public and private properties. The loss of structures not only results in significant financial costs but also impacts community safety and resilience. **Figure 5-5** shows these zones and the City's CFs and FOCs within the area. All structures within this fire zone are at an elevated risk of wildfire impacts and consist of mostly homes. **Figure 5-6** shows the Wildland Urban Interface Perimeter with Critical Infrastructure.

Table 5-8 identifies 1 CFs and 0 FOC within the wildfire hazard zone, resulting in a potential loss of approximately $3 million based on available replacement values. Additional losses associated with schools and residential structures in these areas could also occur.

While these areas have a high degree of vulnerability to wildfire, other areas of the City may also be susceptible to ember cast. These areas, typically referred to as the WUI (Wildland Urban Interface), are vulnerable if the right conditions exist. Typically, the WUI is impacted if adequate fuels are combined with dry conditions and strong winds. Sometimes, the ignition of wildfire may occur if power lines around overgrown trees cause a spark and catch the tree on fire.

Table 5-8: Critical Facilities and Facilities of Concern (Wildfire)

Category	# of Facilities - Critical	# of Facilities - Concern	Potential Loss**
Government Operations	0	0	$0
Emergency Operations	1	0	$2,914,000.00
Recreational and Community Centers	0	0	$0
Total	**1**	**0**	**$2,914,000.00**

*Although most of the City's infrastructure is out of the fire zone, damage to homes and businesses will occur due to a severe wildfire.

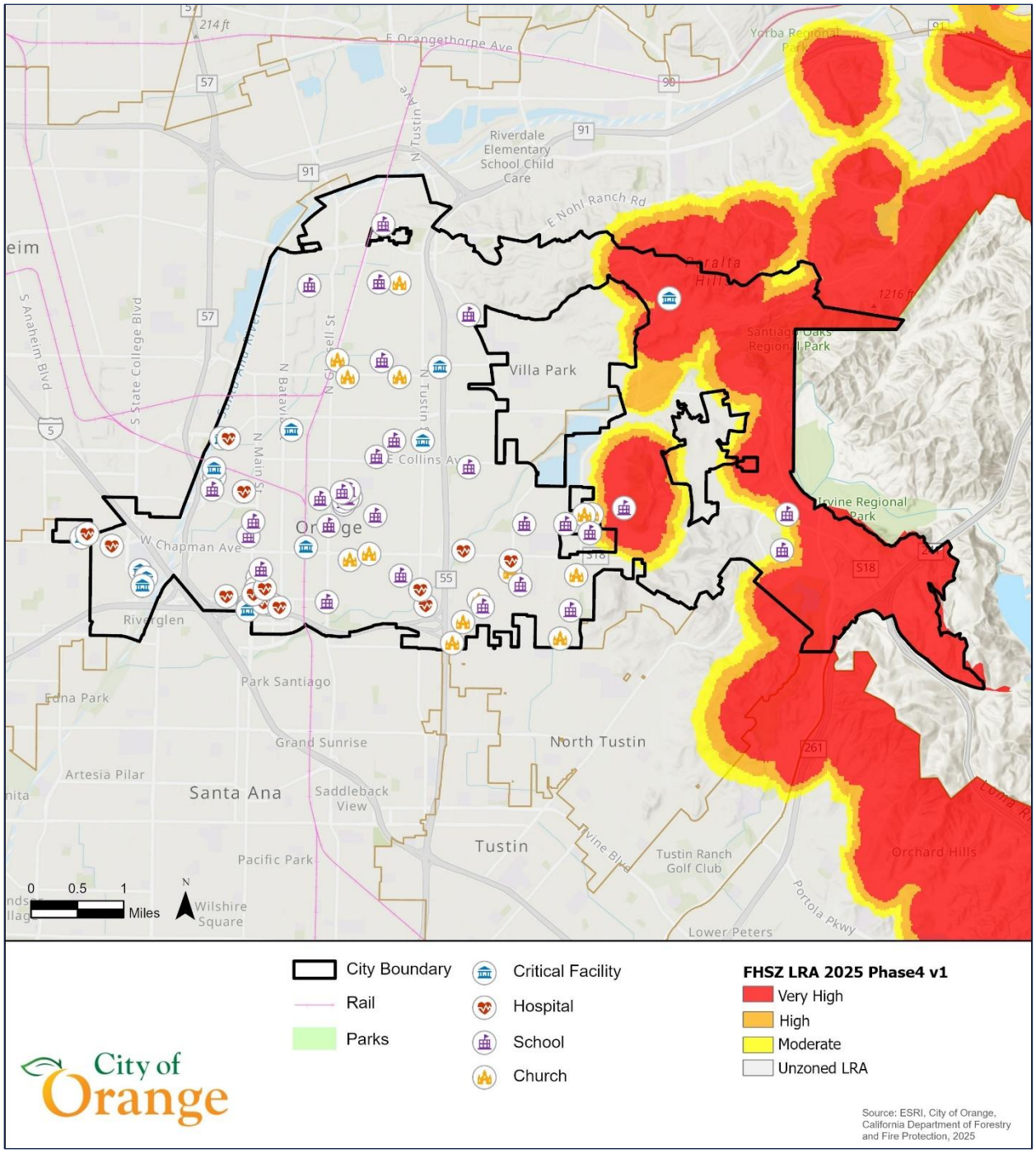


Figure 5-5: Critical Facilities and Facilities of Concern

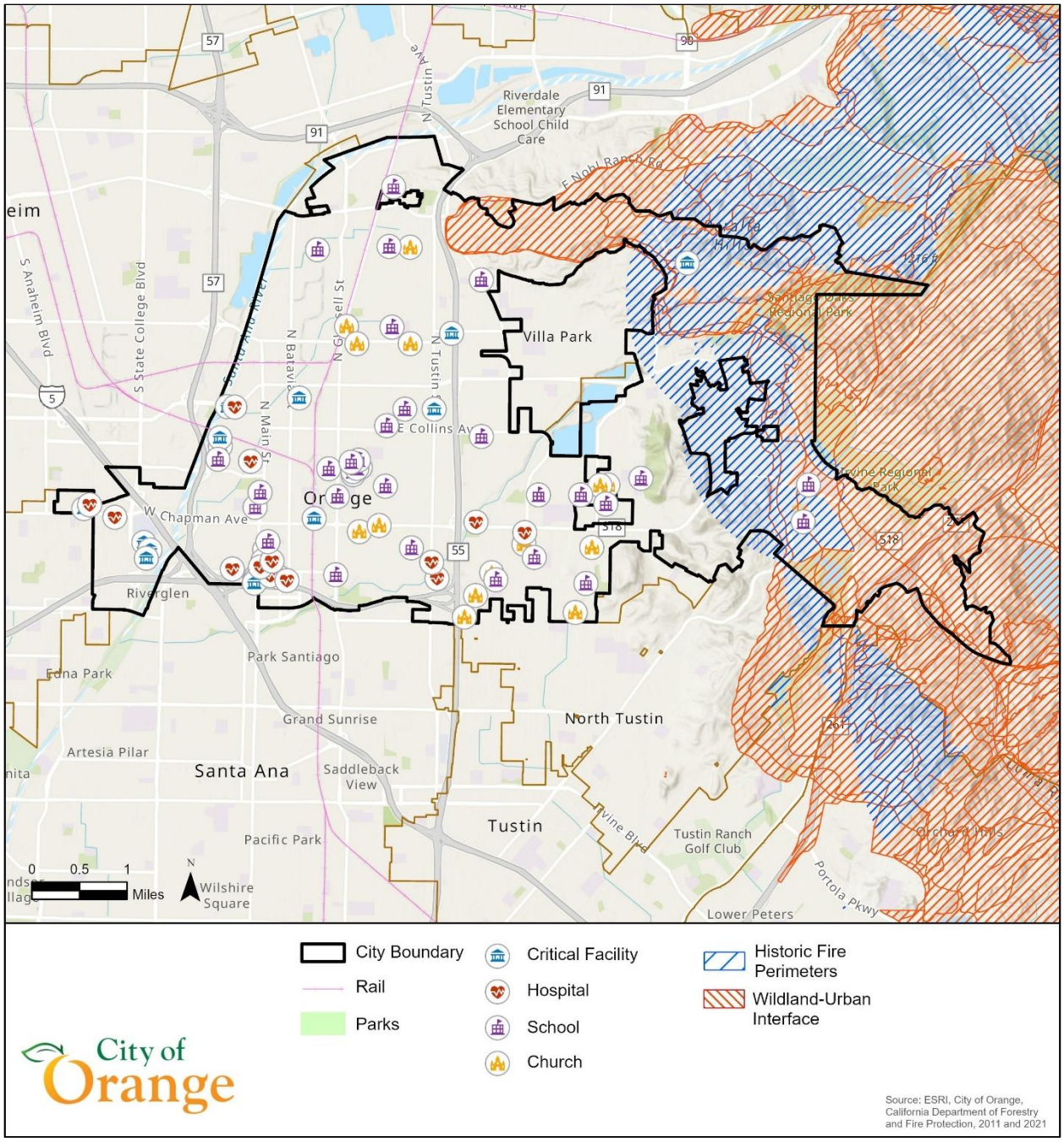


Figure 5-6: Wildland Urban Interface Perimeter with Critical Infrastructure

Urban Fire

Structures and physical assets in Orange that are not equipped with fire suppression technology or design features that mitigate fire vulnerability are at risk of fire. Generally, these buildings are older, may not be well maintained, or may not meet current code requirements and regulations. While all structures can be impacted by urban fire, older structures may have increased vulnerability to this hazard. Power lines located around overgrown trees, where the tree crown envelops part or all the power lines, are also at risk

of catching fire. When the wires overheat, they may ignite a fire in the tree, spread back to the power lines themselves, and burn the power line infrastructure. Underground utilities, like water delivery systems, residential electrical systems, or natural gas pipelines, are not threatened by the occurrence of fire since any urban fires that emerge in Orange are likely to occur on the surface.

Social Threat

A fire hazard can threaten anyone in the City, but older adults and persons with disabilities are at greater risk because they may have limited mobility and reduced environmental awareness. For example, an older adult who lives alone may not be aware that a fire has been ignited in their house until the room begins to fill with smoke or even flashover, at which point escape may be more difficult or impossible. Therefore, a fire that starts in or spreads to any older adult residence in Orange could be highly threatening to those populations. Persons with disabilities may require special mobility devices or caregiver assistance to go outside, which may not be readily available if a fire occurs. Other groups with increased threat levels include lower- income persons and renters. These persons may live in substandard housing with outdated materials known to be flammable. Renters and lower-income persons may also live in housing units with improperly designed or maintained electrical or heating systems that could lead to a fire. Additionally, these groups may not possess enough financial resources to rebuild their homes or search for new homes after a fire occurs.

Table 5-9: Fire-Threatened Populations

Threatened Population Metric	Fire Hazard	City
Population	88,000	117,096
Households	16,450	44,867
Schools	3	26
Houses of Worship	1	13
Medical Centers	0	15

*Amounts are estimates only, as exact values for some statistics were not available. Actual percentages might be greater than the estimate presented in this table.

Other Threats

Fires can consume power lines and force utility operators to shut off electrical and gas transmission activity, leading to utility outages in City homes and businesses. Any streets surrounded by blazes or blocked by burning debris would hinder transportation, prevent people from evacuating, and block emergency response crews from reaching the source of the fire. Anyone living at the end of a cul-de-sac faces an elevated threat of being trapped if the fire occurs or spreads in a way that blocks evacuation. Fires that destroy trees or vegetation (especially within parks and open space areas) could limit or prevent

the use of these areas, affecting future recreational opportunities for residents.

Outreach to residents and businesses to help them understand and prepare for these future events will become an important aspect of the City's overall hazard mitigation strategy.

Changes in Population Patterns and Land Use and Development

If a large urban fire were to occur, it is feasible that changes in population patterns could occur. Land use and development patterns could change if a large urban fire were to occur that impacted older parts of the City. After that type of event, the City would rely on a redevelopment process to determine how best to rebuild. Overall, the population pattern would change temporarily while the new structures are being rebuilt.

Landslide/Erosion

Physical Threat

The City of Orange lies in a region characterized by diverse terrain, including hills and slopes, particularly in the East of the City. Landslides in the City can destroy homes, roads, and water/wastewater infrastructure which can lead to costly repairs. **Table 5-10** displays potential losses to City infrastructure that could incur should landslides occur. **Figure 5-7** displays the CFs and FOCs within the City's landslide potential hazard zones.

Table 5-10: Critical Facilities and Facilities of Concern (Landslide)

Category	# of Facilities - Critical	# of Facilities - Concern	Potential Loss**
Government Operations	0	0	$0
Emergency Operations	1	0	$2,914,000.00
Recreational and Community Centers	0	0	$0
Total	**1**	**0**	**$2,914,000.00**

** Based on the City of Orange insured replacement values Potential loss data are estimates only, as replacement values for some facilities were not available. Actual losses may be greater than the estimate presented in this table.

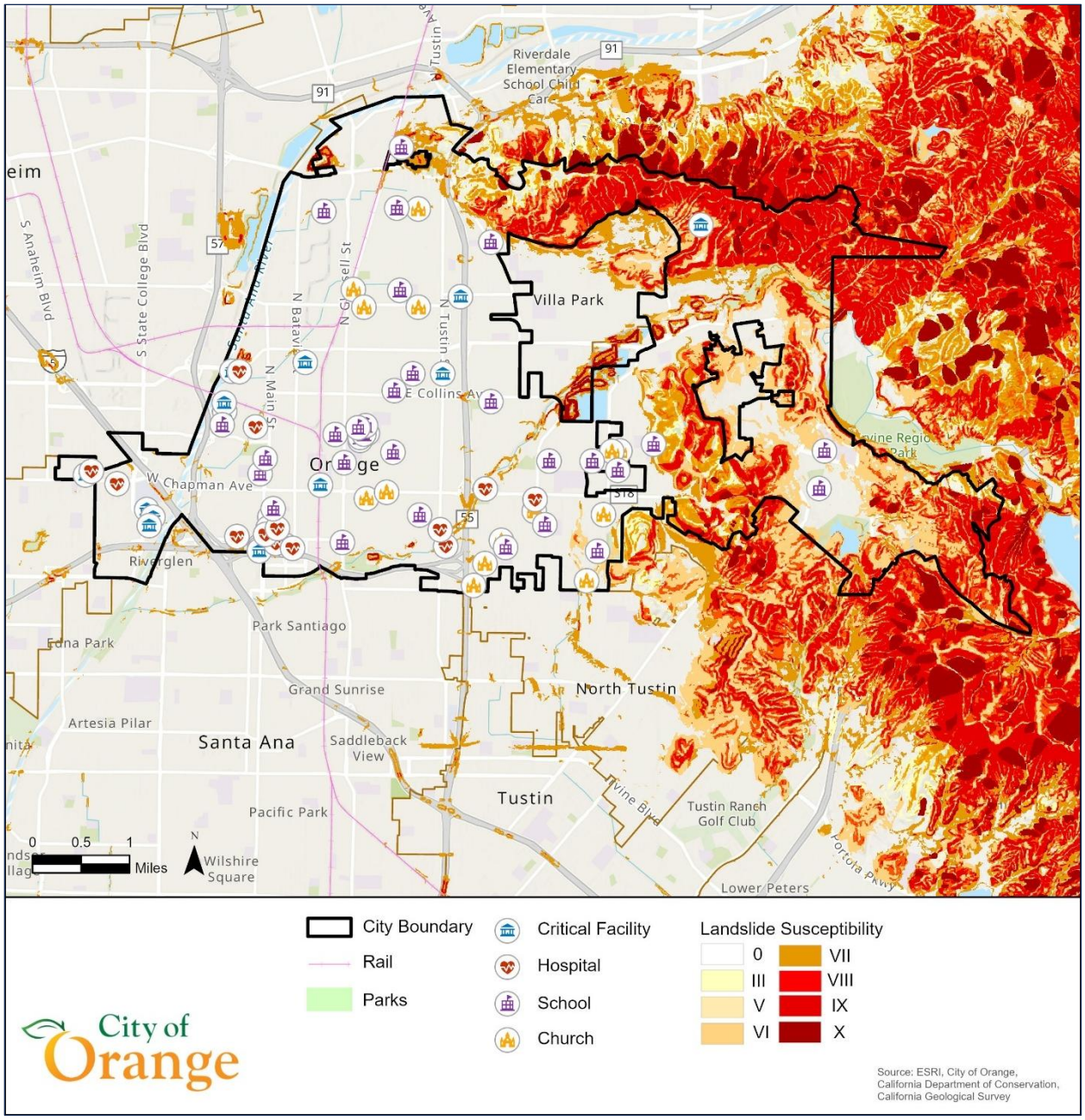


Figure 5-7: Landslide Threat Map with City infrastructure

Social Threat

The sudden nature of landslides can result in fatalities and injuries. Communities located near unstable slopes are especially vulnerable. When landslides damage homes and infrastructure, they force people to leave their homes. Displacement creates a host of challenges, including the immediate need for shelter, food, and clean water. Individuals and families may be moved to temporary housing for a long period of time. Prolonged displacement can strain community bonds and lead to social isolation, particularly for

vulnerable groups such as older adults, disabled, and children. **Table 5-11** displays the threatened populations in Orange that can be impacted by landslides.

Table 5-11: Landslide Threatened Populations

Threatened Population Metric	Population in landslide Zone	City
Population	33,700	144,388
Households	12,342	57,226
Schools	5	26
Houses of Worship	1	13
Medical Centers	0	15

*Amounts are estimates only, as exact values for some statistics were not available. Actual impacts might be greater than the estimate presented in this table.

Other Threats

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for the City of Orange and/or the County of Orange, there are many qualitative factors that point to potential vulnerability.

Landslides can impact major transportation arteries, blocking residents from essential services and businesses. Past landslides have caused major property damage or significantly impacted residents. Continuing to map landslide and debris flow areas will help in preventing future loss.

Changes in Population Patterns and Land Use and Development

Landslides often render large tracts of land unsuitable for agriculture, habitation, or industrial purposes. The deposition of debris can bury fertile topsoil, while the instability of affected areas may prevent future construction or cultivation. In mountainous regions, landslide-prone slopes are frequently abandoned, reducing the availability of usable land and forcing communities to relocate or adapt. Buildings may be relocated to stable zones, and governments may enforce stricter zoning regulations that prohibit development in risky areas. Such policies, while necessary for safety, can limit economic growth and the expansion of the city.

Pandemic

Physical Threat

Public Health events will not harm buildings or infrastructure within the City. However, the regional or global nature of public health incidents might incur indirect costs through personnel death and disease, absenteeism, and reduced efficiency. Public health incidents will likely threaten the city's administrative and facilities operations, whereas automated services and infrastructure itself will not be significantly impacted.

Social Threat

Pandemics can overwhelm healthcare systems, creating shortages of medical supplies and causing significant morbidity and mortality. In addition to the physical health impacts such as respiratory distress, organ failure, and long-term complications for survivors, healthcare workers face an increased risk due to their exposure to infected individuals. Beyond these immediate health impacts, pandemics disrupt daily life, leading to school closures, business interruptions, and economic downturns. The psychological toll on individuals and communities can be profound, with increased levels of anxiety, depression, and stress. These factors contribute to changes in population, influencing migration patterns, birth rates, and mortality rates, thereby altering the demographic landscape.

Other Threats

History has shown that pandemics can lead to supply chain issues - availability for PPE and sanitary product needs (toilet paper, sanitizer, baby wipes, etc.) and proper disposal of biohazard materials.

Tree Mortality

Physical Threat

Dead or dying trees create a cascade of risks that threaten infrastructure in both urban and rural settings. Dead trees lose structural integrity, making them prone to falling, especially during high winds or storms. Falling trees and branches can damage buildings, vehicles, and power lines, creating significant repair costs and safety hazards. One of the most critical threats posed by tree mortality is to electrical and communication infrastructure. Dead trees can easily topple onto power lines, causing outages, sparking fires, or disrupting essential services. Tree roots, even after a tree has died, can pose a threat to foundations. As roots degrade, they may leave voids in the soil, causing structural shifts and compromising the stability of nearby buildings.

Social Threat

Healthy trees provide essential services such as carbon sequestration, temperature regulation, and stormwater absorption. Their loss exacerbates urban heat islands, increases air pollution, and diminishes soil stability. These impacts will affect lower income individuals and those with pre-existing health conditions.

Other Threats

Deadwood is highly flammable, increasing the risk of wildfires, particularly in regions already prone to fire outbreaks. Wildfire threatens homes, utilities, and large-scale infrastructure, often leading to massive economic losses. Repairing infrastructure damaged by tree mortality can be expensive, from clearing roadways to restoring power grids.

Changes in Population Patterns and Land Use and Development

Tree mortality is not expected to have a significant effect on population patterns or land use. Integrating tree mortality concerns into development projects can reduce risks. For example, planting resilient tree species and maintaining safe distances from power lines and buildings can enhance infrastructure protection.

Human-Caused Hazards

Physical Threat

Cyber Attack

A significant cyber event could have considerable impact on the population, built environment, lifeline infrastructure, and the economy. Most jurisdictions have several levels of security in place, dependent upon security levels of individuals and the geographical locations (onsite or remote). Many also have redundant dispatch centers with separate systems that can function if the primary center is not functioning.

Cyber-attacks can infiltrate many institutions including banking, medical, education, government, military, and communication and infrastructure systems. Most of the effective malicious cyber-activity has become web based. Recent trends indicate that hackers are targeting users to steal personal information and targeting computers to cause system failures. The duration of a cyber-attack is dependent on the complexity of the attack, how widespread it is, how quickly the attack is detected, and the resources available to aid in restoring the system. A cyber-attack could be geared toward one organization, one type of infrastructure and/or a specific geographical area. The affected area could range from small to large scale.

Hazardous Materials Release

Hazardous materials can cause damage to infrastructure and the population in Orange if they are released into the environment. Corrosive hazardous materials can damage the exteriors of buildings or structures. Flammable hazardous materials can be ignited and cause damage to nearby structures. Generally, sites closer to the origin of the release of hazardous materials are more at risk than those further away.

Power Outages

Power Outages are considered a form of lifeline system failure and could have a significant impact on the population, built environment, infrastructure, and the economy. Disruptions can be the consequence of another hazard, or can be the primary hazard, absent of an outside trigger. Orange gets its electricity from Southern California Edison, because of this, if the power grid increases in other parts of the state, it could curtail the energy available to Orange. This vulnerability is compounded by the reality that the community has become more reliant on power for gadgets and appliances to perform basic daily activities. This loss of power will not only be an inconvenience but could become a life-threatening experience. Many citizens rely on power and water infrastructure to operate medical machinery to survive (i.e., oxygen tanks, dialysis machines). There are various medical facilities that rely on these resources to maintain basic standards of care for patients.

Climate change considerations indicate that as the weather conditions change, there could be an increase in energy needs. This could be from both potential increase in heat and cold. These predicted increases will put ever greater strain on Orange's energy supply.

Terrorism

There is no way to predict which of Orange's facilities or assets may be impacted by an act of terrorism since the motivation behind the incident is often complex and not easily understood. Generally, these incidents occur at places of political, economic, or cultural importance. If the perpetrator's motives are to shut down City or regional government activity for a period, they may instead target pieces of infrastructure, like water systems, utility delivery systems, or transportation networks. The financial losses that may result from this type of incident would depend on the degree of destruction associated with the activity. If the incident involves the destruction of physical assets, the cost to the City or property owners in Orange could be significant. The City of Orange Police Department works closely with the Orange County Intelligence Assessment Center to identify and investigate any potential terrorist threat.

Social Threat

Cyber Attack

Cities like Orange are an attractive target for criminals and cyber threat actors to exploit vulnerable systems to steal critical infrastructure data and proprietary information, conduct ransomware operations, or launch destructive cyberattacks. Successful cyberattacks against cities could lead to disruption of infrastructure services, significant financial losses, exposure of citizens' private data, erosion of citizens' trust in the smart systems themselves, and physical impacts to infrastructure that could cause physical harm or loss of life. Additionally, a cyber attack that affects public safety systems may cause the public to feel unsafe and panic.

Hazardous Materials Release

The threat of a hazardous materials release event affects those closest to a source of hazardous materials, including industrial sites, gas stations, gas transmission lines, sewer mains, and transportation incidents that produce hazardous material spills. Orange residents living next to major transportation infrastructure such as highways or major roadways also face a greater risk of being affected by a hazardous materials release if vehicles transporting these materials accidentally release their contents into the environment. Groups such as the elderly, low-income, and renters face a greater risk of exposure since they may not have the financial resources necessary to retrofit their homes against infiltration by hazardous materials or relocate to a home farther from the potential sources of hazardous materials. Aerosolized hazardous material releases can cause severe health consequences for populations in and downstream from the epicenter of the release.

Power Outage/Infrastructure Failure

Power outages and infrastructure failures most immediately threaten seniors, people with disabilities, and those with home medical equipment. These groups often face the greatest threat during a power outage, during extreme heat or Public Safety Power Shutoffs. Infrastructure failures are usually short term, which most of the population can withstand. Any long term impacts may cause public concern and increase panic.

Terrorism

Since mass casualty incidents/acts of terrorism could occur anywhere in Orange, all groups are potentially threatened by the impacts of these incidents; however, the extent of the threat would depend upon the type and magnitude of the event. For example, an active shooter situation may be isolated to a single location, whereas a larger-scale incident may affect multiple locations. Some locations are more likely to be targeted than others, including but not limited to medical facilities, government buildings, financial institutions and the people frequently visiting these areas may face a greater threat than the average person. Seniors, pregnant women, and persons with disabilities, for instance, are more likely to frequently visit the local hospitals than other subpopulations in the city. If an

incident occurs at a hospital or within the community (overwhelming hospital resources), these groups are expected to face an increased impact from the incident.

Changes in Population Patterns and Land Use and Development

The hazards identified under human-caused hazards will not affect population patterns or land use and development, as no connection can be drawn between these hazards and changes in population patterns or land use and development.

It is not anticipated that population patterns will change over the next 20 years. A change in population pattern would only occur if a hazardous materials release was severe enough to require people to move for a prolonged period of time due to soil contamination.

Infrastructure Failure (Building Collapse/Water System Failure)

Physical Threat

The impacts of a building collapse can be substantial, including monetary losses for property owners, the private sector, and the public. Insurance deductibles and uninsured losses could result in millions of dollars in damages, with the burden potentially falling on taxpayers if property owners are unable to cover debris removal and disposal costs. Older structures are generally at higher risk of structural failure, highlighting the vulnerability of aging infrastructure within the city.

The direct and indirect effects of water systems failure are difficult to quantify. The loss of water utility, for example, does negatively affect businesses, homes, and critical facilities – with serious consequences from long-term outages. Hotels and restaurants, for example, may have to provide bottled water for guests and diners in the event of a water utility failure, and this can be extremely costly.

The vulnerability of this hazard creates challenges for residents and businesses in the form of water advisories in the event of water pressure losses.

Social Threat

Infrastructure failure can have far-reaching impacts on the community. When essential services like water supply are disrupted, residents may face significant challenges in maintaining daily routines, accessing clean water, and ensuring personal hygiene. Vulnerable populations, such as the elderly and those with medical conditions, are particularly at risk during prolonged outages. Additionally, the stress and uncertainty caused by service interruptions can erode public trust and increase anxiety among residents, affecting overall community well-being.

Businesses, schools, and healthcare facilities also suffer, as they rely on consistent infrastructure to operate safely and efficiently. Water advisories and restrictions can disrupt local economies and force temporary closures, leading to loss of income and employment. In severe cases, extended infrastructure failure may result in population displacement if living conditions become untenable, further straining social networks and increasing demand on emergency services.

Changes in Population Patterns and Land Use and Development

Infrastructure failure is not expected to have any impact on population patterns and land use and development. Most are short term system disruptions. If a building collapse were to occur, other development will take its place.

SECTION 6: CAPABILITY ASSESSMENT

A capability assessment was conducted of the City's authorities, policies, programs, and resources that can help to implement mitigation activities. From the assessment, goals, and mitigation actions were developed to lessen the effects of the identified hazards. The planning team also developed a plan to prioritize, implement, and administer the mitigation actions to reduce risk to existing buildings and new development.

6.1 Existing Authorities, Policies, Programs, and Resources

An assessment of authorities, policies and programs, and resources was conducted to identify capabilities that reduce vulnerability to hazards. The capabilities include authorities and policies, such as legal and regulatory resources, fiscal resources, and staff (e.g., technical personnel such as planners/engineers with knowledge of land development and land management practices, engineers trained in construction practices related to building and infrastructure, planners and engineers with an understanding of natural or human-caused hazards, floodplain managers, surveyors, personnel with GIS skills, and staff with expertise of the hazards in the planning area). The planning team also considered ways to expand on and improve these existing policies and programs to integrate hazard mitigation into the day-to-day activities and programs of the City. **Tables 6-1**, **6-2, 6-3**, and **6-4** summarize the existing authorities, policies, programs, and resources to implement mitigation activities.

6.1.1 Planning and Regulatory Capabilities

Planning and regulatory capabilities include local ordinances, policies, and laws to manage growth and development. Examples include land use plans, capital improvement plans, transportation plans, emergency preparedness and response plans, building codes, and zoning ordinances. These capabilities may be used to inform and support mitigation planning or may be modified as mitigation action. **Table 6-1** lists City planning and regulatory capabilities. Under the Description column is an explanation of the City's ability to use the LHMP to expand on and improve these existing policies and programs.

Table 6-1: Local Planning and Regulatory Capabilities		
Name/Version Date	**Hazards Addressed**	**Description (Effect on Hazard Mitigation)**
Zoning Code	Earthquake	The Zoning Code is the main tool to implement the City's General Plan. It sets land use regulations and the zoning map for the city. Expansion and Improvement: Mitigation actions outlined in this Plan can be adopted in the form of land use/development regulations.
Building Code/Fire Code	Earthquake/ Fire	International Building Code, International Fire Code. Expansion and Improvement: Mitigation actions outlined in this Plan can be adopted in the form of new building codes and regulations
Floodplain Management	Flooding	In City of Orange, the Special Flood Hazard Areas are in the vicinity of Santa Ana River, Santiago Creek, and Handy Creek. City of Orange Municipal Code Chapter 15.60 establishes the code and regulations regarding floodplain management within the City. Expansion and Improvement: Mitigation actions outlined in this Plan can be adopted in the form of new codes and regulations related to building in floodplain locations.
Planning Commission		The Planning Commission meets twice per month to review and decide on planning and development matters in Orange. Expansion and Improvement: The Planning Commission can ensure a periodic review of the city's Hazard Mitigation Plan.
Orange Adopted Budget (2024-2025)	All	The Orange City Council approved the City's Fiscal Year 2024-2025 budget on June 25, 2024. The General Fund budget consists of $145.2 million in revenues excluding transfers, and $156.2 million in expenditures. Expansion and Improvement: Future budget will include hazard mitigation projects as part of the general fund budget.

Table 6-1: Local Planning and Regulatory Capabilities		
Name/Version Date	**Hazards Addressed**	**Description (Effect on Hazard Mitigation)**
Orange County Essential Facilities Risk Assessment Project Report April, 2009	All	Provides risk assessment on six natural hazards and Hazus estimated impacts on Orange County for two Earthquake Scenarios. Expansion and Improvement: Ensure all City plans align with the report.
Capital Improvement Program (2025-2028)	All	A compilation of infrastructure and major maintenance projects designed to expand, enhance and/or preserve the foundation of this great City. Expansion and Improvement: Future iterations of the CIP will incorporate hazard mitigation activities.
Capital Improvement Program Water System	Earthquake, Drought,	A compilation of infrastructure and major maintenance projects designed to expand, enhance, and preserve the water system. Expansion and Improvement: Future iterations of the plan will ensure projects align with the hazard mitigation activities.
2025-2030 Citywide Strategic Plan	Flooding, earthquake, Fire	To provide Orange a five-year economic development strategic plan that guides priorities, policies, programs, and services. Expansion and Improvement: Future iterations of the Strategic Plan will incorporate hazard mitigation activities.
Orange 2010 General Plan	All	Established a long-term vision for growth and change through the year 2030. This “blueprint” for our City specifies goals, policies, and measures to help influence physical growth and change in ways that protect our citizen’s quality of life. Expansion and Improvement: Future iterations of the General Plan will incorporate hazard mitigation activities.
Orange General Plan Safety Element	Natural Hazards	Addresses these safety issues, with emphasis on the naturally occurring conditions that pose a hazard to Orange, and provides goals, policies, and programs aimed at reducing the City’s risk from these hazards. Expansion and Improvement: Align the LHMP with the future iteration of the Safety Element.

Table 6-1: Local Planning and Regulatory Capabilities		
Name/Version Date	**Hazards Addressed**	**Description (Effect on Hazard Mitigation)**
Orange Code of Ordinances	Multiple	Local laws enacted by Orange, created to address matters of local concern that are not covered by state or federal laws. Expansion and Improvement: Ensure ordinances align with industry standards and look at the implications of adding additional restrictions that improve mitigation City wide.
City Urban Water Management Plan (2020)	Drought, Climate Change	The UWMP provides urban water suppliers (including the City) with a planning document for long-term resource planning to ensure adequate water supplies are available to meet existing and future water supply needs. In addition, the UMWP incorporates water supply reliability determinations resulting from potentially prolonged drought, regulatory revisions, and/or changing climatic conditions. Expansion and Improvement: The UWMP and LHMP will be aligned in describing and developing mitigation actions to address climate change and drought. Water demand reduction strategies contained in the UWMP should be considered for inclusion as mitigation activities in the LHMP.

6.1.2 Administrative and Technical Capabilities

Administrative and technical capabilities include community (including public and private) staff and their skills and tools that can be used for mitigation planning and implementation. This capability includes engineers, planners, emergency managers, GIS analysts, building inspectors, grant writers, and floodplain managers. Some communities may rely on other government entities such as counties or special City's for resources. These capabilities may be used when planning mitigation activities to support project feasibility studies, designs, estimates, and construction.

Table 6-2: Administrative and Technical Capabilities

Resource Name	Lead Department	Description (Effect on Hazard Mitigation)
Communications	City Manager's Office	The City's Public Information Office provides outreach and information to the public, creative services to all internal departments, and videography for the City; also handles all website administration. Expansion and Improvement: Strengthen ties with community organizations and businesses to ensure key content and information is timely and relevant. Create additional communications platforms to ensure information and content reaches community members.
City Clerk's Office	City Manager's Office	The City Clerk supervises and coordinates City elections; serves as Filing Officer for City appeals as designated by various sections of the Orange Municipal Code; prepares and updates the City's Conflict of Interest Code, and serves as Filing Officer for the Fair Political Practices Commission; receives and opens all sealed bids and formally releases bid bonds; receives, processes and maintains claims, public record requests, special event applications, summonses and complaints; assists the public and City staff by providing information and research assistance; and directs the retention and destruction of official records in accordance with applicable laws and regulations. Expansion and Improvement: Prioritize new initiatives that support mitigation activities within the City.

Table 6-2: Administrative and Technical Capabilities		
Resource Name	**Lead Department**	**Description (Effect on Hazard Mitigation)**
Engineering	Public Works	The department is charged with overseeing, planning, designing, and implementation of infrastructure projects. Some of the department's functions include: Act as the lead agency for construction and public works contracts within the Right-of- Way. Program, plan, design and administer the construction of the annual Capital Improvement Program. Issue encroachment and traffic control permits for any work within the Right-of-Way. Inspect construction within the Right-of-Way to verify conformance with the permit conditions and compliance with the latest City codes. Review all proposed residential, commercial and industrial development projects and provide engineering input as well as conditions of approval for proposed projects. Plan check all development plans including those that impact other department functions. Manage the NPDES program activities, such as business inspection, construction site inspection, public education, and outreach, etc. Manage traffic engineering and transportation planning activities. Provide support for other departments working within the Right-of-Way. Expansion and Improvement: Work with Engineering to identify soft structures within the City boundary and develop mitigation strategies to make improvements.
Public Works	Public Works	The City of Orange Public Works Department is responsible for maintaining and improving the City's vital infrastructure, including streets, sidewalks, parks, landscaping, sewers, storm drains, and public facilities. Expansion and Improvement: Improve the understanding of the role that daily activities play in hazard mitigation. Develop hazard mitigation projects that aid in mitigation.

Table 6-2: Administrative and Technical Capabilities		
Resource Name	**Lead Department**	**Description (Effect on Hazard Mitigation)**
Water Division	Public Works	The City of Orange Public Works Department is responsible for maintaining and improving the City's potable water distribution system. Expansion and Improvement: Ensure the integration of water infrastructure into the LHMP. Develop hazard mitigation projects that aid in mitigation of water infrastructure.
Information Technology	Information Technology	The role of the IT Department is to support the operational departments with reliable systems and information on a daily basis. The most critical support required of IT being network, communications and applications support. The IT department provides short- and long-term direction in planning, researching, selecting and deploying future technologies. IT strives to accommodate improved business process automation, self-service and quality customer service through a variety of hardware and software solutions. Expansion and Improvement: Increase system redundancy and resiliency through improvements to technologies and connectivity.
Public Safety	Police Department	Orange Police Department is tasked with protecting life and property while preserving peace. This department is responsible for conducting public safety activities, investigating criminal activity, and directing traffic. Expansion and Improvement: Provide training to Officers to better enable them to see potential hazards and take action to report them.
Emergency Management	Fire	Develops, coordinates, and manages programs that prevent, prepare for, respond to, recover from, and mitigate natural and human-caused disasters and emergencies. Expansion and Improvement: Increase coordination and collaboration with other City departments, especially during annual budgeting.

Table 6-2: Administrative and Technical Capabilities		
Resource Name	**Lead Department**	**Description (Effect on Hazard Mitigation)**
Fire Department	Fire	The Orange Fire Department provides fire protection and emergency medical services for the city. Expansion and Improvement: Proactively identify opportunities to coordinate and collaborate with neighboring jurisdictions to increase City and region-wide capabilities.
Housing	Community Development	The Community Development administers funds the City receives from the United States Department of Housing and Urban Development (HUD). These funds are authorized under HUD's Community Development Block Grant (CDBG) program and used to benefit low- and moderate-income families and aid in the rehabilitation and development of blighted areas within the City. Expansion and Improvement: Integrate mitigation actions and strategies into low- and moderate-income areas to reduce blight and potentially spur further investment.
Planning	Community Development	The Community Development Department plays a critical role in achieving the City Council's goals and objectives related to land use, urban design, and the quality and sustainability of the built environment. Expansion and Improvement: Provide opportunities for continued education to Community Development staff to maintain state-of-the-art knowledge of new code and regulatory requirements.
Building	Community Development	The Community Development Department provides professional plan review and inspection services to ensure buildings and projects are built and developed in compliance with all applicable municipal and state code requirements. Expansion and Improvement: Provide opportunities for continued education to Community Development staff to maintain state-of-the-art knowledge of new code and regulatory requirements.

Table 6-2: Administrative and Technical Capabilities		
Resource Name	**Lead Department**	**Description (Effect on Hazard Mitigation)**
Financial Services	Finance	The Finance Department is tasked with maintaining reliable accounting records, payment of approved demands against the City treasury, financial statement reporting, preparation of the annual budget, prudent fiscal planning, payroll processing and debt administration. Expansion and Improvement: Assist with key mitigation activities associated with cost tracking hazard events and disasters, identifying grant funding opportunities, grant reporting and administration, and establishing financial risk calculations that can help assist with budgeting of operations, maintenance, and capital improvements.
Human Resources	Human Resources	The Human Resources Department plans, coordinates and administers a comprehensive human resources management program for the City of Orange and its employees. This includes the recruitment and retention of highly qualified employees, maintenance of a competitive employee compensation program, implementation and use of current technology for the City's human resources, organizational and employee development, and employee/labor relations. Identifies, evaluates and manages the City's risk and liability programs. This includes claims administration, the maintenance of liability/insurance coverage as well as the compliance with governmental regulation. In addition, the department administers the City's workers' compensation and employee safety programs. Expansion and Improvement: Increase knowledge and information through better data collection and tracking.
City Attorney	City Manager's Office	Reviews and approves resolutions and ordinances. Expansion and Improvement: Provide opportunities for the City Attorney to review updates to regulatory information to provide expert review of City resolutions and ordinances that may address hazard mitigation

Table 6-2: Administrative and Technical Capabilities		
Resource Name	**Lead Department**	**Description (Effect on Hazard Mitigation)**
GIS	Public Works	Provides complex mapping and data management of City facilities, land use, and potential hazards. Supports visualization of complex data sets using geo-location and data correlation. Expansion and Improvement: Acquire and conduct training for GIS technicians on the latest versions of ArcGIS.

Financial Capabilities

Financial capabilities include grants, general funds, property sales, income taxes, development impact fees, or stormwater utility fees. Based on procedures for each resource, these financial resources may be used to support mitigation activities.

Table 6-3: Financial Capabilities

Resource Name	Administrator	Description (Effect on Hazard Mitigation)
General Fund	Department Specific	Program operations and specific projects. Consists of property tax, sales tax, transient occupancy tax, and franchise tax that can be used for general purposes. Expansion and Improvement: Hazard mitigation projects may be considered during the annual budgeting process for funding from the general fund.
Utility Fees	Public Works	Revenue from potable water sales is regularly used to fund mitigation activities to water infrastructure. Expansion and Improvement: Continue to use revenue generated from potable water sales on mitigation activities.
Hazard Mitigation Grant Program (HMPG)	Emergency Management	Provides support for pre-and post-disaster mitigation plans and projects. Expansion and Improvement: Train staff on notice of intent (NOI) procedures and track opportunities on the Cal OES mitigation website to initiate applications for grant funding.
Flood Mitigation Assistance grant program (FMA)	Grant Funding	Mitigates structures and infrastructure that have been repetitively flooded. Expansion and Improvement: Train staff on notice of intent (NOI) procedures and track opportunities on the Cal OES mitigation website to initiate applications for grant funding.

Education and Outreach Capabilities

These capabilities include fire safety programs, hazard awareness campaigns, and public information or communications offices. Education and outreach capabilities can be used to inform the public on current and potential mitigation activities.

Table 6-4: Education and Outreach Capabilities

Resource Name	City Leads	Description (Effect on Hazard Mitigation)
Public Information Officer	City Manager's Office, Various Departments	Develops and delivers outreach and engagement programs that promote hazard awareness. Expansion and Improvement: Provide additional information to the community about hazard mitigation activities.
City Web Sites **https://www.cityoforange.org/home**	Various Departments	Provides easily accessed information about the City. Used for LHMP public outreach and engagement. Expansion and Improvement: Use the City website to provide additional information to the community about hazard mitigation activities.
City Social Media Accounts **https://www.facebook.com/cityoforange** **https://www.instagram.com/cityoforange_ca/** **https://www.linkedin.com/company/city-of-orange/** **https://www.x.com/cityoforangeCA** **https://www.facebook.com/orangecityfiredept** **https://www.instagram.com/cityoforangepd/**	Various Department	Provides easily accessed information about the City. Used for LHMP public outreach and engagement. Expansion and Improvement: Use the City social media platforms to provide additional information to the community about hazard mitigation activities.

6.2 National Flood Insurance Program Participation

The City of Orange adopted the Model Floodplain Management Ordinance within the City in order to maintain eligibility within the National Flood Insurance Program (NFIP). **Table 6-5** contains information from the FEMA Community Status Book Report for communities participating in the NFIP.

Table 6-5: NFIP Participation Information for the City of Orange

CID	Community Name	County	Initial FHBM Identified	Initial FIRM Identified	Current Eff Map	Date Reg-Emer Date
060228	City of Orange	Orange County	03/28/1978	09/30/82	12/03/09	05/01/1987

Since 1968 the NFIP has provided federally funded flood insurance to homeowners, renters, and businesses in communities that adopt and enforce floodplain management ordinances to reduce future flood damage. The adoption of Orange Municipal Code Chapter 15.60 allows residents of the City to remain eligible to purchase flood insurance through the National Flood Insurance Program. The Ordinance meets the minimum standards set forth in Title 44, Section 60.3 of the Code of Federal Regulations. The City of Orange participates in the Community Rating System. The City does not have any repetitive flood loss structures or severe repetitive loss structures

The Floodplain Management Ordinance's effect is limited to requiring that any new construction or substantial improvement to existing structures will have to comply with the standards of construction identified in the Ordinance. The City's continued involvement in NFIP supports this plan. Currently, the City of Orange implements a floodplain management program designed to protect the people and property of the City and implements activities such as public information and outreach activities, mapping and regulatory activities, and flood damage reduction activities. The floodplain administrator, City Manager, or designee shall obtain, review, and reasonably utilize any base flood data available from federal or state agencies or other source to identify flood-prone areas within the boundaries of the city.

Post incident, the Floodplain Administrator oversees local floodplain ordinances and will implement any substantial improvements/substantial damage provisions of their floodplain management regulations according to the Orange Municipal Code Chapter 15.60.050.

SECTION 7: MITIGATION STRATEGY

Federal regulations require local mitigation plans to identify goals for reducing long-term vulnerabilities to the identified hazards in the planning area (Section 201.6(c)(3)(i)).

A hazard mitigation plan's primary focus is the mitigation strategy. It represents the efforts selected by the City to reduce or prevent losses resulting from the hazards identified in the risk assessment. The strategy includes mitigation actions and projects to address the risk and vulnerabilities discovered in the risk assessment. The mitigation strategy consists of the following steps:

- Identify and profile hazards and risk within the City
- Identify projects and activities that can prevent or mitigate damage and injury to the population and buildings
- Develop a mitigation strategy to implement the mitigation actions
- Develop an action plan to prioritize, implement, and administer the mitigation actions
- Implement the LHMP mitigation action plan

7.1 Hazard Mitigation Statement

The 2025 LHMP represents the City's commitment to create a safer, more resilient community by taking actions to reduce risk and by committing resources to lessen the effects of hazards on the people and property of the city.

7.2 Hazard Mitigation Goals and Objectives

Mitigation goals are guidelines that represent what the community wants to accomplish through the mitigation plan. Goals are broad statements that represent a long-term, community-wide vision. The planning team reviewed the goals and objectives from the previous LHMP and determined which goals best met the City's objectives for future mitigation. In addition to the overarching hazard mitigation goals, the City worked to develop the strategies aligned with the CIP and other planning mechanisms that relate to hazard mitigation. The 2025 LHMP was revised to focus on the communities' future priorities as they relate to Climate Change, Wild/Urban Fire, and their commitment to involving vulnerable populations to the planning process. **Table 7-1** lists the goals for the 2025 LHMP.

Table 7-1: Hazard Mitigation Goals
2025 Goals
Goal 1: Protect life and property, and reduce potential injuries from natural, technological, and human-caused hazards
Goal 2: Improve public understanding, support of, and need for hazard mitigation measures
Goal 3: Promote disaster resilience for the City's natural, existing, and future built environment
Goal 4: Strengthen partnerships and collaboration to implement hazard mitigation activities
Goal 5: Enhance the City's ability to effectively and immediately respond to disasters

7.3 Mitigation Actions/Projects and Implementation Strategy

Mitigation actions are specific activities or projects that serve to meet the goals that the community has identified. Mitigation actions and projects are more specific than goals or objectives and often include a mechanism, such as an assigned timeframe, to measure the success and ensure the actions are accomplished. The planning team conducted a review of the mitigation actions and strategies from the State Hazard Mitigation Plan and from other planning efforts to develop new mitigation actions and projects to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure.

The City developed and prioritized new mitigation projects, and included them in the action plan discussed below in **Table 7-4**. The mitigation action plan developed by the planning team includes the action items that the City intends to implement during the next five years, assuming funding availability. The action plan includes the implementing department, an estimate of the timeline for implementation, and potential funding sources.

7.4 Previous Mitigation Actions/Projects Assessment

The 2016 LHMP contained 43 mitigations actions. Many of the mitigation actions were completed or carried out to some degree or are considered ongoing. Some of the mitigation actions were duplicative, others were better categorized as emergency preparedness or recovery activities, and others were either not addressed during the time period or were not feasible to accomplish. **Table 7-2** provides the status of mitigation actions from the 2016 LHMP.

Table 7-2: 2016 Hazard Mitigation Plan Mitigation Action Status		
#	Mitigation Action	Status (Complete, Ongoing, Planned, Remove)
1	Develop a strategy to effectively alert, warn, and make notifications to all community members in the event of an imminent threat or a need to evacuate. This strategy should include distribution of notices and "canned messages" through multiple methods (television, phone, radio, mobile device, door-to-door notifications, etc.) and in all languages widely spoken in the community and for people with disabilities and access and functional needs.	Remove
2	Distribute information about ways to reduce the threat of hazards to all community members through mailings, printed notifications, television and digital devices, and in-person events and workshops. All information should be in multiple languages, culturally appropriate, and for people with disabilities and access and functional needs	Remove (Combined with #14 and added to 2025 Mitigation Actions)
3	Incorporate all hazards identified in the Local Hazard Mitigation Plan into all City emergency response planning efforts and programs.	Ongoing (Added to 2025 Mitigation Actions)
4	Identify and implement needed infrastructure and program-level actions to maintain City services to community members during emergency situations.	Remove
5	Work with regional utility companies and service agencies, including electricity and natural gas providers, telecommunication providers, and transit agencies, to determine approximate time frames for service interruptions, develop appropriate stopgap measures, and establish emergency activities to provide public safety through the restoration process	On-going (Added to 2025 Mitigation Actions)
6	In coordination with state and regional agencies and other key stakeholders, conduct disaster training and exercises of increasing complexity.	Remove
7	Ensure General Plan updates and incorporates hazards information provided in this Local Hazard Mitigation Plan and a policy framework consistent with the actions in this Local Hazard Mitigation Plan. Consider adopting the LHMP into the Safety Element of the General Plan.	On-going (Added to 2025 Mitigation Actions)
8	Coordinate and participate with local, regional, and state agencies to monitor potential changes in the severity, duration, and affected areas of all hazards, and evaluate the possibility for additional hazards to become a threat. In particular, monitor the effects that climate change may have on future hazards.	On-going (Added to 2025 Mitigation Actions)

Table 7-2: 2016 Hazard Mitigation Plan Mitigation Action Status		
#	**Mitigation Action**	**Status (Complete, Ongoing, Planned, Remove)**
9	Invest in energy efficiency upgrades, energy conservation programs, renewable energy facilities, and innovative energy technologies such as microgrids to ensure government facilities are operational during extreme events. Critical facilities and facilities identified as cooling centers should be prioritized.	On-going (Added to 2025 Mitigation Actions)
10	Identify seismically vulnerable municipally owned facilities and identify potential funding sources to conduct seismic retrofits in public buildings.	On-going (Added to 2025 Mitigation Actions)
11	Inventory the unreinforced masonry, soft story, and other seismically vulnerable private buildings in the city. Advise the owners of potential means of pursuing solutions to assist with seismic retrofits.	Removed
12	New development will be required to abide by the most recently adopted City and state seismic and geotechnical requirements. All older buildings, particularly unreinforced masonry buildings, and buildings located near the Peralta Hills and El Modena Faults should be reinforced and strengthened to prevent damage to structures and loss of life in the event of an earthquake.	Remove
13	Contact utility companies and districts to obtain information regarding seismic evaluations of utility infrastructure, including power lines, water pipelines, sewer lines, freeways and key surface streets, and natural gas pipelines, in coordination with utility companies and appropriate agencies. Advise utility companies and districts of potential means of pursuing solutions to assist with seismic retrofits.	Remove
14	Continue to provide public education programs regarding geologic and seismic hazards and continue to cooperate with surrounding cities, regional, state, and federal government in programs designed to implement the most strategic and efficient actions to mitigate such hazards.	On-going (Added to 2025 Mitigation Actions)
15	Require liquefaction assessment studies and implementation of mitigation measures for qualifying projects. Potential mitigation measures include soil densification or compaction, displacement or compaction grouting, post-tensioned slab foundations, piles, or caissons.	Ongoing (Added to 2025 Mitigation Actions)
16	Identify critical facilities and key pieces of infrastructure that are at an elevated risk of liquefaction and conduct retrofits to reduce vulnerability.	Remove

Table 7-2: 2016 Hazard Mitigation Plan Mitigation Action Status		
#	**Mitigation Action**	**Status (Complete, Ongoing, Planned, Remove)**
17	Continue to educate the public and provide up-to-date maps delineating areas that could face fire hazards.	Remove (Combined with #14 and added to 2025 Mitigation Actions)
18	Regulate structural development within or adjacent to wildland to ensure best building practices to create fire resistive communities	Ongoing (Added to 2025 Mitigation Actions)
19	Designate selected City and community facilities as cooling centers, ensuring that all residents have easy access to a cooling center, including those with limited mobility. Set a temperature trigger to open the cooling centers and distribute information about cooling center availability through multiple media forms.	Completed
20	Provide training to outdoor City workers, including landscaping, recreation, and construction staff, about the risks posed by extreme heat and ways to reduce vulnerability. Work with local businesses and community groups to encourage similar training in the private sector.	Remove
21	Identify and pursue alternative water sources to supplement imported Colorado River and State Water Project deliveries.	On-Going (Added to 2025 Mitigation Actions)
22	Explore constructing additional water storage facilities and additional emergency connections to supplement water supplies during drought conditions or short-term shortages.	On-Going (Added to 2025 Mitigation Actions)
23	Develop and implement long-term strategies to reduce community water use, including mandatory use of drought-tolerant plants in new or replacement landscapes, and requirements to install water fixtures in new buildings that exceed minimum code requirements.	On-Going (Added to 2025 Mitigation Actions)
24	Educate community residents and businesses about available rebates for water-efficient and water-conserving equipment.	On-Going (Added to 2025 Mitigation Actions)
25	Consider implementing additional mandatory restrictions on water use during drought conditions.	Remove
26	Install drought-tolerant or artificial turf at City parks as feasible.	On-going (Added to 2025 Mitigation Actions)

Table 7-2: 2016 Hazard Mitigation Plan Mitigation Action Status		
#	**Mitigation Action**	**Status (Complete, Ongoing, Planned, Remove)**
27	When conducting water supply analyses for future Urban Water Management Plans, use more severe/long-lasting drought scenarios.	On-Going (Added to 2025 Mitigation Actions)
28	Design future critical infrastructure to withstand wind events beyond minimum code standards.	Remove
29	Monitor trees and other vegetation near power lines, and promptly inform Utilities and/or Public Works of the need for any tree trimming.	Remove
30	Develop and maintain protocols to ensure that City staff and emergency responders are notified as soon as possible following a hazardous materials release, or if an emergency situation (e.g., a flood) may result in a hazardous materials release.	Complete
31	Require all new development to abide by the most recently adopted City and state seismic and geotechnical requirements.	Ongoing (Added to 2025 Mitigation Actions)
32	Provide public education programs regarding geologic threats and hazards.	Removed (Combined with #14 and added to 2025 Mitigation Actions)
33	Continue to cooperate with surrounding cities, regional, state, and federal government in programs designed to implement the most strategic and efficient actions to mitigate landslide, expansive soil, and erosion hazards.	Ongoing (Added to 2025 Mitigation Actions)
34	Evaluate the effectiveness of City-owned stormwater drainage and pipeline systems, and conduct improvements as needed.	On-Going (Added to 2025 Mitigation Actions)
35	In coordination with utility companies and state and regional agencies, conduct a flood resiliency analysis of critical facilities and key utility and transportation infrastructure. Identify actions to reduce vulnerability and pursue funding to carry out improvements.	Remove
36	Supplement existing drainage systems with low-impact development features as feasible such as promoting developments that incorporate permeable surfaces within site design	Remove
37	Support the use of low-impact development features in new projects, including as a condition of approval for major developments.	Ongoing (Added to 2025 Mitigation Actions)

Table 7-2: 2016 Hazard Mitigation Plan Mitigation Action Status		
#	**Mitigation Action**	**Status (Complete, Ongoing, Planned, Remove)**
38	Investigate the City's ability to continue to participate in the National Flood Insurance Program's Community Rating System to reduce local insurance premiums and further mitigate flood impacts.	Remove
39	Develop critical public and private facilities such as medical, educational, and civic facilities to be located outside of flood zones.	Ongoing (Added to 2025 Mitigation Actions)
40	Develop and offer educational programs for the public and City staff regarding flood hazards.	Remove
41	Develop an outreach campaign for residents regarding the upgrades to Prado Dam, and potential flooding impacts in the city associated with Santiago and/or Villa Park dam failures.	Remove
42	Coordinate with the Orange County Public Health Services, Orange County Vector Control District, and local medical care providers to distribute information about ways to reduce the risks associated with diseases of concern, including influenza and West Nile virus.	Remove
43	Identify areas of poor drainage or other areas with consistently stagnant water and address through new or retrofitted drainage infrastructure.	Remove

7.4.1 New Mitigation Actions

Mitigation actions are specific activities or projects that serve to meet the goals that the community has identified. Mitigation actions and projects are more specific than goals or objectives and often include a mechanism, such as an assigned time period, to measure the success and ensure the actions are accomplished. The planning team conducted a review of the mitigation actions and strategies from the 2016 LHMP. With information from the risk assessment, capability assessment, and status of the actions implemented since the 2016 LHMP, the planning team developed 32 new ongoing mitigation actions and projects to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure. Those actions that were carried over from the 2016 LHMP, were incorporated into similar actions.

Table 7-3 lists potential mitigation actions developed by the planning team. Mitigation Actions that were chosen were excluded from Table 7-3 and incorporated into **Table 7-4**.

Table 7-3: Potential Mitigation Actions 2025					
Goal	**Action Item #**	**Action Description**	**Mitigation Type**	**Related Hazards**	**Implementing Organizations**
Goal 1: Protect life, property, and reduce potential injuries from natural caused hazards	1.1	Assess and implement flexible piping joints at above-ground storage reservoirs as appropriate	Prevention	Seismic	Operations
	1.2	Continue to identify and ensure that pipe specifications are compatible with engineering and earthquake specifications	Prevention	Seismic	Operations
	1.3	Identify funding and acquire a mobile command and communications vehicle	Response	All	Operations
	1.4	Continue to include back-up power	Preparedness	Loss of Power/ PSPS	Operations

7.4.2 Mitigation Action Plan

The action plan developed by the planning team includes the action items that the City intends to implement during the next five years, assuming funding availability. The action plan, shown in **Table 7-4,** includes the implementing department, an estimate of the timeline for implementation, and potential funding sources.

The new mitigation actions include a broad range of approaches to hazard mitigation such as retrofitting, code enforcement, development of new regulations, public education, development of redundant facilities, and others. Measures are included to mitigate risks to existing buildings and infrastructure, as well as new buildings and infrastructure. The mitigation action plan assigns primary responsibility for each of the action items to an implementing department. The implementing department is the controlling department that will assign funding and oversee activity implementation, monitoring, and evaluation.

The planning team does not presume the expertise to prescribe which projects will be implemented. Prioritization of projects in the LHMP is a means to provide a basis for implementing the mitigation strategies, but all new mitigation actions and projects will be

formally prioritized and selected by the implementing department. This will accommodate the project funding, schedule of the department, staff requirements, and ability to integrate the new project into existing and ongoing projects. D

Prioritization

To assist with implementing the mitigation action plan, the planning team used the following ranking process to provide a method to prioritize the projects for the Action Plan. Designations of High, Medium, and Low priorities have been assigned to each action item using the following criteria.

Does the action	Solve the problem?
	Address vulnerability assessment?
	Reduce the exposure or vulnerability to the highest priority hazard?
	Address multiple hazards?
	Offer benefits that equal or exceed costs?
	Implement a goal, policy, or project identified in the General Plan or Capital Improvement Plan?
Can the action	Be implemented with existing funds?
	Be implemented by existing state or federal grant programs?
	Be completed within the five-year life cycle of the LHMP?
Will the action	Be implemented with currently available technologies?
	Be accepted by the community?
	Be supported by community leaders?
	Adversely affect segments of the population or neighborhoods?
	Require a change in local ordinances or zoning laws?
	Result in a positive or neutral impact on the environment?
	Comply with all local, state, and federal environmental laws and regulations?
Is there	Sufficient staffing to undertake the project?
	Existing authority to undertake the project?

Each positive response is equal to one point. Answers to the criteria above determined the priority according to the following scale:

1–6 = Low priority **7–12** = Medium priority **13–18** = High priority

Benefit-Cost Analysis

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

Funding

The funds required to implement the mitigation action plan will come from a variety of sources, including Federal Hazard Mitigation Grants, City budget, bonds, fees and assessments, and others. Some projects are (or will be) included in capital improvement budgets, while some, especially ongoing projects, are included in department operating budgets.

Prior to beginning a project or when federal funding is involved, the implementing department will use a FEMA approved benefit/cost analysis approach to identify the actual costs and benefits of implementing these mitigation actions. For non-structural projects, implementing departments will use other appropriate methods to weigh the costs and benefits of each action item and then develop a prioritized list.

Implementation

Mitigation projects were assigned one of three categories as a tentative schedule for implementation: short-range, mid-range, and long-range. Projects that are currently being implemented by various departments are assigned to the ongoing category. Implementation of short-range projects will typically begin within the next three (3) years. Mid-range projects will require some planning and likely require funding beyond what is currently allocated to the various departments in the City's Operations and Maintenance budget. Projects in the mid-range category will generally begin implementation in the next three (3) to five (5) years. Long-range projects will require great planning and funding and will generally begin implementation within five years and beyond.

7.5 Previous Plan Incorporated into Other Planning Mechanisms

The 2016 LHMP was integrated into the following planning mechanisms:

- The City EOP contains a list of hazards. The LHMP provided a similar, more detailed description of these hazards. The update to the LHMP informed revisions to the EOP.
- The American Water Infrastructure Act required Risk and Resiliency Assessment

(RRA) informed the update to the hazard analysis that are contained in both. Hazard analysis and risk/vulnerability updates to one document should be reviewed for inclusion in both.

- The City reviewed the 2016 mitigation action plan in the LHMP to update the CIP. Several mitigation actions addressed facility improvement and resiliency.

Table 7-4: Mitigation Action Implementation Plan						
#	Mitigation Action	Funding Sources	Responsible Department	Relative Cost*	Time Frame	Priority
1	Install energy efficient equipment and harden emergency backup power at critical facilities deemed necessary. Prioritize installations for facilities that serve as key cooling/warming centers and evacuation centers/shelters. (Hazards addressed: All, Power Outage, Infrastructure Failure)	General Fund, HMGP	Public Works	$$	2-5 years	Medium
2	Develop a list of key facilities. Conduct a feasibility assessment of installing solar and battery backup systems at critical facilities within the City. (Hazards addressed: All, Power Outage, Infrastructure Failure)	General Fund, HMGP	Public Works	$	2 years	Medium
3	Upgrade power and water facilities, to include reservoirs, to improve resiliency due to power loss, flooding, and seismic activity. (Hazards addressed: All)	General Fund, HMGP	Public Works	$$$	Ongoing - Yearly	High
4	Develop a policy to ensure the City's LHMP is reviewed during the development of capital improvement plans/projects. (Hazards addressed: All)	General Fund, HMGP	Fire	$	1 year	Medium

Table 7-4: Mitigation Action Implementation Plan						
#	Mitigation Action	Funding Sources	Responsible Department	Relative Cost*	Time Frame	Priority
5	Develop a Public Outreach Plan geared towards providing hazard education, emergency management, and mitigation action activities. Create and Integrate hazard mitigation material into public safety information and training programs (e.g. Community Emergency Response Team Program) (Hazards addressed: All)	General Fund, HMGP	Fire	$	Ongoing - yearly	Low
6	Integrate the LHMP into the City's General Plan by complying with AB 2140. (Hazards addressed: All)	General Fund, HMGP	Planning	$	Ongoing - yearly	Low
7	Develop a policy to ensure the City's Building Codes are reviewed annually to reflect changes and best practices in hazard science (Hazards Addressed: Flood, Earthquake).	General Fund, HMGP	Planning	$	3 years	Medium
8	Closely monitor changes in the boundaries of mapped hazard areas resulting from land use changes or climate change and adopt new mitigation actions or revise existing ones to ensure continued resiliency. (Hazards addressed: All)	General Fund, HMGP	Fire/ Planning	$	2 years	Medium
9	Integrate climate change mitigation and adaptation information and analysis into future LHMP updates and others. (Hazards addressed: Climate Change)	General Fund, HMGP	Fire	$	Ongoing - Yearly	High

Table 7-4: Mitigation Action Implementation Plan						
#	Mitigation Action	Funding Sources	Responsible Department	Relative Cost*	Time Frame	Priority
10	Implement measures to bolster local water supply to meet demand, create a sustainable water supply, while meeting environmental mandates. (Hazards addressed: Drought)	General Fund, HMGP	Public Works	$$$	3 years	High
11	Develop public messaging about water conservation to address climate change-induced drought for posting on websites, social media, and other platforms. (Hazards addressed: Drought)	General Fund, HMGP	Public Works	$	Ongoing - Yearly	Low
12	Implement and enforce the soft story retrofit ordinance. (Hazards addressed: Seismic)	General Fund, HMGP	Planning	$	2 years	Medium
13	Conduct an educational campaign, incentivize and promote medium-scale seismic retrofits, such as window films to minimize shattering, anchors for rooftop-mounted equipment, bracing for masonry chimneys, and other preventative measures to reduce damage to private buildings. (Hazards addressed: Seismic)	General Fund, HMGP	Planning	$	2 years	Medium
14	Develop a Landslide Management Plan that identifies areas at risk and mitigation strategies and develop a policy to ensure the annual review of potential landslide areas in the City of Orange. (Hazards addressed: Landslide)	General Fund, HMGP	Fire/ Planning/ Public Works	$	5 years	Low

Table 7-4: Mitigation Action Implementation Plan						
#	Mitigation Action	Funding Sources	Responsible Department	Relative Cost*	Time Frame	Priority
15	Conduct a seismic analysis of all City-owned key facilities and retrofit vulnerable facilities. (Hazards addressed: Seismic)	General Fund, HMGP	Public Works	$	2-3 Years	High
16	Initiate a program to schedule installation of resilient (seismically appropriate) piping for new or replacement water distribution pipelines. (Hazards addressed: Seismic)	General Fund, HMGP	Public Works	$$$$	Ongoing - Yearly	High
17	Identify and retrofit key critical facilities with seismically rated window film treatments that ensure glass windows do not shatter during a strong seismic event. (Hazards addressed: Seismic)	General Fund, HMGP	Planning/ Public Works	$$	5 years	High
18	Investigate the use of permeable paved and landscaped swales for new construction and replacement of City-owned hardscaped areas. [Identify which locations] (Hazards addressed: Flooding)	General Fund, FMA	Public Works	$$	3 years	Medium
19	Retrofit roadway medians to capture stormwater during rain events. Prioritize improvements along major arterials/ roadways throughout the City. (Hazards addressed: Flooding)	General Fund, FMA	Public Works	$$$	4 years	Medium
20	Remove or trim trees determined to be susceptible to blowing over during a severe wind event and underground power lines, where feasible. (Hazards addressed: High Winds, Severe Rainstorm)	General Fund, HMGP	Parks/ Public Works	$	Ongoing - yearly	Medium

Table 7-4: Mitigation Action Implementation Plan

#	Mitigation Action	Funding Sources	Responsible Department	Relative Cost*	Time Frame	Priority
21	Educate and promote the proper maintenance and separation of power lines from trees and other hazards. (Hazards addressed: All)	General Fund, HMGP	Fire/ Public Works	$	Ongoing - Yearly	High
22	Conduct regular fuel modification projects to reduce fire hazard risks, such as clearing out dead vegetation in parks, open spaces, right-of-way embankments, and other areas that could become fuel for fires. (Hazards addressed: Wildfire)	General Fund, HMGP	Fire/Public Works	$	Ongoing - Yearly	High
23	Adopt a wildfire mitigation ordinance to limit the use and development of wildfire hazard areas to mitigate risk to life and property. (Hazards addressed: Wildfire)	General Fund, HMGP	Fire	$	2 years	High
24	Identify Dam inundation threats to the City and implement an early warning system/protocol that notifies downstream communities in the event of a potential dam failure incident. (Hazards addressed: Dam Failure)	General Fund, HMGP	Public Works	$	2 years	Low
25	Continuously inspect businesses and other properties storing hazardous materials and create an inventory of storage locations that require updates, maintenance, or renovation. (Hazards addressed: Hazardous Materials)	General Fund, HMGP	Fire	$	Ongoing - Yearly	Medium

Table 7-4: Mitigation Action Implementation Plan

#	Mitigation Action	Funding Sources	Responsible Department	Relative Cost*	Time Frame	Priority
26	Establish and provide annual cyber-security risk briefings to City officials. Leverage the Department of Homeland Security's State, Local, Tribal, and Territorial Cyber security engagement programs. (Hazards addressed: Cyber Attack)	General Fund, HMGP	IT	$	2 years	High
27	Conduct an annual survey of high-risk trees in the City and develop a strategy to remove high risk trees prior to major wind or rain event. (Hazards addressed: Tree Mortality)	General Fund, HMGP	Public Works	$	2 years	Low
28	Evaluate all critical facilities, facilities of concern for potential human-caused hazard vulnerabilities and integrate counterterrorism design elements and building materials, where feasible. (Hazards addressed: Terrorism)	General Fund, HMGP	Police	$	Ongoing - Yearly	Medium
29	Develop and coordinate planning with partners for dispensing of medications or vaccines. Coordinate infection control planning with partners. (Hazard Addressed: Pandemic)	General Fund, HMGP	Public Health	$$	Ongoing - Yearly	Medium
30	Storm drain enhancements throughout the city (Hazard Addressed: Flooding)	General Fund, HMGP	Public Works	$$	Ongoing - Yearly	Medium

SECTION 8: PLAN IMPLEMENTATION AND MAINTENANCE

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This section details the process that the City will use to monitor, update, and evaluate the plan within the five-year cycle of the plan's revision to ensure the LHMP remains an active and relevant document. The format of the plan aligns with the regulation checklist and is divided into sections of information. When it is time to maintain or revise the LHMP, data can be easily located and incorporated, resulting in an easy method to keep the plan current and relevant.

8.1 Monitoring and Evaluation

The planning team represents City staff from each department and other stakeholders that contributed to the development of the 2025 plan. The planning team oversaw the development of the plan and made recommendations on key elements of the plan, including the maintenance strategy.

It was important to the City that each department be represented in the planning team and given the opportunity to provide input during the plan development. This philosophy will continue for future plan revisions through evaluations, maintenance, and updates of data, processes, and programs. The City Emergency Manager will convene the planning team annually to perform annual reviews of the LHMP Mitigation Actions and its implementation to review the plans progress and effectiveness. To evaluate the plan's effectiveness, the planning team will review project timelines and whether the project continues to meet the needs and goals of the City. The planning team will include representatives from the City, non-profit, chamber of commerce, County department, and interest groups within the planning area.

If internal planning team members can no longer serve on the planning team, the Department Director will assign another staff person to be on the planning team so that every City department is represented.

8.2 Plan Update

Section 201.6.d.3 of 44CFR requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under the Disaster Mitigation Act. The City intends to update its hazard mitigation plan on a five-year cycle. The next update will begin starting April of 2029

Based on needs identified by the planning team, the update will, at a minimum, include the following elements:

- The hazard risk assessment will be reviewed and updated using the most recent information and technologies
- The action plan will be reviewed and revised to account for any initiatives completed, dropped, or changed and to account for changes in the risk assessment
- Any new City policies identified under other planning mechanisms, as appropriate
- The draft LHMP update will be sent to appropriate agencies and organizations for comment
- The public will be given an opportunity to comment on the updated version prior to adoption
- The City Council will adopt the updated plan

At a minimum of 12 months before the expiration date of the 2026 LHMP, The City Emergency Manager will convene the planning team to commence the plan revision schedule to formally update the 2026 plan. The plan will be revised using the latest FEMA hazard mitigation guidance documents, such as the Mitigation Planning Tool and Regulation Checklist, to ensure compliance with current hazard mitigation planning regulations.

8.3 Continued Public Involvement

The overall success of the LHMP is through implementation of the plan's hazard mitigation strategy and activities to reduce the effects of hazards, protect people and property, and improve the City's efforts to respond to and recover from disasters. Members of the public and the City will ultimately benefit from the implementation of the LHMP and must be given the opportunity to provide input to the continuous cycle of LHMP planning.

The City will strive to keep the public aware of hazard mitigation projects that take place as a result of the LHMP. Public information will be released through press releases, City website announcements, public hearings as required, council meetings, social media, and press releases.

Projects that mitigate hazards are included in the City's annual budget planning process. The public is made aware of the planning through City Council meetings and press releases during this time. The budget planning process will serve as an annual opportunity to conduct outreach to the public on updates to the hazard mitigation planning process.

A survey can be conducted to gather input on how the community feels about the progress being made on LHMP activities. The Public Information Officer will be tasked with public outreach and responsible for ensuring the public is included and involved in the annual public plan update and outreach.

When the time comes to begin revising the 2025 LHMP, the plan update process will be implemented, which will include continued public involvement and input through

attendance at designated public meetings, web postings, through press releases to local media, community fairs, and events, and surveys. As part of this effort, a series of public meetings will be held, and public comments will be solicited on the revisions to the LHMP according to the five-year cycle. **Table 8-1** summarizes successful public involvement efforts previously conducted by the City, as well as proposed activities for public involvement and dissemination of information that shall be pursued whenever possible and appropriate.

Table 8-1: Past and Proposed Continued Public Involvement Activities or Opportunities Identified by the City

Department	Public Involvement Activity or Opportunity	
	Past	Proposed
Fire	LHMP Survey was conducted online and given out at City events in person.	Conduct annual surveys to be completed online.
All		Place more emphasis on the risks associated with natural and manmade hazards at public awareness campaigns conducted by various City departments. Consider developing and distributing public education materials for natural hazards.

APPENDIX A – LOCAL MITIGATION PLAN REVIEW TOOL

[To be inserted prior to State submission]

APPENDIX B – PLANNING TEAM MEETING/STAKEHOLDER DOCUMENTATION

Appendix B contains documentation of the planning process for the LHMP Planning Team, including meetings, presentations, emails, etc.

Date	Activity	Documentation
February 10, 2025	Project Kick-off Meeting	• Documentation 1: Meeting Notes
March 4, 2025	Planning Team Meeting #1	• Documentation 2: Meeting Notes
May 7, 2025	Planning Team Meeting #2	• Documentation 3: Meeting Notes
October 7, 2025	Draft sent to stakeholders for review	• Documentation 4: Stakeholder Email

Documentation 1: Kick-off Meeting Notes

City of Orange
Local Hazard Mitigation Plan Development

February 12, 2025

To: Megan Berumen
From: Francisco Soto

Kickoff Meeting Notes

The City of Orange hosted the project kickoff meeting with Tandem Solutions (Tandem) on February 10, 2025, from 10:00 PM - 11:00 PM.

Attendees

Attendee	Organization
Megan Berumen	City of Orange
Francisco Soto	Tandem Solutions

Summary of Discussion

- Tandem provided the agenda for the kickoff meeting
- Tandem provided an overview of hazard mitigation
- The client was walked through the scope of work to include:
    a. Task 1: Planning/Process
        i. In addition to internal City Departments, the City will invite the following organizations:
            1. Hospitals: UCI Medical, CHOC, St. Josephs
            2. Orangewood Children's Home
            3. Orange Unified School District
            4. Chapman University
            5. Santiago Community College
            6. Non-profit Organizations (ARC)
            7. Congregations
            8. County Partners
                a. Social Services Agency
                b. Emergency Management
            9. Amateur Radio Group
            10. CERT

11. Representative from the Chamber of Commerce

ii. The County has various pockets within the City that are technically controlled by the County but the City provides support.

iii. Tandem recommended the first planning meeting be composed of the core planning team which include City departments and large organizations.

iv. Community Concerns

1. There are various horse properties in the City that have concerns about large animal evacuations during a wildfire.

b. Task 2: Risk Assessment/Hazard Identification

i. Tandem and the City will review existing hazards and identify new hazards that may impact the planning area.

ii. Tandem will provided city specific hazard maps that are overlayed with City infrastructure.

iii. Tandem will include vulnerable populations in the vulnerability assessment

iv. Tandem will update the city's capabilities that allows them to implement mitigation activities.

c. Task 3: Mitigation Strategy

i. Develop new goals for the 2025 LHMP

ii. The planning team will review the progress of the 2016 mitigation activities.

iii. Develop new mitigation activities that are actionable

d. Task 4: Plan Implementation and Maintenance

i. Tandem along with the planning team will create a plan to monitor plan progress

ii. Tandem will describe how the LHMP will be integrated into other planning mechanisms

iii. Tandem will work with CalOES and FEMA to during the review process.

e. Tandem reviewed the project schedule that will allow the plan to be submitted to CalOES within 6 months.

f. Tandem reviewed the Project Management tasks and strategy which included:
    i. Bi-weekly calls between Orange and Tandem Project Manager
    ii. Project Management Plan
    iii. Monthly statements that report work accomplished, percent of project completed, and remaining funds
    iv. Meeting presentations, agendas, and minutes
    v. Detailed comment matrix for reviewing deliverables
g. Tandem provided the Next Steps in the process:
    i. Form the Project Planning Team
    ii. Deliver the Project Management Plan
    iii. Begin the information collection process
    iv. Create & Initiate Outreach Strategy
    v. Identify new/existing hazards
h. Other Topics Discussed
    i. Megan will invite IT and a GIS representative to the planning team meetings.
    ii. Outreach materials will be provided in English and Spanish.
    iii. The first planning team meeting will include an overview of hazard mitigation and the planning process.
    iv. Megan will begin to determine what existing meetings or outreach events are planned so that we can either present or have a booth to present material to the public.

Action Items on next page

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Action Items

Action Item	Responsible Party	Due Date	Status
Deliver meeting minutes	Tandem	February 12, 2025	Complete
Provide draft public outreach strategy for approval	Tandem	February 12, 2025	Complete
Develop and distribute a public outreach survey	Tandem	February 12, 2025	Complete
Send planning meeting #1 invitation language to Orange.	Tandem	February 12, 2025	Complete
Schedule the second planning meeting in March	Tandem/ Orange	February 20, 2025	Open
Draft risk assessment and hazard profiles	Tandem	March 7, 2025	Open

Points of Contact

For concerns or questions regarding these notes, please contact:
Francisco Soto, 323-605-4200 or Francisco@tandemsolutionsusa.com

Documentation 2: Planning Meeting Notes

City of Orange
Local Hazard Mitigation Plan Development

March 10, 2025

To: Megan Berumen
From: Francisco Soto

Planning Meeting #1 Notes

City of Orange hosted the first planning meeting with Tandem Solutions (Tandem) on March 4, 2025, from 1:00 PM - 3:00 PM that focused on providing an overview of the hazard mitigation planning process and identifying the hazards.

Attendees

Attendee	Organization
Nathalie Adorian	City of Orange
Robert Ambriz	City of Orange
Aida Cuevas	City of Orange
Jose Diaz	City of Orange
Stephen Fan	City of Orange
Janet Flores	City of Orange
Rick Hurtado	City of Orange
Adam Jevec	City of Orange
Matthew Lorenzen	City of Orange
Anna Pehoushek	City of Orange
Steven Scardina	City of Orange
Shelby Alley	City of Orange
Charlene Cheng	City of Orange
Megan Berumen	City of Orange
Robert Prendergast	City of Orange
Douglas Yates	City of Orange
Francisco Soto	Tandem Solutions

Summary of Discussion

- Meeting participants introduced themselves.
- **Hazard Mitigation Plan Overview**

  Tandem explained the purpose of the hazard mitigation plan, which is to reduce the impact of disasters by identifying hazards that affect the planning area and developing mitigation strategies to lessen their future effects. Additionally, the plan is essential for securing funding for hazard mitigation grants.
- **Planning Team Roles and Composition**

The core planning team will consist of City department, additional partners can include Orange County Emergency Management Organization, County Emergency Management, school districts, transit agencies, utilities, healthcare facilities, and surrounding jurisdictions. The role of the planning team is to identify new hazards, support to assess city capabilities, determine a mitigation strategy, and review drafts of the plan prior to submission to CalOES and FEMA.

- **Planning Process**

  The planning process involves the following elements:

  - Hazard Identification – Identifying and profile hazards that affect the planning area, assess future event probability, describe any recent impacts from the identified hazards, and describe any impacts as they relate to climate change.
  - Risk Assessment - Update assets at risk from identified hazards, analyze the impacts of the identified hazards, and summarize vulnerabilities to identified hazards.
  - Capabilities Assessment – As part of the process, we will identify what capabilities exist to help implement mitigation activities. Including:
    - *Planning and Regulatory*: Codes, ordinances, policies, laws, plans and programs that guide growth and development.
    - *Administrative and Technical:* "People-powered" capabilities. (Engineers, planners, emergency managers, GIS analysts, building inspectors, grant writers, etc.)
    - *Financial:* Resources to fund mitigation actions. (General Funds, taxes, utility fees, State and Federal Funding programs, etc.)
    - *Education and Outreach:* Programs and methods that can communicate and encourage risk reduction.
  - Mitigation Strategy – The mitigation strategy helps the city identify mitigation projects to help reduce or eliminate the risks of the identified hazards. The four types of mitigation activities include:
    - *Plans and Regulations:* Government authorities, policies or codes that influence the way land and buildings are developed and built.
    - *Structure and Infrastructure Projects:* Modifying existing public buildings, private buildings, and infrastructure or constructing new structures to protect against hazards.
    - *Education and Awareness Programs:* Informing and educating citizens, elected officials and property owners about hazards and potential ways to mitigate them.
    - *Natural Systems Protection:* Minimizing damage and losses while also preserving or restoring the functions of natural systems.

- Public Engagement Strategy – The plan must include strategies for public engagement, such as using social media, city websites, and public events to gather input and inform the community about the hazard mitigation planning process. Public participation is crucial for meeting FEMA requirements.
- Plan Review and Adoption –Prior to official submission, the planning team and the public must review the plan and provide comments. Once the comments are received and validated, the final step in the development process is to prepare the plan for CalOES/FEMA review and adoption. Upon notice of "Approval Pending Adoption" from the State, the City Council must adopt the plan before it is resubmitted to the State and FEMA for Final Approval.

- **2025 Mitigation Goals**

  The planning team identified the following goals for the 2025 Local Hazard Mitigation Plan:

  - *Goal 1:* Protect life, property, the environment and public health from natural and human-caused hazards
  - *Goal 2:* Improve public understanding, support of, and need for hazard mitigation measures
  - *Goal 3:* Promote disaster resilience for the City's natural, existing and future built environment
  - *Goal 4:* Strengthen partnerships and collaboration to implement hazard mitigation activities
  - *Goal 5:* Enhance the City's ability to effectively and immediately respond to disasters

- **Project Schedule**

  The goal is to have a draft plan by June of 2025 for internal and public reviews. Once comments have been adjudicated, the plan will be submitted to CalOES and FEMA for review/approval which can take 3-6 months.

- **Hazard Identification Exercise**

  The planning team discussed potential hazards affecting the city and their level of risk. Below is a list of the hazards that were identified during the planning meeting.

Hazard Type	Sub-Categories
Climate Change	Discussed as a standalone hazard and in all Hazard Categories
Dam Failure	
Drought	

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Hazard Type	Sub-Categories	
Earthquake/Geologic Hazards	• Seismic Shaking • Subsidence	• Fault Rupture • Liquefaction
Erosion		
Fire	• Urban Fire	• Wildland Fire
Flooding		
Landslide		
Pandemic		
Severe Weather	• Severe Wind • Extreme Heat	• Storm
Tree Mortality		
Human-Caused Hazards	• Power Outage • Cyber Attack • Hazardous Materials	• Terrorism

- **Priority Risk Index**
  The group evaluated each hazard to determine its probability, severity, warning time, and duration. The calculation determines how each hazard will be ranked/prioritized. Below is the Critical Priority Risk Index Matrix discussed during the planning meeting.

2025 Proposed Hazards	Probability	Weighted 45%	Magnitude Severity	Weighted 30%	Warning Time	Weighted 15%	Duration	Weighted 10%	CPRI Ranking
Climate Change	4	1.8	2	.60	1	.15	4	.40	2.95
Cyber Attack	2	.90	4	1.20	4	.60	4	.40	3.10
Dam Failure	1	.45	3	.90	3	.45	2	.20	2.00
Drought	3	1.35	2	.60	1	.15	4	.40	2.50
Earthquake	3	1.35	4	1.20	4	.60	4	.40	3.55
Extreme Weather	3	1.35	2	.60	1	.15	3	.30	2.40
Fire (Wild/Urban)	3	1.35	3	.90	4	.60	3	.30	3.15

City of Orange
Local Hazard Mitigation Plan Development

2025 Proposed Hazards	Probability	Weighted 45%	Magnitude Severity	Weighted 30%	Warning Time	Weighted 15%	Duration	Weighted 10%	CPRI Ranking
Flooding	3	1.35	2	.60	2	.30	2	.20	2.45
Hazardous Materials	3	1.35	3	.90	4	.60	2	.20	3.05
Landslide	2	0.90	2	.60	4	.60	1	.10	2.20
Pandemic	2	0.90	4	1.20	2	.30	4	.40	2.80
Power Outage	3	1.35	3	.90	4	.60	2	.20	3.05
Erosion	3	1.35	2	.60	1	.15	3	.30	2.40
Terrorism	3	1.35	4	1.20	4	.60	2	.20	3.35
Tree Mortality	2	.90	1	.30	4.	.60	4	.40	2.20

CPRI Hazard Risk Scoring

Risk Level	Severe	High	Moderate	Low
Rank Score	3.5 – 4.0	3.0 – 3.4	2 – 2.9	1 – 1.9

Next Steps

- Develop and Approve the Public Outreach Strategy
- Develop and Disseminate the Public Survey
- Profile Identified Hazards
- Conduct the Risk Assessment
- Identify Public Outreach Opportunities

Action items are available on the next page.

City of Orange
Local Hazard Mitigation Plan Development

Action Items

Action Item	Responsible Party	Due Date	Status
Deliver meeting minutes	Tandem	N/A	Complete
Provide draft public outreach strategy for approval	Tandem	N/A	Complete
Develop a public outreach survey, social media content, press release content, and outreach flyer/images.	Tandem	3/13/2025	Open
Draft risk assessment and hazard profiles	Tandem	4/25/2025	Open

Points of Contact

For concerns or questions regarding these notes, please contact:
Francisco Soto, 323-605-4200 or Francisco@tandemsolutionsusa.com

Documentation 3: Planning Meeting Notes

City of Orange
Local Hazard Mitigation Plan Development

May 13, 2025

To: Megan Berumen
From: Francisco Soto

Planning Meeting #2 Notes

City of Orange hosted the first planning meeting with Tandem Solutions (Tandem) on May 7, 2025, from 1:00 PM - 2:00 PM that focused on providing an update on the planning process, reviewing the City's capabilities, and revieing the 2016 mitigation actions.

Attendees

Attendee	Organization
Janet Flores	City of Orange
Andrea Pham	City of Orange
Deniss Sok	City of Orange
Emily Bustamante	City of Orange
Jennifer Connally	City of Orange
Rick Hurtado	City of Orange
Phillip Mcmullim (sp?)	City of Orange
Cody Kleen	City of Orange
Eric Rosauer	City of Orange
Steven Scardina	City of Orange
Charlene Cheng	City of Orange
Robert Prendergast	City of Orange
Francisco Soto	Tandem Solutions

Summary of Discussion

- Meeting participants introduced themselves.
- Reviewed the 2025 Hazards that will be included in the 2025 LHMP. **(See Page 2)**

City of Orange
Local Hazard Mitigation Plan Development

Hazard Type	Sub-Categories	
Climate Change	Discussed as a standalone hazard and in all Hazard Categories	
Dam Failure		
Drought		
Earthquake/Geologic Hazards	• Seismic Shaking • Subsidence	• Fault Rupture • Liquefaction
Fire	• Urban Fire	• Wildland Fire
Flooding		
Landslide/Erosion		
Pandemic		
Severe Weather	• Severe Wind • Extreme Heat	• Storm • Loss of Power
Tree Mortality		
Human-Caused Hazards	• Power Outage • Cyber Attack • Hazardous Materials	• Terrorism • Infrastructure Failure

- Previewed the planning team meeting schedule.
  - 1st Meeting: Completed
  - 2nd Meeting: Review Capabilities and Past Mitigation Activities (Today)
  - 3rd Meeting: Review Final Risk Assessment and Develop New Mitigation Activities
- Reviewed the current outreach efforts that have taken place.
  - Posted HMP information on the City Webpage
  - Flyers are located at various City public facing facilities
  - Booth at the Car Show
  - LHMP presentation at the Stop the Bleed training in June.
- The planning team identified the city's capabilities to implement mitigation actions.
  - **Planning and Regulatory Capabilities**
    - City's Fiscal Year 2024-2025 Budget

- Capital Improvement Plan
- Orange General Plan
  - Land Use Element
  - Safety Element
- Consolidated Plan
- City Urban Water Management Plan

- **Administrative and Technical Capabilities**
  - Building and Safety
  - Engineering
  - Public Works
  - Information Technology
  - Emergency Manager
  - Flood Plain Manager
  - Building Official
  - GIS Staff
- **Fiscal Capabilities**
  - General Funds
  - Hazard Mitigation Grants
  - ~~Community Development Block Grant~~ – Planning Team asked to remove since it would never be used to implement mitigation activities.
- **Education and Outreach Capabilities**
  - Public Information Officer
  - City Website
  - City Social Media Accounts

- Reviewed the status of the 2016 Mitigation Activities.

Next Steps

- Continue Public Engagement Process
- Finalize Risk Assessment
- Finalize Reviewing 2016 Mitigation Actions
- Developing New Mitigation Actions
- Internal Review Draft

City of Orange
Local Hazard Mitigation Plan Development

- Public Review Draft
- Finalize the Hazard Mitigation Plan
- Submit to CalOES and FEMA
- City Council Plan Adoption

Action Items

Action Item	Responsible Party	Due Date	Status
Deliver meeting minutes	Tandem	N/A	Complete
Send Sections 1-3 to the Planning Team	Megan	5/15/2025	Open
Send Section 4 to Megan	Tandem	4/25/2025	Complete
Send Section 4 to the Planning Team	Megan	5/21/2025 (Tentative)	Open

Points of Contact

For concerns or questions regarding these notes, please contact:
Francisco Soto, 323-605-4200 or Francisco@tandemsolutionsusa.com

Documentation 4: Email to Stakeholders

Orange LHMP Public Review

Reply | Reply All | Forward

MB Megan Berumen <mberumen@cityoforange.org>
To
Cc Francisco Soto
Tue 10/7/2025 9:04 AM

If there are problems with how this message is displayed, click here to view it in a web browser.
Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Orange LHMP Public Review Draft_10.1.2025.pdf
16 MB

Good afternoon!

As a key stakeholder for the City of Orange, we would like to share the Public Review Draft Local Hazard Mitigation Plan with your agency. As part of this review process we have prepared an online comment form that you can use to provide feedback.

To access the form, please use the following link: Orange LHMP Comments Matrix.xlsx

Best regards,

Megan Berumen
Emergency Manager
Fire Headquarters • Station 1

p (714) 288-2571 | **c** (714) 788-3422
ORANGE CITY FIRE DEPARTMENT
1176 E. Chapman Avenue • Orange, CA 92866
family • pride • tradition

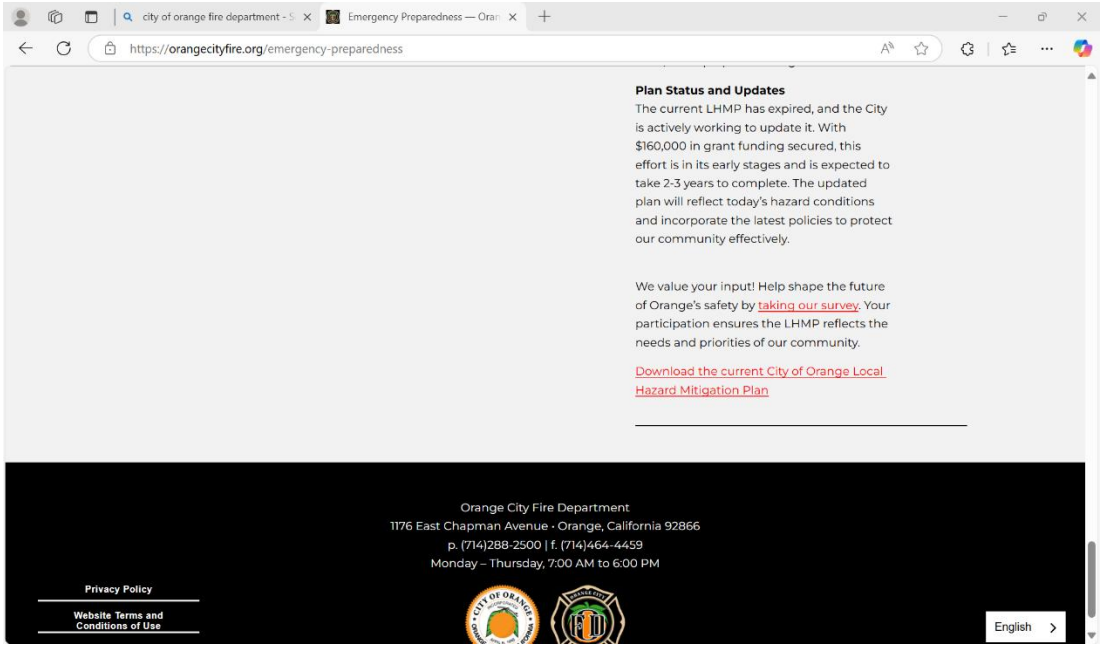
APPENDIX C – PUBLIC ENGAGEMENT DOCUMENTATION

Appendix C contains documentation of the planning process including meetings, presentations held for the stakeholders and public, and other stakeholder/public outreach efforts.

Date	Activity	Documentation
November 19, 2024 - Present	Survey posted on City Website with links provided in social media accounts. General Hazard Mitigation documents. Pictures of events and posting of information.	Documentation 2: Orange Fire Website Survey Distribution Documentation 3: Orange Fire Website Hazard Mitigation Material Documentation 4: Flyers at City Public Facing Facilities Documentation 5: Social Media Hazard Mitigation Material Screenshots Documentation 7: Hazard Mitigation Flyer
November 19, 2024 – July 2025	LHMP Outreach Event	Documentation 1: City of Orange Car Show Documentation 8: Hazard Mitigation Public Outreach Presentation
3 months	Public hazard mitigation survey conducted.	Documentation 6: Hazard Mitigation Public Survey Documentation 9: Hazard Mitigation Public Survey Results
TBD	Draft LHMP provided for public review.	TBD
TBD	Draft LHMP provided to neighboring jurisdiction for review and comment.	TBD

Documentation 1: City of Orange Car Show

Documentation 2: Orange Fire Website Survey Distribution



https://orangecityfire.org/emergency-preparedness

Plan Status and Updates

The current LHMP has expired, and the City is actively working to update it. With $160,000 in grant funding secured, this effort is in its early stages and is expected to take 2-3 years to complete. The updated plan will reflect today's hazard conditions and incorporate the latest policies to protect our community effectively.

We value your input! Help shape the future of Orange's safety by taking our survey. Your participation ensures the LHMP reflects the needs and priorities of our community.

Download the current City of Orange Local Hazard Mitigation Plan

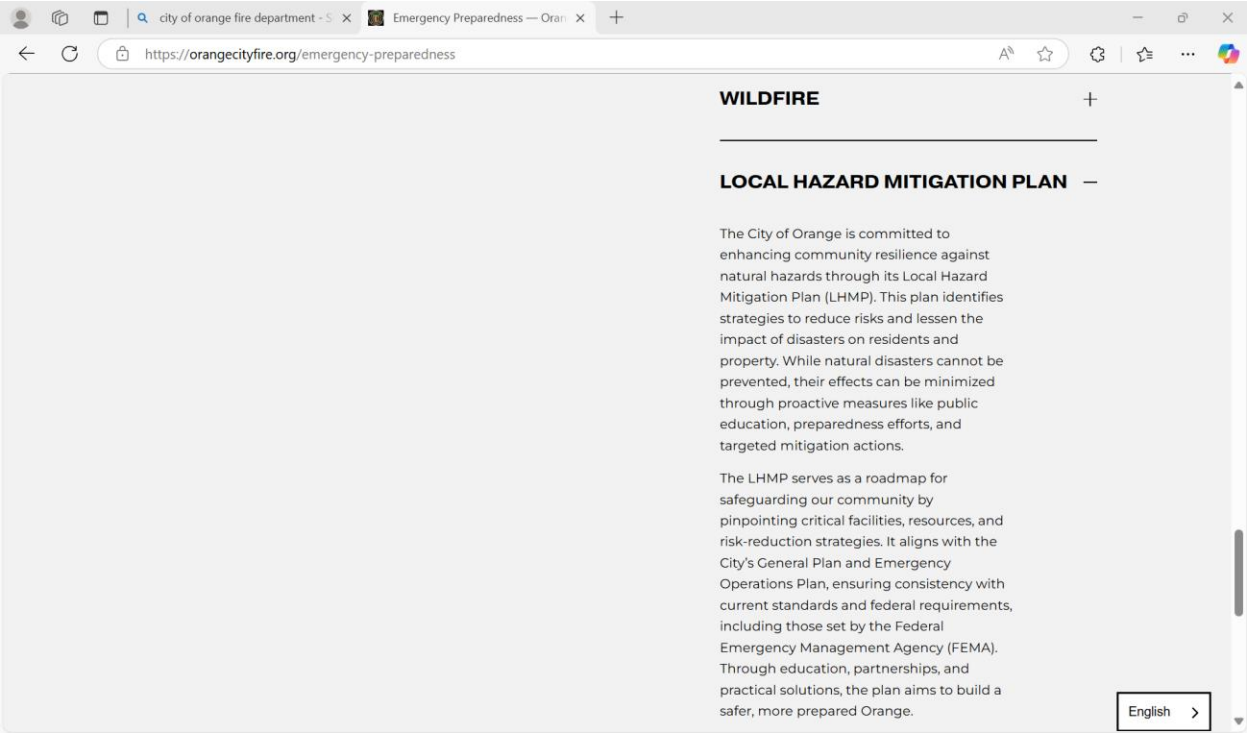
Orange City Fire Department
1176 East Chapman Avenue • Orange, California 92866
p. (714)288-2500 | f. (714)464-4459
Monday – Thursday, 7:00 AM to 6:00 PM

Privacy Policy

Website Terms and Conditions of Use

English

Documentation 3: Orange Fire Website Hazard Mitigation Material

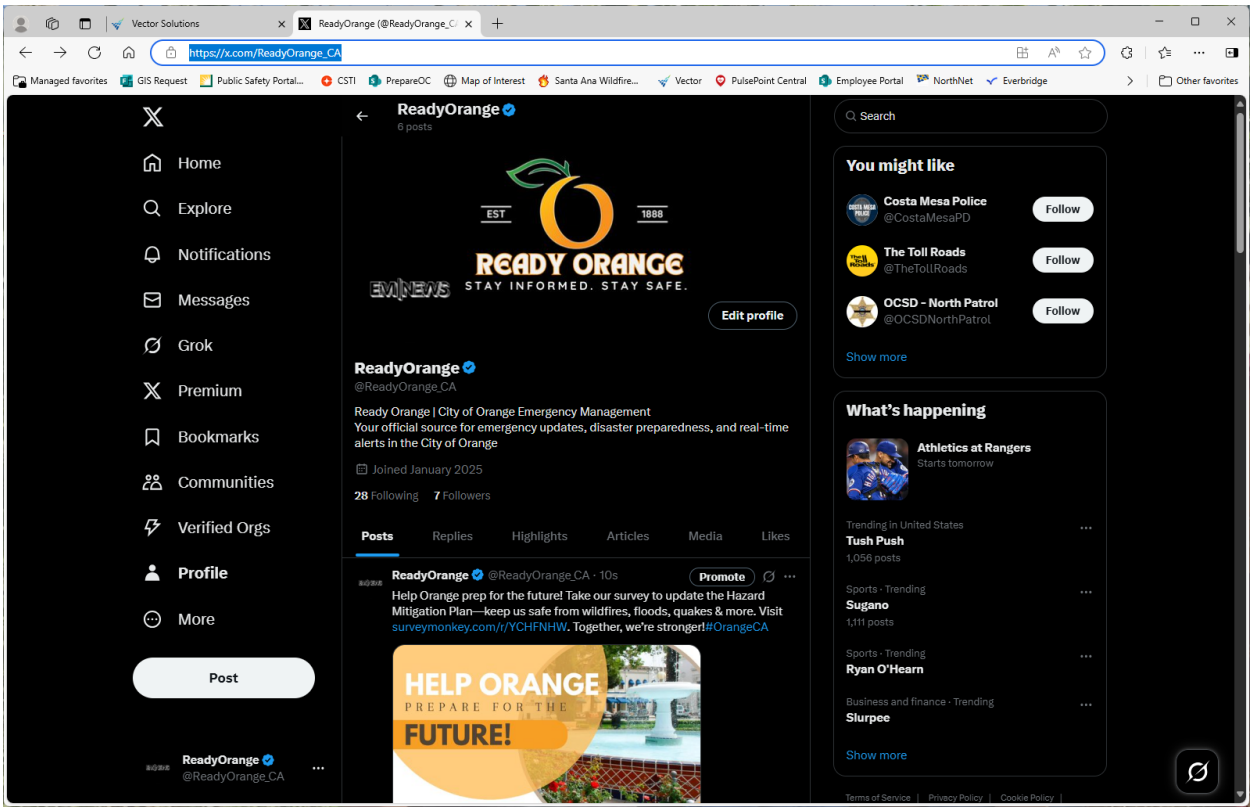


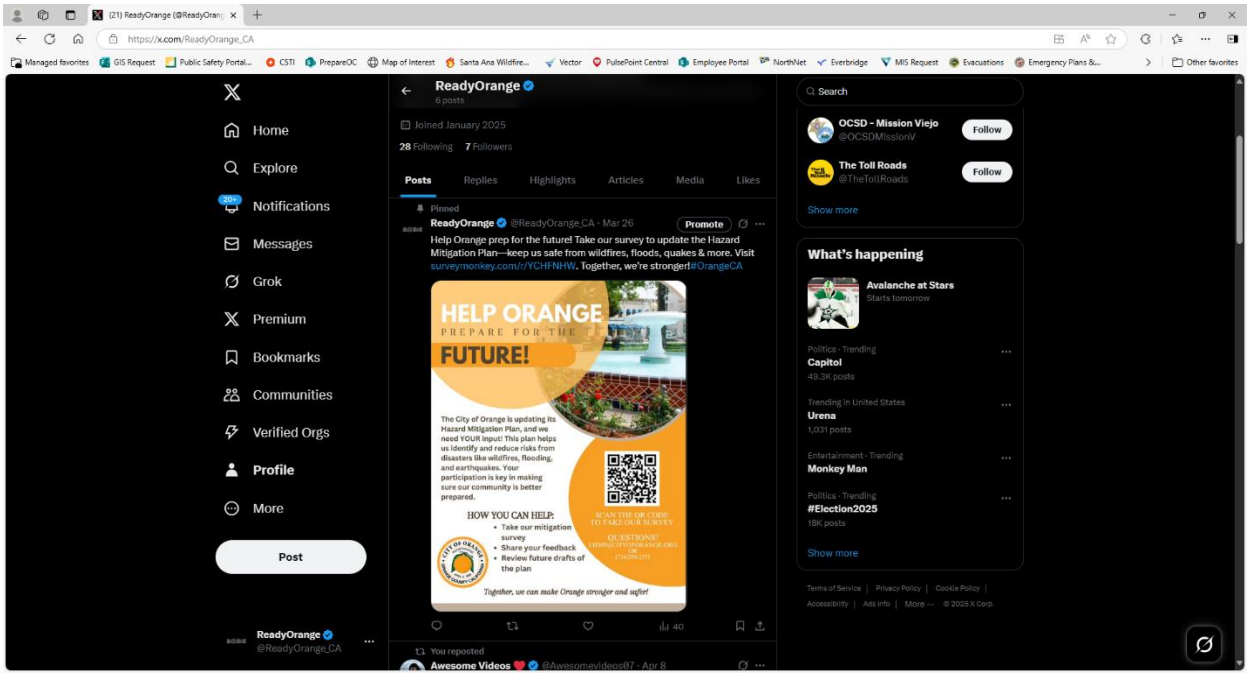
Documentation 4: Flyers at City Public Facing Facilities

HELP ORANGE
PREPARE FOR THE
FUTURE!
The City of Orange is updating its Hazard Mitigation Plan, and we need YOUR input! This plan helps us identify and reduce risks from disasters like wildfires, flooding, and earthquakes. Your participation is key in making sure our community is better prepared.
HOW YOU CAN HELP:
• Take our mitigation survey
• Share your feedback
• Review future drafts of the plan
SCAN THE QR CODE TO TAKE OUR SURVEY
QUESTIONS?
LHMP@CITYOFORANGE.ORG
OR
(714)258-2571
CITY OF ORANGE
ORANGE COUNTY CALIFORNIA
Together, we can make Orange stronger and safer!
USPS
OUTGOING MAIL

Library
Postings Only
POSTING BY THE PUBLIC IS NOT PERMITTED
The Library's policy on posting, displaying or distributing materials at the library is to only permit programs, events or organizations that are related to promoting the Library or the City of Orange.
ALL material must be approved by the library.
Material posted without permission will be discarded.
Thank you.
Review the Agenda Packet on Your Phone!
SCAN TO VIEW
HELP ORANGE
FUTURE!
ASSISTANCE LEAGUE
Scholarships
General
Arts
Nursing & Health
Special Needs Student
Criteria for Scholarship
COLLEGE SCHOLARSHIP OPPORTUNITIES
SCHOLARSHIPS AVAILABLE FOR HIGH SCHOOL SENIORS
The Arts
General Studies
Health Related Fields
Trade/Technical Schools
Special Needs Students or Working With Special Needs
APPLY ONLINE
COMMUNITY EMERGENCY RESPONSE TEAM
We're here.
We believe you.
You have options.
1-800-799-SAFE
Free Admission!
The Women's Club of Orange Presents
Music in the Garden
86th Annual Spring Flower Show
Saturday, April 26, 2025
12 Noon to 4 PM

Documentation 5: Social Media Hazard Mitigation Material Screenshots





Documentation 6: Hazard Mitigation Public Survey

City of Orange
Local Hazard Mitigation Plan
Public Engagement Survey

City of Orange

2025 Local Hazard Mitigation Plan Survey

The City of Orange is updating the City's Local Hazard Mitigation Plan (LHMP). The plan identifies natural and human caused hazards that can impact the City. The new and updated plan will list potential actions needed to reduce risk and future damage. The plan enables the City to be eligible for various assistance grants. Public involvement is critical to the plan as the LHMP must represent the current needs and values of the community. To assist with obtaining public input, we invite you to participate in the following survey. We thank you in advance for your cooperation and assistance.

Confidentiality: Your responses are completely confidential and will only be used to enhance our hazard mitigation efforts.

1. Do you (Select all that apply)
   - ☐ Live in Orange
   - ☐ Work in Orange
   - ☐ Study in Orange
   - ☐ Visit Orange, but live and work elsewhere

2. What is your age group?
   - ☐ Under 18
   - ☐ 18-24
   - ☐ 25-34
   - ☐ 35-44
   - ☐ 45-54
   - ☐ 55-64
   - ☐ 65+
   - ☐ prefer not to answer

City of Orange
Local Hazard Mitigation Plan
Public Engagement Survey

3. If a large earthquake or wildfire were to strike tomorrow……
   - ☐ I feel confident that I know how to protect myself during an emergency.
   - ☐ I am unsure how to protect myself during the emergency
   - ☐ Other: _____

4. How prepared is your household for a natural hazard (for example, wildfire, flood, earthquake) on a scale of 1 to 5 with 1 being not prepared and 5 being very prepared?
   - ☐ 1
   - ☐ 2
   - ☐ 3
   - ☐ 4
   - ☐ 5

5. The City's 2016 Hazards Mitigation Plan identified a range of natural hazards posing a threat to the City. Select the natural hazard that concerns you the most?
   - ☐ Climate Change
   - ☐ Drought
   - ☐ Earthquake
   - ☐ Flooding
   - ☐ Landslide
   - ☐ Wildfire
   - ☐ Dam Failure
   - ☐ Windstorms
   - ☐ Extreme Heat
   - ☐ Other:_____

City of Orange
Local Hazard Mitigation Plan
Public Engagement Survey

6. What steps has your household taken to Mitigate against natural hazards? (Check all that apply)
   - ☐ Bought a backup generator
   - ☐ Trim trees to prevent limbs from falling onto the house during storms
   - ☐ Anchor water heaters and other large appliances to prevent tipping
   - ☐ Bought earthquake and/or flood insurance
   - ☐ Install automatic shutoff valves for gas and water
   - ☐ Other (please specify)

7. Choose the ways you prefer to seek information about incoming or ongoing threats?
   - ☐ Social media (X, Facebook, Instagram)
   - ☐ Local Government Website
   - ☐ Community Notification
   - ☐ City Press Conferences
   - ☐ Other (please specify)

8. Please provide any additional comments or insight below into how local hazards should be mitigated.

_____

_____

_____

Thank you for taking the time to complete this survey.

Please return it to a staff member.

3

Documentation 7: Hazard Mitigation Flyer

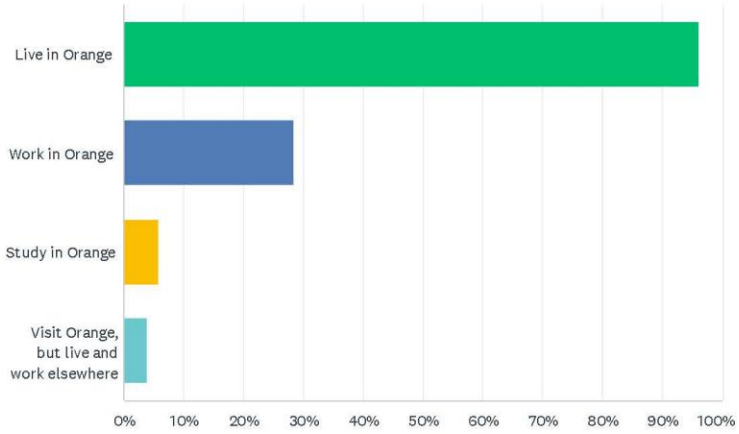
Documentation 8: Hazard Mitigation Public Outreach Presentation (Cover Slide Only)

Documentation 9: Hazard Mitigation Public Survey Results

City of Orange 2025 Local Hazard Mitigation Plan Survey SurveyMonkey

Q1 Do you (check all that apply)

Answered: 53 Skipped: 1

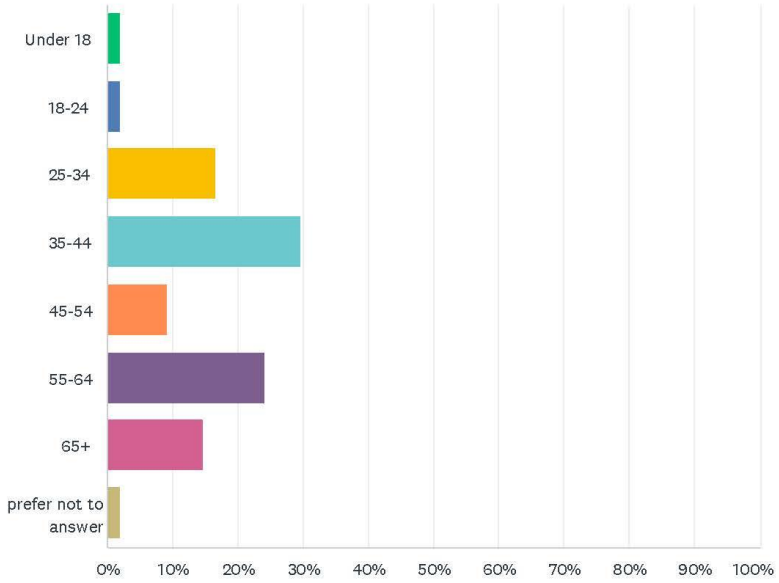


ANSWER CHOICES	RESPONSES	
Live in Orange	96.23%	51
Work in Orange	28.30%	15
Study in Orange	5.66%	3
Visit Orange, but live and work elsewhere	3.77%	2
Total Respondents: 53		

1 / 9

Q2 What is your age group?

Answered: 54 Skipped: 0

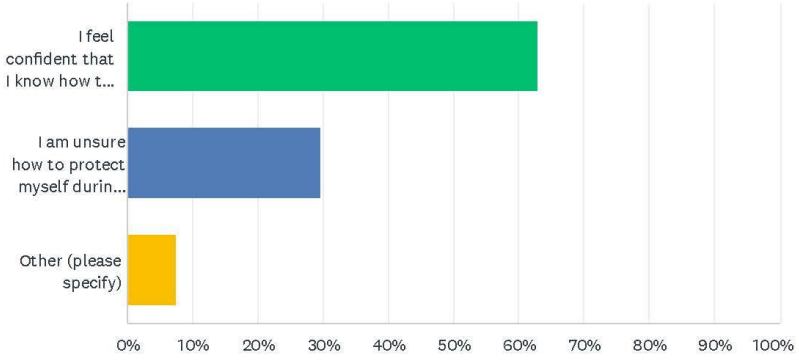


ANSWER CHOICES	RESPONSES	
Under 18	1.85%	1
18-24	1.85%	1
25-34	16.67%	9
35-44	29.63%	16
45-54	9.26%	5
55-64	24.07%	13
65+	14.81%	8
prefer not to answer	1.85%	1
TOTAL		54

City of Orange 2025 Local Hazard Mitigation Plan Survey SurveyMonkey

Q3 If a large earthquake or wildfire were to strike tomorrow……

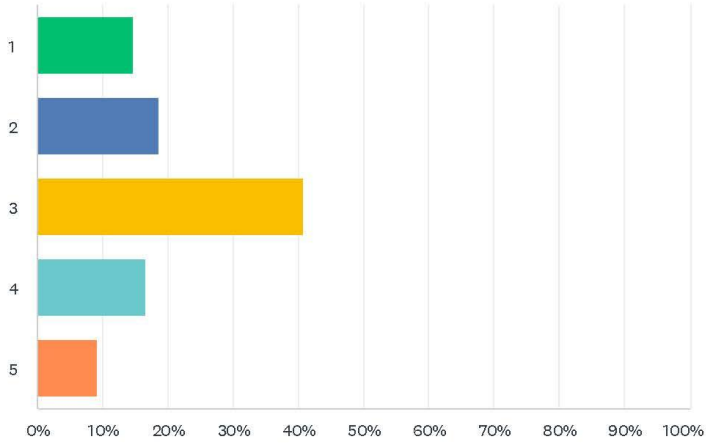
Answered: 54 Skipped: 0



ANSWER CHOICES	RESPONSES	
I feel confident that I know how to protect myself during the emergency.	62.96%	34
I am unsure how to protect myself during the emergency	29.63%	16
Other (please specify)	7.41%	4
TOTAL		54

Q4 How prepared is your household for a natural hazard (for example, wildfire, flood, earthquake) on a scale of 1 to 5 with 1 being not prepared and 5 being very prepared?

Answered: 54 Skipped: 0

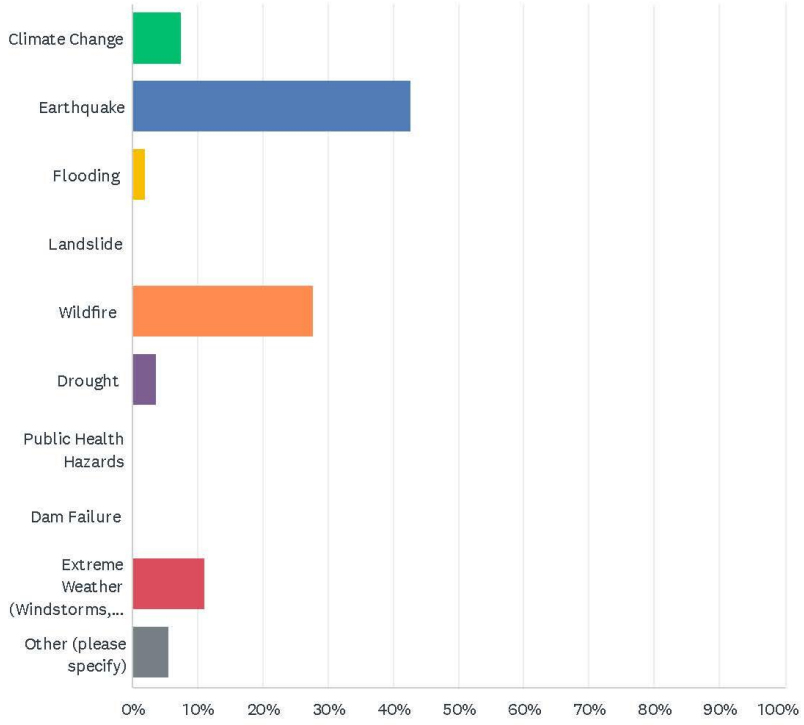


ANSWER CHOICES	RESPONSES	
1	14.81%	8
2	18.52%	10
3	40.74%	22
4	16.67%	9
5	9.26%	5
TOTAL		54

City of Orange 2025 Local Hazard Mitigation Plan Survey SurveyMonkey

Q5 The City of Orange 2016 Local Hazard Mitigation Plan has identified a range of natural hazards posing a threat to the City. Select the natural hazard that concerns you the most?

Answered: 54 Skipped: 0

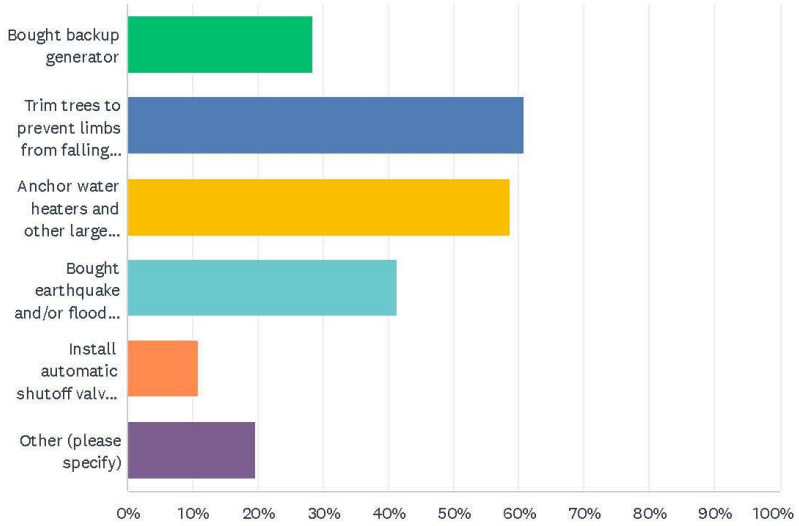


City of Orange 2025 Local Hazard Mitigation Plan Survey SurveyMonkey

ANSWER CHOICES	RESPONSES	
Climate Change	7.41%	4
Earthquake	42.59%	23
Flooding	1.85%	1
Landslide	0.00%	0
Wildfire	27.78%	15
Drought	3.70%	2
Public Health Hazards	0.00%	0
Dam Failure	0.00%	0
Extreme Weather (Windstorms, Extreme Heat)	11.11%	6
Other (please specify)	5.56%	3
TOTAL		54

Q6 What steps has your household taken to mitigate against natural hazards? (Check all the apply)

Answered: 46 Skipped: 8

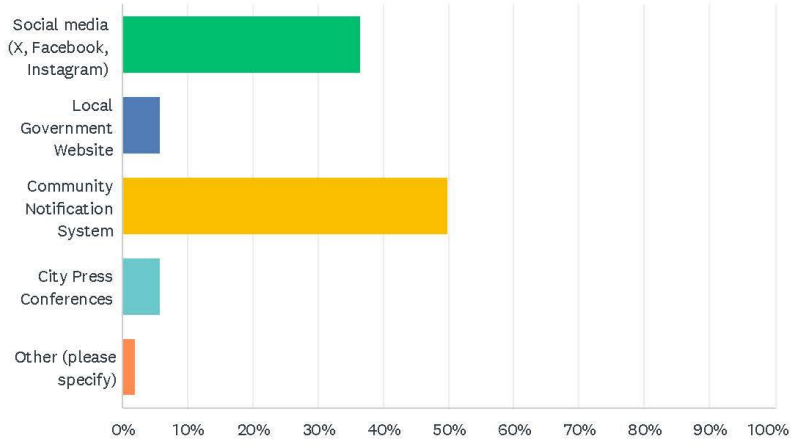


ANSWER CHOICES	RESPONSES	
Bought backup generator	28.26%	13
Trim trees to prevent limbs from falling onto the house during storms	60.87%	28
Anchor water heaters and other large appliances to prevent tipping	58.70%	27
Bought earthquake and/or flood insurance	41.30%	19
Install automatic shutoff valves for gas and water utilities	10.87%	5
Other (please specify)	19.57%	9
Total Respondents: 46		

City of Orange 2025 Local Hazard Mitigation Plan Survey SurveyMonkey

Q7 Choose the ways you prefer to seek information about incoming or ongoing threats?

Answered: 52 Skipped: 2



ANSWER CHOICES	RESPONSES	
Social media (X, Facebook, Instagram)	36.54%	19
Local Government Website	5.77%	3
Community Notification System	50.00%	26
City Press Conferences	5.77%	3
Other (please specify)	1.92%	1
TOTAL		52

Q8 Please provide any additional comments or insight below into how local natural hazards should be mitigated.

Answered: 15 Skipped: 39

APPENDIX D – ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AB	Assembly Bill
Cal OES	California Governor's Office of Emergency Services
CARB	California Air Resource Board
CDAA	California Disaster Assistance Act
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
CPRI	Calculated Priority Risk Index
DMA 2000	Disaster Mitigation Act of 2000
EAP	Emergency Action Plan
EOP	Emergency Operations Plan
ERP	Emergency Response Plan
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance
GHG	Greenhouse Gas
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
LHMP	Local Hazard Mitigation Plan
MWD	Metropolitan Water District of Southern California
NFIP	National Flood Insurance Program
PDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
OCTA	Orange County Transportation Authority
PDM	Pre-Disaster Mitigation
RFC	Repetitive Flood Claims
RL	Repetitive Loss
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition

Acronym	Definition
SHMO	State Hazard Mitigation Officer
SHMP	State Hazard Mitigation Plan
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, Environmental
U.S. EPA	U.S. Environmental Protection Agency
UCERF3	(the third) Uniform California Earthquake Rupture Forecast
USDM	U.S. Drought Monitor
USSDO	U.S. Seasonal Drought Outlook
UWMP	Urban Water Management Plan
NIDIS	National Integrated Drought Information System
WUI	Wildland Urban Interface