CITY OF LOS ANGELES

2024 LOCAL HAZARD MITIGATION PLAN

TETRA TECH

EMERGENCY MANAGEMENT DEPARTMENT
"IN OMNIA PARATUS"
CITY OF LOS ANGELES

City of Los Angeles
2024 Local Hazard Mitigation Plan

June 2024

Prepared for

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EXECUTIVE SUMMARY

Updating the City of Los Angeles Plan

The *City of Los Angeles 2024 Local Hazard Mitigation Plan* (HMP) is the third comprehensive update to the City's hazard mitigation plan, meeting federal requirements for regular review and update of hazard mitigation plans. The City of Los Angeles prepared its initial local hazard mitigation plan in 2004, and FEMA approved that plan in 2005. A revision was approved in July 2011 and again in January 2018. The 2024 update includes a number of significant changes and enhancements:

- A reorganization and repackaging of the plan to be more user-friendly and conducive to updates
- An enhanced risk assessment
- Updated and enhanced public outreach
- A revised mitigation action plan prioritization protocol
- An enhanced definition of community lifelines.

Plan Development Approach

A core planning team was assembled to facilitate the update of this plan, consisting of City of Los Angeles Emergency Management Department staff and a contract consultant. A 44-member steering committee was assembled to oversee the plan update, consisting of both governmental and non-governmental stakeholders within the planning area, which was defined as the incorporated area of the City of Los Angeles. Coordination with other local, state, and federal agencies involved in hazard mitigation occurred throughout the plan update process. The planning team and Steering Committee reviewed the existing hazard mitigation plan, the California statewide hazard mitigation plan, and existing programs that may support hazard mitigation actions and activities.

The planning team implemented a multi-media public involvement strategy that was approved by the Steering Committee. The strategy included participation at various community events to make the public aware of the hazard mitigation plan update. Public outreach efforts included a hazard mitigation survey, a project website, and the use of social media (such as Facebook, X [Twitter], and Nextdoor). An integral part of the public involvement strategy was the NotifyLA Emergency Alert System, through which mass notification was sent out during the September Preparedness Month and the October ShakeOut Day.

Based on the review of existing plans and programs, the input received through the public involvement strategy, the direction of the Steering Committee, the findings of a new, detailed risk assessment performed for this update, and newly updated FEMA guidance, the planning team assembled a document that meets both state and federal hazard mitigation planning requirements. During the plan development and review, more than 700 comments were received from City departments, stakeholders, and others. Once pre-adoption approval of the document has been granted by the California Office of Emergency Services and FEMA Region 9, the final adoption phase will begin. The City of Los Angeles City Council will adopt the updated plan.

HAZARDS ADDRESSED IN THE PLAN

To identify significant hazards that could affect the Los Angeles planning area, the updated hazard mitigation plan reviews state and local hazard planning documents as well as information on the frequency of, magnitude of, and costs associated with hazards that have struck the planning area or could do so. Anecdotal information regarding hazards and the perceived vulnerability of the planning area's assets to them was also used. Based on the review, the updated plan addresses the following hazards (presented in alphabetical order; the order of listing does not indicate the hazards' relative severity):

- Civil disorder
- Cyber threats
- Dam failure
- Drought
- Earthquake
- Extreme cold or freeze
- Extreme heat
- Flood
- Geomagnetic storm (space weather)
- Hazardous material release
- High winds
- Landslide and other mass movements Oil spills
- Public health hazards
- Radiological accidents
- Sea-level rise, coastal flood and erosion
- Smoke and air pollution
- Terrorism
- Tsunami and seiche
- Wildfire
- Transportation accidents
- Urban structure fire

Based on the risk assessment, the hazards of greatest concern were ranked for the risk they pose to the overall planning area, as shown in Figure ES-1.

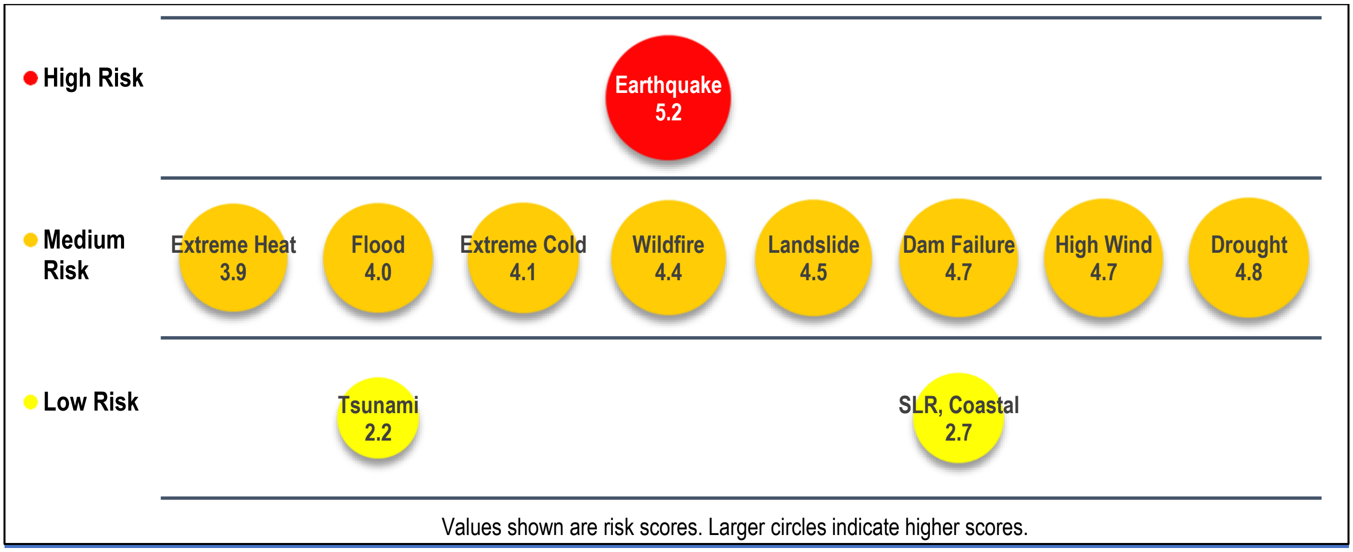


Figure ES-1. Hazard Risk Rating

Mission Statement, Goals, and Objectives

The Steering Committee collaborated to revise the mission statement, goals, and objectives for this update. The committee developed new goals and objectives in which the objectives stand alone rather than being subsets of the goals. The Steering Committee added a purpose to the mission statement from the previous plan, resulting in the following new mission statement for this update:

> Through whole community engagement, the mission of the City of Los Angeles hazard mitigation plan is to reduce risk and increase resilience through comprehensive risk analysis and identifying corresponding mitigation strategies to protect City residents, their property, community lifelines, and the environment from traditional and emerging hazards.

Five new goals were developed for the 2024 update, which were developed by the planning team and affirmed by the Steering Committee. The new goals are listed below:

1. Protect life and property, including protecting the health and safety of communities
2. Engage the whole community to better understand the hazards affecting Los Angeles and ways to reduce personal vulnerability to those hazards
3. Align the City of Los Angeles hazard mitigation plan with future climate vulnerability assessments, action plans, and all levels of government's hazard mitigation goals.
4. Develop and implement hazard mitigation strategies that use public funds in an efficient and cost-effective way.
5. Strive to increase adaptive capacity to reduce risk from hazard impacts based on future conditions.

The Steering Committee affirmed the following plan objectives:

1. Where applicable, develop mitigation strategies that are inclusive of engineering, design, feasibility, cost, and co-benefits, such as ecosystem and social benefits.
2. Identify locations, potential impacts, and linkages among threats, hazards, vulnerability, and measures needed to protect life, property, and the environment.
3. Reduce repetitive property losses from various hazards by determining and implementing hazard mitigation plans and projects based on available data and science that are consistent with state, regional, and local climate action and adaptation goals, policies, and programs.
4. Where feasible, identify and implement nature-based solutions across hazards to provide resilience benefits, including but not limited to sequestering carbon to mitigate climate change, and other community benefits, including environmental justice.
5. Establish, strengthen, and maintain partnerships among all levels of government, the private sector, community-based organizations, and academic institutions that improve the ability to protect life, property, and the environment.
6. Incorporate risk-informed analysis to strengthen communication and coordination with local, state, and federal partners to reduce the potential consequences of dam-specific incidents.
7. Develop and provide updated information about threats, hazards, vulnerabilities, climate change, and mitigation strategies to local, state, and regional agencies, as well as private-sector and community groups.
8. Integrate life and property protection measures for all communities, with particular attention to socially vulnerable communities that have fewer resources and capacity to adapt or strengthen vulnerable community lifelines (critical facilities located in hazard areas).
9. Incorporate hazard mitigation measures into repairs, major alterations, new development, and redevelopment practices, targeting communities with historically underserved populations that are disproportionately impacted by disasters and climate change.
10. Prevent or reduce mitigation related disparities among under-served and under-represented communities through plans and investments that prioritize multi-objective projects and culturally competent outreach programs.
11. Identify financial and regulatory incentives to motivate stakeholders, such as property owners, renters, private sector businesses, and community-based organizations, to identify risk and mitigate hazards.
12. Utilize understanding of risk to support trainings and exercises for city staff and external stakeholders.

Mitigation Action Plan

Mitigation actions presented in this update are designed to reduce or eliminate losses resulting from hazard events. The update process resulted in the identification of 143 mitigation actions to be led by 12 City departments.

Implementation and Maintenance

Plan implementation will occur over the next five years as City Departments begin to implement the actions identified in this plan. Full implementation of the recommendations of this plan will require time and resources. The measure of the plan's success will be its ability to adapt to changing conditions. The City of Los Angeles assumes responsibility for adopting the recommendations of this plan and committing resources toward implementation. The framework established by this plan prioritizes actions whose benefits exceed their cost. The planning team and Steering Committee developed this plan with extensive public input, and public support of the actions identified in this plan will help ensure the plan's success.

The Steering Committee developed a plan maintenance strategy that includes annual progress reporting, a strategy for continued public involvement, a commitment to plan integration with other relevant plans and programs, and continued oversight from a proposed new hazard mitigation task force.

PART 1—INTRODUCTION AND THE PLANNING PROCESS

1. Introduction

1.1 Hazard Mitigation Planning Overview

Hazard mitigation is defined as any action taken to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves long- and short-term actions implemented before, during, and after disasters. Hazard mitigation activities include planning efforts, policy changes, programs, studies, improvement projects, and other steps to reduce the impacts of hazards.

The federal Disaster Mitigation Act (DMA) of 2000 emphasizes planning for disasters before they occur. The DMA requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Regulations developed to fulfill the DMA's requirements are included in Title 44 of the Code of Federal Regulations (44 CFR).

The responsibility for hazard mitigation lies with many, including private property owners, commercial interests, and local, state, and federal governments. The DMA encourages cooperation among state and local authorities in pre-disaster planning. The planning network called for by the DMA helps local governments articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk-reduction projects.

The DMA also promotes sustainability in hazard mitigation. To be sustainable, hazard mitigation needs to incorporate sound management of natural resources and address hazards and mitigation in the largest possible social and economic context.

1.2 Benefits of Planning for Los Angeles

The City of Los Angeles prepared this DMA-compliant hazard mitigation plan (HMP) to identify resources and strategies for reducing risk from natural hazards. All residents, organizations, and businesses of the City of Los Angeles are the ultimate beneficiaries of this hazard mitigation plan. The plan identifies ways to reduce risk for those who live in, work in, and visit the City of Los Angeles. It provides a viable planning framework for all foreseeable natural hazards. Participation in the development of the plan by key stakeholders helped ensure that outcomes would be mutually beneficial. The plan's goals and recommendations can lay the groundwork for the development and implementation of local mitigation strategies, activities, and partnerships.

1.3 Contents of This Plan

This hazard mitigation plan is organized into the following primary parts:

- Part 1—Introduction and Planning Process

- Part 2—Community Profile
- Part 3—Risk Assessment for Hazards of Concern
- Part 4—Risk Assessment for Hazards of Interest
- Part 5—Mitigation Strategy

Each part includes elements required under federal guidelines. Compliance requirements are cited at the beginning of subsections as appropriate. Appendices provided at the end of the plan include information or explanations to support the main content of the plan.

1.4 Defining the Planning Area

The planning area for this hazard mitigation plan consists of the incorporated area of the City of Los Angeles, as shown in Figure 1-1. The City does possess assets outside the city limits, which were identified and considered during the planning process. For planning purposes, many of the analyses presented in this HMP divide the City into its seven Area Planning Commissions (APCs). APC boundaries are shown in the figure. Further information about the APCs is provided in Section 4.3.

1.5 The Updated Plan—What Is Different?

Under 44 CFR, a community's hazard mitigation plan expires five years from the date of adoption and must be evaluated and updated in order for the community to remain eligible for funding that requires a current hazard mitigation plan. This is the third update of the City of Los Angeles hazard mitigation plan. The update process provides an opportunity to reevaluate recommendations, monitor the effects of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies.

The City of Los Angeles acknowledges the dynamic landscape of research on natural hazards and associated risks specific to its region. Accordingly, certain elements of this plan may undergo adjustment as new insights emerge within the framework of the Los Angeles HMP.

1.5.1 Previous Plans

The Federal Emergency Management Agency (FEMA) approved the first City of Los Angeles local hazard mitigation plan in 2005. A revision was approved in July 2011. A second update received FEMA approval in 2018. The City's defined purpose for the local hazard mitigation plan is to integrate hazard mitigation strategies into the day-to-day activities and programs of the City of Los Angeles.

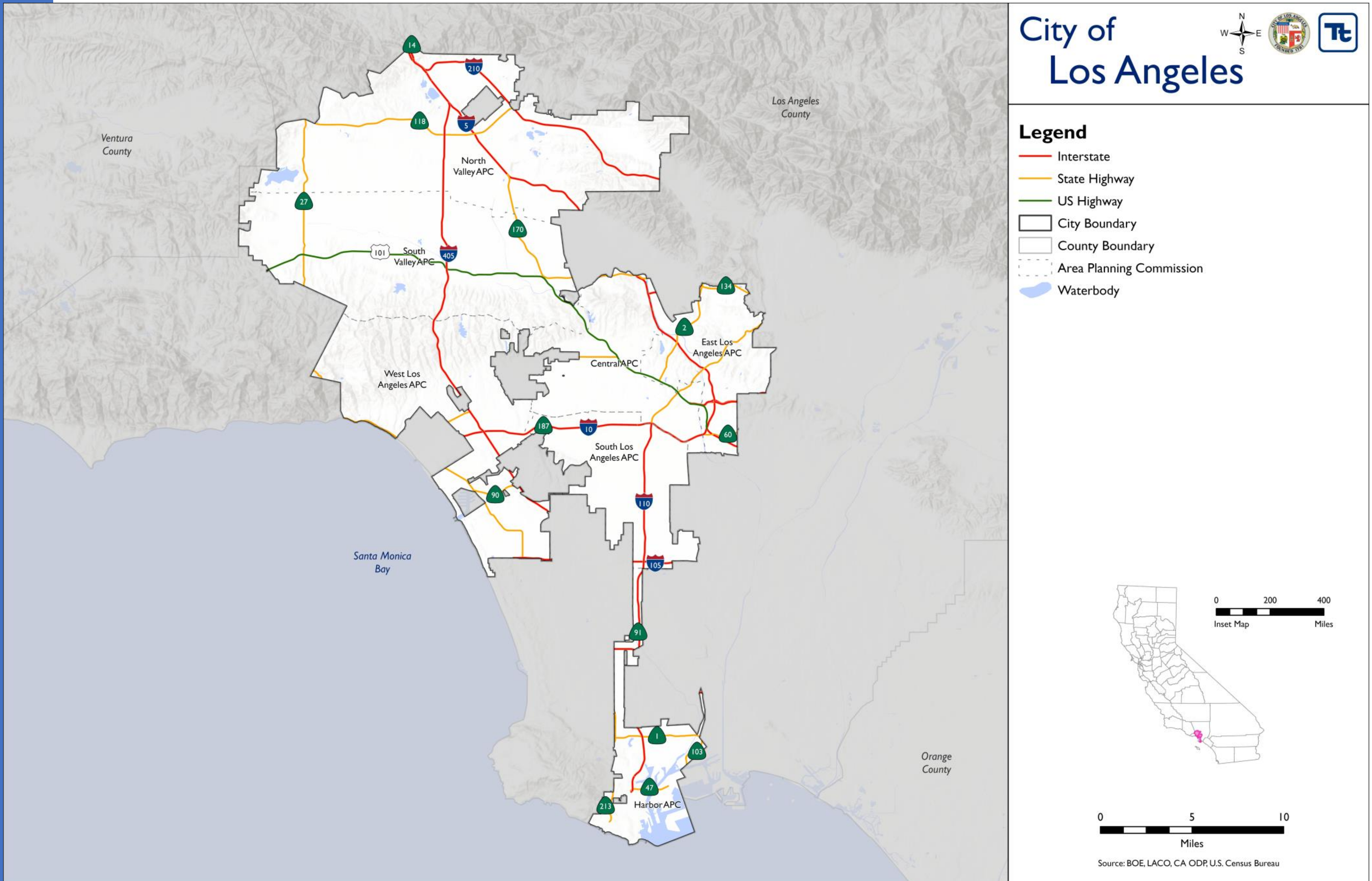


Figure 1-1. Planning Area for This Hazard Mitigation Plan

The following goals were established for the 2018 update:

1. Protect life, property, and cultural resources.
2. Increase public awareness.
3. Coordinate with other programs that can support or enhance hazard mitigation.
4. Increase emergency services effectiveness.
5. Pursue cost-effective and environmentally sound mitigation measures.
6. Strive to increase adaptive capacity to reduce risk from hazard impacts based on future conditions.

The 2018 plan recommended actions for mitigating the risks presented by identified hazards of concern. City departments and agencies were given specific responsibilities for implementing specific mitigation actions, using a mitigation strategy project worksheet created during the update process. The 2018 plan identified plans, policies, procedures, and protocols in which to integrate the information and data captured during the update process. The following are examples of how the plans information has been integrated:

- Updated hazard information informed and contributed to emergency operation planning
- Hazard information contributed to updating and revising zoning and planning efforts
- Hazard data contributed to the City's look at climate change, especially in the areas of heat and heat zones, and resilience planning efforts
- The General Plan identified the 2018 update of the HMP

1.5.2 Changes for This Update

The updated 2024 plan differs from the previous plan in a variety of ways:

- An enhanced public outreach effort was conducted as outlined in Chapter 2.4
- The risk assessment (Part 3) has been improved so that it aligns with the 2023 updated FEMA guidance
- The risk assessment for adverse weather has been broken into separate assessments for extreme cold, extreme heat, and high winds.
- The risk assessment for urban and wildland-urban interface fires has been revised to focus on wildfires.
- The effects of climate change have been incorporated into the risk assessments for each natural hazard rather than being assessed as a separate hazard showing the potential effects of a changing climate on the hazards.
- A new approach was used to rank the risk associated with hazards. The new approach considers the effect of climate change and local mitigation capabilities on the risk posed by each hazard.
- The following have been defined as "hazards of interest," with a more limited, qualitative assessment of risk performed:

- Civil disorder
  - Cyber threats
  - Geomagnetic storm (space weather)
  - Hazardous material release
  - Oil spills
  - Public health hazards (epidemic/pandemic/vector-borne diseases)
  - Radiological accidents
  - Smoke and air pollution
  - Terrorism
  - Transportation accidents
  - Urban structural fire
- The plan's mission statement, goals, and objectives were updated (see Chapter 31).
- The consideration of hazard impacts on critical facilities was revised to align with FEMA's definition of community lifelines.

The updated plan, once approved and adopted, will be used in various ways, such as:

- Enhancing public education and outreach efforts on hazards and how to be prepared when an incident occurs
- Climate change and resilience planning; the City is currently drafting a Climate Vulnerability Assessment
- Updating and revising zoning and planning codes and regulations with updated hazard data and information as required by state and federal agencies
- Implementing action items related specifically to hazard mitigation efforts
- Exploring ways to better engage socially vulnerable populations as related to hazard mitigation planning efforts

Table 1-1 indicates the major changes between the two plans as they relate to 44 CFR planning requirements.

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: **(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;** **(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process; and** **(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.**	The plan development process for this update followed the Community Rating System (CRS) 10-step planning process, which features the facilitation of a planning process through an organized steering committee. The process included a robust commitment to public engagement through all phases using multiple media.	The 2024 plan update again followed the CRS 10-step process that includes the opportunity for public comment through the planning process. Outreach efforts included contact with socially vulnerable communities, gatherings, and events. Steering Committee meetings were open to the public, and the promoted public comment period spanned 27 days.
§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.	Significant enhancements were made to the risk assessment for the 2018 update. Over 20 hazards of concern were grouped into 14 categories covering both the natural and non-natural hazard spectrum. The risk assessment includes multiple-scenario modeling for dam failure, earthquake, flood, and sea-level rise. Hazard profiles are standardized for each hazard of concern so that there is uniformity in the discussion of each hazard and the information provided can support the ranking of risk.	Following the implementation of new FEMA guideline effective April 2023 additional enhancements were made during the risk assessment process. There are 22 hazards contained In this update. Similar to the previous update, the risk assessments include modeling of scenarios for dam failure, earthquake, flood and sea-level rise. The included hazards and their profiles are also compared to the recent California State Hazard Mitigation Plan update.
§201.6(c)(2)(i): [The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	A robust profile was created for each hazard profiled that addresses the potential effects of climate change on the natural hazards of concern. Profiles in each hazard category include information on past events, location, frequency, severity, warning time, secondary effects, vulnerability, impacts, future trends, scenarios, and issues.	The 2024 update contains robust profiles and additional data outlined in appendices for each hazard, including the potential effect from climate change. Profiles include required information from the updated guidance as well as information on past events, location, frequency, severity, warning time, additional effects, vulnerability, impacts, future trends, scenarios, and issues.

Table 1-1. Plan Changes Crosswalk

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i). This description shall include an overall summary of each hazard and its impact on the community	Vulnerability was assessed for all hazards of concern. The Hazus computer model was used for the dam failure, earthquake, flood, and tsunami hazards. These were Level 2 (user-defined) analyses using city and county data. Site-specific data on City-identified critical facilities were entered into the Hazus model. Hazus outputs were generated for other hazards by applying an estimated damage function to an asset inventory extracted from Hazus.	Vulnerability was assessed for all hazards of concern. The Hazus computer model was used for the dam failure, earthquake, flood, and tsunami hazards. These were Level 2 (user-defined) analyses using city and county data. Vulnerability was assessed for other hazards by applying an estimated damage function to an asset inventory extracted from Hazus. The City reviewed and updated its site-specific data on critical facilities that were entered into the Hazus model.
§201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program insured structures that have been repetitively damaged floods	The plan includes a comprehensive analysis of repetitive loss areas that includes an inventory of the number and types of structures in the repetitive loss area. Repetitive loss areas are delineated, causes of repetitive flooding are cited, and these areas are reflected on maps.	The plan summarizes the analysis of repetitive loss areas from the city's most recent flood management plan, with updates to the number and types of structures in repetitive loss areas. That information is outlined and delineated with the cited cause and respective maps.
§201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program, and continued compliance with the program's requirements, as appropriate.	The City of Los Angeles participates in the NFIP and has identified actions stating its commitment to maintain compliance and good standing under the program. The City reviewed its current NFIP programmatic capabilities and included the results.	The City of Los Angeles continues to participate in the NFIP and CRS and has identified actions stating its commitment to maintain compliance and good standing under the program. The City reviewed its current NFIP programmatic capabilities. The City is in the process of updated its Flood management plan.
§201.6(c)(3)(iii): [The mitigation strategy shall describe] how the actions identified in Section C(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	Each recommended initiative is prioritized using a qualitative methodology that looked at the objectives the project will meet, the timeline for completion, how the project will be funded, the effects of the project, the benefits of the project and the costs of the project.	The updated plan looked at each recommended action and prioritized it using a qualitative methodology that looked at the objectives the project will meet, the timeline for completion, how the project will be funded, the effects of the project, the benefits of the project and the costs of the project.

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	This plan update includes a detailed plan maintenance strategy centered on an annual progress report via an automated platform that will be maintained by the City over the 5-year performance period of the plan.	Consistent with the updated guidance, the updated plan incorporates a maintenance strategy that centers on at least an annual review and progress reporting. The maintenance process will be managed by the City's emergency management department.
§201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	The plan details recommendations for incorporating it into other planning mechanisms, such as: • General plan • Emergency response plan • Capital improvement programs • Municipal code • The City's resilience plan Specific current and future plan and program integration activities are detailed in the capability assessment.	The 2024 plan includes detailed recommendations for incorporating it into various City documents, codes, regulations, and procedures, such as: • General Plan • Emergency plans • Capital improvement plan • Municipal code • Building and zoning codes • Climate plans • Resiliency plans Specific current and future plan and program integration activities are detailed in the capability assessment.
§201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.	The plan details a comprehensive strategy for continuing public involvement.	Consistent with the new FEMA guidance, the plan maintenance section outlines continued public engagement and involvement.
§201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commission, Tribal Council).	The plan includes all formal adoption and FEMA plan approval documentation.	The plan includes all formal adoption and FEMA plan approval documentation. The City plans to adopt following Cal OES and FEMA approval.

2. Plan Development Approach

2.1 Forming a Planning Team

A core planning team was assembled to facilitate the update of this HMP, consisting of staff from City of Los Angeles Emergency Management Department (EMD) and consultant firm Tetra Tech. The planning team provided guidance and direction to the HMP update effort to ensure that the resulting document will be embraced by City leaders and residents. The planning team was made up of the following members:

- Jon Brown | City of Los Angeles—Division Chief, Emergency Management Department
- Jillian De Vela | City of Los Angeles—Emergency Management Coordinator, Emergency Management Department
- Bart Spencer | Tetra Tech—Lead Project Planner, Project Manager (2023 – 2024)
- JaLeesa Tate | Tetra Tech—Project Coordination and Engagement Lead (2023 – 2024)
- Jake Poland | Tetra Tech—Project Planner
- Kami Spahn | Tetra Tech—Risk Assessment Discipline Lead (July 2023 – 2024)
- Rob Flaner | Tetra Tech—Project Manager (March 2023 – July 2023)
- Megan Brotherton | Tetra Tech—Project Coordinator (March 2023 – July 2023)
- Carol Bauman | Tetra Tech—Risk Assessment Discipline Lead (March 2023 – July 2023)

The key responsibilities of the planning team were as follows:

- Oversee the planning process on behalf of the Steering Committee
- Conduct project coordination meetings to discuss project status and ensure the project is on track and meets major plan milestones
- Confirm meeting content for Steering Committee and Stakeholders held throughout the planning process
- Establish a timeline for completion of the plan
- Attend and participate in all Steering Committee and Stakeholder meetings
- Identify issues during the planning process
- Review deliverable.

2.2 Establishing a Steering Committee

The planning team identified candidates from a wide range of organizations to include on a Steering Committee to coordinate and develop the HMP. These included City departments, county agencies, academia, and non-profit organizations. In total, 44 members agreed to participate and attended a kickoff meeting; 12 alternate members were identified. Table 2-1 lists the Steering Committee members. Communication to members mostly occurred through email and telephone calls. Appendix B includes examples of materials distributed by email.

Table 2-1. Steering Committee Members

Organization	Sector/ Community Lifeline	Member	Alternate
American Red Cross	Health and Medical, Health and Social Services	Francisca Herrera, Disaster Cycle Services	None
California Institute of Technology	Academia	Dr. Monica Kohler[b], Research Professor of Mechanical and Civil Engineering	None
City of Los Angeles Community for Investment in Families[a]	Health and Social Services, Social Vulnerability	Ruth Rodrigues, Senior Management Analyst	None
City of Los Angeles Department of Building and Safety	Safety and Security	Lisa Yancey, Chief Inspector	None
City of Los Angeles Department of Disability[a]	Health and Social Services, Social Vulnerability	Deisy Gonzalez, Emergency Management Coordinator	None
City of Los Angeles Department of General Services	Safety and Security	Howard Bein, Emergency Planning Unit	None
City of Los Angeles Department of Neighborhood Empowerment[a]	Health and Social Services, Social Vulnerability	John Darnell, Neighborhood Empowerment Advocate	None
City of Los Angeles Department of Public Works	Transportation	Adam Shephard, Emergency Management Coordinator Samson Wong, Civil Engineer Associate Raul Virgen, GIS Chief	Robert Kadomatsu, Chief Management Analysis
City of Los Angeles Department of Recreation and Parks	Natural and Cultural Resources	Adriana Smith, Emergency Management Coordinator Monica Gonzalez, Emergency Management Coordinator	None
City of Los Angeles Department of Transportation	Transportation	Paul Weinberg, Emergency Management Coordinator	Vilma Boada-Tellez, Emergency Management Coordinator
City of Los Angeles Department of Water and Power	Water Systems	Patrick Munongo, Emergency Management Coordinator Alejandro Becerra, Civil Engineering Associate Cliff Plumb, Engineering Geologist	None

Organization	Sector/ Community Lifeline	Member	Alternate
City of Los Angeles Emergency Management Department	Emergency Management	Omari Battles, DAFN Principal Project Coordinator Jon Brown, Division Chief of Planning and Resilience Jillian De Vela, Emergency Management Coordinator Joseph Riser, Public Information Officer	None
City of Los Angeles Fire Department	Safety and Security	Rico Gross, Captain	None
City of Los Angeles Housing Department	Housing	EJ Martinez, Emergency Management Coordinator	None
City of Los Angeles Information Technology Agency	Communications	Thanh Su, Management Analyst	None
City of Los Angeles Mayor's Office	Safety and Security	Jacquelyn Sandoval, Mayoral Aide	None
Los Angeles City Planning Department	Safety and Security	Gabriela Juárez, City Planner	Marie Cobian, Senior City Planner Conni Pallini-Tipton, Senior Planner
City of Los Angeles Police Department	Safety and Security	Hayley Smith, Lieutenant	Michael Boyle, Sergeant Richard Rogers, Officer
City of Los Angeles Sanitation & Environment	Water systems	Jennifer Kong, Grants Program Manager	Thien Phan, Environmental Engineering Associate
City of Los Angeles World Airports	Transportation	Justin Pierce, Director of Emergency Management Division Zina Cheng, Grants & PFC Manager	None
Climate Emergency Mobilization Office	Safety and Security, Climate Change	Marta Segura, Climate Emergency Mobilization Office, Chief Heat Officer	None
Community Emergency Response Team	Safety and Security	Chin Thammasaengri, CERT South Bureau & LAFD Dispatch	None
Emergency Network in Los Angeles	Safety and Security	Rene Martin, Interim Program Director Kayla Kelly-Slatten, Program Director	Michael Flood
Los Angeles Area Chamber of Commerce	Safety and Security	Andrea Nunn, Senior VP, Entrepreneurship & Innovation	Peter Foo, VP of Entrepreneurship & Workforce Development

Organization	Sector/ Community Lifeline	Member	Alternate
Los Angeles County Office of Emergency Management	Emergency Management	Sinan Khan, Associate Director	None
Los Angeles Unified School District	Safety and Security	Jill Barnes, Administrator of Emergency Management	None
National Weather Service	Communications	Eric Boldt, Warning Coordination Meteorologist John Dumas, Science and Operations Officer	None
Neighborhood Council Emergency Preparedness Alliance[a]	Health and Social Services	Commissioner Leonard Shaffer, Commissioner	None
Office of the City Administrative Officer	Safety and Security	Mary Reuschel, Senior Administrative Analyst	None
Harbor Department/Port of Los Angeles	Transportation	Lynette Ursery, Emergency Management Coordinator Jennifer Maradiaga-Contreras, Emergency Management Coordinator	None
The Nature Conservancy	Natural and Cultural Resources	Kelsey Jessup, Urban Conservation Program Manager	Alysa Mann, Climate Resilience Project Director Deborah Glaser, Climate Resilient Communities Project Director
University of California, Los Angeles	Academia	Dr. Travis Longcore[b], Adjunct Professor	Sahar Derakhshan[b], Postdoctoral Research Fellow
University of Southern California Sea Grant Program	Academia	Karina Alvarez[b], Science, Research, and Policy Specialist	None
U.S. Army Corps of Engineers	Safety and Security	Major Kevin Stucker, Operations Officer	None

a. Includes involvement with socially vulnerable communities
b. Individuals affiliated with academic institutions provided their subject matter expertise but were not official spokespersons on behalf of their institutions

Steering Committee members were charged to do the following:

- Represent their department or agency throughout the planning process and ensure participation expectations were met.
- Assist in gathering information for inclusion in the HMP update.
- Solicit and encourage the participation of regional agencies, a range of stakeholders, and residents in the plan development process.

- Support and promote the public involvement process.
- Assist with the development and completion of certain planning elements, including the following:
  - Reviewing and updating the hazards of concern
  - Developing a public and stakeholder outreach program
  - Ensuring that the data and information used in the plan update process are the best available
  - Reviewing and updating the hazard mitigation goals
  - Reporting on the progress of mitigation actions identified in prior HMPs
  - Identifying and screening appropriate mitigation strategies and activities
  - Reviewing and commenting on plan documents prior to submission to the California Governor's Office of Emergency Services (Cal OES) and FEMA
  - Adopting, implementing, and maintaining the plan update

Leadership roles and ground rules were established during the Steering Committee's kickoff meeting on April 25, 2023. The Steering Committee agreed to meet five times throughout the course of the plan's development (four meetings were held as of January 11, 2024). The planning team facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the planning process. Steering Committee meetings were open to the public. Agendas and meeting summaries were posted to the hazard mitigation plan website and promoted by neighborhood commissioners, stakeholders, and community groups.

2.3 Coordinating with Stakeholders

Stakeholders are the individuals, agencies, and jurisdictions that have a vested interest in the recommendations of the HMP. Diligent efforts were made to ensure broad regional, county, and local representation in this planning process. To that end, a comprehensive list of stakeholders was developed with the support of the Steering Committee. Stakeholder outreach was performed early on and continually throughout the planning process. Contact was made by email, telephone calls, and personal contact as summarized below. Example of the informational materials distributed by email are included in Appendix B.

Key elements of outreach to stakeholders were as follows:

- All Steering Committee meetings were open to the public and advertised via the EMD website (https://emergency.lacity.gov/Local-Hazard-Plan).
- All agencies that were contacted through the outreach process were kept apprised of plan development milestones. These agencies received meeting announcements,

meeting agendas, and meeting minutes by e-mail throughout the plan development process. Additionally, information was regularly posted on the project's website.

- In 2023, over 100 stakeholders and neighboring communities were emailed to notify them of the planning process and invite them to complete a mitigation survey regarding vulnerabilities, capabilities, and mitigation projects.
- In March 2024, the City deployed a StoryMap to provide information regarding the hazard mitigation planning process and an opportunity for virtual public participation. It also provides an interactive platform to learn about the hazards of concern and view hazard maps prepared for the HMP.
- All the agencies contacted from May 2023 through February 2024 were provided an opportunity to review and comment on a review draft of the plan.
- For the public comment period, information on the draft HMP was provided on the EMD webpage. Questions and comments could be submitted by Google Form. The planning team conducted listening sessions during identified "office hours" where members of the public and other stakeholders could have a dialogue about the plan and provide their feedback and comments.

This subsection summarizes key stakeholders and their participation in the development of this HMP. Stakeholders included academia, state and local government, businesses, non-profits, emergency services, public works, transportation, and utility providers. Those who served on the planning team or Steering Committee or those who provide services to the socially vulnerable populations of the City are noted accordingly. Appendix B provides additional details on the public and stakeholder outreach, including responses received to a survey that was distributed as part of the planning process.

2.3.1 Government Agencies

Federal Agencies

Key federal agency participation in the HMP update process was by email as follows:

- FEMA Region 9 provided updated planning guidance and conducted plan reviews.
- The U.S. Army Corps of Engineers served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.

State Agencies

Key state agency participation in the HMP update process was by email as follows:

- Cal OES administered the planning grant, provided updated planning guidance, and provided a review of the draft HMP update.
- California Division of Safety of Dams (DSOD) provided information on dams, specifically high-hazard dams.
- California Geological Survey (CGS) provided data on Tsunami Inundation Phases.

City Agencies

Key City agency participation in the HMP update process was as follows:

- City of Los Angeles Community for Investment in Families was invited by City email and served on the Steering Committee and provided input to the planning process; provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Department of Building and Safety served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- The City of Los Angeles Department of Disability was invited by City email and served on the Steering Committee and provided input to the planning process; provided services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Department of General Services was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Department of Neighborhood Empowerment was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Department of Recreation and Parks was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Housing Department was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Information Technology Agency was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.

- The City of Los Angeles Mayor's Office was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Planning Department was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- Climate Emergency Mobilization Office was invited by City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Provides services to all populations, including socially vulnerable populations, who often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.

2.3.2 Regional and Local Stakeholders

Academia

The following schools, universities, and other academia institutions were invited by emails sent to specific individuals to attend planning process meetings and asked to complete the stakeholder survey:

- University of California Los Angeles (UCLA)—A faculty member provided data utilized to develop the UCLA heat maps and heat risk maps, served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- The University of Southern California (USC)—A faculty member provided data on the sea-level rise hazard.
- California Institute of Technology (Caltech)faculty member served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- Los Angeles Unified School District faculty member served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- The University of Southern California Sea Grant Program faculty member served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.

Individuals affiliated with academic institutions provided their subject matter expertise but were not official spokespersons on behalf of their institutions.

Business, Commercial, Non-Profit, and Sustainability Organizations

The following business, commercial, non-profit, and sustainability organizations were invited by emails sent to specific individuals to attend planning process meetings and asked to complete the stakeholder survey:

- American Red Cross staff member served on the Steering Committee and provided input to the planning process; provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.
- The Nature Conservancy staff member served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- Los Angeles Area Chamber of Commerce staff member served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.

Emergency Services

The following emergency service providers (police, fire, and EMS) were invited by City email to attend planning process meetings and asked to complete the stakeholder survey:

- The City of Los Angeles Emergency Management Department led the overall planning process of the HMP update, served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Fire Department was included in City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to lack of ability to evacuate or housing that does not meet modern building requirements.
- The City of Los Angeles Police Department was included in City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to lack of ability to evacuate or housing that does not meet modern building requirements.
- Emergency Network in Los Angeles was included in City email and served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to lack of ability to evacuate or housing that does not meet modern building requirements.
- Community Emergency Response Team was included in email and served on the Steering Committee, provided input to the planning process, and identified mitigation

strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.

Public Works and Transportation

The following highway and public works departments were invited through City email to attend planning process meetings and asked to complete the stakeholder survey:

- The City of Los Angeles Department of Public Works served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- The City of Los Angeles Department of Transportation served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- The City of Los Angeles World Airports served on the Steering Committee, provided input to the planning process, and identified mitigation strategies.
- StreetsLA attended meetings and provided input to the planning process.

Utilities

The following utility providers that serve the City were invited by City email to attend planning process meetings and asked to complete the stakeholder survey:

- The City of Los Angeles Department of Water and Power served on the Steering Committee, provided input to the planning process, and identified mitigation strategies. Also provides services to all populations, including socially vulnerable populations. Socially vulnerable populations often need additional emergency assistance in disaster events due to a lack of ability to evacuate or housing that does not meet modern building requirements.

Neighboring Communities

The City made efforts to keep surrounding communities apprised of the project. Los Angeles County and surrounding communities and municipalities were invited to take the stakeholder survey and given an opportunity to provide input to this planning process. The County acted as a conduit for collecting information using the Operational Area process and forwarded it back to the City.

A representative from the Los Angeles County Office of Emergency Management (OEM) was invited by email and telephone call and participated in the HMP update process, including serving on the Steering Committee. The County OEM in its capacity as the Operational Area Coordinator facilitated an invitation to area and neighboring jurisdictions to participate and/or provide feedback and input during the City's hazard mitigation planning process. This invitation was by email. There were no neighboring municipalities that actively participated in the planning process.

During the project, the City had telephone conversations with the Cities of Santa Monica and Pasadena that included details on the planning process, social media, surveys, data sets, and how these integrated into the plan.

The meeting with Pasadena was with Naelly Procopio, Emergency Services Manager and discussed:

- Steering Committee
- List of hazards
- Community Survey
- Website
- Social media toolkit

Planning Information was also shared at some of the Disaster Area Coordinato meetings. These meetings, hld every Monday discuss specific concerns and actions within the Area.

2.4 INVOLVING THE GENERAL PUBLIC

> The public involvement strategy used for the plan update introduced the concept of mitigation to the public and provided the Steering Committee with feedback to use in developing the plan. All residents of the planning area had opportunities to provide comments during all phases of the plan update process.

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. The public must have opportunities to comment on hazard mitigation plans during the drafting stages, prior to plan approval (44 CFR, Section 201.6(b)(1)). The Steering Committee formation process and stakeholder coordination efforts described in this chapter were initial efforts toward the involvement of targeted members of the public. Outreach to the broader general public, including underserved communities, neighborhoods, and groups, was achieved through a multi-point public involvement strategy as described below.

The planning team and Steering Committee developed a public outreach plan to involve as many planning area residents as possible in the development and review of this plan. The following sections describe efforts toward public participation in the planning process.

2.4.1 HMP Website

During the planning process, a webpage was created on the EMD website to introduce the hazard mitigation plan update and keep the public apprised of upcoming outreach events, meeting dates and times, public surveys, and plan update process (see Figure 2-1).

Figure 2-1. Hazard Mitigation Plan Webpage on the Emergency Management Department Website

The site's address (https://emergency.lacity.gov/Local-Hazard-Plan) was publicized at all public meetings and in all social media releases. Information on the plan development process, the Steering Committee, the survey, and drafts of the plan were made available to the public on the website throughout the process. The City of Los Angeles intends to keep a website active after the plan's completion to keep the public informed about successful mitigation projects and future plan updates.

Additionally, this information was shared on the websites of the City of Los Angeles Community Emergency Response Team (CERT), and Harbor Gateway North Neighborhood Council.

2.4.2 StoryMap

An online site was created using the Esri StoryMap software to communicate the variety and severity of hazards facing Los Angeles (see Figure 2-2). The StoryMap was released to the public in March 2024 and promoted through print and social media, the project website, and during public meetings. It includes risk assessment results for all relevant hazards and an interactive hazard mapping tool. The StoryMap expanded the ways in which members of the public could interact with hazard data as the hazard mitigation plan update was underway. After the completion of the hazard mitigation plan update, the City of Los Angeles StoryMap (https://experience.arcgis.com/experience/71ef7b52b4cf48af853f5c1c7051e951/) will continue to support visual and data-based communication about the range of hazards relevant to the city.

Figure 2-2. City of Los Angeles Hazard Mitigation Plan StoryMap

2.4.3 Social Media

The EMD created a Social Media Toolkit which was shared with the Steering Committee members and other partner agencies. The Social Media Toolkit included the flyers, social media graphics, links, and paper survey that was developed and used throughout the planning process. The purpose of the Toolkit is to provide materials to the City team members and stakeholders so they can share and spread the information about the HMP to their stakeholders and their constituents. The Toolkit can be found at: https://drive.google.com/drive/folders/1qcPnjSP1pMzwBe5k6cL1iBSFjJ1M9v-Y?usp=drive_link

To reach the general public and socialize the survey, informational messages in multiple languages were posted on social media inviting the public and businesses to participate in the update process by completing the public survey. Multiple social media platforms were utilized including Nextdoor, Facebook, Instagram, and X (Twitter). Figure 2-3 shows social media posts with information about the hazard mitigation planning process. The planning team's social media efforts were boosted by reposts from the City of Los Angeles Mayor. Additionally, the City conducted mass notification through text/email via NotifyLA to the subscribers during September Preparedness Month and October's ShakeOut day.

Figure 2-3. Sample Social Media Posts on the Hazard Mitigation Planning Process

2.4.4 Public Survey

A hazard mitigation survey (see Figure 2-4 and Figure 2-5), developed by the planning team with guidance from the Steering Committee, was used to gauge preparedness for all hazards and the level of knowledge about ways to reduce risk and loss from natural hazards. The survey responses helped guide the Steering Committee in determining planning goals, objectives, and mitigation strategies. Surveys were distributed at public outreach events, and a web-based version of the survey was made available on the hazard mitigation plan website.

The survey identified general needs for hazard mitigation and resiliency in the City from the perspective of a broad range of community members, along with specific projects that may be included in the mitigation plan. It was distributed to the general public, City departments, neighborhood and community groups, and socially vulnerable populations. The Steering Committee reviewed Feedback reviewed the results for use in this plan as appropriate.

City of Los Angeles 2023 Hazard Mitigation Plan Update: Community Hazard Awareness Survey

The City of Los Angeles is committed to engaging the community throughout the Plan update process.
This anonymous survey is designed to help the City better prepare our communities to withstand the hazards and potential disasters that are most relevant to the area. The information you provide will directly support the development of strategies and actions to reduce vulnerability to potential hazards.
Thank you for taking the time to participate!

1. Which of the following natural hazards have you ever been impacted by within the City of Los Angeles? (Check all that apply)

- ☐ Adverse Weather (i.e., wind, lightning, extreme cold, winter storm, tornado, etc.)
- ☐ Dam Failure
- ☐ Drought
- ☐ Earthquake
- ☐ Extreme Heat
- ☐ Flooding
- ☐ Landslide / Debris Flow
- ☐ Tsunami
- ☐ Wildfire
- ☐ None
- ☐ Other (please specify)

Figure 2-4. Sample Page from Survey Distributed to the Public—English

Encuesta comunitaria para la actualización del plan de mitigación de Ciudad de Los Ángeles 2023

La ciudad de Los Ángeles está comprometida a involucrar a la comunidad durante el proceso de actualización del Plan.

Esta encuesta anónima está diseñada para ayudar a la ciudad a prepararse para los peligros y desastres potenciales que son más frecuentes en la ciudad de Los Ángeles. La información que proporcione apoyará directamente el desarrollo de estrategias y acciones para reducir la vulnerabilidad a peligros potenciales.

¡Gracias por tomarse el tiempo para participar!

1. ¿Cuál de los siguientes peligros naturales le ha afectado alguna vez dentro de la ciudad de Los Ángeles? (Marque todo lo que corresponda)

- ☐ Clima adverso (viento, relámpagos, frío extremo, tormenta de invierno, tornado, etc.)
- ☐ Falla de represa
- ☐ Sequía
- ☐ Terremoto
- ☐ Calor extremo
- ☐ Inundación
- ☐ Deslizamiento de tierra/flujo de escombros
- ☐ Tsunami
- ☐ Incendios
- ☐ Ninguna de las anteriores
- ☐ Otro (especifique, por favor)

Figure 2-5. Sample Page from Survey Distributed to the Public—Spanish

In total, 5,450 responses to the public survey were received: 5,399 responses to the English version and 51 responses to the Spanish version of the survey. Respondents included community members and stakeholders involved in academics or research, emergency services, health and human services, public works, and neighborhood and community organizations. The following is a summary of the results (see Appendix B for complete results):

- Over 70 percent of respondents reported having experienced an earthquake, 49 percent having experienced drought, and 56 percent having experienced severe weather. Regarding non-natural hazards, 48 percent have experienced civil unrest and 38 percent have experienced critical infrastructure failure.
- Survey respondents ranked earthquake and public health as the hazards of highest concern, followed by extreme heat, severe weather, and drought.
- Most respondents believe that the best method to receive emergency preparedness information is from the internet, followed by TV news and social media.
- Over 50 percent of respondents who indicated that they live near an earthquake fault do not have earthquake insurance.
- Over 50 percent of respondents indicated that the presence of a hazard risk zone was not disclosed to them when they purchased their home.
- Over 85 percent of the respondents indicated that disclosure of this type of information would have influenced their decision to purchase or move into a home.
- Most respondents stated that incentives would entice them to spend money to mitigate their property. The two most popular incentives were property tax incentives and insurance premium discounts.

Survey responses included 766 “write in” comments. All of these comments were reviewed by the planning team. Information and comments received will potentially be incorporated into the City’s development of emergency management programs (including hazard mitigation) and outreach efforts.

2.4.5 Public Events

The planning team attended public events throughout the planning process to make the public aware of the update to the hazard mitigation plan, and invite residents, business owners, and employees to take the online public survey (see Figure 2-6 through Figure 2-9). Residents who attended the events were asked to complete a survey, and each was given an opportunity to provide comments for the planning team. Table 2-2 provides a detailed list of presentations, preparedness fairs, community presentations, and email communication.

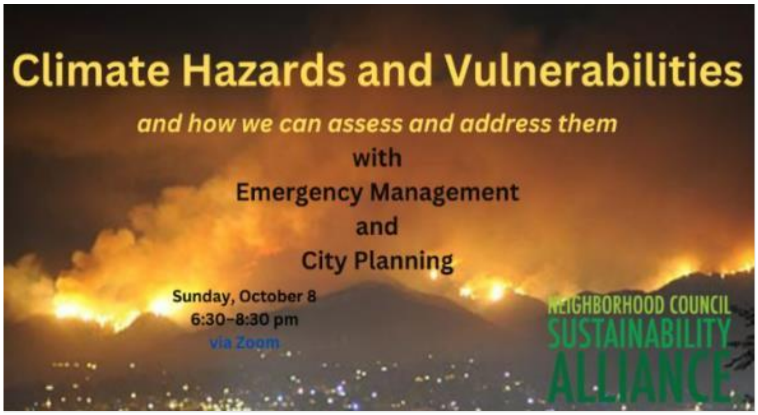


Figure 2-6. Advertisement for Community Meeting

Figure 2-7. Presentation at Camp Ready LA

Figure 2-8. Preparedness Fair, June 10, 2023

Figure 2-9. Outreach During P-22 Day Festival

Table 2-2. Points of Engagement

Date	Event	Organization	Method of Outreach	Population/ Neighborhood
04/25/2023	Steering Committee Meeting	Interagency Coordination/Steering Committee Members	Presentation	Steering Committee Meetings are open to the Public
05/21/2023	Emergency Preparedness Fair	Chinatown Service Center	Preparedness Fair (included information on mitigation) survey available	Chinatown
06/10/2023	Public Safety Fair	Council District 11	Preparedness Fair (included information on mitigation) survey available	Brentwood, Del Rey, Mar Vista, Marina del Rey, Pacific Palisades, Playa del Rey, Playa Vista, Sawtelle, Venice, West Los Angeles, Westchester, Los Angeles Airport

Date	Event	Organization	Method of Outreach	Population/ Neighborhood
06/20/2023	Steering Committee Meeting	Interagency Coordination/Steering Committee Members	Presentation	Steering Committee Meetings are open to the Public
07/11/2023	Community Emergency Preparedness Task Force Meeting	Community Task Force Meeting	Presentation (included emergency preparedness and awareness)	Task Force Members (Community Based Organization groups)
07/19/2023	Disabilities Access and Functional Needs Coalition Meeting*	DAFN Task Force	Presentation (included emergency preparedness and awareness for socially vulnerable groups) survey available	Socially Vulnerable (Community Based Organization groups)
07/19/2023	Planning & Resilience Task Force Meeting	Planning & Resilience Task Force Meeting	Presentation	City partners and stakeholders
07/25/2023	Steering Committee Meeting	Interagency Coordination/Steering Committee Members	Presentation	Steering Committee Meetings are open to the Public
08/01/2023	National Night Out	Northridge West Neighborhood Council	Preparedness Fair survey available	Northridge West
08/03/2023	Camp Ready LA*	EMD	Youth Camp	Minority Youth
08/05/2023	Los Angeles Neighborhood Coalition Meeting	Los Angeles Neighborhood Coalition	Presentation | Survey available	Various Neighborhood Councils
08/10/2023	Valley Alliance of Neighborhood Councils	VANC Meeting	Presentation | Survey available	Various Neighborhood Councils
08/24/2023	City of Los Angeles Hazard Mitigation Plan Survey: We need your feedback!	EMD	All City Email	City employees
08/30/2023	Community Coalition South LA*	Community Coalition South LA	Email	Black, Brown, Indigenous, and People of Color
08/31/2023	FamilySource Executive Directors Meeting*	Los Angeles Community Investment for Families Department, and various FamilySource Centers	Presentation (included emergency preparedness and awareness for socially vulnerable groups)	Low-income residents throughout the City
09/01/2023	LA City: Community Hazard Awareness Survey	EMD Mass Notification	Email-only mass notification	Mass notification subscribers

Date	Event	Organization	Method of Outreach	Population/ Neighborhood
09/23/2023	Congress of Neighborhood	Neighborhood Empowerment	Preparedness Fair | Survey available	Various Neighborhood Council groups
09/24/2023	Senior Citizen Centers*	Recreation and Parks Department	Flyer/survey distribution	Older Adults
09/25/2023	Los Angeles Libraries	Los Angeles Public Library	Flyer/survey distribution to all 72 branches	Citywide
10/8/2023	Climate Hazards and Vulnerabilities*	Neighborhood Council Sustainability Alliance	Presentation | Survey available	Various Neighborhood Council groups focused on sustainability
10/18/2023	Loyola Marymount University (LMU) Preparedness Fair	Quakefest	Emergency Preparedness Fair| Survey available	LMU students, faculty, and staff
10/11/2023	Included the HMP Flyers in the Public Housing Bill	Public Housing	HMP Flyer included in Public Housing Bill	Public Housing Residents
10/19/2023	LA City: Great ShakeOut Survey	EMD Mass Notification	Email & Text Only mass notification	Mass notification subscribers
10/22/2023	P-22 Day Festival	Save the Cougars	Festival/Table	Citywide
10/24/2023	Smart City Showcase	The Mayor's Office of Finance and Innovation	Preparedness Fair	Various stakeholders and Los Angeles constituents
11/28/2023	10 Freeway Local Business Assistance Center	EMD	Table	Business owners impacted by 10 freeway closures
1/6/2024	Ready for Anything SD3 Emergency Preparedness Fair	Los Angeles County District	Preparedness Fair | Survey available	Pacoima residents

* Outreach efforts included socially vulnerable population groups

2.4.6 Specific Outreach to Socially Vulnerable Populations

Throughout the planning process, EMD worked with the Disabilities, Access, and Functional Needs (DAFN) Coalition to share information about the plan and gather additional input from members of the Coalition. The membership of the DAFN Coalition is extensive and diverse, consisting of almost 80 organizations (detailed in Appendix B). The DAFN Coalition stakeholders assisted with distributing flyers within their respective networks, emailing their respective constituents, making personal contacts, and boosting social media postings regarding the HMP public survey.

The California State Hazard Mitigation Plan defines socially vulnerable populations as individuals and groups who have access and functional needs, such as, but not limited to, people without vehicles, people with disabilities, older adults, and people with limited English proficiency.

> Underserved communities are communities sharing characteristics that have been systematically denied a full opportunity to participate in aspects of economic, social, or civic life (Federal Register 2021).

Targeted outreach to socially vulnerable individuals and underserved communities included providing a flyer with a QR code linking to the public survey. Flyers were included with Housing Authority of the City of Los Angeles (HACLA) public housing rent bills and posted in common areas at HACLA sites. Through these approaches, the flyers reached more than 19,000 individuals living at HACLA sites. Table 2-3 lists the HACLA sites engaged during the planning process. HACLA provides affordable housing for the City. The average family income of HACLA residents is $31,307; 74.3 percent of residents are Hispanic (HACLA 2023).

Table 2-3. HACLA Sites Engaged in Planning Process

Site	Address	City	Zip
Avalon Gardens	701 E. 88th. Pl.	Los Angeles	90002
Estrada Courts & Extension	3232 Estrada St.	Los Angeles	90023
Gonzaque Village	1515 East 105th. St.	Los Angeles	90002
Imperial Courts	11541 Croesus Ave.	Los Angeles	90059
Jordan Downs	9800 Grape St.	Los Angeles	90002
Mar Vista Gardens	11965 Allin St.	Culver City	90230
Nickerson Gardens	1590 114th. St.	Los Angeles	90059
Pico Gardens	1526 E. 4th. St.	Los Angeles	90033
Pueblo Del Rio & Extension	1801 E. 53rd. St.	Los Angeles	90058
Ramona Gardens	2830 Lancaster	Los Angeles	90033
Rancho San Pedro & Extension	275 West First St.	San Pedro	90731
Rose Hill Courts	4466 Florizel St.	Los Angeles	90032
San Fernando Gardens	10995 Lehigh Ave.	Pacoima	91331
William Mead Homes	1300 North Cardinal	Los Angeles	90012

On August 31, 2023, representatives from EMD and the City Planning Department held an in-person presentation to discuss the HMP and the planning process to FamilySource Centers, an organization that provides social, education, work, and family support services to over 37,000 low-income City residents. FamilySource Centers was provided with the HMP fact sheet with a QR code to complete the public survey online and a PDF version of the public survey. Refer to Section 2.4.4 for a summary of survey results and the total number of surveys completed.

EMD also worked directly with the Department of Recreation and Parks' Senior Citizen Centers to distribute paper surveys to those utilizing the centers. The centers posted the HMP fact sheet and had paper surveys available.

2.4.7 Public Comments on the Draft Plan

A formal, 27-day public comment period was initiated on March 20, 2024. During this comment period, the public was asked to review the proposed draft of the hazard mitigation plan and provide comments to the planning team by April 15, 2024. The public comment period was advertised on the hazard mitigation plan website as well as a press release to all media outlets and social media blast through outlets used by the City.

The planning team received 15 comments during the public comment period. Those that were deemed relevant to the overall plan by the planning team were incorporated into the final submittal draft of the plan. Copies of the comments were retained by the planning team and are available upon request.

At the conclusion of the public comment period, the complete draft plan was submitted to Cal OES and FEMA for a pre-adoption review to ensure program compliance.

2.5 Reviewing Existing Materials

Hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (44 CFR, Section 201.6(b)(3)). The following programs were reviewed for their potential to affect mitigation within the planning area:

- California Enhanced State Hazard Mitigation Plan
- Regional Adapt LA: Coastal Impacts Planning for the Los Angeles Region
- Sustainable City Plan
- Resilience by Design
- California Fire Code
- 2022 California Building Code
- California State Hazard Mitigation Forum
- City Capital Improvement Programs
- City Emergency Operations Plan
- City General Plan
- The Framework Element
- Housing Element
- Safety Element
- City Zoning Ordinances
- City Coastal Program Policies

Chapter 5 of this plan provides a review of laws and ordinances that can affect hazard mitigation actions in the planning area. In addition, dozens of documents and web pages relevant to hazard mitigation planning were reviewed and incorporated as cited in the text throughout this plan and identified in the list of references at the end of the plan. More information on integration of such plans is included in Chapter 5.

2.6 Plan Development Chronology/Milestones

Table 2-4 summarizes important milestones in the plan update process.

Table 2-4. Plan Development Chronology/Milestones

Date	Event	Description	Number of Attendees
2024			
TBD	Final Approval	FEMA granted final approval of the adopted plan.	n/a
TBD	Plan adopted by the Los Angeles City Council	Plan is finalized with the Council's adoption	n/a
TBD	Approval Pending Adoption	Approval pending adoption received from FEMA Region 9	n/a
4/26	Plan Review	Plan sent to Cal OES for review and approval pending adoption	n/a
4/24	Steering Committee #5	Final briefing to Steering Committee prior to submission	TBD
4/15	Public Outreach	Closure of 27-day final public comment period	n/a
4/6	Public Meeting	Open public meeting | summary plan presentation |question and answer period	TBD
3/27	Public Meeting	Open public meeting | summary plan presentation |question and answer period	TBD
3/20	Public Outreach	Beginning of 27-day final public comment period	n/a
3/14	CPT Meeting #23	Planning process | discussion of public comment period and distribution of the plan	5
2/29	CPT Meeting #22	Planning process | discussion of StoryMap	5
2/27	4th Steering Committee Meeting	Review of the planning process to date and milestones | discussion of action items, public comment process, and submission/review/approval process	30
2/12	Internal City Review	Closure of internal review period	n/a
2/1	CPT Meeting #21	Planning process	5
1/30	Internal City Review	Beginning of internal review period	n/a
1/18	CPT Meeting #20	Planning process	4
1/4	CPT Meeting #19	Planning process	4

Date	Event	Description	Number of Attendees
2023			
11/30	CPT Meeting #18	Planning process	5
11/16	CPT Meeting #17	Planning process	5
11/2	CPT Meeting #16	Planning process	5
10/5	CPT Meeting #15	Planning process	5
9/22	CPT Meeting #14	Planning process	5
9/20	Nature-Based Solutions for Local Hazard Mitigation Actions	• Presented by The Nature Conservancy • Identifying nature-based solution • Benefits of nature-based solutions	10
9/7	CPT Meeting #13	Planning process	5
9/1	CPT Meeting #12	Planning process	5
8/15	Hazard Mitigation Workshop	• Hazard mitigation overview • Planning process • What is the mitigation strategy • How to develop mitigation actions	20
8/10	CPT Meeting #11	Planning process	5
7/27	CPT Meeting #10	Planning process	6
7/25	3rd Steering Committee Meeting	• Accept goals and objectives • Accept hazard datasets (aside from extreme heat) • Discuss hazard datasets and scenarios • Discuss project coordination • Discuss Public Engagement	
7/13	CPT Meeting #9	Planning process	6
6/29	CPT Meeting #8	Planning process	6
6/26	Public Outreach	Web-based hazard survey deployed	n/a
6/20	2nd Steering Committee Meeting	• Accept mission statement • Accept list of hazards • Accept revised Steering Committee Ground Rules • Discuss goals and objectives • Discuss Public Engagement and Hazard Assessment/Risk Analysis	40
6/12	CPT Meeting #7	Planning process	6
6/01	CPT Meeting #6	Planning process	6
5/18	CPT Meeting #5	Planning process	6
5/09	CPT Meeting #4	Planning process	6

Date	Event	Description	Number of Attendees
4/25	1st Steering Committee Meeting	• Project overview, work plan, timeline, important milestones. • Discuss recently updated FEMA guidance • Steering Committee's role, purpose, expectations, organization, and charter. • Discuss plan review, public outreach capabilities	40
4/20	CPT Meeting #3	Planning process	6
4/06	CPT Meeting #2	Planning process	6
3/14	CPT Meeting #1	Planning process	6
2022			
8/23	HMP Orientation Meeting	Orientation Presentation to EMD and various Department Heads	10

PART 2—COMMUNITY PROFILE

3. Hazards That Can Affect Los Angeles

3.1 History of Declared Disaster Events

The history of historical hazard events in the Los Angeles planning area is a key consideration in identifying the hazards for which the City needs to consider mitigation. Federal disaster declarations and California governor's emergency proclamations are good indicators of the hazards that have had the most severe impacts on the planning area.

3.1.1 Federal Disaster Declarations

Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can manage without assistance from the federal government. They put local response, reimbursement, and recovery programs into motion to assist public entities' disaster victims. The federal government established the disaster declaration process in the 1950s. Initially, declarations applied to entire states. Beginning in 1969, the process was refined to specify the individual counties affected by each declaration (though some statewide declarations are still issued). Since then, Los Angeles County has been designated in 80 federal disaster declarations, as listed in Table 3-1. Table 3-2 lists an additional 15 federal declarations that were designated as statewide.

Table 3-1. Federal Disaster Declarations Specifying Los Angeles County

Event Start Date	Type	Title	Disaster Declaration Date	Disaster Declaration Number[a]
2023-02-21	Severe Storm	Severe Winter Storms, Straight-Line Winds, Flooding, Landslides, and Mudslides	2023-04-03	DR-4699
2023-03-09	Flood	Severe Winter Storms, Flooding, Landslides, and Mudslides	2023-03-10	EM-3592
2022-12-27	Flood	Severe Winter Storms, Flooding, Landslides, and Mudslides	2023-01-14	DR-4683
2023-01-08	Flood	Severe Winter Storms, Flooding, and Mudslides	2023-01-09	EM-3591
2020-09-04	Fire	Wildfires	2020-10-16	DR-4569
2020-09-13	Fire	Bobcat Fire	2020-09-13	FM-5374
2020-01-20	Biological	Covid-19 Pandemic	2020-03-22	DR-4482
2020-01-20	Biological	Covid-19	2020-03-13	EM-3428
2019-10-28	Fire	Getty Fire	2019-10-28	FM-5297
2019-10-24	Fire	Tick Fire	2019-10-24	FM-5296
2019-10-10	Fire	Saddleridge Fire	2019-10-11	FM-5293
2018-11-08	Fire	Wildfires	2018-11-12	DR-4407
2018-11-08	Fire	Woolsey Fire	2018-11-09	FM-5280
2018-11-08	Fire	Wildfires	2018-11-09	EM-3409
2017-12-04	Fire	Wildfires, Flooding, Mudflows, and Debris Flows	2018-01-02	DR-4353
2017-12-04	Fire	Wildfires	2017-12-08	EM-3396
2017-12-06	Fire	Skirball Fire	2017-12-06	FM-5227
2017-12-05	Fire	Rye Fire	2017-12-05	FM-5226

Event Start Date	Type	Title	Disaster Declaration Date	Number[a]
2017-12-05	Fire	Creek Fire	2017-12-05	FM-5225
2017-09-01	Fire	La Tuna Fire	2017-09-02	FM-5201
2017-01-18	Flood	Severe Winter Storms, Flooding, and Mudslides	2017-03-16	DR-4305
2016-07-22	Fire	Sand Fire	2016-07-23	FM-5135
2016-07-09	Fire	Sage Fire	2016-07-09	FM-5132
2016-06-20	Fire	Fish Fire	2016-06-21	FM-5129
2016-06-04	Fire	Old Fire	2016-06-05	FM-5124
2014-01-16	Fire	Colby Fire	2014-01-16	FM-5051
2013-05-31	Fire	Powerhouse Fire	2013-06-02	FM-5025
2010-07-29	Fire	Crown Fire	2010-07-30	FM-2851
2010-01-17	Severe Storm	Severe Winter Storms, Flooding, and Debris and Mud Flows	2010-03-08	DR-1884
2009-08-27	Fire	Station Fire	2009-08-28	FM-2830
2009-08-27	Fire	PV Fire	2009-08-28	FM-2828
2008-11-13	Fire	Wildfires	2008-11-18	DR-1810
2008-11-15	Fire	Freeway Fire Complex	2008-11-15	FM-2792
2008-11-14	Fire	Sayre Fire	2008-11-15	FM-2791
2008-10-13	Fire	Sesnon Fire	2008-10-13	FM-2789
2008-10-12	Fire	Marek Fire	2008-10-12	FM-2788
2008-04-26	Fire	Santa Anita Fire	2008-04-27	FM-2763
2007-10-21	Fire	Wildfires, Flooding, Mud Flows, and Debris Flows	2007-10-24	DR-1731
2007-10-21	Fire	Wildfires	2007-10-23	EM-3279
2007-10-20	Fire	Ranch Fire	2007-10-22	FM-2736
2007-10-21	Fire	Buckweed Fire	2007-10-21	FM-2733
2007-10-21	Fire	Canyon Fire	2007-10-21	FM-2732
2007-07-07	Fire	Canyon Fire	2007-07-08	FM-2708
2007-05-10	Fire	Island Fire	2007-05-10	FM-2694
2007-05-08	Fire	Griffith Park Fire	2007-05-09	FM-2691
2007-01-11	Freezing	Severe Freeze	2007-03-13	DR-1689
2005-09-28	Fire	Topanga Fire	2005-09-28	FM-2583
2005-08-29	Hurricane	Hurricane Katrina Evacuation	2005-09-13	EM-3248
2005-02-16	Severe Storm	Severe Storms, Flooding, Landslides, and Mud and Debris Flows	2005-04-14	DR-1585
2004-12-27	Severe Storm	Severe Storms, Flooding, Debris Flows, and Mudslides	2005-02-04	DR-1577
2004-07-20	Fire	CA-Crown Wildfire-07-21-2004	2004-07-21	FM-2535
2004-07-17	Fire	CA-Foothill Wildfire-07-18-2004	2004-07-18	FM-2534
2004-07-12	Fire	CA - Pine Fire - 7-13-2004	2004-07-14	FM-2528
2003-10-21	Fire	Wildfires, Flooding, Mudflow and Debris Flow Directly Related	2003-10-27	DR-1498
2003-10-24	Fire	CA-Verdale Fire 10-25-2003	2003-10-25	FM-2502
2003-01-06	Fire	CA - Wildfire (Pacific Fire) - 01-06-2003	2003-01-07	FM-2466
2002-09-22	Fire	Williams Fire	2002-09-24	FM-2464
2002-09-03	Fire	Leona Fire	2002-09-04	FM-2462
2002-06-05	Fire	CA - Copper Fire - 06-06-2002	2002-06-06	FM-2417

Event Start Date	Type	Title	Disaster Declaration Date	Number[a]
1998-02-02	Severe Storm	Severe Winter Storms and Flooding	1998-02-09	DR-1203
1996-10-21	Fire	Severe Firestorms	1996-10-23	EM-3120
1995-02-13	Severe Storm	Severe Winter Storms, Flooding Landslides, Mud Flow	1995-03-12	DR-1046
1995-01-03	Severe Storm	Severe Winter Storms, Flooding, Landslides, Mud Flows	1995-01-10	DR-1044
1994-01-17	Earthquake	Northridge Earthquake	1994-01-17	DR-1008
1993-10-26	Fire	Fires, Mud/Landslides, Flooding, Soil Erosion	1993-10-28	DR-1005
1993-01-05	Flood	Severe Winter Storm, Mud & Land Slides, & Flooding	1993-02-03	DR-979
1992-04-29	Fire	Fire During A Period Of Civil Unrest	1992-05-02	DR-942
1992-02-10	Flood	Rain/Snow/Windstorms, Flooding, Mudslides	1992-02-25	DR-935
1990-12-19	Freezing	Severe Freeze	1991-02-11	DR-894
1990-06-26	Fire	Fires	1990-06-30	DR-872
1988-01-17	Flood	Severe Storms, High Tides & Flooding	1988-02-05	DR-812
1987-10-01	Earthquake	Whittier Narrows Earthquake & Aftershocks	1987-10-07	DR-799
1983-01-21	Coastal Storm	Coastal Storms, Floods, Slides & Tornadoes	1983-02-09	DR-677
1980-11-27	Fire	Brush & Timber Fires	1980-11-27	DR-635
1980-01-08	Flood	Severe Storms, Mudslides & Flooding	1980-02-21	DR-615
1978-10-29	Fire	Brush Fires	1978-10-29	EM-3067
1978-02-15	Flood	Coastal Storms, Mudslides & Flooding	1978-02-15	DR-547
1971-02-09	Earthquake	San Fernando Earthquake	1971-02-09	DR-299
1970-09-29	Fire	Forest & Brush Fires	1970-09-29	DR-295
1969-01-26	Flood	Severe Storms & Flooding	1969-01-26	DR-253

Source: (FEMA 2024b)

a. Declaration numbers are coded as follows: DR = Major Disaster; EM = Emergency Declaration; FM = Fire Management

Table 3-2. Federal Disaster Declarations for California Specified as Statewide

Event Start Date	Type	Title	Disaster Declaration Date	Number[a]
1988-09-13	Fire	Forty Niner Fire	1988-09-13	FM-2071
1987-09-02	Fire	Stanislaus Complex Fire	1987-09-02	FM-2065
1985-07-11	Fire	Hidden Valley Lake Fire	1985-07-11	FM-2055
1985-07-11	Fire	Lexington Fire	1985-07-11	FM-2054
1977-08-07	Fire	Scarface Fire	1977-08-07	FM-2028
1964-04-01	Other	Seismic Sea Wave	1964-04-01	DR-169
1963-12-21	Dam/Levee Break	Flood Due To Broken Dam	1963-12-21	DR-161
1963-02-25	Flood	Severe Storms, Heavy Rains & Flooding	1963-02-25	DR-145
1962-10-24	Flood	Severe Storms & Flooding	1962-10-24	DR-138
1962-03-06	Flood	Floods	1962-03-06	DR-122
1961-11-16	Fire	Fire (Los Angeles County)	1961-11-16	DR-119
1958-04-04	Flood	Heavy Rainstorms & Flood	1958-04-04	DR-82

Event Start Date	Type	Title	Disaster Declaration Date	Number[a]
1956-12-29	Fire	Forest Fire	1956-12-29	DR-65
1955-12-23	Flood	Flood	1955-12-23	DR-47
1954-02-05	Flood	Flood & Erosion	1954-02-05	DR-15

Source: (FEMA 2024b)

a. Declaration numbers are coded as follows: DR = Major Disaster; = Fire Management

3.1.2 California Governor's Emergency Proclamations

The governor of California is authorized to proclaim an emergency statewide or at local levels. Such proclamations trigger emergency powers under California's Emergency Services Act and assistance programs under the California Disaster Assistance Act. The governor can issue an emergency proclamation when a state of emergency exists, defined in state code as conditions of disaster or extreme peril to people and property that are of a magnitude to be beyond the control of individual local governments (Cal OES n.d.) Since 1991, the governor has issued 46 emergency proclamations that included Los Angeles County, as listed in Table 3-3.

Table 3-3. California Governor Emergency Proclamations Including Los Angeles County

Date of Disaster	Type of Disaster
February 2024	Severe winter storms
August 20, 2023	Tropical Storm Hilary
February-March 2023	Severe winter storms
December 27, 2022 – January 2023	Severe winter storms
September 9, 2022	Tropical Storm Kay
August 31, 2022	Fire (Route Fire)
December 2021	Winter Storms
October 2021	Drought
September 2020	Fires (Slater, Bobcat, and Oak Fires)
August 2020	Fires
October 27, 2019	High winds and wildfires
October 25, 2019	Wildfires (Kincade and Tick Fires)
October 10, 2019	Wildfire (Saddleridge Fire)
January-February 2019	Winter storms
November 2018	Wildfire (Hill & Woolsey Fires)
December 2017	Wildfires (Creek and Rye Fires)
September 2017	Wildfire (La Tuna Fire)
January 2017	Storm System
July 22, 2016	Wildfire (Sand Fire)
October 23, 2015	Aliso Canyon natural gas leak
October 2015	Rainstorms
June-July, 2015	Wildfires
July 18, 2015	Rainstorms

Date of Disaster	Type of Disaster
January 2014	Drought
May 30-June 11, 2013	Wildfire (Powerhouse Fire)
November 30, 2011	Windstorms
December 2010 – January 2011	Winter storms
January 17-21, 2010	Winter storms
August – September 2009	Wildfires
November 2008	Wildfires
October 2008	Wildfires
October 21, 2007	Wildfires
January 2007	Freeze
March 2005	Severe rainstorms
January 2005	Storms
November 12, 2003	Flash flooding
October – November 2003	Wildfires
February 2, 1998	El Niño
October 1996	Firestorms
February 1995	Late Winter Storms
January 1995	Severe Winter Storms
January 17, 1994	Earthquake
October 27 & 28, 1993	Firestorms
December 1992	Late Winter Storms
April 29, 1992	Civil Disorder
February 1992	Winter Storms

Source: (California State Board of Equalization 2024)

3.2 HAZARDS EVALUATED IN THIS PLAN

Many hazard events do not trigger state or federal disaster declarations but have significant impacts on their communities. These events are also important to consider in projecting how frequently hazard events are likely to occur in the future. The Steering Committee considered the full range of hazards that could affect the planning area and City-owned assets outside the planning area and then listed hazards that present the greatest concern. The process incorporated a review of state and local hazard planning documents as well as information on the frequency of, magnitude of, and costs associated with hazards that have struck the planning area or could do so. Anecdotal information regarding hazards and the perceived vulnerability of the planning area's assets to them was also used.

Based on the review, this plan addresses 22 hazards in two categories defined for this HMP:

- **Hazards of concern** are hazards that are generally recognized across the United States as those with a longstanding history of causing significant impacts. With the exception of dam failure, they are generally natural hazards rather than those that human-caused. For many of these hazards, quantitative methods have been established for calculating the number of assets that may be exposed and the potential losses that may be experienced. (The 18 hazards included in FEMA's National Risk Index (FEMA n.d.-a)are among the most commonly recognized hazards of concern.)

- **Hazards of interest** are hazards with a less extensive history of recorded events and less well established methods for quantitative analysis. Many of these are human-caused rather than natural hazards.

The following are the hazards evaluated in this HMP (presented in alphabetical order; the order of listing does not indicate the hazards' relative severity):

- Hazards of Concern:
  - Dam failure
  - Drought
  - Earthquake
  - Extreme cold or freeze
  - Extreme heat
  - Flood
  - Landslide and other mass movements
  - Sea-level rise, coastal flood and erosion
  - High winds
  - Tsunami and seiche
  - Wildfire
- Hazards of Interest:
  - Civil disorder
  - Cyber threats
  - Geomagnetic storm (space weather)
  - Hazardous material releases
  - Oil spills
  - Public health hazards
  - Radiological accidents
  - Smoke and air pollution
  - Terrorism
  - Transportation accidents resulting in explosions or toxic releases
  - Urban structure fire

3.2.1 Significant Events Not Assessed as Hazards

Hazards assessed in this HMP are those with a clear record of presenting ongoing risk to the City of Los Angeles. Not all individual events that have affected the City represent ongoing hazards of concern. For example, the remnants of Tropical Storm Hilary brought extreme rainfall to Los Angeles in August 2023, but tropical cyclones (the class of weather phenomena that includes hurricanes and tropical storms) do not have a record of historical impacts in Southern California. The tropical storm watch issued for Hilary was the first such alert ever issued for Southern California (Thiem 2023). The heavy rain in Los Angeles associated with Hilary is recognized in the profile of the flood hazard in this HMP, but tropical cyclone/hurricane is not recognized as a hazard of concern.

Similarly, the Los Angeles area has experienced newsworthy tornado events in the past, such as the March 22, 2023, tornado in Montebello. However, tornadoes reported in Los Angeles County have exceeded the lowest tornado strength ratings only three times since 1950 (F2 event ins 1966, 1982, and 1983). Based on a review of these records, this HMP does not assess tornadoes as a stand-alone hazard. Mitigation planning for the high-wind hazard will provide benefit against the risk that tornadoes pose to Los Angeles.

3.2.2 Comparison to State-Designated Hazards

Table 3-4 compares the hazards selected for inclusion in this HMP to those assessed in the most recent California State Hazard Mitigation Plan.

Table 3-4. City of Los Angeles Hazard Comparison with California State Hazards

Hazard Name from 2023 California State Hazard Mitigation Plan	Not Included in This HMP		Included in This HMP		
	Not a Concern for the City[a]	Addressed in Other City Plans	Hazard of Concern	Hazard of Interest	Hazard Name
Air Pollution				X	Smoke and Air Pollution
Civil Disorder				X	Civil Disorder
Cyber Threats				X	Cyber Threats
Dam Failure			X		Dam Failure
Drought			X		Drought
Earthquake			X		Earthquake
Electromagnetic Pulse Attack		X			
Energy Shortage	X[b]				
Epidemic/Pandemic/Vector -Borne Disease				X	Public Health Hazards
Extreme Cold or Freeze			X		Extreme Cold or Freeze
Extreme Heat			X		Extreme Heat
Geomagnetic Storm (Space Weather)				X	Geomagnetic Storm
Hazardous Materials Release				X	Hazardous Materials Release
Invasive and Nuisance Species	X[c]				
Landslide, Debris Flow, and other Mass Movements			X		Landslide and Other Mass Movements
Levee Failure			X		Included with Flood
Natural Gas Pipeline Hazards		X			
Oil Spills				X	Oil Spills
Other Potential Causes of Long-Term Electrical Outage	X[b]				
Public Safety Power Shutoff	X[b]				
Radiological Accidents				X	Radiological Accidents
Riverine, Stream and Alluvial Flood			X		Flood
Sea-Level Rise, Coastal Flooding and Erosion			X		Sea-Level Rise, Coastal Flooding and Erosion

Hazard Name from 2023 California State Hazard Mitigation Plan	Not Included in This HMP		Included in This HMP		
	Not a Concern for the City[a]	Addressed in Other City Plans	Hazard of Concern	Hazard of Interest	Hazard Name
Severe Wind, Weather, and Storms			X		Severe Wind & Storms
Snow Avalanche	X[d]				
Subsidence	X[e]				
Terrorism				X	Terrorism
Transportation Accidents Resulting in Explosions or Toxic Releases				X	Transportation Accidents
Tree Mortality	X[f]				
Tsunami and Seiche			X		Tsunami and Seiche
Urban Structural Fire				X	Urban Structural Fire
Volcano	X[g]				
Well Stimulation and Hydraulic Fracturing	X[h]				
Wildfire			X		Wildfire

a. As reviewed by the planning team and confirmed by the Steering Committee, these hazards were not included in the 2018 plan and were not considered necessary for inclusion in the 2024 update.
b. Energy shortage, PSPS, and other potential electrical outages are addressed by local utility providers and by other response plans.
c. Invasive and nuisance species are addressed in the State Hazard Mitigation Plan and by the California Department of Food and Agriculture and the California Department of Fish and Wildlife.
d. Snow avalanche—There is no past occurrence within the City.
e. Subsidence—There are no significant incidents within the City.
f. Tree mortality—While it was included in the State Hazard Mitigation Plan, it was not determined to be a concern for the City.
g. Volcano—There is no past occurrence within the City.
h. Well stimulation and hydraulic fracturing—While it was included in the State Hazard Mitigation Plan, it was not determined to be a concern for the City.

4. City of Los Angeles Assets

4.1 NATURAL SETTING

Los Angeles is an irregularly shaped city on the southwest coast of California encompassing over 498 square miles of land (214 square miles of which are hills and mountains) and approximately 29 square miles of water (see Figure 1-1). It is the state's largest city by area. The City maintains over 420 public parks for residents and visitors to enjoy, including Griffith Park. The Angeles National Forest and Santa Monica Mountains National Recreation Area lie just outside of the City, providing a natural backdrop to the sprawling city.

4.1.1 Topography

The Los Angeles area consists of flat basins defined by the San Gabriel, Santa Susana and Santa Monica Mountains, three major rivers, and the Pacific Ocean (LA Almanac 2013). The terrain is about 75 percent alluvial plain and 25 percent rugged canyons and hills. Elevations range from 5,074 feet at Sister Elsie Peak in the San Gabriel Mountains to nearly mean sea level in the southwestern part of the City. The San Gabriel and Santa Susana Mountains bound the City on the north and the Santa Monica Mountains extend across the middle of the City. The Palos Verdes Hills and Pacific Ocean bound the City on the south and west.

Due to the City of Los Angeles's unique topography, a number of natural hazards pose increased levels of risk to the City. The nearby Pacific Ocean presents the potential for flooding, sea-level rise, coastal erosion, or, in rare occurrences, tsunami incidents pose a significant risk to the City. Nearby rivers could also exacerbate the risk of this flood hazard. In the event of a major earthquake, landslides or other mass movements could be triggered and cause significant damage to people and property. Cascading impacts of these hazard events could be amplified due to the topographical features found in the Los Angeles area.

4.1.2 Soils and Geology

The 1903 soil survey of Los Angeles (Mesmer 1903) identifies 17 soil types in the area, as summarized in Table 4-1.

California is divided into several large "geomorphic provinces" defined by similar topography and geologic structure. The northern portion of the City of Los Angeles is in the Transverse Ranges geomorphic province and the southern portion is in the Peninsular Ranges geomorphic province (CDEC 2019). The boundary between the two provinces is generally the Santa Monica-Hollywood-Raymond fault system along the south edge of the Santa Monica Mountains (Bilodeau, et al. 2007).

Table 4-1. Identified Soil Types in the Los Angeles Area

Soil	% of Total Survey Area	Soil	% of Total Survey Area	Soil	% of Total Survey Area
Placentia sandy loam	18.1	Oxnard loam	5.4	Maricopa gravelly loam	1.6
Fresno sand	15.9	Fresno fine sand	4.4	Galveston clay	1.3
Santiago silt loam	10.8	Maricopa sandy loam	3.8	Dune sand	0.9
Fresno fine sandy loam	10.6	Los Angeles sandy loam	2.5	River wash	0.5
San Joaquin black adobe	10.3	Fullerton sandy adobe	1.9	Peat	0.3
Oxnard sand	9.8	Sierra adobe	1.9		

Source: (Mesmer 1903)

The Transverse Ranges geomorphic province is characterized by east-west trending mountains, valleys, and faults that extend eastward from the Channel Islands to the eastern end of the San Bernardino Mountains. Most active faults in the Transverse Ranges are east-west trending faults. Rock types in this province near the City include gneiss, granitic rocks, and sedimentary rocks (Bilodeau, et al. 2007). Volcanic rocks are found in the Santa Monica Mountains. Alluvial sediments are typically in canyon bottoms and valleys, with broad alluvial fans at the mouths of steep canyons.

The Peninsular Ranges geomorphic province extends southward from the south edge of the Transverse Ranges geomorphic province to the tip of Baja California in Mexico (Norris and Webb 1990). The Peninsular Ranges are characterized by northwest-southeast trending hills and valleys separated by similarly trending faults. Most active faults in the Peninsular Ranges province are northwest trending. Rock types in this province in the Los Angeles region generally include schist and sedimentary rocks. Surface materials in canyon bottoms and basins generally consist of alluvium.

The City of Los Angeles is within a seismically active region that is well known for its many active faults. Due to the area's historical seismicity, it is reasonable to expect future seismic shaking along local or regional faults. The San Andreas Fault is a major tectonic boundary about 34 miles northeast of downtown Los Angeles, outside the city limits. Significant faults within the City include the Newport-Inglewood, Santa Monica, Hollywood, Puente Hills Blind Thrust, Palos Verdes Hills, Verdugo, San Fernando, Northridge, and Santa Susana faults.

Subsurface geology of the area is generally shown in Figure 4-1, which illustrates mapped rock types and seismic faults and folds. The City of Los Angeles is delineated by the blue line in the figure.

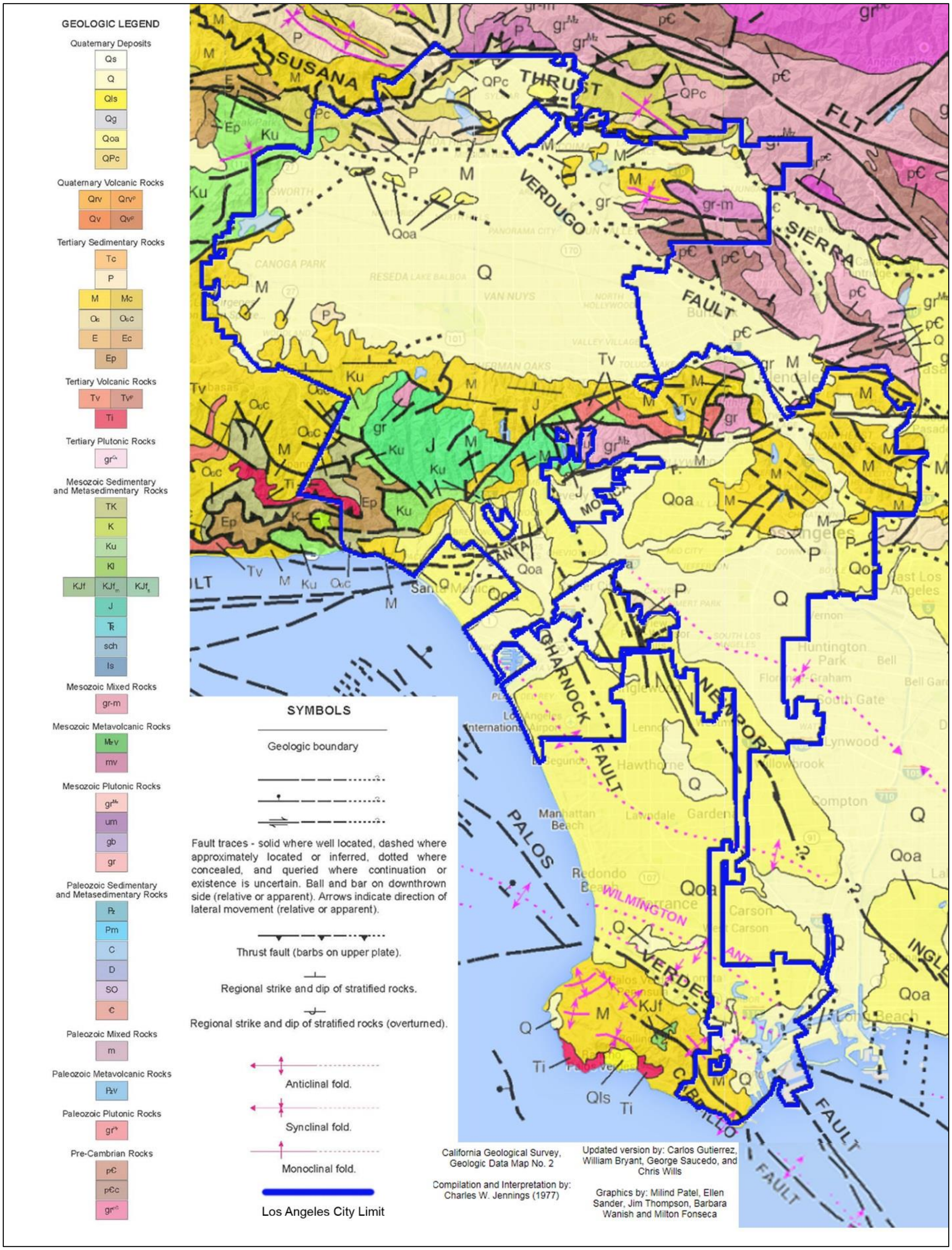


Figure 4-1. Los Angeles Geologic Features

4.1.3 Climate

In the basins and valleys along the California coast, climate is subject to wide variations within short distances as a result of the influence of topography on the circulation of marine air. In general, the Los Angeles area has a mild climate characterized by warm, dry summers and cool, wet winters. Temperature and precipitation vary considerably with elevation, topography, and distance from the Pacific Ocean. A storm producing moderate rainfall on the coast (1 inch during a 24-hour period) may produce very heavy rainfall in the mountains (10 to 20 inches during the same 24-hour period). Changing environmental conditions due to climate change have caused variations in these average climate and rainfall conditions, exacerbating natural hazards and causing a number of notable cascading impacts detailed later in this HMP. Figure 4-2 summarizes key climate data at Los Angeles International Airport (LAX) on the coast and in downtown Los Angeles.

(NWS 2024)

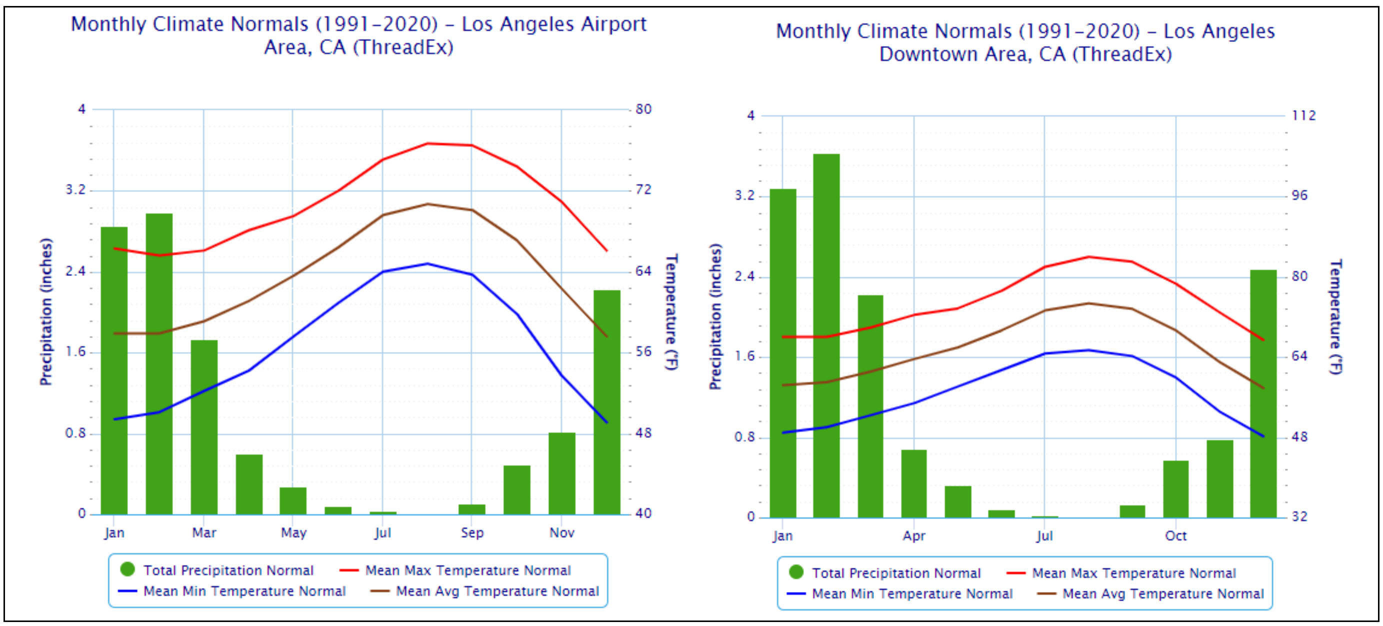


Figure 4-2. Monthly Normal Climate Data for Downtown Los Angeles and LAX

Most precipitation occurs from December through March. Precipitation during the summer is infrequent, and rainless periods of several months are common. Precipitation usually occurs as localized cloudbursts, mostly in the mountains and deserts after summer, and light to moderate rains in winter. Six to eight heavy rain events each year result in most of the total precipitation. In general, the quantity of precipitation increases with elevation.

Although the basic air flow above the area is from the west or northwest during most of the year, mountain chains deflect these winds so that, except for the immediate coast, wind direction is more a product of local terrain than of the prevailing circulation. Strong and sometimes damaging winds from the east or northeast occur when there is a strong high-pressure area to the east and an intense low-pressure area approaching the coast from the west. In southern California, these winds are called "Santa Ana Winds." Their air is typically very dry, and the winds are strong and gusty, sometimes exceeding 100 mph, particularly near the mouth of canyons oriented along the direction of airflow. These conditions occasionally lead to serious fire suppression problems and often result in the temporary closing of highways to campers, trucks, and light cars. These land and sea breezes are more pronounced in summer and affect air pollution levels.

The Los Angeles area is almost completely enclosed by mountains on the north and east. In addition, a vertical temperature structure (inversion) in the air along most of coastal California tends to prevent vertical mixing of the air. The geographical configuration and coastal location of the Los Angeles area permit a fairly regular daily reversal of wind direction—offshore at night and onshore during the day (WRCC 2023).

4.2 Sensitive Resources

4.2.1 Historic and Cultural Resources

Historical Overview

Archeological studies have indicated that people have been living in the area that now surrounds Los Angeles since 3000 B.C. By the time of the arrival of the Spanish in the 1700s, an estimated 5,000 native people lived in the Los Angeles area (McCawley 2023) When Captain Gaspar de Portola arrived in 1769, he encountered the Tongva People living in the area (NAHC n.d.).

The city that is now Los Angeles was founded in September 1781, with the name "El Pueblo de la Reina de Los Angeles" or "The Town of the Queen of the Angels." By 1800, there were 29 buildings in the community. By 1821, when Mexico became independent of Spain, Los Angeles had grown into the largest self-sustaining farming community in the province of Alta California. In 1835, the Mexican Congress declared Los Angeles a city and the capital of Alta California. The City came under the control of the United States in 1848 with the ending of the Mexican American War. Los Angeles was incorporated in the U.S. on April 4, 1850.

The City of Los Angeles mostly remained within its original 28-square-mile area until the 1890s. The first large additions were the districts of Highland Park, Garvanza, and South Los Angeles. In 1906, the approval of the Port of Los Angeles and a change in state law allowed the City to annex "the Shoestring," or Harbor Gateway, a narrow strip from Los Angeles to the port. San Pedro and Wilmington were added in 1909 and Hollywood was added in 1910. Also added in 1910 were Colegrove, Cahuenga, and a part of Los Feliz. By referendum, 170 square miles of the San Fernando Valley, along with the Palms district, were added to the City in 1915, almost tripling its area. Additional annexations brought the City's area to 450 square miles by 1932 and to 469 square miles by 2004 (Alexander 2023).

The City's economy began steady growth with completion of the Santa Fe railroad line from Chicago to Los Angeles in 1885 and subsequent immigration from the east (Thompson 1993). A strong economic base was developed early, in farming, oil, tourism and real estate. Hollywood made the City world famous, and World War II brought new industry, especially high-tech aircraft construction. Since the 1960s old industries have declined, including farming, oil and aircraft, but tourism, entertainment and high tech remain strong.

Resource Inventory

HistoricPlacesLA

Between 2010 and 2017, the Los Angeles City Planning Department conducted field surveys of over 880,000 legal parcels in an area of about 500 square miles. SurveyLA, the citywide historic resources survey used, serves as the primary planning tool for identifying, recording, and evaluating historic properties and districts in Los Angeles.

The Los Angeles City Planning Office of Historic Resources oversees HistoricPlacesLA.org, an online historic resource inventory and management system. The website includes information collected for SurveyLA and other historic resources surveys. Also included are City Historic-Cultural Monuments, Historic Preservation Overlay Zones, and properties listed in the National Register and California Register. HistoricPlacesLA is a collaboration between the City and the Getty Conservation Institute. It uses Arches, an open-source, geospatial, and web-based software built as a platform for documenting and cataloging cultural heritage places worldwide. The Getty Conservation Institute chose the City of Los Angeles for the first large-scale U.S. customization and implementation of Arches.

The HistoricPlacesLA map includes the location of each historic resource or historic district and links to resource reports that contain more detailed evaluation information. As the City's inventory of significant historic resources, HistoricPlacesLA provides comprehensive information on the City's historic resources and where they can be found. Many of the City's historic resources represent the earliest periods of development, dating back to the 19th century, and could be at risk from seismic events and other natural disasters. The inventory helps to guide thoughtful long-range planning initiatives and project reviews for planning and zoning approvals, all conducted by Los Angeles City Planning.

HistoricPlacesLA provides key information to help guide disaster preparedness at a citywide or community level, making transparent to planners and the public the locations and significance of the City' s most cherished historic resources and historic neighborhoods. Such data, as mapped in HistoricPlacesLA, may be overlaid onto maps of key potential hazards, such as areas prone to sea-level rise, flooding, wildfires, or seismic liquefaction zones, to yield a better understanding of risks to significant historic resources. In the aftermath of a disaster or emergency, HistoricPlacesLA's baseline documentation of significant historic or architectural features associated with each historic resource can help inform sound decision-making on rehabilitation and recovery approaches.

Historic-Cultural Monuments

The City of Los Angeles has designated over 1,200 historic places as Historic-Cultural Monuments (HCMs) that are vulnerable to the potential effects of all natural and human-caused hazards identified in this plan. An HCM may be a building, site, structure, or resource (including trees and plant life) recognized for its historical significance (Los Angeles City Planning n.d.). City Hall, Grauman's Chinese Theater, the Philharmonic Auditorium, Union Station, MacArthur Park, and the Chateau Marmont are among the sites on the list. The City's five-member, mayor-appointed Cultural Heritage Commission oversees the designation of and review of proposed alterations to any City HCM and can serve as a resource and partner in addressing mitigation planning and potential changes to HCM properties.

National Register of Historic Places

In addition to the HCM Program, some properties in the planning area have been designated by the federal National Register of Historic Places and the California Register of Historical Resources as historically or culturally significant. Examples of these historic sites listed by the National Register include (National Park Service 2023):

- 52nd Place Historic District
- Golden Gate Theater
- Hale House
- Los Angeles Central Library
- North University Park Historic District
- Old Farmdale School

4.2.2 Environmentally Sensitive Areas and Resources

The City of Los Angeles hosts several unique and sensitive natural areas. The La Brea Tar Pits, located in the Mid-Wilshire area of the city, form one of the world's richest Ice Age fossil sites and is famous for specimens of saber-toothed cats, mammoths, giant sloths, and more than 180 species of insects (American Museum of Natural History 2017).

City of Los Angeles Biodiversity Index Baseline Report

The City of Los Angeles is located within the California Floristic Province, one of 36 global biodiversity hotspots (i.e., regions rich in endemic biodiversity, yet facing severe threats). The California Floristic Province has 2,125 endemic plant species, but estimates suggest that half of these species are currently threatened, and that the combination of climate change and increased in development may lead to the loss of as many as two thirds of California's endemic plant and animal species by 2100. These estimates highlight the urgent need for informed conservation strategies to address these challenges (LA Sanitation 2022).

In 2017, Los Angeles Sanitation and Environment convened a transdisciplinary group of scholars, practitioners, and City staff to measure an established urban biodiversity index, the Singapore Index on Cities' Biodiversity, to provide a baseline measurement of biodiversity. The process also served as a starting point for creating a customized index for Los Angeles. The LA Biodiversity Index is tailored specifically to the Los Angeles context and is designed to monitor progress toward the no-net loss target. It is intended to be institutionalized within municipal environmental management practices as a central tool in implementing a future LA Biodiversity Policy and guiding long-term management and monitoring of biodiversity stewardship. It includes three core themes of urban biodiversity: conservation of native biodiversity, social justice aspects of biodiversity, with a focus on equity, and governance and management activities. The 2022 Biodiversity Report is the third of its kind, with the City having also released reports in both 2018 and 2020.

City of Los Angeles Urban Forest Program

The Los Angeles Recreation and Parks Department estimates that there are at least one million trees growing in the City's 15,000 acres of parkland, spread amongst developed urban parks and growing naturally in coastal and inland areas. This "Urban Forest" is a great asset to the City of Los Angeles. Forested urban parks are a functional and attractive environment for residents and visitors. Natural areas provide shelter for wildlife and offer an escape for park visitors into the semi-wilderness (City of Los Angeles n.d.-a).

The Urban Forest is comprised of the trees and understory vegetation growing in an urban area and, perhaps most importantly, people. This includes privately maintained trees, publicly maintained trees, and naturally occurring vegetation, i.e., hillside chaparral, riparian areas (City of Los Angeles n.d.-b). The Urban Forest Program designates the Forestry Division of the Department of Recreation and Parks to implement the strategies identified in the program's Tree Care Manual, including pruning, tree replacement, and tree inventory. The Recreation and Park's Tree Preservation Policy is the primary regulatory tool that gives direction for orderly protection of specified trees, maintains their value, and avoids significant negative effects to the ecosystem (City of Los Angeles 2004).

4.3 Development

The population of Los Angeles is concentrated in urban centers, which are interspersed by low-density residential neighborhoods. Much of the City is built within old floodplains or adjacent to the Pacific Ocean. Development in the hills and mountainous areas is challenging due to steep slopes, landslide areas, and unpredictable bedrock. Vulnerability to fires and flooding has increased as development has encroached into remaining open space areas. Concentrated development and infrastructure have increased the vulnerability of greater numbers of people, businesses, and facilities to seismic, fire and flood events, while at the same time providing greater resources for responding to such events.

The City's General Plan and Zoning Code guide local development. The Land Use Element of the General Plan defines 35 Community Plan areas for guidance of the physical development of the City's neighborhoods. These community plan areas are distributed between seven Area Planning Commissions (APCs):

- Central APC
- East Los Angeles APC
- Harbor APC
- North Valley APC
- South Los Angeles APC
- South Valley APC
- West Los Angeles APC

4.3.1 Land Use

Development patterns in Los Angeles have evolved in response to factors as diverse as the area's geological features and the arrival of the automobile. Table 4-2 summarizes the breakdown of current land use in the City. The high percentage of development has resulted in a large percentage of the area being covered by impervious surfaces, which alters natural drainage characteristics.

Table 4-2. General Plan Land Use Within the Planning Area

Land Use	Planning Area	
	Area (acres)	% of total
Agriculture	566	0.2%
Barren Land	237	0.1%
Forest	3,106	1.0%
Rangeland	47,562	15.5%
Urban Area	248,815	81.3%
Water	3,801	1.2%
Wetland	1,989	0.6%
City of Los Angeles (Total)	**306,077**	**100.0%**

Most of the flat lands of the City have been developed. The remaining open space tends to be concentrated in floodplains or along steep hillside and drainage water courses, which typically have been designated as public park land, recreational, flood control or low intensity uses, consistent with state law. The City has insufficient vacant properties to accommodate forecast population increases. Consequently, the City's growth will require the reuse and intensification of existing developed properties (Los Angeles City Planning 2024)

4.3.2 Building Stock

According to Los Angeles City Planning data, there are 739,644 buildings in the planning area, with a total replacement value of $781.6 billion. Residential buildings make up 93.5 percent of the total number of buildings and 78.0 percent of the total replacement cost value. Table 4-3 shows the distribution of buildings by type of use.

Table 4-3. Distribution of Buildings in the Planning Area by Use Type

Use Type	Number of Buildings	Replacement Costs
Residential	691,743	$341,678,264,407
Commercial	33,219	$310,547,292,223
Industrial	8,785	$75,688,140,869
Government, Religion, Agricultural, and Education	5,897	$53,690,003,370
Total	**739,644**	**$781,603,700,869**

4.3.3 Community Lifelines

The Community Lifeline Concept

FEMA defines community lifelines as the most fundamental functions of a community. Lifelines are all the services, capabilities, and physical assets that are used day-to-day to support a community's ongoing needs. When stabilized and working properly, community lifelines enable all other aspects of society to function. The following are the basic community lifelines (in alphabetical order) and multiple components of each, as defined by FEMA (FEMA 2019b):

- **Communications**—Communications infrastructure; responder communications; alerts, warnings, and messages; finance; 911; and dispatch
- **Energy**—Power grids and fuel supplies
- **Food, hydration, shelter**—Food and water suppliers, shelter locations, agriculture
- **Hazardous material**—Hazardous materials facilities, pollutants, and contaminants
- **Health and medical**—Medical care, public health, patient movement, medical supply chain, and fatality management
- **Safety and security**—Law enforcement, security, fire services, search and rescue services, government services, and community safety (including dams)
- **Transportation**—Highway, roadway, and motor vehicle networks; mass transit; railways; aviation; and maritime facilities
- **Water systems**—Potable water and wastewater infrastructure

FEMA further defines subcomponents for each of the above components—nearly 100 altogether. These subcomponents include physical facilities as well as public and private services, capabilities, activities, and systems. The essential subcomponents that make up community lifelines range from police stations to farm animals, from public records to the food supply chain, and from medical treatment to banking services.

Lifelines Identified for This Plan's Risk Assessment

It is an essential element of hazard mitigation planning to identify the community lifelines whose function can be negatively impacted by hazard events and to develop mitigation actions that will minimize the potential for such impacts. For this hazard mitigation plan, the assessment of community lifelines focuses on physical assets—the critical facilities and infrastructure that can be geographically located within mapped hazard areas and for which quantitative estimates can be made of current value and potential loss.

Table 4-4 summarizes counts of identified physical community lifeline assets in the planning area by category and APC, based on the best data available at the time of this plan. This information is subject to change as new information about such structures becomes available during the performance period for this plan. Maps provided in Appendix C show the general locations of these physical community lifeline structures in the planning area.

Table 4-4. Community Lifeline Structures in the Planning Area

	Number of Facilities							
	Central APC	East Los Angeles APC	Harbor APC	North Valley APC	South Los Angeles APC	South Valley APC	West Los Angeles APC	City Total
Communications	82	36	13	46	43	89	53	362
Energy	213	4	575	60	101	5	237	1,195
Food, Hydration, Shelter	94	36	26	40	62	35	16	309
Hazardous Materials	25	70	62	129	38	44	17	385
Health & Medical	444	166	39	282	223	419	96	1,669
Safety & Security	217	190	81	215	286	188	122	1,299
Transportation	223	240	108	231	149	182	129	1,262
Water Systems	4	6	22	10	7	10	19	78
Other Critical Facilities	3	4	1	2	1	3	1	15
Total	**1,305**	**752**	**927**	**1,015**	**910**	**975**	**690**	**6,574**

4.3.4 City Assets Outside the Planning Area

City assets evaluated for this hazard mitigation plan are within the boundaries of the defined planning area. The City does possess assets outside the city limits, which were identified and considered during the planning process.

4.4 POPULATION

4.4.1 Current Population

The City of Los Angeles is the most populous city in California, with an estimated population, according to 2020 decennial U.S. Census data, of 3,870,946. This is a decrease since the last HMP update. The California Department of Finance estimates the City's populations as of January 1, 2023, to be 3,766,109. The risk assessments included in this hazard mitigation plan use the 2020 U.S. Census population.

4.4.2 Demographic Indicators for Social Vulnerability

Some populations are at greater risk from hazard events because of decreased resources or physical abilities. These socially vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard occurrence, capabilities during an incident, and access to resources for post-disaster recovery. Indicators of social vulnerability—such as disability, age, poverty, unhoused, and minority race and ethnicity—often overlap spatially and often in areas that are most at risk from natural hazards. Human-caused hazards may present additional challenges for the socially vulnerable, depending on the severity, extent, location, and other elements of the hazard event. EMD maintains updated information on social vulnerability in its Emergency Operations Plan and other planning documents

Los Angeles Community Health and Equity Index

The 2024 HMP update uses the Health Atlas developed by Los Angeles City Planning to analyze the geographic distribution of socially vulnerable populations. The Health Atlas provides a broad illustration of the vulnerable communities, other health factors, and health outcomes different areas of Los Angeles face. The Index combines demographic, socio-economic, health conditions, land use, transportation, food environment, crime, and pollution burden variables, standardizing the variables on a scale of 0 to 100. Lower values indicate better community health and more equitable conditions (Los Angeles City Planning 2021).

Figure 4-3 shows the Census tracts with the highest index values as of 2021: tracts with values greater than 48.57, representing the highest 20 percent of all tracts in the City; and those with values of 43.56 to 48.57, representing the next highest 20 percent. In the hazard risk assessments performed for this HMP, those two categories (combined, the 40 percent of tracts in the City with the highest index values) are used to represent the City's socially vulnerable communities.

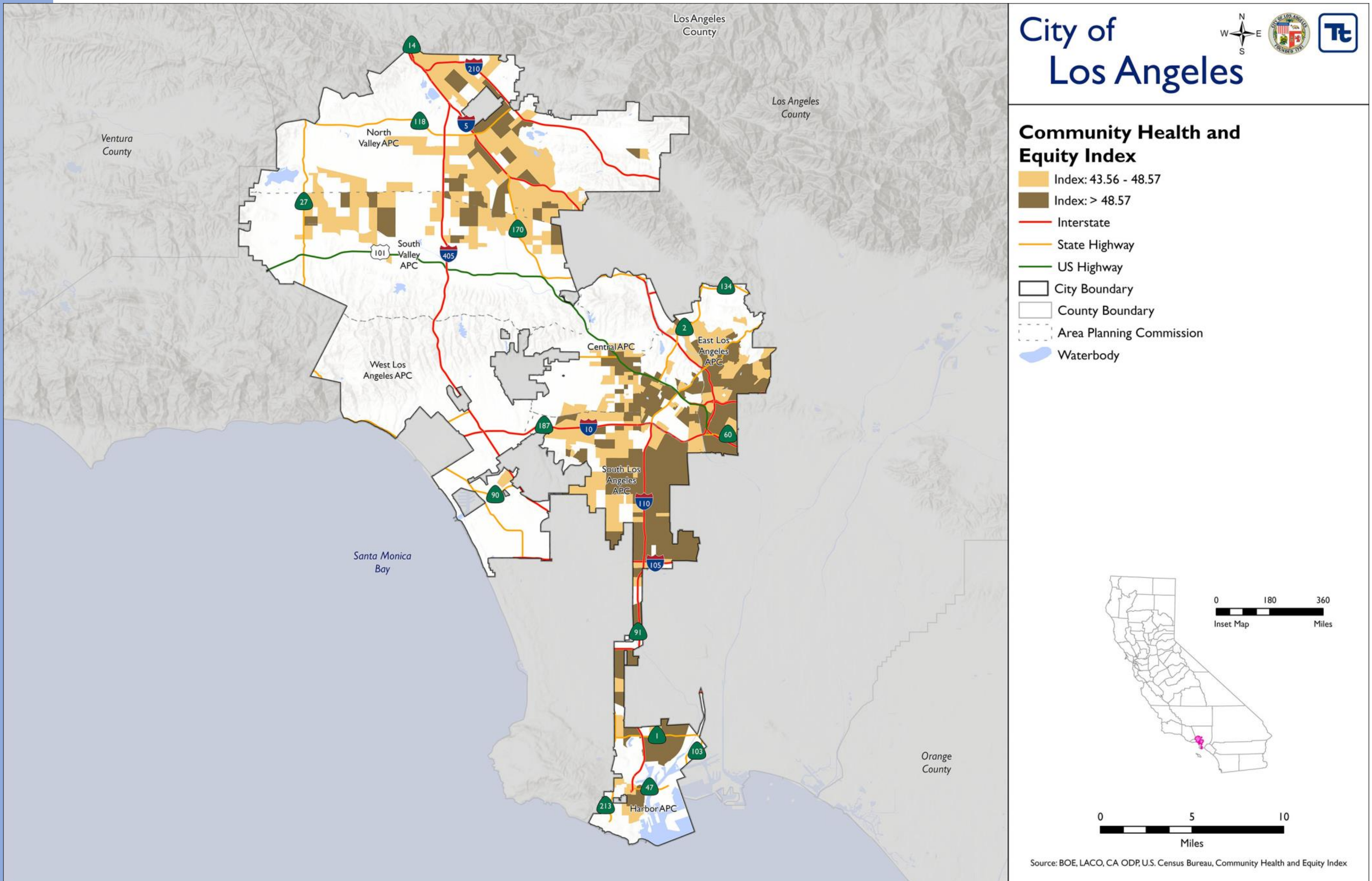


Figure 4-3. Community Health and Equity Index Values in Los Angeles

Common Indicators of Social Vulnerability

The following indicators from Census data are commonly used to assess social vulnerability:

- **Population Under 15 Years of Age—**Children, especially in the youngest age groups, often cannot protect themselves during a disaster because they lack the necessary resources, knowledge, or life experiences to effectively cope with the situation. Hazard mitigation planning needs to be tailored such that the community is prepared to ensure that children are safe during disaster events and that families with children have access to necessary information and tools.
- **Population Over 65 years of Age—**People 65 years old and older are likely to require financial support, transportation, medical care, or assistance with ordinary daily activities, especially during disasters. They are more likely to be vision, hearing, and/or mobility impaired, more likely to experience mental impairment or dementia, and more likely to live in assisted-living facilities where emergency preparedness is at the discretion of facility operators. Hazard mitigation needs to account for such needs.
- **People of Color—**Social and economic marginalization of certain racial and ethnic groups, including real estate discrimination, has resulted in these groups being more at risk from all types of hazards. Based on data from a number of studies, African Americans, Native Americans, and populations of Asian, Pacific Islander, or Hispanic origin are likely to be more at risk than the broader community. Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during disaster events. Post-disaster recovery often exhibits cultural insensitivity. Higher proportions of ethnic minorities live below the poverty line than the majority white population, and poverty can compound hazard impacts. Hazard mitigation plans need to identify the spatial distribution of these population groups and direct resources to reduce their risk from hazards.
- **Limited English-Speaking Households—**For populations with limited English proficiency, disaster communication may be difficult, especially in communities for whom translators and accurate translations of advisories may be scarce. Such households are likely to rely on relatives and local social networks (i.e., friends and neighbors) for information for preparing for a disaster event.
- **Persons with Disabilities—**Persons with disabilities or other access and functional needs are more likely to have difficulty responding to a hazard event than the general population. Family, neighbors, and local government are the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. Emergency managers need to distinguish between functional and medical needs to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with access and functional needs allows emergency management personnel and first responders to anticipate the services needed by that population.
- **Families Below the Poverty Level—**Economically disadvantaged families have limited ability to absorb losses due to hazard events. Wealth enables families to absorb and recover from losses more quickly, due to insurance, savings, and often the availability of low-cost credit. People with lower incomes tend not to have access to these resources. At the same time, poorer families are likely to inhabit poor quality housing and reside in locations that are most vulnerable to hazard events. Economically disadvantaged

neighborhoods are also likely to have relatively poor infrastructure and facilities, which exacerbate the disaster consequences for community members there.

- **Renter Occupied Housing Units—** People who rent often do so because they do not have the financial resources for home ownership. They often lack access to information about financial aid during recovery. In the most extreme cases, renters lack sufficient shelter options when lodging becomes uninhabitable and limited supply causes housing costs to rise dramatically after a disaster. Renters commonly have limited opportunities for implementing mitigation measures at their home and may not have insurance to cover their personal property. Additionally, renters may not be aware of hazard risks at the property where they live. Hazard mitigation planning needs to explore ways to ensure that renters are aware of risks and opportunities available to them to mitigate known risks.

The following sections describe these indicators for the planning area.

Age Distribution

The overall age distribution for the planning area is shown in Figure 4-4. Based on the 2020 five-year estimates from the U.S. Census Bureau's American Community Survey, 12.8 percent of the planning area's population is 65 or older and 17 percent is 14 or younger.

Race, Ethnicity, Language

At the federal level, race and ethnicity in the United States are categorized separately. The most recent U.S. Census officially recognized six racial categories: White American, Black or African American, Native Americans and Alaska Native, Asian American, Native Hawaiian and Other Pacific Islander, and "two or more races." In completing the census form, each person is asked to choose from among these racial categories, so all Americans are included in the numbers reported for those categories.

Separately, the Census Bureau classifies respondents as "Hispanic or Latino" or "Not Hispanic or Latino," identifying Hispanic and Latino, the largest minority group in the nation, as an ethnicity not a race. Hispanic and Latino Americans have ethnic origins in a Spanish-speaking country or Brazil. Latin American countries are, like the United States, racially diverse. Consequently, no separate racial category exists for Hispanic and Latino Americans, as they do not constitute a race or a national group.

However, the U.S. Supreme Court has unanimously held that, in law, the term "race" is not limited to Census designations but extends to all ethnicities, which may include Jewish, Arab, Italian, Laotian, Zulu, etc. Any racial category may contain people of Hispanic or Latino ethnicity. For example: the White or European-American race category contains Non-Hispanic Whites and Hispanic Whites; the Black or African American category contains Non-Hispanic Blacks and Hispanic Blacks; etc.

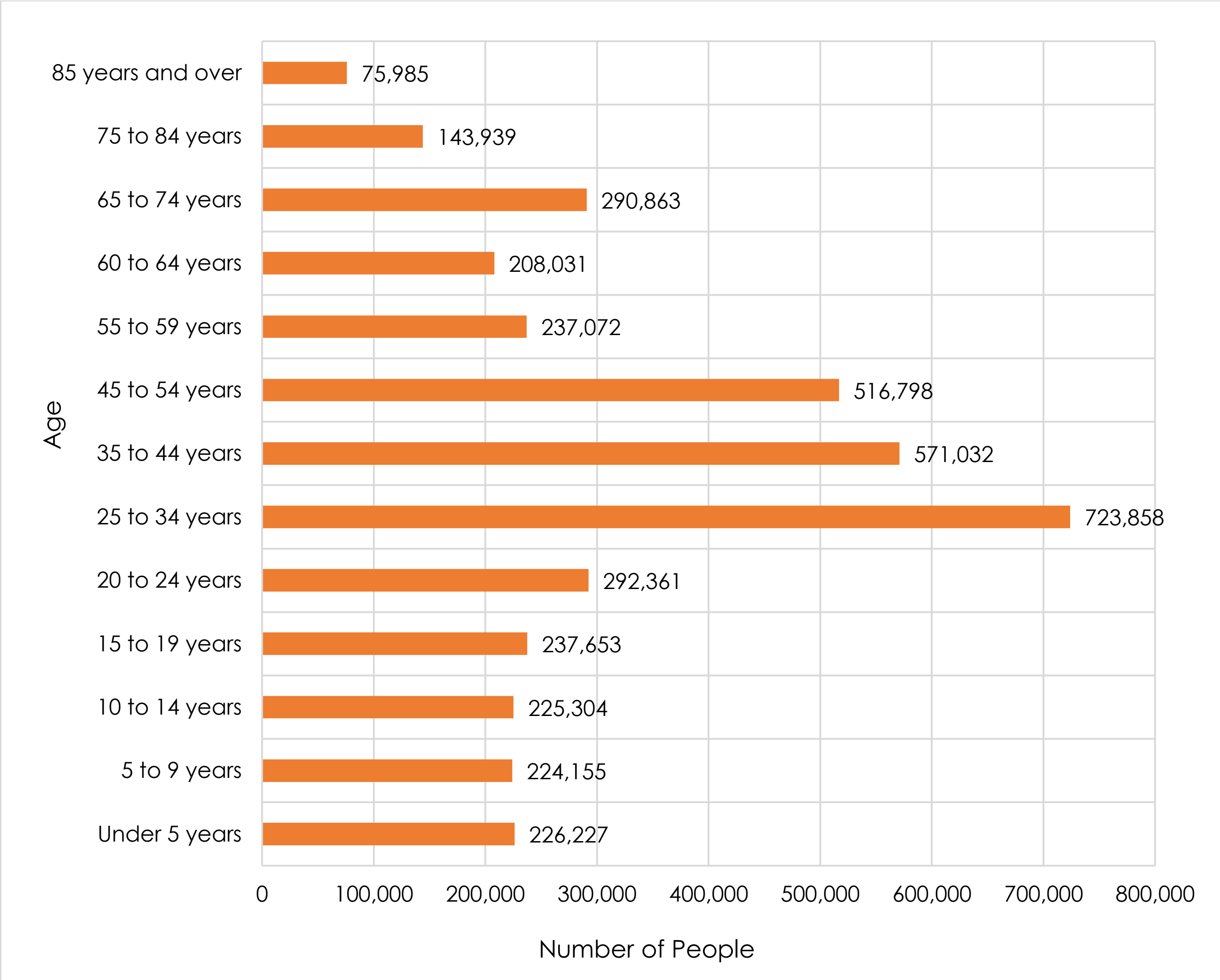


Figure 4-4. Los Angeles Age Distribution

According to the 2020 5-year estimates from the U.S. Census Bureau's American Community Survey, the racial composition of Los Angeles is 48.9 percent white. The City's next largest identified ethnic population is "some other race" at 22.7 percent. Other prominent populations are Asian at 11.8 percent and Black or African American at 8.8 percent. Figure 4-5 shows the racial distribution in the City. The census ethnicity breakdown shows that 48.1 percent of the Los Angeles population is Hispanic or Latino ethnicity, compared to 18.2 percent nationwide. Figure 4-6 shows the ethnic distribution in the City.

The City of Los Angeles has a 36.3 percent foreign-born population. Census data indicate that over half of the population—58.3 percent—speak a language other than English at home, including 41.5 percent of the total population who speak Spanish at home; another 8.3 percent speak an Asian or Pacific Islander language at home. The census estimates that 25 percent of the residents speak English "less than very well."

Source: (U.S. Census 2020)

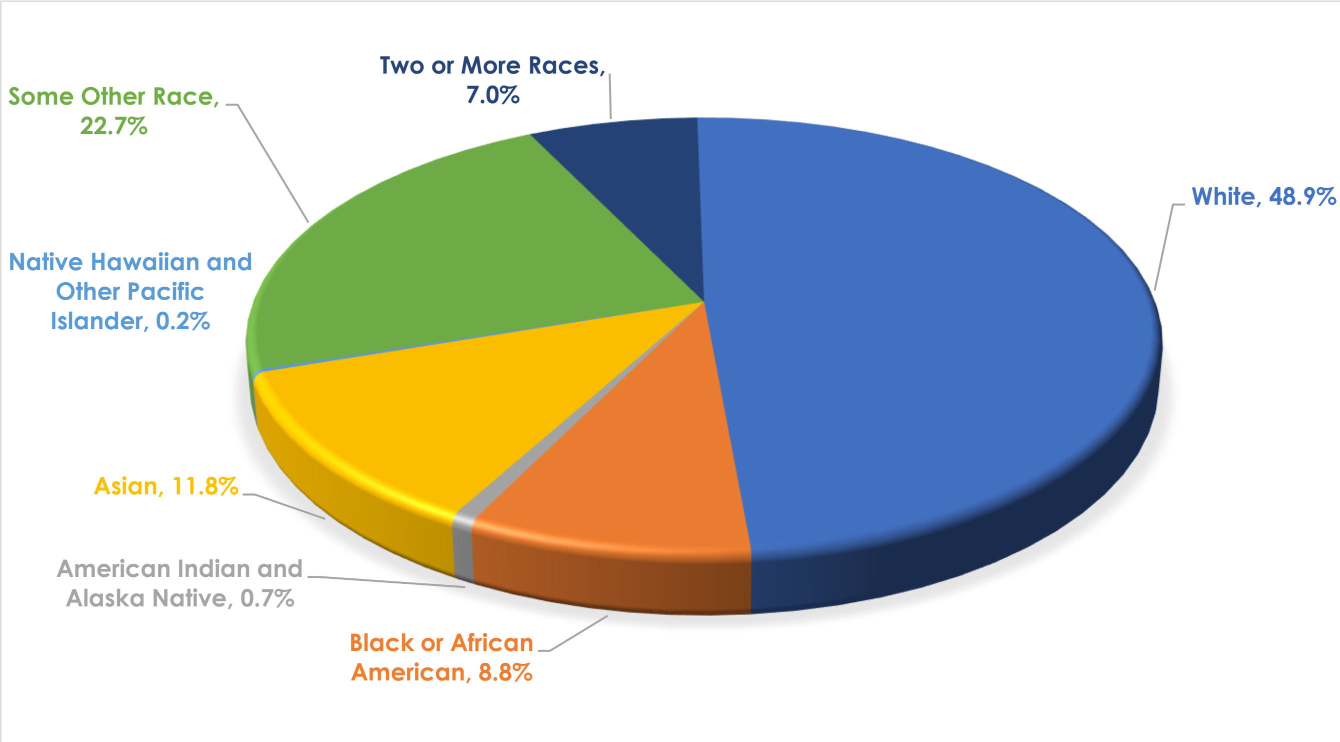


Figure 4-5. Los Angeles Race Distribution

Source: (U.S. Census 2020)

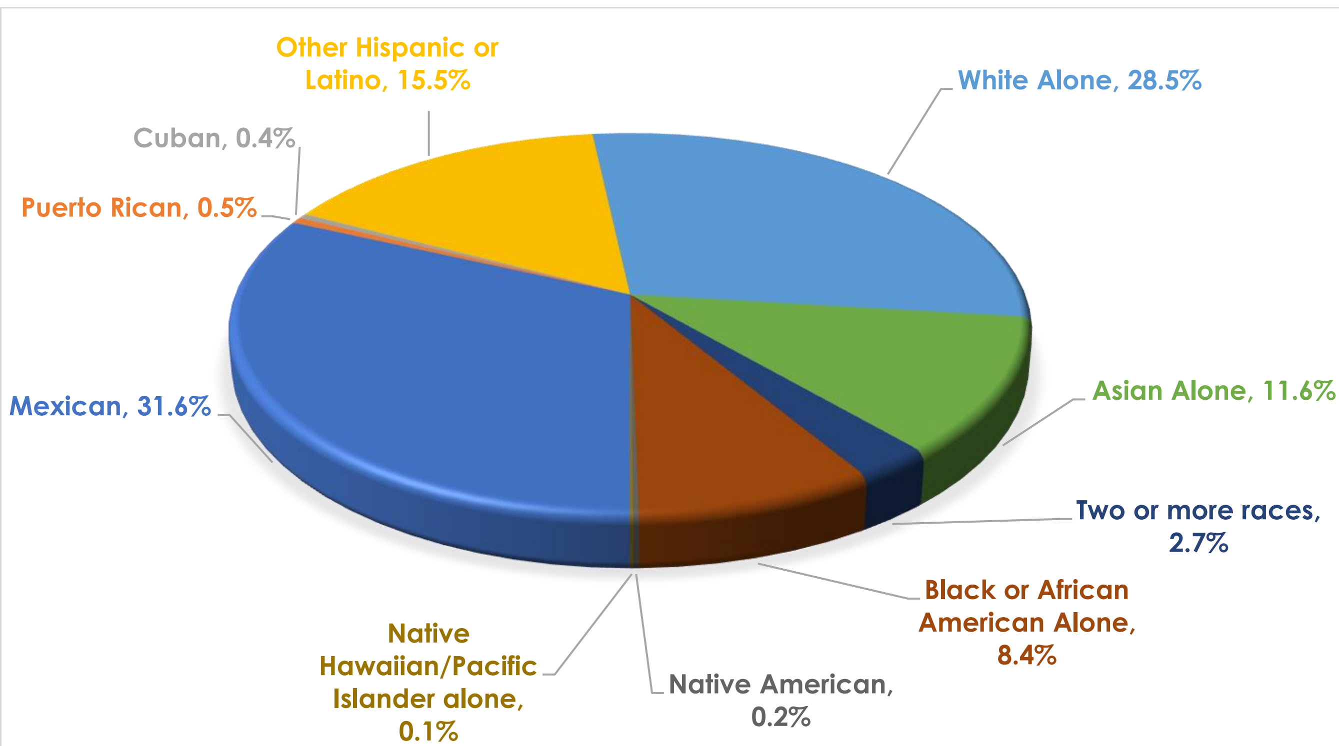


Figure 4-6. Los Angeles Ethnicity Distribution

Individuals with Disabilities or Access and Functional Needs

According to the 2020 5-year American Community Survey, 10.3 percent of Los Angeles residents (406,386 individuals) live with one or more disabilities. This includes 2.9 percent with a self-care disability, 2.1 percent with vision difficulty, 2.4 with hearing difficulty, 4.3 percent with cognitive difficulty, 5.5 percent with an independent living difficulty, and 5.9 percent with ambulatory difficulty. Other residents with access and functional needs may be unreported.

Income

People living in California must be prepared financially to overcome the inherent risks associated with residing in the state. For the most part, individuals and families are expected to prepare for, respond to and recover from disasters with their personal resources. People with median and low incomes may not recover from a major disaster, and those who are economically disadvantaged likely will not recover. In urban areas such as Los Angeles County, the economically disadvantaged often live-in older homes or apartments that may not have been retrofitted or kept current with building codes that would mitigate some of the damage from the disasters prevalent to the area. Renters have no control over the strength and stability of the buildings they live in. All people have a great deal to lose during a disaster, but those economically disadvantaged will lose the most due to their inability to recover.

Based on U.S. Census Bureau estimates, per capita income in the planning area in 2020 was $101,006, and the median household income was $65,290. It is estimated that about 14.9 percent of households receive an income between $100,000 and $149,999 per year, and about 18.3 percent of household incomes are above $150,000 annually. About 20.7 percent of the households in the planning area make less than $25,000 per year and are therefore below the poverty level. The weighted average poverty threshold for a family of four in 2020 was $26,496; for a family of three, $20,591; for a family of two, $16,733.

Homeownership and Renter-Occupied Housing

According to 2020 American Community Survey estimates, there are 1,402,522 occupied housing units in the City of Los Angeles. Table 4-5 compares general demographic statistics for renter-occupied and owner-occupied housing units.

Table 4-5. Comparative Statistics for Renter-Occupied and Owner-Occupied Housing Units

	Renter-Occupied Housing Units	Owner-Occupied Housing Units
Occupied Housing Units		
Number	884,176	518,346
% of Total	63.0%	37.0%
Age of Residents		
< 35	274,126	37,053
Time Living at Current Residence		
Moved in in 2019 or Later	54,522	10,200

Unhoused (Homeless) Population

The 2023 Greater Los Angeles Homeless Count results were released in 2023, showing a 9 percent rise in homelessness on any given night in Los Angeles County to an estimated 75,518 people and a 10 percent rise in the City of Los Angeles to an estimated 46,260 people. While this year's increases are slightly lower than previous year-over-year increases in the homeless count, they continue a steady growth trend of people experiencing homelessness in the annual Point-in-Time Count (PIT Count).

The rise in L.A. County's homeless population coincides with increases in major cities across the United States. Chicago and Portland saw double-digit increases (+57 percent and +20 percent, respectively), while several Southern California counties experienced increases larger than Los Angeles, including San Bernadino (+26 percent), San Diego (+22 percent), Kern (+22 percent), and Riverside (+12 percent).

While the number of unhoused people in interim housing held steady at 20,363, the rise in the number of people experiencing unsheltered homelessness coincided with the overall increase in the PIT Count (Los Angeles Homeless Services Authority 2023).

4.5 ECONOMY

4.5.1 Industry, Businesses, and Institutions

In 2018, the City of Los Angeles had a gross metropolitan product of over $1 trillion, making it the third largest economic metropolitan area in the world after Tokyo and New York (Bureau of Economic Analysis 2018). The Port of Los Angeles is ranked as the busiest container port in the Western Hemisphere (Port of Los Angeles 2021) and handled over $290 billion during the last fiscal year (Port of Los Angeles 2021).

The City's economy is diverse. Tourism and hospitality, professional and business services, international trade, entertainment production, and wholesale trade and logistics all contribute significantly to local employment. The Port of Los Angeles handles the largest volume of containerized cargo of all U.S. ports and is top in cargo value for U.S. waterborne foreign traffic. Los Angeles International Airport (LAX) is the third busiest airport in the world in number of passengers and 13th in air cargo tonnage (Los Angeles City Controller 2020). In 2021, total City revenues were $18.4 billion, up 5.2 percent from 2020 (Los Angeles City Controller 2021).

Los Angeles is well known for its higher education institutions, events, sports centers, urban and outdoor recreational tourist attractions, shopping enclaves, dining destinations, and arts and cultural institutions. Los Angeles is regarded as the entertainment capital of the world and is leading in several growth industries, including the fashion, health services/biomedical, and aerospace/technology industries (Los Angeles Tourism 2023). It is estimated that recent concert events in the City by pop stars Taylor Swift and Beyonce netted the city well over $160 million in local revenue, with an estimated $320 million contribution to Los Angeles County's gross domestic product. (Vazquez 2023). The City also hosted the 2022 Super bowl, 2022 Summit of the Americas and 2023 U.S. Open, and is anticipated to host the upcoming 2026 World Cup and 2028 Summer Olympics and Paralympics. The booming economy in Los Angeles can be significantly disrupted in the event of a notable natural or human-caused hazard event, making hazard mitigation planning efforts an important priority.

Online data sources identify the following large employers in Los Angeles County (CA EDD, LA Business Journal, LA Almanac, 2022):

- Government organizations—Los Angeles County, Los Angeles Unified Schools, the City of Los Angeles, the federal government and the State of California
- Universities—The University of California Los Angeles, the University of Southern California and the California Institute of Technology
- Large health-care providers—Kaiser Permanente, Cedars-Sinai Medical Center, Providence Health and Services, Long Beach Memorial Medical Center, Children's Hospital of Los Angeles and Adventist Health
- Large defense contractors—Northrop Grumman Corporation, the Boeing Company, Raytheon Company and Lockheed Martin Corporation
- Major employers in retail—Kroger, Target, The Home Depot, Walmart, and Costco
- Banks—Bank of America, Wells Fargo, and J.P. Morgan Chase
- Entertainment industry—FX Networks, Walt Disney Company, Warner Bros. Entertainment Inc. and Sony Pictures Entertainment
- Other major employers—VXI Global Solutions call centers, American Apparel, Farmers Insurance Group, UPS, and AT&T Inc.

The planning area's economy is strongly based in the education/health care/social service industry (18.5 percent), followed by the professional/scientific/management/administrative industry (15.8 percent), and arts/ entertainment/recreation industry (10.2 percent). Natural resource industries (<1 percent), and public administration (2.9 percent) make up the smallest sources of the local economy. Figure 4-7 shows the breakdown of industry types.

Major Special Events

The City of Los Angeles has hosted a number of major special events since completion of the 2018 HMP and will be hosting multiple major sports events in the next 5 years. Notable special events hosted by the City of Los Angeles in the last 5 years include:

- Superbowl Experience 2022
- Summit of the Americas 2022
- U.S. Open 2023

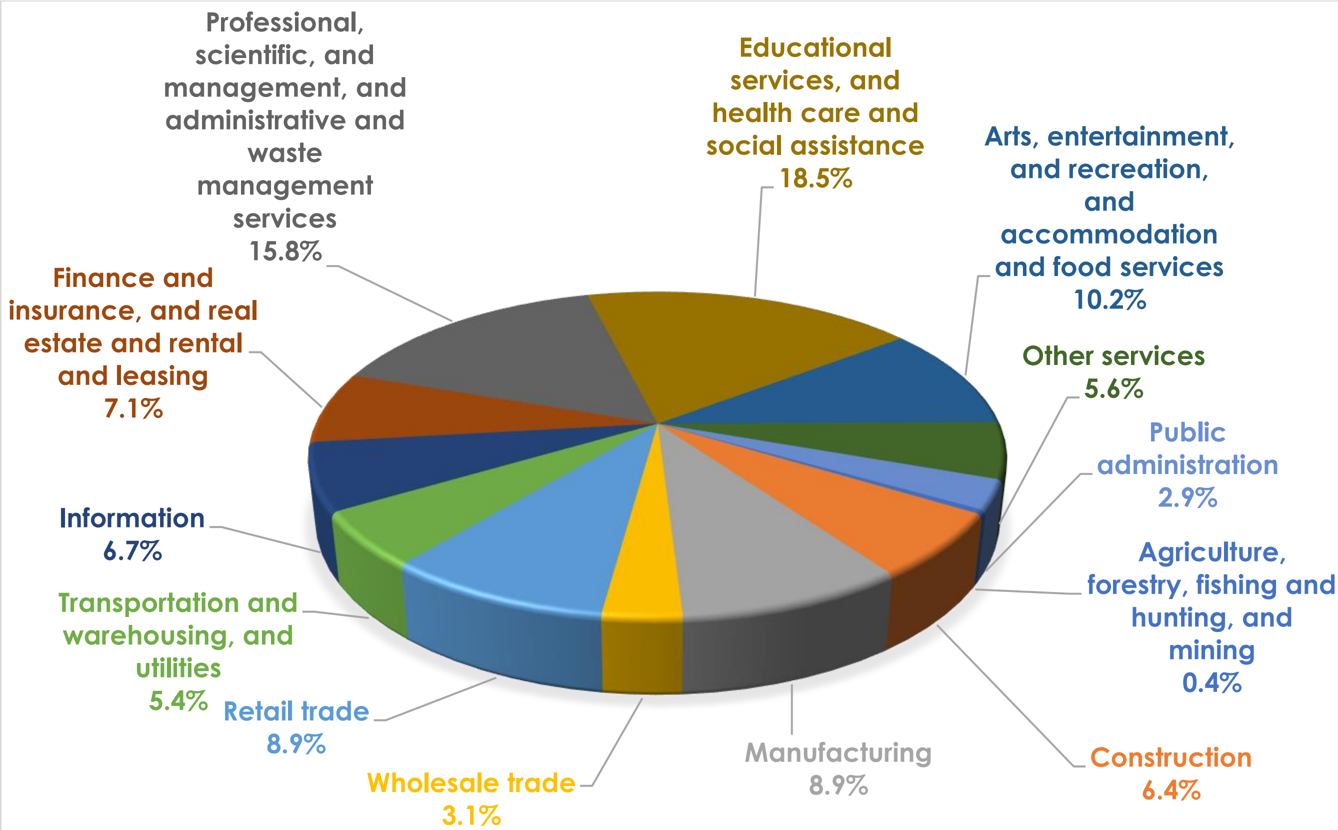


Figure 4-7. Industry in the Planning Area

Within the next 5 years, the City will be hosting the following major special events:

- FIFA World Cup 2026
- 2028 Summer Olympics & Paralympics
- Superbowl 2027

4.5.2 Employment Trends and Occupations

According to the 5-year American Community Survey (2016-2020), about 66.5 percent of the City of Los Angeles's population 16 years old or older is in the labor force. Of the working-age population, 84.1 percent of men and 73.2 percent of women are in the labor force.

Figure 4-8 compares state and city unemployment trends from 2000 through 2021. The City of Los Angeles unemployment rate was lowest in 2019 at 4.4 percent. The rate peaked at 13.8 percent in 2010 and was in decline until 2020 when the COVID-19 pandemic struck, disrupting thousands of businesses in the City and statewide. The City unemployment rate has generally been slightly higher than the statewide rate.

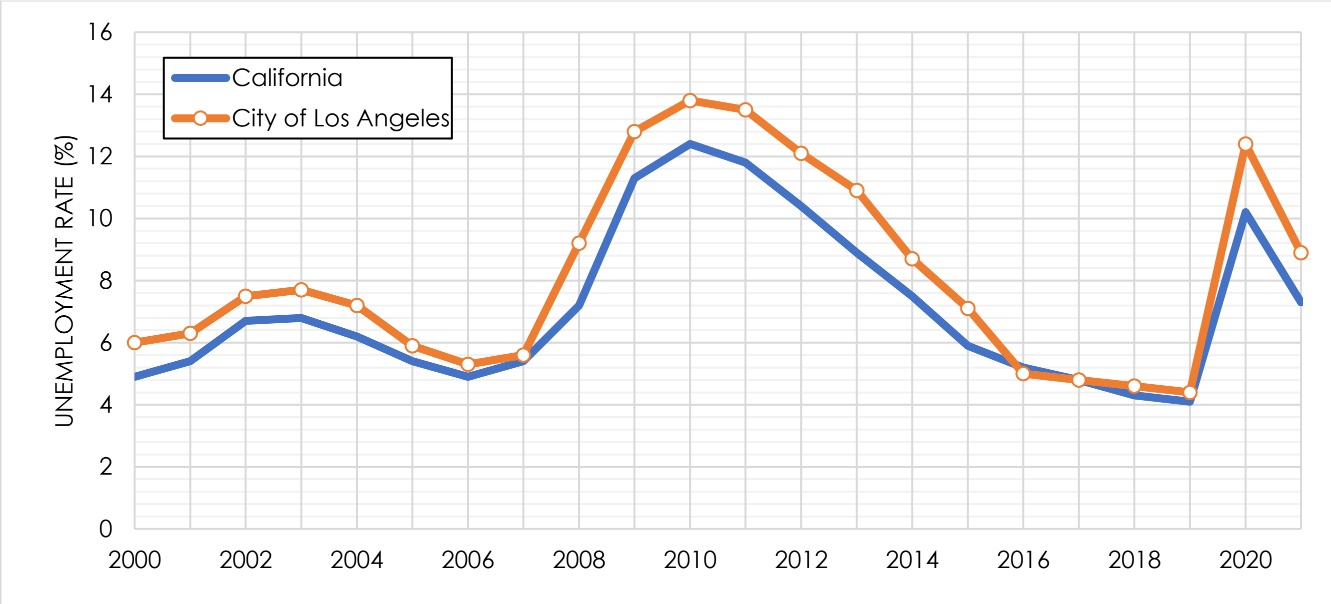


Figure 4-8. California and City of Los Angeles Unemployment Rate

Figure 4-9 shows U.S. Census Bureau estimates of employment distribution by occupation category. Management, business, science, and arts occupations make up about 40 percent of the jobs in the City of Los Angeles. Sales and office occupations make up about 20 percent of the local working population.

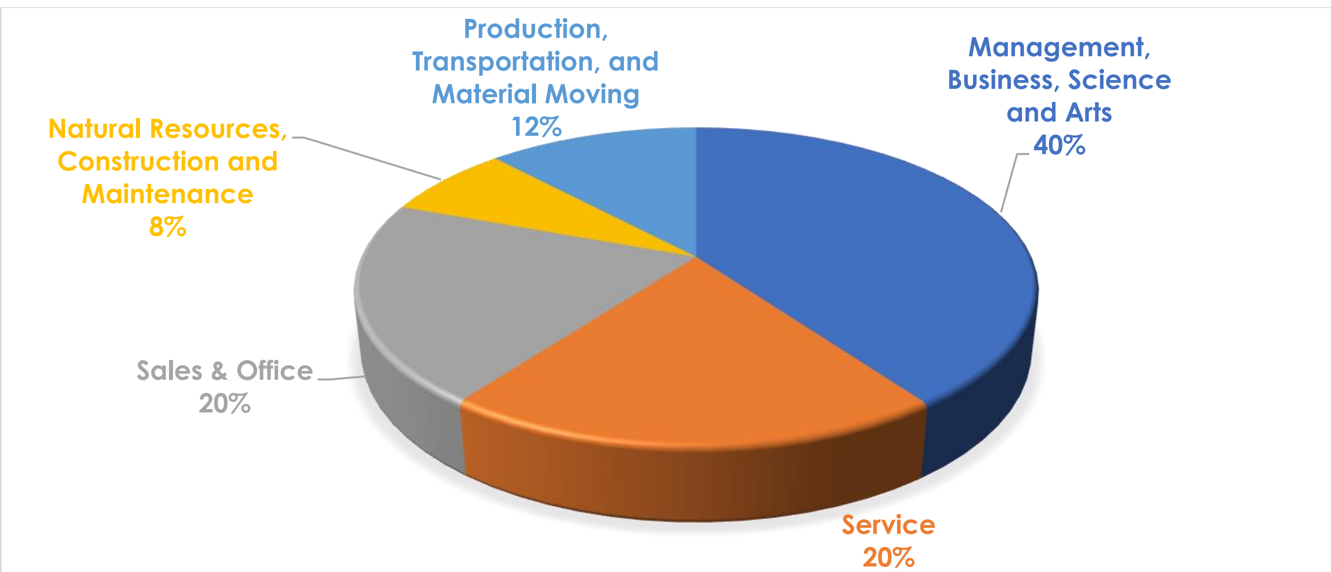


Figure 4-9. Occupations in the City of Los Angeles

The U.S. Census Bureau estimates that over 67.7 percent of workers in the planning area commute alone (by car, truck, or van) to work, and the mean travel time to work is 31.9 minutes.

4.5.3 Economic Development Areas

Los Angeles Opportunity Zones

In December 2022, The Community Disaster Resilience Zones Act was passed by Congress and signed into law by President Joe Biden. By identifying Community Disaster Resilience Zones, communities will be building disaster resilience and federal, public, and private resources will be driven to the most at-risk and in-need jurisdictions. FEMA has identified nearly 500 areas in the U.S. "community disaster resilience zones" that will receive special attention because of climate change risks. The City of Los Angeles has one area that has been identified as being a "community disaster resilience zone" by FEMA. The City of Los Angeles has 193 designated opportunity zones, which are census tracts in which businesses, equipment, and real property can receive investment through special funding. Opportunity zones were enacted as part of a 2017 tax reform package (Tax Cuts and Jobs Act) to increase investment and improve economic recovery in distressed areas of the country. Zones in each state are identified by governors as economically distressed based on Census data (Los Angeles EWDD 2022).

The community benefit of the opportunity zone program is the incentive it provides for increased investment in business and property in distressed areas. Using special investment vehicles called Opportunity Zone Funds, investors can receive federal tax incentives by investing their capital gains into the communities in these opportunity zones (Los Angeles Economic & Workforce Development Department 2022). The benefit to the investor is the deferral or elimination of capital gains taxes in return for long-term (10 years) investment in an opportunity zone project (Los Angeles EWDD 2022).

The Opportunity Zone Fund consists primarily of realized capital gains acquired through the sale of real estate or a business asset normally subject to capital gains tax. Funds are organized as a corporation or partnership that must hold at least 90 percent of its assets in an opportunity zone project (Los Angeles EWDD 2022).

Promise Zones

Promise Zones are high-poverty communities where the federal government partners with local leaders to increase economic activity, improve educational opportunities, leverage private investment, reduce violent crime, enhance public health and address other priorities identified by the community. The 22 urban, rural, and tribal Promise Zones were selected through three rounds of national competition, in which applicants demonstrated a consensus vision for their community and its residents, the capacity to carry it out, and a shared commitment to specific, measurable results (HUD n.d.). Two of the promise zones are in Los Angeles:

- **LA Promise Zone—**The LA Promise Zone consists of five ethnically and linguistically diverse neighborhoods based in Central Los Angeles—Hollywood, East Hollywood, Pico-

Union, Westlake, and Wilshire Center. These communities face challenges attributed to a large number of families living in poverty (LA EWDD 2019).

- **South Los Angeles Transit Empowerment Zone (SLATE-Z)—**The SLATE-Z area is home to 197,539 residents in parts of the following Los Angeles neighborhoods: Vernon-Central, South Park, Florence, Exposition Park, Vermont Square, Leimert Park, and Baldwin Hills Crenshaw. The SLATE-Z boundaries follow major transit lines that come into and through South Los Angeles in order to capitalize on revitalization opportunities related to transit-oriented development, education and training, and job opportunities accessible to residents via transit. SLATE-Z has a relatively young population: 66 percent are of working age (18-64), and 25 percent are under 18. Only 8 percent are 65 years or older (LA EWDD 2019).

5. Capabilities to Support Hazard Mitigation

5.1 OVERALL ASSESSMENT OF LOCAL CAPABILITIES

The planning team performed an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of a jurisdiction's codes, programs and policies, and evaluates its capacity to carry them out. It presents a toolkit for implementing the hazard mitigation plan and for identifying opportunities to increase the City's core capabilities to support mitigation actions.

5.1.1 Planning and Regulatory Capabilities

Jurisdictions have the ability to develop policies and programs and to implement rules and regulations to protect and serve residents. Local policies are typically identified in a variety of community plans, implemented via a local ordinance, and enforced through a governmental body. An assessment of planning and regulatory capabilities is presented in Table 5-1.

5.1.2 Integration Opportunity

The assessment looked for opportunities to integrate this mitigation plan with the planning and regulatory capabilities identified. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The City considered actions to implement this integration. The column in Table 5-1 labeled "Integration Opportunity" identifies capabilities that can support or be supported by components of this plan. Where "yes" is indicated in this column, the City has considered actions to integrate these capabilities with the plan.

Table 5-1. Legal and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Codes, Ordinances & Requirements				
Building Code	Yes	No	Yes	Yes
Comment: City of Los Angeles Municipal Code, Chapter IX, Article I, amended by Ordinance No. 182,850, effective 1/3/2014 Ordinance No. 183893 Establish mandatory standards for earthquake hazard reduction in existing wood-frame buildings with soft, weak, or open-front walls and existing non-ductile concrete buildings. Signed 10/13/2015, effective 11/22/2015. ***Integration Opportunity:*** FEMA's Building Resilient Infrastructure and Communities (BRIC) grant program provides financial support for the adoption and enforcement of building codes, specifications, and/or standards. With the adoption of the updated HMP, opportunities to enhance existing building codes, specifications, and/or standards should be identified to incorporate higher standards and hazard resistant concepts.				
Zoning Code	Yes	No	Yes	No
Comment: City of Los Angeles Municipal Code, Chapter I, Article 2 and Article 3, amended by Ordinance No. 138,800, effective 6/13/1969				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Subdivisions	Yes	No	Yes	No

Comment: City of Los Angeles Municipal Code, Chapter I, Article 7, added by Ordinance No. 122,064, effective 6/14/1962 regulates and controls the division of land in a manner that is consistent with the applicable general and specific plans as well as the public health, safety and welfare. The ordinance ensures that the subdividing of land in the City of Los Angeles is done in accordance with the grading regulations of the City contained and set forth in Article 1 (Building Code) of Chapter 9 (Building Regulations) of this code and in such a way as to establish, when possible, beauty and attractiveness in the hills, consistent with watershed drainage, erosion and fire control requirements, and good engineering practices.

Integration Opportunity: The information and data captured during the HMP update process create opportunities for the City to potentially update zoning policies and procedures including areas targeted for redevelopment.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Stormwater Management	Yes	Yes, Los Angeles County	Yes	Yes

Comment: City of Los Angeles Municipal Code, Chapter VI, Article 4.4, Section 64.70, Article and Section added by Ordinance. No. 172,176, effective 10/1/1998.
Integration Opportunity: City-owned facilities constructed under this code may be eligible for FEMA Hazard Mitigation Assistance grants. All future updates to this plan should consider eligible stormwater management activities as potential actions for this plan. Additionally, the stormwater ordinance was amended in 2011 to include a Low Impact Development (LID) ordinance which requires runoff to be mitigated in a manner that captures rainwater at its source utilizing natural best management practices.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Post-Disaster Recovery	Yes	No	No	Yes

Comment: City of Los Angeles, Administrative Code, Division 8, Chapter 3, Section 8.61 amended by Ordinance No. 165,083, effective 9/4/1989
Integration Opportunity: The City will inform the next update to this code using all of this plan's information on vulnerability and impact associated with the hazards assessed.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Real Estate Disclosure	No	No	Yes	No

Comment: State of California Natural Hazards Disclosure Act, effective 6/1/1998 (California Civil Code Section 1002.6c)

Integration Opportunity: Real estate disclose information may need to be updated based on the changing climate, recent atmospheric rivers, and other updated hazard information.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Growth Management	Yes	Yes	Yes	Yes

Comment: City of Los Angeles Municipal Code, Article 1.5, Section 11.5.6 General Plan, amended by Ordinance 173,268, effective 7/1/2000, Operational 7/1/2000. Other jurisdictional authority is with the Southern California Association of Governments. *General Planning Law—Cal. Gov. Code §65300 et seq.*
Integration Opportunity: See comments below for the General Plan

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Site Plan Review	Yes	No	No	No

Comment: City of Los Angeles Ordinance No. 187,938, effective 08/16/2023; operational 10/13/1990. The Site Plan Review ordinance encourages the production of affordable housing and ensures that qualifying housing and commercial projects comply with zoning regulation, including all applicable municipal code regulations, California Environmental Quality Act standards, overlay zones regulations, high quality design, construction standards, and objective standards.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Environmental Protection	No	Yes, Los Angeles County	Yes	No

Comment: County of Los Angeles has authority for Environmental Protection

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Flood Damage Prevention	Yes	No	Yes	Yes

Comment: *Flood Hazard Management Ordinance*, ordinance No. 186952, effective 4/19/2021. Qualifies the City to be participant in the NFIP.

Integration Opportunity: FEMA's Building Resilient Infrastructure and Communities (BRIC) grant program provides financial support for the adoption and enforcement of building codes, specifications, and/or standards. Opportunities to enhance existing building codes, specifications, and/or standards should be identified to incorporate higher standards and hazard resistant concepts.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Emergency Management	Yes	No	Yes	Yes

Comment: Emergency Operations Ordinance No. 153772, signed 1980 established a multi-agency Emergency Operations Organization. It is under the director of Mayor and administration of an Emergency Operations Board.

***Integration Opportunity*:** The City of Los Angeles Emergency Management Department is an integral part of the multi-agency Emergency Operations Organization created by this code. EMD is also the lead for this mitigation plan. Therefore, this integration has already occurred.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Climate Change	Yes	Yes	Yes	Yes

Comment: *Los Angeles' Sustainable City pLAn*, 2015. SB 97 directs California Environmental Quality Act Guidelines to address greenhouse gas emissions. Other state policies include AB 32, and SB 375, SB 379 and regulations of the Climate Action Plan. Los Angeles County adopted the AB 32 *Community Climate Action Plan* as part of *Los Angeles County General Plan 2035* on 10/ 6/2015. Additionally, Ordinance No. 16887 (1993 Transportation Demand Management Ordinance, amended 2021) and Complete Streets projects are intended to support the reduction of drive-alone trips and vehicle miles traveled to reduce greenhouse gas emissions and support sustainable modes of transportation.

***Integration Opportunity*:** The "Sustainable City pLAn" has been integrated by reference into this plan. All future updates to this plan will continue to use this plan as a source document. Additionally, any future update to the Sustainable City pLAn will look to this mitigation plan for information that can support its update.

Planning Documents

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
General Plan	Yes	No	Yes	Yes

Is the plan compliant with Assembly Bill 2140? Yes

Comment: Consists of a framework last adopted in 2001, 11 citywide elements adopted from 1991 through 2016, and land use elements for 35 community plan areas, adopted from 1981 through 2000.

***Integration Opportunity*:** Based on directives from AB-2140, SB-379 and SB-1000, the City will fully integrate this mitigation plan into the Safety Element of its General Plan upon its next update. Additionally, the City could look for opportunities to promote consistency among the several City plans related to emergency preparedness and hazard mitigation.

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Capital Improvement Plan	Yes	No	No	Yes

What types of capital facilities does the plan address? City buildings and projects (fire facilities/fire stations, animal shelters, police facilities, seismic retrofit program of bridges, construction projects such as neighborhood city halls, Chicago Building, Police SID Tech Lab, El Pueblo Capital Program, youth recreational and cultural facilities, street and transportation projects, clean stormwater, recharge groundwater and provide cleaner beaches projects, zoo exhibits). Public housing, community investments.

Comment: City of Los Angeles Capital Improvement Program, 2008-09 to 2012-13 (last version available online)

Integration Opportunity: This integration is ongoing. As a best practice the City should periodically review its capital improvement plan to identify actions that are eligible for FEMA grant funding. All future updates to the City's capital improvement plans will look to this plan to potentially leverage FEMA grant funding for project implementation.

Floodplain Management Plan	Yes	No	No	Yes

Comment: City of Los Angeles Floodplain Management Plan, Adopted 10/7/2015.

Integration Opportunity: The latest version of the City of Los Angeles Floodplain Management Plan was incorporated by reference into this plan update. Information from the floodplain management plan informed the flood hazard risk assessment for this plan, and actions from the floodplain management plan have been included in this plan.

Stormwater Plans	Yes	Yes	Yes	Yes

Comment: *Standard Urban Stormwater Mitigation Plan*, adopted by the State Regional Water Quality Control Board in 2000. Municipalities, non-governmental organizations, and community stakeholders throughout the County of Los Angeles are working collaboratively to develop *Enhanced Watershed Master Plans* for each of the Los Angeles area's five watersheds. The objective of the planning initiative is to comply with water quality mandates; improve the quality of rivers, creeks, and beaches; and address current and future regional water supply issues.

Integration Opportunity: As the Enhanced Watershed Master Plans are developed, this plan should be reviewed for opportunities to integrate identified mitigation actions that align with the objectives of those master plans. Additionally, actions identified in the master plans should be evaluated for eligibility to apply for FEMA Hazard Mitigation Assistance grant funds.

Habitat Conservation Plan	Yes	No	No	No

Comment: *Greater Los Angeles County Open Space for Habitat and Recreation Plan, 2012.*

In 2000, the Port of Los Angeles and Port of Long Beach created a biological survey of the Los Angeles-Long Beach Harbor habitat conditions and marine biological communities "Biological Baseline Surveys." Surveys were completed in 2008, 2013-2014, and 2018.

Integration Opportunity: As the climate and weather change, updated information, data, and predictions learned during the plan update could influence habitat conservation planning.

Economic Development Plan	Yes	No	No	No

Comment: *Economic Development in Los Angeles: A New Approach for a World Class City*, December 2012, Chapter 7 of framework element of the *Los Angeles General Plan, Los Angeles County Strategic Plan for Economic Development 2010-2014. Citywide Economic Development Strategy 2019.*

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Shoreline Management Plan	Yes	No	Yes	No
Comment: *Local Coastal Program Land Use Plan*, Venice ***Integration Opportunity:*** With changes in the environment, ocean waters, rising seas and oceans, the City can utilize information learned during the update process to contribute to potential changes in planning efforts.				
Community Wildfire Protection Plan	No	No	No	No
Comment: *Santa Monica Mountains Community Wildfire Protection Plan*, 2018				
First Step Urban Forest Management Plan	Yes	Yes	No	Yes
Comment: With the support of a grant from the California Department of Forestry and Fire Protection (CAL FIRE) Urban and Community Forestry Program and USDA Forest Service, the City of Los Angeles (City) is taking a progressive step towards developing a comprehensive *Urban Forest Management Plan (UFMP)*. The purpose of this First Step toward a UFMP for Los Angeles (*First Step UFMP*) is to provide a clear understanding of the current urban forest and its management, to provide perspective by comparing Los Angeles with industry sustainability standards, and to outline the future UFMP framework. ***Integration Opportunity:*** As the *UFMP* is developed, this plan should be reviewed for opportunities to integrate identified mitigation actions that align with the objectives of the *First Step UFMP*, its subsequent *UFMP*. Additionally, actions identified in the *First Step UFMP* and *UFMP* should be evaluated for eligibility to apply for FEMA Hazard Mitigation Assistance grant funds.				
Response/Recovery Planning				
Emergency Operations Plan	Yes	No	Yes	No
Comment: *Base Emergency Operations Plan*, September 2023. Mayoral Directive 15 for the City of Los Angeles requires City departments to submit an Emergency Operations Plan and Continuity of Operations Plan annually. ***Integration Opportunity***: Although there is no viable way to integrate this mitigation plan into the Emergency Operations Plan, information in the hazard mitigation plan on vulnerability and impacts can inform future updates to that plan. Relevant annexes include adverse weather; brush fire; chemical, biological, radiological, and nuclear (CBRN); civil disturbance; critical infrastructure; debris flow; earthquake; pandemic; terrorism; tsunami; and urban flooding.				
Threat & Hazard Identification & Risk Assessment	Yes	No	No	Yes
Comment: City of Los Angeles THIRA (2022) ***Integration Opportunity***: Information on hazards of concern, including vulnerability and impacts contained in this plan can inform future updates to the City's THIRA.				
Emergency Operations Plan Functional and Hazard-Specific Annexes	Yes	No	No	Yes
Comment: Los Angeles Operational Area Terrorism Plan; City of Los Angeles Police Department Counterterrorism and Special Operations Bureau; Terrorism Annex to the *Base Emergency Operations Plan*; Post-Disaster Recovery Plan annex to the *Base Emergency Operations Plan (2023), Recovery Annex* ***Integration Opportunity:*** Information on vulnerability and impacts contained in this plan can inform future updates to the City's Emergency Operations Plan Functional and Hazard-Specific Annexes.				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity
Continuity of Operations Plan	Yes	No	Yes	Yes
Comment: The City Council has provided for the preservation of the City government in the event of an emergency (City of Los Angeles Administrative Code, Section 8.25). Alternates to key positions in the regular departments and agencies of government, or of business and industry, are shown in the *City's Department Emergency and Continuity of Operations Plan*. Mayoral Directive 15 for the City of Los Angeles requires City departments to submit this plan annually by January 31. ***Integration Opportunity*:** Information on vulnerability and impacts contained in this plan can inform future updates to the City's Department Emergency and Continuity of Operations Plan.				
Public Health Plan	No	Yes, Los Angeles County	No	No
Comment: *Community Health Improvement Plan, 2015-2020;* Prehospital Care Policy Ref. No. 842.1 Minimum EMS Resource Guidelines for Mass Gatherings and Special Events; Annex to the base Emergency Operations Plan; Emerging Infectious Disease and Medical Points of Distribution.				

5.1.3 Administrative and Technical Capabilities

Successful implementation of the mitigation strategy requires appropriate personnel and skills. Administrative and technical capabilities focus on the availability of personnel resources responsible for implementing all the facets of hazard mitigation. These resources include technical experts, such as engineers and scientists, as well as personnel with capabilities that may be found in multiple departments, such as grant writers. An assessment of administrative and technical capabilities is presented in Table 5-2.

5.1.4 Fiscal Capabilities

Assessing a jurisdiction's fiscal capability provides an understanding of the ability to fulfill the financial needs associated with hazard mitigation projects. This assessment identifies both outside resources, such as grant-funding eligibility, and local jurisdictional authority to generate internal financial capability, such as through impact fees. An assessment of fiscal capabilities is presented in Table 5-3.

5.1.5 Participation in Other Programs

Other programs, such as the CRS, part of the National Flood Insurance Program (NFIP) which recognizes and encourage floodplain management practices, and Firewise USA, a program which provides a framework for reducing the risk of wildfire, can enhance a jurisdiction's ability to mitigate, prepare for, and respond to natural hazards. These programs indicate a jurisdiction's desire to go beyond minimum regulatory requirements in order to create a more resilient community. These programs focus on communication, mitigation, and community preparedness to minimize the impact of natural hazards on a community. Classifications under various community mitigation programs are presented in Table 5-4.

Table 5-2. Administrative and Technical Capability

Staff/ Personnel Resources	Available (Y or N)	Department or Agency (Positions)
Planners or engineers with knowledge of land development and land management practices	Yes	Department of City Planning
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Yes	Department of Building and Safety, Department of Public Works – Bureau of Engineering, and Department of Transportation
Planners or engineers with an understanding of natural hazards	Yes	Department of Public Works, Bureau of Engineering and Bureau of Sanitation
Floodplain manager	Yes	City Engineer, Bureau of Engineering
Surveyors	Yes	Department of Public Works, Bureau of Engineering
Personnel skilled or trained in GIS Applications	Yes	Multiple Departments (Fire, Police, Emergency Management Department, Public Works, Harbor Department, Building and Safety Department, Mayor's Office).
Scientist familiar with local natural hazards	Yes	Various, including Bureau of Engineering and City Planning
Emergency manager	Yes	All Emergency Operations Board Departments: Emergency Operations Coordinator and other job classification with emergency management collateral duties assigned.
Grant writers	Yes	Various, including the Emergency Management Department, Mayor's Office of Public Safety, Office of the City Administrative Officer, Public Works, Water and Power, Fire, and Police.
Staff with expertise or training in benefit/cost analysis	Yes	City Administrative Officer, Economic Development and Grants Group, Mayor's Office Grants, Fiscal Management Unit and Contracts Division

Table 5-3. Fiscal Capability

Financial Resources	Accessible or Eligible to Use (Y or N)
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 5-4. Community Classifications

	Participating?	Classification	Date Classified
Community Rating System	Yes	Class 7	2005
Building Code Effectiveness Grading Schedule	Yes	2/2	2014
Public Protection	Yes	Class 1	1947
Firewise	No	—	—
Storm Ready	Yes	NOAA	January 27, 2012
Tsunami Ready	Yes	NOAA	January 27, 2012

5.1.6 Development and Permitting Capability

Jurisdictions regulate land use through the adoption and enforcement of zoning, subdivision and land development ordinances, building codes, building permit ordinances, floodplain, and stormwater management ordinances. When effectively prepared and administered, these regulations can lead to hazard mitigation. Development and permitting capabilities are presented in Table 5-5.

Table 5-5. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits? • **If no, who does? If yes, which department?** Building and Safety	Yes
Does your jurisdiction have the ability to track permits by hazard area?	Yes (Flood Hazard Only)
Does your jurisdiction have a buildable lands inventory?	Yes

5.1.7 Public Outreach Capability

Regular engagement with the public on issues regarding hazard mitigation provides an opportunity to directly interface with community members. Assessing this outreach and education capability illustrates the connection between the government and community members, which opens a two-way dialogue that can result in a more resilient community based on education and public engagement. An assessment of education and outreach capabilities is presented in Table 5-6.

5.1.8 Adaptive Capacity

An adaptive capacity assessment evaluates a jurisdiction's ability to anticipate the effects of future conditions. By looking at public support, technical adaptive capacity, and other factors, jurisdictions identify their core capability for resilience against issues such as sea-level rise. The adaptive capacity assessment provides jurisdictions with an opportunity to identify areas for improvement by ranking their capacity high, medium, or low. The community's adaptive capacity for the effects of climate change is presented in Table 5-7.

Table 5-6. Education and Outreach

Criteria	Response
Do you have a Public Information Officer or Communications Office?	The City has multiple personnel that serve this capacity of each department of City government
Do you have personnel skilled or trained in website development?	Each City department has a website with personnel dedicated to its development and maintenance
Do you have hazard mitigation information available on your website?	Yes
• **If yes, briefly describe.**	The City has established a hazard mitigation planning website within the Emergency Management Department website at: http://emergency.lacity.org/hazard-mitigation-plan
Do you utilize social media for hazard mitigation education and outreach? • **If yes, briefly describe.**	The City has extensive social media capability that includes Facebook, X (Twitter), and Nextdoor
Do you have any resident boards or commissions that address issues related to hazard mitigation?	The City has identified 99 Neighborhood Councils that could facilitate this capability. (https://empowerla.org/councils/)
Do you have any other programs already in place that could be used to communicate hazard-related information? • **If yes, briefly describe.**	Yes Community Emergency Response Team (https://www.cert-la.com/), Volunteer programs, Ready Your LA Neighborhood Program (https://ready.lacity.gov/).
Do you have any established warning systems for hazard events?	Yes (https://emergency.lacity.gov/alerts/notifyla)
• **If yes, briefly describe.**	Details on the City's emergency alert and warning capabilities are described in the City's Emergency Alert and Warning Annex.

Table 5-7. Adaptive Capacity for Climate Change

Adaptive Capacity Assessment Question	Rating[a]
Technical Capacity:	
Jurisdiction-level understanding of potential climate change impacts	High
Jurisdiction-level monitoring of climate change impacts	Medium
Technical resources to assess proposed strategies for feasibility and externalities	Medium
Land use decisions informed by potential climate impacts	Medium
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Medium
Capital planning and land use decisions informed by potential climate impacts	Medium
Participation in regional groups addressing climate risks	High
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Identified strategies for greenhouse gas mitigation efforts	Medium
Identified strategies for adaptation to impacts	Medium

Adaptive Capacity Assessment Question	Rating[a]
Champions for climate action in local government departments	Medium
Political support for implementing climate change adaptation strategies	High
Financial resources devoted to climate change adaptation	Low
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Local residents' support of adaptation efforts	High
Local residents' capacity to adapt to climate impacts	Low
Local economy current capacity to adapt to climate impacts	Low
Local ecosystems capacity to adapt to climate impacts	Low

a. High = Capacity exists and is in use; Medium = Capacity may exist but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement

5.1.9 Ability to Expand or Improve Existing Capabilities

During the planning process, the City and its departments identified and assessed their capabilities in the areas of planning and regulatory, administrative, and technical, and fiscal. By completing this assessment, the City and its departments learned how or whether they would be able to implement certain mitigation actions by determining the following:

- Limitations that could exist on undertaking actions.
- The range of local and state administrative, programmatic, regulatory, financial, and technical resources available to assist in implementing their mitigation actions.
- Actions deemed infeasible, as they are currently outside the scope of capabilities.
- Types of mitigation actions that could be technically, legally (regulatory), administratively, politically, or fiscally challenging or infeasible.
- Opportunities to enhance local capabilities to support long term mitigation and risk reduction.

During the plan update process, the City and its departments were tasked with developing or updating their capability assessment, paying particular attention to evaluating the effectiveness of these capabilities in supporting hazard mitigation and identifying opportunities to enhance capabilities to integrate hazard mitigation into their plans, programs, and day-to-day operations. The sections below describe the City's ability to improve its capabilities in response to identified needs.

Planning and Regulatory Capabilities

Any of the City's planning and regulatory capabilities could be expanded to some degree to address the impacts from the hazards assessed by this plan. Codes can include higher standards; plans can include enhanced focus on hazards and impacts. Opportunities to integrate these plans and regulations with this hazard mitigation plan are identified in

Table 5-1. These points of integration will occur as plans, codes, and standards are reviewed and revised.

Administrative and Technical Capabilities

The City possesses a high level of administrative and technical capability that will be utilized to implement the actions identified in this plan. This existing capability will be maintained by the City and expanded as necessary based on development of new programs or changes in scope of existing programs. Improvement in the availability of resources for socially vulnerable populations, including personnel to assist and programs implemented, will be a focus during this planning cycle. The City provides a robust outreach program to the various marginalized communities, including the homeless, elderly, low-income households, and others, through various communities groups and organizations as well as various City departments, such as LA Civil Rights, Disability, Housing, Neighborhood Empowerment, and others.

Fiscal Capabilities

One primary City objective for the creation of this local hazard mitigation plan is to gain eligibility to pursue hazard mitigation grant funding under FEMA's suite of Hazard Mitigation Assistance (HMA) grant programs, thus leveraging the City's funding for capital improvement projects. This plan identifies more than 100 actions across multiple mitigation categories and represents a comprehensive range of mitigation alternatives. Each action, once implemented, will increase the City's resilience to the hazards assessed by this plan.

The HMA grant programs typically fund projects at 75 percent, and communities must have sources for the remaining 25 percent local match. The financial capability assessment found that the City has all of the capabilities assessed, providing a sound local footing for funding mitigation actions. Based on this assessment, the City will expand its financial capabilities by continuing to apply for FEMA HMA funds to improve the City and offset costs.

Public Outreach Capabilities

Regular engagement with the public on issues regarding hazard mitigation provides an opportunity to directly interface with community members. Assessing this outreach and education capability illustrates the connection between the government and community members, which opens a two-way dialogue that can result in a more resilient community based on education and public engagement. An assessment of education and outreach capabilities is presented in Table 5-6. As part of the mitigation planning project update, EMD has developed an outreach strategy to better inform City residents about hazards and how to be better prepared during a possible incident.

5.2 Key Local Plans and Programs

This section identifies local programs, plans, and studies that can support or enhance the core capabilities of the City. Each can be leveraged by the City to support or enhance the implementation of mitigation actions identified in this plan. These programs, plans and studies are hereby integrated into this hazard mitigation plan by reference—mitigation actions identified in any of them are considered to be fully integrated into this hazard mitigation plan by reference.

5.2.1 General Plan

The Los Angeles General Plan is a comprehensive set of purposes, policies and programs to guide the future form and development of the City. The Plan is presented to the City Planning Commission, adopted by the City Council, and approved by the Mayor. The General Plan is a strategic, long-term document, broad in scope and specific in nature. It is implemented by decisions that direct the allocation of public resources and that shape private development, which affects the lives of residents and the business community. The General Plan is prepared and maintained by the Department of City Planning and must comply with State General Plan Guidelines maintained by the Governor's Office of Planning and Research. The law requires specific planning elements, including land use, circulation, housing, conservation, open space, noise, safety, and air quality. The City of Los Angeles' General Plan consists of the following elements:

- Plan for a Healthy LA: A Health and Wellness Element of the General Plan, March 2015 and technical update 2021
- The Citywide General Plan Framework: An Element of the General Plan, August 2001
- Air Quality Element: An Element of the City of Los Angeles General Plan, November 1992
- Conservation Element of the City of Los Angeles General Plan, September 2001
- The Housing Element 2021 - 2029 of the City of Los Angeles General Plan, November 2021
- Noise Element of the City of Los Angeles General Plan, February 1999
- The Open Space Element of the City of Los Angeles General Plan, June 1973
- Service Systems Element of the City of Los Angeles General Plan, Unknown Date
- Safety Element of the City of Los Angeles General Plan, November 2021
- Mobility Plan 2035, An Element of the General Plan, September 2016 (used to be Transportation Plan)
- The Land Use Element of the General Plan, July 2003 (consisting of 35 community plans, LAX Specific Plan and Port of Los Angeles's Dual Coastal Plan))

The Safety Element addresses protection from unreasonable risks associated with natural disasters, including fire and rescue, stormwater and inundation, slope failure and subsidence, seismic events, and hazardous materials. The Safety Element includes the Emergency Operations Organization and other interagency coordination, the California State Safety Element requirements, and emergency response, disaster recovery and hazard mitigation.

The Department of City Planning is reviewing all of the General Plan elements and establishing a suggested schedule for updating those plans that are still pending as well as developing a sequence for updating other existing elements. Laws, requirements, resources, and research that affect general planning include SB 375 (sustainable communities strategies), SB 5 (flood management), SB 743 (vehicle miles traveled), SB 244 (island or fringe communities), AB 52 (tribal consultation), and AB 2140 (local hazard mitigation plans).

Each year the City Planning Department prepares annual progress reports on the Implementation of the Housing Element and General Plan. Both reports are provided to the California Department of Housing and Community Development and the Office of Planning and Research. The annual reports are also submitted to Council, allowing the public an opportunity to review and comment, and are posted on the City Planning Department website (Los Angeles City Planning 2022).

5.2.2 Comprehensive Zoning Code

The Zoning Code regulates all land, building, structures, and uses within the City of Los Angeles. Since 2013, the City has been in the process of creating a new Zoning Code for the 21st century. The original zoning regulations were developed in 1946 and had not been revised since then. The proposed approach aims to establish a new Zoning Code that is more responsive to the needs of Los Angeles' different neighborhoods.

Los Angeles Municipal Code Chapter 1, Article 2, also known as the Comprehensive Zoning Plan of the City of Los Angeles, coordinates all City zoning regulations and provisions in order to regulate the location and use of buildings, structures and land. The goals of the Comprehensive Zoning Plan are to encourage the most appropriate use of land; to stabilize the value of property; to provide adequate open spaces; to prevent and fight fires; to prevent undue concentration of population; to lessen street congestion; to facilitate adequate provisions for transportation, water, sewerage, schools, parks and other public requirements; and to promote health, safety and the general welfare in accordance with the General Plan. It includes designation of zones that allow for floodplains and flood control facilities and presents design standards including those that deal with flood prevention and control.

5.2.3 City of Los Angeles Resilience Program

The City of Los Angeles is committed to addressing resilience by strengthening the City's physical, social, and economic foundations. The Mayor's Office has adopted far-reaching strategies to develop the tools the City needs to rebound from major crises—including storms, earthquakes, and economic recessions—if and when they come. Led by the Mayor's office, the City's resilience program is based on plans and programs summarized below. The status of these programs is presented in the City Planning Department's annual progress report for the General Plan, which is posted on the City Planning Department website (Los Angeles City Planning 2022).

Resilience by Design

Released in December 2014, Resilience by Design addresses Los Angeles' greatest earthquake risks, including building retrofitting and steps to secure the water supply and communications infrastructure. The report presents recommendations of the Mayoral Seismic Safety Task Force. These recommendations suggest strategic solutions to protect the lives of residents; improve the capacity of the City to respond to earthquakes; prepare the City to recover quickly from earthquakes; and protect the economy of the City and all of Southern California. The Mayoral Seismic Task Force evaluated four areas of seismic risk: pre-1980 "non-ductile reinforced concrete" buildings: pre-1980 "soft-first story" buildings; water system infrastructure (including impact on firefighting capability); and telecommunications infrastructure.

The Sustainable City pLAn

The Sustainable City pLAn is a road map for a Los Angeles that is environmentally healthy, economically prosperous, and equitable in opportunity for all—now and over the next 10 years. The pLAn focuses on both short-term results and long-term goals to transform the City. The pLAn provides the following:

- A vision for Los Angeles' future—Presents a clear vision and details specific long-term outcomes to be achieved over the next two decades in 14 key aspects of the environment, the economy and measures of social equity.
- A pathway to short-term results that lay the foundation for long-term outcomes—Created a set of near-term, back-to-basics outcomes to be accomplished by 2017 that create a foundation to achieve transformational change by 2025 and 2035.
- A framework to build out policies—Lays out strategies and priority initiatives that will be developed and detailed to deliver the tangible outcomes in the pLAn.
- A platform for collaboration—Creates a platform for collaboration to identify, create, and strengthen programs, policies, and partnerships that cut across bureaucratic boundaries to improve the city and neighborhoods.
- A set of tools to help manage Los Angeles—Provides the Mayor with a set of tools to ensure implementation and empower the people who work for the City.
- A dashboard of sustainability metrics to transparently measure progress—Identifies and tracks clear metrics to measure progress and share how everyone—in city operations, and as Angelenos—is doing along with way.

- A pathway for engaging our residents—Builds on leadership throughout Los Angeles, while providing Angelenos ways and opportunities to participate in creating tangible improvements to their lives, their neighborhoods, and the entire city.

5.2.4 Enhanced Watershed Management Plans

In order to improve water quality, comply with water quality mandates and address water supply issues, cities and community stakeholders throughout Los Angeles County have worked to develop Enhanced Watershed Management Plans for each of the county's four watersheds—Ballona Creek, Dominguez Channel, Santa Monica Bay and Los Angeles River.

Each plan identifies projects to improve water quality, promote water conservation, enhance recreational opportunities, manage flood risk, improve local aesthetics, and support public education. Each plan also outlines water quality priorities, watershed control measures, reasonable assurance analysis, project scheduling and the monitoring, assessment, and adaptive management of projects (LA Stormwater 2015, LACP 2022).

5.2.5 Greater Los Angeles County Region Integrated Regional Water Management Plan

Municipalities and groups across the Greater Los Angeles County Region collaborated to develop an Integrated Regional Water Management (IRWM) Plan in 2006 that focused on water resource management. The plan identified solutions over a 20-year period to reduce dependence on imported water, clean up local groundwater and stormwater, enhance in-stream water quality, improve habitat, and expand parks and open space. The Greater Los Angeles County IRWM Plan was later updated in 2014 to reflect new development.

In 2017, the IRWM leadership committee updated the 2014 IRWM Plan to comply with 2016 guidelines issued by the California Department of Water Resources (DWR). DWR reviewed and approved the updated Greater Los Angeles County IRWM Plan on May 18, 2018. On May 19, 2020, the County of Los Angeles Board of Supervisors approved the adoption of the 2017 Plan (GLAC IRWM Leadership Committee 2017).

5.2.6 Los Angeles County Flood Control District

The Los Angeles County Flood Control Act (ACT) was adopted by the State Legislature in 1915, after a disastrous regional flood took a heavy toll on lives and property. The Act established the Los Angeles County Flood Control District and empowered it to provide flood protection, water conservation, recreation and aesthetic enhancement within its boundaries. The Flood Control District is governed, as a separate entity, by the County of Los Angeles Board of Supervisors.

In 1984, the Flood Control District entered into an operational agreement with the Los Angeles County Department of Public Works transferring planning and operational activities to the

Department of Public Works. Watershed Management Division is the planning and policy arm of the Flood Control District. Public Works Flood Maintenance and Water Resources Divisions, respectively, oversee its maintenance and operational efforts.

The Flood Control District encompasses more than 3,000 square miles, 85 cities and approximately 2.1 million land parcels. It includes the vast majority of drainage infrastructure within incorporated and unincorporated areas in every watershed, including over 500 miles of open channel, 2,800 miles of underground storm drains, and an estimated 120,000 catch basins. The District includes portions of the City of Los Angeles.

5.2.7 U.S. Army Corps of Engineers Los Angeles River Ecosystem Restoration Feasibility Study and Project

The City of Los Angeles, in conjunction with the U.S. Army Corps of Engineers, prepared the Final Integrated Feasibility Report, which includes the Final Feasibility Report and Environmental Impact Statement/Environmental Impact Report for the proposed Los Angeles River Ecosystem Restoration Project. The City Council adopted the Study in June 2016.

Since that time, the City has taken significant steps forward to achieve the project goals. After City application and Army Corps approval, the Los Angeles River Ecosystem Project was designated as a P3/Alternative Delivery pilot project in 2020 to develop approaches to deliver the project faster and with great flexibility. This development is expected to accelerate delivery to complete a majority of the project benefits by 2028, lower total project costs, maximize the federal return on investment, and generally produce better value for tax-holder dollars (City of Los Angeles 2021a).

5.2.8 Los Angeles River Master Plan

The following content is excerpted from the Los Angeles River Master Plan 2022 (Los Angeles County Public Works 2022).

The Los Angeles River Master Plan 2022 is an update of the Los Angeles County 1996 Los Angeles River Master Plan.

Since 1996, several plans have been completed that reference the Los Angeles River. While it is common for infrastructure plans to exist within a similarly robust goal-driven context as this plan, there is no plan that is exactly parallel in context and scope to the Los Angeles River Master Plan. Los Angeles County and the Los Angeles River are unique. No other county in the country has as large a population, as robust a set of resources, and as much administrative capacity as Los Angeles County. Other rivers that impact as many people as the Los Angeles River are not contained within a single county and have a different character than the Los Angeles River.

The Los Angeles River Master Plan 2022 recognizes the need for resilient systems that address the most complex issues facing the Los Angeles region, such as climate change, population growth, resource scarcity, and social inequity. These resilient systems are necessary to create 51-miles of connected open space that supports clean water, native habitat, parks, recreation, multiuse trails, art, and cultural resources to improve human and ecosystem health, equity, access, mobility, and economic opportunity for the diverse communities of Los Angeles County, while managing flood risk. The Los Angeles River Master Plan seeks to make the reimagined river a reality over the next two and a half decades, connecting people, culture, water, open space, and wildlife across and along this iconic river.

5.2.9 City of Los Angeles Floodplain Management Plan

The following content is excerpted from the City of Los Angeles 2020 Floodplain Management Plan (City of Los Angeles 2020).

Recent history has demonstrated how the City of Los Angeles can be significantly affected by flooding. On November 12, 2003, 5.6 inches of precipitation fell during a 4-hour period over the Watts area of Los Angeles and portions of the City of Carson, causing significant flooding in areas not previously considered at risk for flooding. National Weather Service records show a total of 37.25 inches of rain at the downtown Los Angeles Civic Center during the rainy season of 2004-2005—the second highest recorded seasonal rainfall (the highest was 38.18 inches in 1883-1884). In 2014, Hurricane Marie brought one of the largest hurricane-related surf events in decades to Southern California, leading to overall losses of $20 million. Hurricane Marie tied for the sixth most-intense Pacific hurricane on record.

Even though the City of Los Angeles has adopted multiple mitigation and flood control projects and plans, it is constantly seeking additional ways to mitigate flood impacts in the community. Additionally, as a participant in the Community Rating System, the City can use an updated floodplain management plan as a key step toward significant reductions in flood insurance premiums.

The *2020 City of Los Angeles Floodplain Management Plan* provides a blueprint for flood risk reduction and management for the City. The plan identifies and prioritizes 78 flood hazard mitigation actions to be implemented over a 5-year performance period. Progress reports on the status of the implementation of the actions in the plan are prepared by the Bureau of Engineering annually.

5.2.10 City of Los Angeles Flood Hazard Management Ordinance

The City's Flood Hazard Management Ordinance, last revised in April 2021, provides for the establishment, management and regulatory control of flood hazard areas in Los Angeles. It incorporates a map (the Los Angeles Flood Hazard Map) that identifies areas expected to be impacted by 1 percent-annual-chance (100-year) floods. Under the ordinance, public and private development is prohibited in areas where flood-related hazards would seriously endanger human life, health or property, as identified on the map. It also generally prohibits nonessential public utilities and public or quasi-public facilities in special hazard areas, but directs that, when such facilities must be located in hazard areas, they are to be constructed to minimize or eliminate any flood hazards (City of Los Angeles 2021b).

5.2.11 Other Relevant City Ordinances, Plans, and Initiatives

The following are additional City ordinances, plans, and initiatives with a connection to hazard mitigation:

- Hillside Construction Regulations
- Building Decarbonization Ordinance
- Wildlife District Ordinance—Related to biodiversity, fire safety, and watershed health.
- Organic Waste Diversion—In 2022, the City passed Ordinance No. 187711, effective January 2023, to implement Senate Bill 1383 (SB 1383), the State-mandated organics diversion program aimed at reducing short lived climate pollutants such as methane.
- Slauson Corridor Transit Neighborhood Plan—The Slauson Corridor Transit Neighborhood Plan will identify land use, zoning, and urban design strategies to examine opportunities related to employment and industry, and to improve access to the future Rail to River Corridor and Metro stations along the Blue Line, Silver Line, and Crenshaw/Los Angeles International Airport (LAX) Line.
- Complete Streets—projects are intended to support the reduction of drive-alone trips and vehicle miles traveled to reduce greenhouse gas emissions and support sustainable modes of transportation.
- Housing-related programs intended to reduce homelessness and support the hazard-vulnerable unhoused population— The Mayor's Inside Safe Initiative and City Planning's proposed Citywide Housing Incentive Program (CHIP) which supports affordable housing development, especially in High Opportunity areas. The CHIP also supports housing development in areas with convenient access to public transit and neighborhood amenities related to the Federal Emergency Management Agency (FEMA) Community Lifelines.
- Technical amendments to the Health Element were made in 2021 to highlight compliance with Senate Bill 1000, which required local jurisdictions to address Environmental Justice in their general plans. This effort also included updates to the Health Atlas, a companion document that spatially quantifies several different

5.3 Multi-Hazard Related Activities of City Departments

The following is a summary of key City activities related to hazard mitigation:

- Department of Public Works, Bureau of Engineering
    - Maintain FEMA Flood Insurance Rate Map data.
    - Maintain a map of hillside areas.
    - Maintain records of drainage complaints. Complaints are investigated by staff engineers or maintenance crews. Complaints have been entered into a database and geo-coded for display on the GIS.
    - Maintain a list of known deficiencies. A project is identified to address each deficiency, so the deficiency list serves as a list of proposed projects. The projects can also be displayed on the GIS.
    - Assess infrastructure damage through field investigations after major storms that might impact public right of way.
    - Prepare geotechnical reports related to geologically unstable areas.
    - Maintain a database of FEMA Repetitive Loss Properties.
- Department of Public Works
    - Assess infrastructure damage through field investigations after major hazard incidents.
    - Identify areas in need of frequent maintenance of the flood control system.
    - Provide post-disaster debris clearance.
- Department of Building and Safety
    - Identify mud-prone and landslide areas throughout the City.
    - Track the number of building permits issued in flood risk areas.
    - Lead the Safety Assessment Program using volunteers and mutual aid building inspectors in safety evaluation of the built environment in the aftermath of a disaster.
    - Oversee mandatory seismic retrofit programs. Ordinances 183893 and 184081 require the retrofit of pre-1978 wood-frame soft-story buildings and non-ductile concrete buildings. The goal is to reduce these structural deficiencies and improve the performance of these buildings during earthquakes. Without proper strengthening, these vulnerable buildings may be subjected to structural failure during or after an earthquake (LADBS n.d.)
- City Planning Department
    - Maintain demographic, building, land use and zoning data.
    - Provide hazard descriptions of fire and rescue, stormwater, inundation and other water action, slope failure and subsidence, seismic events, and hazardous materials and phases of disasters such as hazard mitigation, and multi-hazard emergency response and disaster recovery provided by the Safety Element of the General Plan.
    - Maintain tsunami maps, dam failure inundation maps and landslide hazard identification maps from the Safety Element of the General Plan (input from the State Division of Mines and Geology and the State Office of Emergency Services).

- ➢ Assess City policy in maintaining open space and the effectiveness of regulatory and preventive standards in preventing flood damage.
- ➢ Maintain list of natural and beneficial areas within the City (wetlands, riparian areas, sensitive areas, and habitat for rare or endangered species).
- ➢ Environmental Justice Team & Policy Program—The City Planning Department was allocated seven staff positions for a dedicated Environmental Justice team during the 2023-2024 fiscal year. In August 2023, the Environmental Justice Policy Program was launched. This multi-year program includes a comprehensive review of the existing goals, policies, and programs in the General Plan to centralize and strengthen environmental justice priorities and to develop implementation programs that will help achieve the environmental justice vision of the General Plan.
- ➢ Framework Element and Infrastructure Monitoring The City Planning Department has periodically produced a "Growth and Infrastructure" report to monitor demographic trends and detail how infrastructure departments are providing for projected growth. Using funding from the Regional Early Action Planning (REAP) 1.0 grant program the City Planning Department is continuing to work with on a background study on infrastructure provisions. The study will help the City Planning Department better communicate how different assets of infrastructure are monitored and periodically upgraded across the City.

- Civil + Human Rights and Equity Department
  - ➢ Programs implemented by the Civil + Human Rights and Equity Department to address conditions that may lead to greater hazard vulnerability included the Commission on the Status of Women, the Reforms for Equity and Public Acknowledgement of Institutional Racism (REPAIR) Innovation Fund that has targeted vulnerable communities including Skid Row, Participatory Budgeting programs providing City funding for rental assistance, the creation of a community garden, mobile health outreach services, and after-school programming.
- Emergency Management Department
  - ➢ Establish and maintain a comprehensive citywide planning, training/exercise and coordination effort for mitigation, preparedness, response, and recovery for multi-hazard incidents.
  - ➢ Activate and operate the City Emergency Operations Center for coordination of all-hazards incidents.
  - ➢ Maintain emergency operations plans and associated hazard-specific and functional support annexes for the City to respond to events.
  - ➢ Provide disaster awareness and emergency preparedness information to the public.
  - ➢ Provide emergency public information regarding emergency alert and warning, notifications, evacuations, and sheltering for the public and City personnel.
- Harbor Department/Port of Los Angeles
  - ➢ Coordinate vessel evacuation for the safety of crewmembers, when needed.
  - ➢ Evacuate Port facilities and the Port area, when needed.
  - ➢ Procure and maintain emergency supplies and equipment.
  - ➢ Conduct damage assessment and establish damage response prioritization in the Port area.

- Identify shelter facilities around the Port area.
- Provide emergency preparedness training to Harbor Department employees.
- Conduct studies to evaluate the reasonability of and potential environmental impacts associated with development and operations of proposed projects in the Port area.
- Utilize findings from the Sea Level Rise Adaptation Study to address the impacts of sea-level rise and determine mitigation measures as appropriate in the Port area.
- Manage programs and projects designed to reduce local air pollution from the Port.
- Collaborate in maintenance of the tsunami signs around the Port area.

- Department of Water and Power
  - Implement necessary planning in the design, construction, reconstruction and maintenance of water and power systems to carry out hazard and risk mitigation measures, including dam hazards.
  - Corporate Health and Safety to oversee security and emergency preparedness strategies, programs, and measures for the department.
  - Develop an Urban Water Management Plan every five years to comply with California's Urban Water Management Planning Act.
  - The U.S. Department of Energy's National Renewable Energy Laboratory LA100 study identified multiple paths for the Los Angeles Department of Water and Power to achieve a 100 percent renewable and carbon-free power grid as early as 2035. The results from the study were used as a starting point for the Los Angeles Department of Water and Power's (LADWP's) 2022 Strategic Long Term Resource Plan.
- Los Angeles Housing Department
  - Systematic Code Enforcement Program—Under this program, inspectors have legal authority from the City for code enforcement over all multi-family rental properties in the city. On a four-year cycle, on a schedule coordinated with every landlord, the Housing and Community Investment Department systematically inspects all multi-family properties in the city on a variety of codes (building, plumbing, electrical and mechanical, health and safety, etc.) to ensure that life and fire safety systems are working and the property meets habitability standards.
  - Lead Hazard Remediation Program—This program provides grants to property owners to make their properties lead-safe and to eliminate health and safety hazards. The grants are primarily targeted to low-income families with children under the age of six. The program also provides education regarding the dangers of lead-based paint and health and safety hazards.
- Los Angeles Sanitation and Environment (LASAN)
  - Maintain and release Annual Community and Municipal Greenhouse Gas Inventory Reports
  - Under the One Water 2040 Plan, mitigation actions related to climate change were submitted in compliance with new National Pollutant Discharge Elimination System (NPDES) Permit requirements. These, along with recommended climate resilience adaptation measures from the One Water 2040 Plan, are being incorporated for at-risk Wastewater Pumping Plants where applicable.

- The Hyperion 2035 Program will allow the City to source at least 70 percent of its water locally and recycle all of its wastewater. The primary goal of the Hyperion 2035 Program is the transformation of the Hyperion Water Reclamation Plant from a conventional full secondary wastewater treatment plant to an advanced water purification facility to produce recycled water for indirect and potable reuses.
- Healthy Soils Initiative—The Healthy Soils Strategy was prepared by LASAN with guidance from the City's Healthy Soils Advisory Panel. This document details relevant urban soil topics and provides strategies and supporting actions that LASAN, other City departments, community groups, stakeholders, and residents can take to conserve, test, restore, and properly manage healthy soils.
- Metrics of community vulnerability, to provide more current data and information.

5.4 Federal and State Laws and Programs

Existing laws, ordinances, plans and programs at the federal and state level can support or hinder hazard mitigation actions identified in this plan. This section summarizes federal and state programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan. State and federal regulations and programs that need to be considered in hazard mitigation are constantly evolving. For this plan, a review was performed to determine which regulations and programs are currently most relevant to hazard mitigation planning. The findings are summarized in Table 5-8 and Table 5-9. Short descriptions of each program are provided in Appendix D.

Table 5-8. Summary of Relevant Federal Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Americans with Disabilities Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Civil Rights Act of 1964	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Clean Water Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Community Development Block Grant Disaster Resilience Program	Action Plan Funding	This is a potential alternative source of funding for actions identified in this plan.
Community Rating System	Flood Hazard	This voluntary program encourages floodplain management activities that exceed the minimum National Flood Insurance Program requirements.
Disaster Mitigation Act	Hazard Mitigation Planning	This is the current federal legislation addressing hazard mitigation planning.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Emergency Relief for Federally Owned Roads Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Emergency Watershed Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Endangered Species Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Federal Energy Regulatory Commission Dam Safety Program	Dam Failure Hazard	This program cooperates with a large number of federal and state agencies to ensure and promote dam safety.
National Dam Safety Act	Dam Failure Hazard	This act requires a periodic engineering analysis of most dams in the country
National Environmental Policy Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
National Flood Insurance Program	Flood Hazard	This program makes federally backed flood insurance available to homeowners, renters, and business owners in exchange for communities enacting floodplain regulations
National Incident Management System	Action Plan Development	Adoption of this system for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards is a prerequisite for federal preparedness grants and awards
Presidential Executive Order 11988 (Floodplain Management)	Flood Hazard	This order requires federal agencies to avoid long and short-term adverse impacts associated with modification of floodplains
Presidential Executive Order 11990 (Protection of Wetlands)	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable presidential executive orders.
U.S. Army Corps of Engineers Dam Safety Program	Dam Failure Hazard	This program is responsible for safety inspections of dams that meet size and storage limitations specified in the National Dam Safety Act.
U.S. Army Corps of Engineers Flood Hazard Management	Flood Hazard, Action Plan Implementation, Action Plan Funding	The Corps of Engineers offers multiple funding and technical assistance programs available for flood hazard mitigation actions

Table 5-9. Summary of Relevant State Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
AB 32: The California Global Warming Solutions Act	Action Plan Development	This act establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020
AB 70: Flood Liability	Flood Hazard	A city or county may be required to partially compensate for property damage caused by a flood if it unreasonably approves new development in areas protected by a state flood control project
AB 162: Flood Planning	Flood Hazard	Cities and counties must address flood-related matters in the land use, conservation, and safety and housing elements of their general plans.
AB 747: General Plans—Safety Element	Hazard Mitigation Planning	The safety elements of cities' and counties' general plans must address evacuation routes and include any new information on flood and fire hazards and climate adaptation and resiliency strategies.
AB 1409: Planning and Zoning, General Plan—Safety Element	Hazard Mitigation Planning	This bill requires the Safety Element to be reviewed and updated to identify evacuation locations.
AB 2140: General Plans—Safety Element	Hazard Mitigation Planning	This bill enables state and federal disaster assistance and mitigation funding to communities with compliant hazard mitigation plans.
AB 2800: Climate Change—Infrastructure Planning	Action Plan Development	This act requires state agencies to take into account the effects of climate change when developing state infrastructure.
Alquist-Priolo Earthquake Fault Zoning Act	Earthquake Hazard	This act restricts construction of buildings used for human occupancy on the surface trace of active faults.
California Department of Water Resources	Flood Hazard	This state department is the state coordinating agency for floodplain management.
California Division of Safety of Dams	Dam Failure Hazard	This division monitors the dam safety program at the state level and maintains a working list of dams in the state.
California Coastal Act	Tsunami and Sea-Level Rise Hazards	The Coastal Act guides how land along the coast of California is developed. It dictates that development be clustered to preserve open space, and that coastal agricultural lands be preserved. It prioritizes coastal recreation as well as commercial and industrial uses that need a waterfront location.
California Environmental Quality Act	Action Plan Implementation	This act establishes a protocol of analysis and public disclosure of the potential environmental impacts of development projects. Any project action identified in this plan will seek full California Environmental Quality Act compliance upon implementation.
California General Planning Law	Hazard Mitigation Planning	This law requires every county and city to adopt a comprehensive long-range plan for community development, and related laws call for integration of hazard mitigation plans with general plans.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
California Multi-Hazard Mitigation Plan	Hazard Mitigation Planning	Local hazard mitigation plans must be consistent with their state's hazard mitigation plan.
California Residential Mitigation Program	Earthquake Hazard	This program helps homeowners with seismic retrofits to lessen the potential for damage to their houses during an earthquake.
California State Building Code	Action Plan Implementation	Local communities must adopt and enforce building codes, which include measures to improve buildings' ability to withstand hazard events.
Disadvantaged and Low-Income Communities Investments	Action Plan Funding	This is a potential source of funding for actions located in disadvantaged or low-income communities.
Division of the State Architect's AB 300 List of Seismically At-Risk Schools	Earthquake Hazard, Action Plan Development	The Division of the State Architect recommends that local school districts conduct detailed seismic evaluations of seismically at-risk schools identified in the inventory that was required by AB 300.
Governor's Executive Order S-13-08 (Climate Impacts)	Action Plan Implementation	This order includes guidance on planning for sea-level rise in designated coastal and floodplain areas for new projects.
Senate Bill 1: Coastal Resources	Sea-level rise	This bill directs the state to provide funding to local governments to develop sea-level rise adaptation plans and implementation projects.
Senate Bill 92: Public Resources Portion of Biennial Budget Bill	Dam Failure Hazard	This bill requires dams (except for low-risk dams) to have emergency action plans that are updated every 10 years and inundation maps updated every 10 years, or sooner if specific circumstances change.
Senate Bill 97: Guidelines for Greenhouse Gas Emissions	Action Plan Implementation	This bill establishes that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for California Environmental Quality Act analysis.
Senate Bill 99: General Plans: Safety Element: Emergency Evacuation Routes	Action Plan Implementation	This bill requires that safety elements include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes.
Senate Bill 379: General Plans: Safety Element—Climate Adaptation	Action Plan Implementation	This bill requires cities and counties to include climate adaptation and resiliency strategies in the Safety Element of their general plans.
Senate Bill 1000: General Plan Amendments—Safety and Environmental Justice Elements	Action Plan Implementation	Under this bill, review and revision of General Plan safety elements are required to address only flooding and fires (not climate adaptation and resilience), and environmental justice is required to be included in general plans.
Senate Bill 1035: Fire, Flood, and Adaptation Safety Element Updates	Action Plan Implementation	Clarifies that revisions to the Safety Element to address fire hazards, flood hazards, and climate adaptation and resilience strategies all must occur upon each revision to a Housing Element or Local Hazard Mitigation Program.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Senate Bill 1241: Fire Hazards	Wildfire Hazard	This bill requires the Safety Element to be reviewed and updated as necessary to address the risk of fire in state responsibility areas and very high fire hazard severity zones, taking into account the most recent version of the Office of Planning and Research's "Fire Hazard Planning" document.
Standardized Emergency Management System	Action Plan Implementation	Local governments must use this system to be eligible for state funding of response-related personnel costs.

6. Changes and Trends

6.1 Population Trends and Projections

6.1.1 Historical City Population

Table 6-1 shows past population estimates for Los Angeles from 2000 to 2020. Over that time, California's population grew by 17.4 percent while the planning area's population increased by 9.2 percent. Figure 6-1 shows the planning area's annual population growth rates from 2000 to 2020 compared to those of the state. Los Angeles has experienced negative growth in several years over that period.

Table 6-1. Annual City Population Data

Year	Population	Year	Population	Year	Population
2000	3,627,878	**2007**	3,764,063	**2014**	3,912,494
2001	3,714,515	**2008**	3,774,497	**2015**	3,938,939
2002	3,740,481	**2009**	3,781,952	**2016**	3,958,803
2003	3,760,410	**2010**	3,794,586	**2017**	3,984,916
2004	3,773,549	**2011**	3,819,073	**2018**	3,996,298
2005	3,769,131	**2012**	3,851,990	**2019**	3,986,031
2006	3,768,645	**2013**	3,884,674	**2020**	3,975,234

Source: California Department of Finance Historical Population Estimates

Source: California Department of Finance Historical Population Estimates

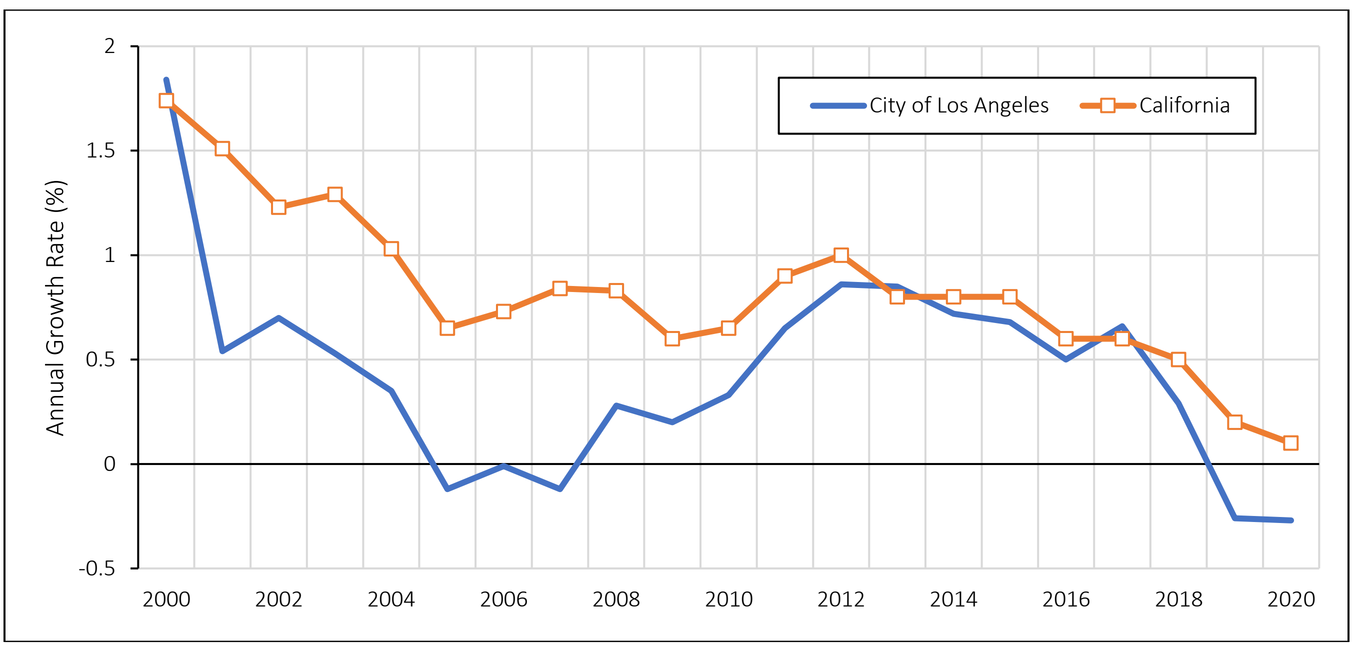


Figure 6-1. California and City of Los Angeles Population Growth

6.1.2 Projected Future Population

According to projections by the California Department of Finance, Los Angeles County's population is projected to decrease to 9,306,759 by 2040 (California Department of Finance 2023).

6.2 Development Trends and Projections

Development changes in hazard-prone areas can increase or decrease the potential impacts from hazard events. Reviewing these changes ensured that the mitigation strategy for this update will continue to address the risk to existing and potential development and take into consideration possible future conditions that could affect the potential impact.

6.2.1 Changes Since Previous Plan

Since the last plan update, there have been no development changes that affected the City's overall vulnerability. The City has updated its General Plan that governs land-use decisions and policy making.

6.2.2 Trends

Tracking growth in potential hazard areas provides an overview of increased vulnerability to a hazard within a community. Identifying previous and future development trends is achieved through a comprehensive review of permitting since completion of the previous plan and in anticipation of future development.

The City's General Plan governs land use decision and policy making. This hazard mitigation plan will work together with the General Plan to support wise land use in the future by providing vital information on the risk associated with hazards within the city. The City of Los Angeles will incorporate by reference the Hazard Mitigation Plan Update in its General Plan. This will ensure that all future trends in development can be established with the benefits of the information on vulnerability and hazard impacts identified in this plan.

As a component of its work on the General Plan, the Los Angeles City Planning Department is responsible for periodically reporting on growth and infrastructure to provide details on the City's demographics, development activity, infrastructure, and public facilities. Notable highlights in the 2022 annual report include the following (Los Angeles City Planning 2023c):

A. Updated population, household, and employment projections through 2045, produced by the City and the Southern California Association of Governments, show a projected 2045 population of 4,771,300.

B. The Los Angeles World Airports is continuing work on a large Airfield and Terminal Modernization Project including the People Mover, to connect the light rail system to LAX.
C. The Harbor Department/Port of Los Angeles has initiated a process to redevelop 4.75 acres for commercial and recreational use at Berth 44; develop 80 acres for the Terminal Island Maritime Support Facility; develop 18.63 acres for parking; and several other development projects (The Port of Los Angeles 2024).
D. The City Planning Department has commissioned a study on infrastructure provisions to better communicate how infrastructure is monitored and upgraded throughout the City.
E. The Housing Element was amended and approved in July 2022 to incorporate additional considerations for fair housing issues.
F. Homeless population and inadequately housed vulnerable populations continue to grow in the City. Since 2018, the City has deployed significant resources to address these concerns and growing trends.

For the second quarter of 2021, the City's Department of Buildings and Safety approved 55 percent more permits for new construction than during the same quarter of 2020—the first year-over-year increase since the start of the COVID-19 pandemic. A total of 40,888 permits were issued between April and June, compared to 26,324 in 2020. The total valuation of permits increased 15 percent year over year, to $1.5 billion for the second quarter from $1.2 billion over the same period last year. The average value of each permit was $35,685, or about $10,000 less than the average value of permits issued in the second quarter of 2020, possibly a sign that developers are more confident undertaking smaller projects. Despite the uptick in building permits, the number was still down from pre-pandemic levels. The City issued nearly 48,000 permits in the second quarter of 2019 (The Real Deal 2021).

6.3 Progress in Local Mitigation Efforts

The needs for hazard mitigation today are partly influenced by the effectiveness of mitigation efforts in the recent past. The previous Los Angeles hazard mitigation plan recommended an extensive array of one-time or ongoing mitigation actions, as well as the need to integrate current hazard understandings into many of the City's related plans and programs. Some of the previous plan's recommendations are complete, some are no longer relevant, and some remain to be carried out in the future. The status of these recommendations is meaningful for the development of a new mitigation strategy for this update. A thorough review of the mitigation strategy from the previous plan is provided Section 33.1 of this update, as part of the development of a new mitigation strategy to carry the City into the future. Annual updates are presented in the City Planning Department's annual progress report for the General Plan, which is posted on the City Planning Department website (Los Angeles City Planning 2022).

6.4 CHANGES IN COMMUNITY PRIORITIES

Elements and strategies in this hazard mitigation plan were selected because they meet a program requirement or a priority of the City. To help guide mitigation activities throughout the planning area, this update was developed to meet the following community priorities for the City of Los Angeles. They remain consistent for this plan update.

- Meet or exceed program requirements specified under the DMA and 44 CFR
- Enable the City to apply for federal grant funding to reduce hazard risk through mitigation
- Fulfill state and federal requirements for hazard mitigation planning
- Create a risk assessment that focuses on the hazards of concern in Los Angeles
- Coordinate existing plans and programs so that high-priority projects to mitigate potential disaster impacts are funded and implemented
- • Integrate the planning requirements of the City's Comprehensive Flood Hazard Management Plan, which allows the City of Los Angeles to maintain or enhance its Community Rating System (CRS) classification.
- Develop and implement methodologies for prioritizing the City's most vulnerable communities that may be impacted most by climate hazards.

6.5 CLIMATE CHANGE

"California is one of the most 'climate-challenged' regions of North America; its historical climate is extremely variable, and climate change is making extreme conditions more frequent and severe. California's temperatures are already warming, heat waves are more frequent, and precipitation continues to be highly variable."

Source: (State of California 2018)

Climate change refers to alterations in the long-term patterns of temperature, precipitation, humidity, wind, and seasons that play a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them. These shifts may result from natural processes (e.g., cyclical ocean patterns like El Niño, La Niña and the Pacific Decadal Oscillation, volcanic activity, changes in the sun's energy output, variations in Earth's orbit), but they can also be driven by human activity. Many of the changes observed in Earth's climate since the early 20th century have been attributed to human activity.

Climate change will continue to exacerbate the frequency, scale, and intensity of hazards across California. Many communities have experienced substantial damage from climate-related hazards, and 20 county HMPs identify climate change as a hazard. Climate patterns are shifting, resulting in more extreme and variable weather conditions across the state, with more extreme precipitation events, declining snowpack, more frequent and severe heat waves, and drought conditions (CNRA; CEC; OPR 2022).

Climate change has impacted the state's natural areas and forests, increasing the frequency of catastrophic wildfires. The planet's oceans and glaciers have also experienced changes: oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising. Global sea level has risen approximately 9 inches, on average, in the last 140 years (NASA 2022a). This has already put some coastal homes, beaches, roads, bridges, and wildlife at risk. Areas across California have experienced negative impacts on air and water quality and energy reliability from wildfires and extreme heat. Drought conditions have stressed water supplies and affected large industry sectors such as agriculture. There are no parts of California that escape climate impacts, although the scale, severity, and population vulnerability vary across the state.

Climate change currently affects and will continue to affect the people, property, economy, and ecosystems of the planning area in a variety of ways. Consequences of climate change include increased flood impacts and increased heat-related illnesses. The occurrence and severity of natural hazards can be significantly affected.

An essential aspect of hazard mitigation is predicting the likelihood of hazard events. Typically, predictions are based on statistical projections from records of past events. This approach assumes that the likelihood of hazard events remains essentially unchanged over time. Thus, averages based on the past frequencies of, for example, floods are used to estimate future frequencies: if a river has flooded an average of once every 5 years for the past 100 years, then it can be expected to continue to flood an average of once every 5 years.

For hazards that are affected by climate, the assumption that future behavior will be equivalent to past behavior is not valid if climate conditions are changing. As flooding is generally associated with precipitation frequency and quantity, for example, the frequency of flooding will not remain constant if broad precipitation patterns change over time. Specifically, as hydrology changes, storms currently considered to be the 100-year flood might strike more often, leaving many communities at greater risk. For this reason, an understanding of climate change is pertinent to efforts to mitigate natural hazards. Information about how climate patterns are changing provides insight on the reliability of future hazard projections used in mitigation analysis.

The City is in the process of preparing a Climate Vulnerability Assessment (CVA) to examine the anticipated impacts of climate change across the City and identify areas and communities that are most vulnerable to those impacts. The CVA is a partnership between the City Planning Department, EMD and the Climate Emergency Mobilization Office (CEMO).

The CVA is an important step to ensure that the City can adapt and be resilient to the impacts of climate change with a strong focus on climate equity. The City will assess climate change impacts, identify at-risk communities and develop adaptation strategies, in partnership with City stakeholders including vulnerable communities and populations, community based organizations, City departments and other agencies. The CVA will coordinate the update with

HMP planning efforts and other relevant data sources to map projected climate hazards and analyze impacts related to:

- Extreme heat
- Sea-level rise and coastal flooding
- Extreme precipitation and flooding
- Wildfires
- Drought

6.5.1 Greenhouse Gases

The well-established worldwide warming trend of recent decades and its related impacts are caused by increasing concentrations of carbon dioxide and other greenhouse gases in the earth's atmosphere. Greenhouse gases are gases that trap heat in the atmosphere, resulting in a warming effect. Carbon dioxide is the most commonly known greenhouse gas; however, methane, nitrous oxide and fluorinated gases also contribute to warming.

Emissions of these gases come from a variety of sources, such as fossil fuel combustion for energy and transportation, wastewater treatment, agricultural production, livestock, landfills, and changes in land use. According to the National Aeronautics and Space Administration (NASA), carbon dioxide concentrations in the atmosphere measured about 280 parts per million (ppm) before the industrial era began in the late 1700s and have risen dramatically since then, surpassing 400 ppm in 2013 for the first time in recorded history (see Figure 6-2). The latest carbon dioxide measurement, taken in February 2022, was 418 ppm (NASA 2022). Figure 6-3 shows greenhouse gas emissions by economic sector in California for 2021, the most current data. Transportation is the largest source of CO_2e for the state.

The City of Los Angeles has set goals to reduce greenhouse gases from City operations and community-wide:

- Goals for City operations are for the following reductions from 2008 greenhouse gas emission levels:
  - 55 percent reduction by 2025
  - 65 percent reduction by 2035
  - Carbon neutrality (100 percent reduction) by 2045
- Goals for community-wide emissions are for the following reductions from 1990 levels:
  - 50 percent reduction by 2025
  - 73 percent reduction by 2035
  - Carbon neutrality (100 percent reduction) by 2050

Los Angeles Sanitation and Environment prepares annual reports summarizing the most recent progress toward these goals (LASAN 2024).

Source: *(NASA 2022)*

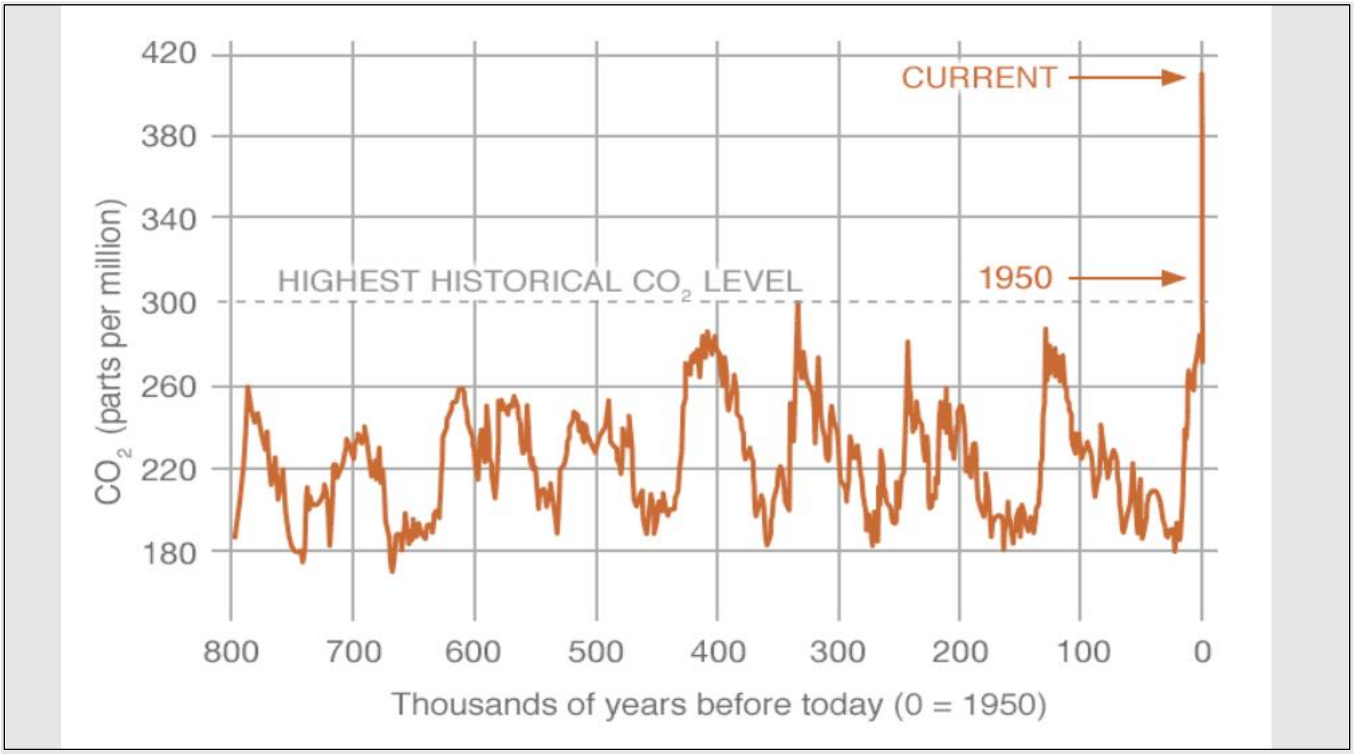


Figure 6-2. Global Carbon Dioxide Concentrations Over Time

Source: *(California Air Resources Board 2023)*

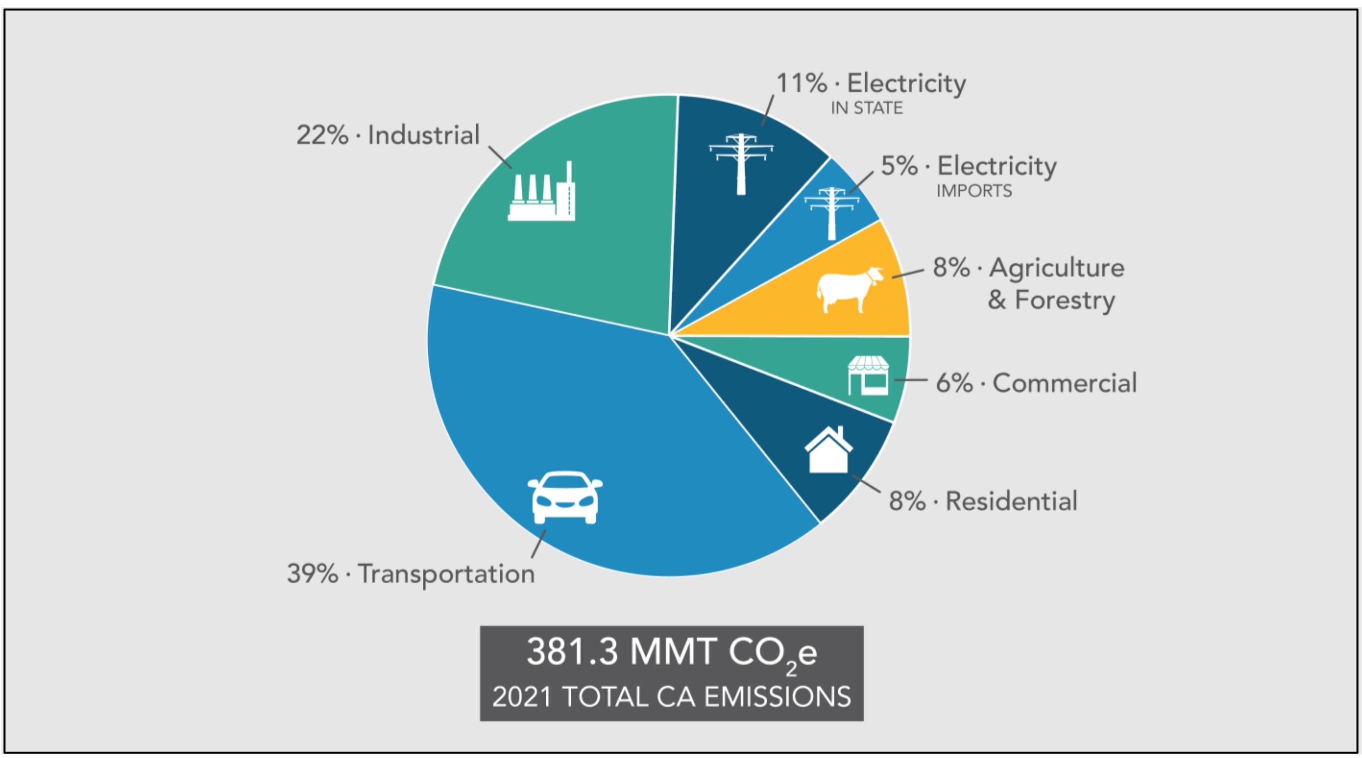


Figure 6-3. California's 2021 Greenhouse Gas Emission Inventory by Sector

Impacts of Climate Change on Public Health and Biodiversity

As the impacts of climate change continue to affect the City of Los Angeles, impacts on public health and biodiversity are still being studied. To address these impacts, the City of Los Angeles is in the process of releasing an updated 2024 Climate Vulnerability Assessment. Additionally, the City of Los Angeles Climate Emergency Mobilization Office (CEMO) plans to release a Heat Action and Resilience Plan to address the impacts of climate change and extreme heat on topics related to public health and biodiversity.

6.5.2 Current Indicators of Climate Change in California

Monitoring and research efforts across California have generated data that describe changes already underway in the state. Notable examples across the state include the following (OEHHA 2022):

- Greenhouse gas emissions are continuing to decline across the state.
- Atmospheric levels of methane, nitrous oxide, and certain fluorinated gases continue to increase.
- Annual average air temperatures continue to increase, with 2022 being one of the warmest years on record.
- Drought conditions have become more frequent and intense.
- Reduced snowpack and earlier spring warming have affected snowmelt runoff.
- Coastal ocean temperatures, specifically off the coast of Southern California, have warmed at a rate of approximately 0.3°F per decade.
- Unprecedented rates of tree mortality have increased fuel loads, leading to increased risk of severe wildfires.
- The incidence of Valley fever (Coccidioidomycosis) has increased over the past 20 years in California during periods of drought. (CDPH 2024)

6.5.3 Projected Future Impacts in California

Statewide

According to the 2022 report by California's Office of Environmental Health Hazard Assessment (OEHHA), *Indicators of Climate Change in California*, the following are emerging climate change issues impacting the state (OEHHA 2022):

- Reductions in the duration and extent of Central Valley and coastal fog, which play a vital role in their respective ecosystems
- Increased lightning activity with warming air temperatures
- Apparent increased frequency and extent of harmful algal blooms in freshwater bodies, and how much is attributable to climate change versus nutrient discharges and other anthropogenic factors

- Transmission of bluetongue, a viral disease of sheep, goats, and cattle
- Changing climate conditions that allow invasive agricultural pest species such as the Oriental fruit fly to thrive in places where they previously could not survive
- Influence of shifts in temperature and rainfall on reported declines in bumble bee populations globally and in California (in combination with other factors, including insecticides, pathogens infections and habitat loss)
- Increasing levels of allergens from plants and mold, which trigger asthma and hay fever
- Increasing risks of food- and waterborne infections due to changes in climate
- Increasing transmission of diseases between humans and animals

South Coast Region

The *California Climate Adaptation Planning Guide* outlines the following climate change impact concerns for the South Coast climate impact region, which includes Los Angeles (SCAG 2020):

- Extremes of precipitation and temperature
- Increased storm frequency and intensity
- Sea-level rise
- Increased frequency of wildfires
- More extreme droughts
- New disease vectors
- Coastal erosion
- Increase in landslides and other debris flows

Some of these changes are direct or primary climatic changes, such as increased temperature, while others are indirect or secondary effects resulting from the direct changes, such as new disease vectors. Some direct changes may interact with one another to create unique secondary effects. These primary and secondary effects may then result in impacts on human and natural systems. The primary and secondary effects likely to affect the planning area are summarized in Table 6-2.

Climate change projections contain inherent uncertainty, largely because they depend on future greenhouse gas emission scenarios. Generally, the uncertainty in greenhouse gas emissions is addressed by the assessment of differing scenarios: low-emissions scenarios and high-emissions scenarios. In low-emissions scenarios, greenhouse gas emissions are reduced substantially from current levels. In high-emissions scenarios, greenhouse gas emissions generally increase or continue at current levels. Uncertainty in outcomes is generally addressed by averaging a variety of model outcomes.

Despite this uncertainty, climate change projections present valuable information to help guide decision-making for possible future conditions. The following sections summarize information developed for the City of Los Angeles by Cal-Adapt, a resource for public information on how climate change might affect local communities, based on the most current data available.

Table 6-2. Summary of Primary and Secondary Effects Likely to Affect the City of Los Angeles

Primary Effect	Secondary Effect	Example Human and Natural System Effect
Increased Temperature	Heat waves and high carbon emissions	• Increased frequency of illness and death • Increased high alert ozone days, urban heat islands • Increased stress on mechanical systems, such as HVAC systems • Increased stress on electricity supply and demand
Reduced Precipitation	Changed seasonal patterns	• Reduced water supply • Reduced tourism
	Increased wildfires	• More people, wildlife, land, and structures affected by fires. • Summer dryness will begin earlier, last longer, and become more intense.
Sea-Level Rise	Permanent inundation of previously dry land	• Loss of assets and tax base • Loss of coastal habitat • Loss of tourism
	Larger areas affected by extreme high tide	• More people and structures affected by storms
	Increased coastal erosion	• Loss of assets and tax base
Reduced Mountain Snowpack	Reduced water supply	• Primary sources of water are State Water Project and the Colorado River, both originating in mountain snowpack; change may reduce water supply. • Increased costs for water

Adapted and expanded from California Adaptation Planning Guide: Planning for Adaptive Communities

Extreme Heat & Average Temperature

The historical (1961-1990) average temperature in the City of Los Angeles was 73.7°F. By 2035, the average temperature is expected to increase above this baseline by 3.7°F and 4.6°F in the low- and high-emissions scenarios, respectively (see Figure 6-4). By 2100, if temperatures rise to the higher warning range, average temperatures within the City of Los Angeles could rise by an alarming +7.9 °F to 81.6 °F.

Overall temperatures are projected to rise in California during the 21st century. While the entire state will experience temperature increases, the local impacts will vary greatly with many communities and ecosystems already experiencing the effects of rising temperatures (Cal-Adapt 2023). Given the geographic layout of the City, temperatures could vary from coastal regions to inland areas.

According to a 2022 UCLA Adapting to Extreme Heat in California study, California is forecast to experience hotter than average temperatures as well as longer and more frequent heat waves over the coming decades due to climate change (UCLA 2021). In the study, the research showed that heat exposure will likely have large and increasing health, social, and financial costs. The study analyzed seven priority settings for heat exposure; 1) homes, 2) workplaces, 3) schools and childcare facilities, 4) senior assisted living facilities, 5) prisons, jails, and correctional facilities, 6) public outdoor spaces, 7) public transit stops.

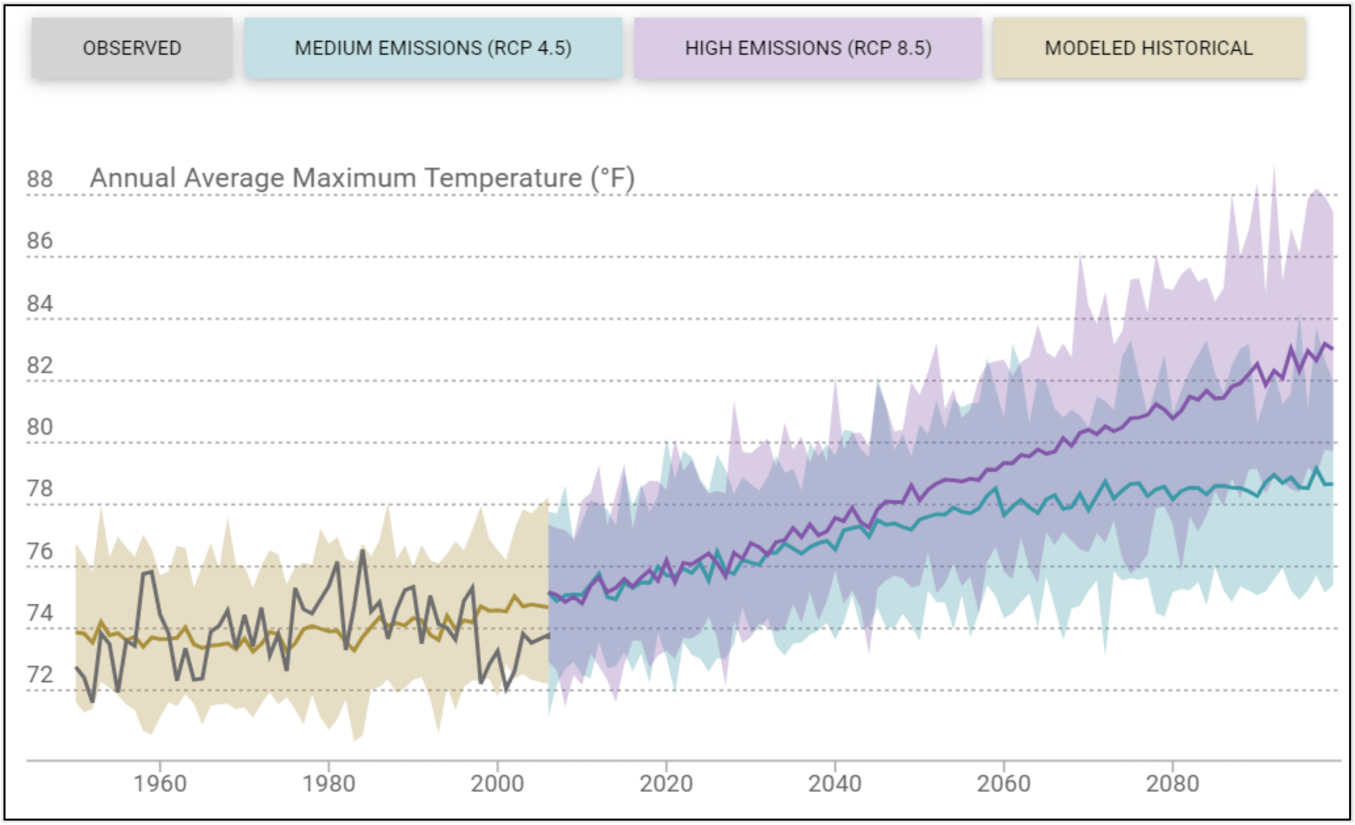


Figure 6-4. Observed and Projected Average Temperatures for the City of Los Angeles

Precipitation

California's climate varies between wet and dry years. Research suggests that for much of the state, wet years will become wetter, and the dry years will become drier. Dry years are also likely to be followed by additional years of low precipitation, increasing the risk of drought.

While California does not see average annual precipitation changing significantly in the next 50 to 75 years, precipitation will likely be delivered in more intense storms and within a shorter wet season. Atmospheric rivers are the source of most of California's heaviest rains and floods and are a main contributor to the State's water supply. These systems, which are pushed along by strong winds, can deliver much of the State's precipitation from just a few storms. Maximum 1-day precipitation projections are modeled in Figure 6-5. We are already seeing some of the impacts from a shift towards larger year to year fluctuations (Cal-Adapt 2023).

Wildfire

Wildfire risk is expected to change in the coming decades (see Figure 6-6). The frequency, severity, and impacts of wildfire are sensitive to climate change as well as many other factors, including development patterns, temperature increases, wind patterns, precipitation change and pest infestations. Therefore, it is more difficult to project exactly where and how fires will burn. Instead, climate models estimate increased risk to wildfires.

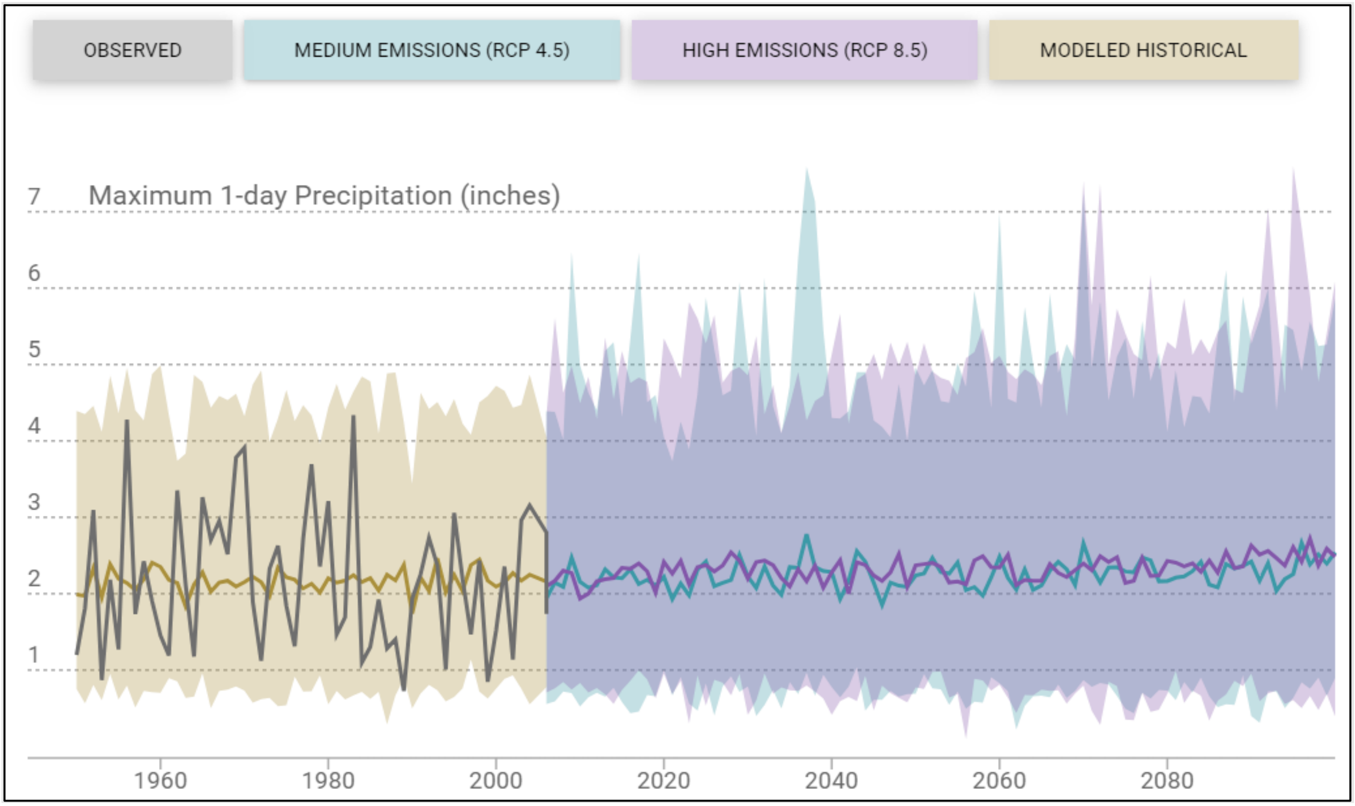


Figure 6-5. Projected Maximum 1-Day Precipitation (Inches) for City of Los Angeles

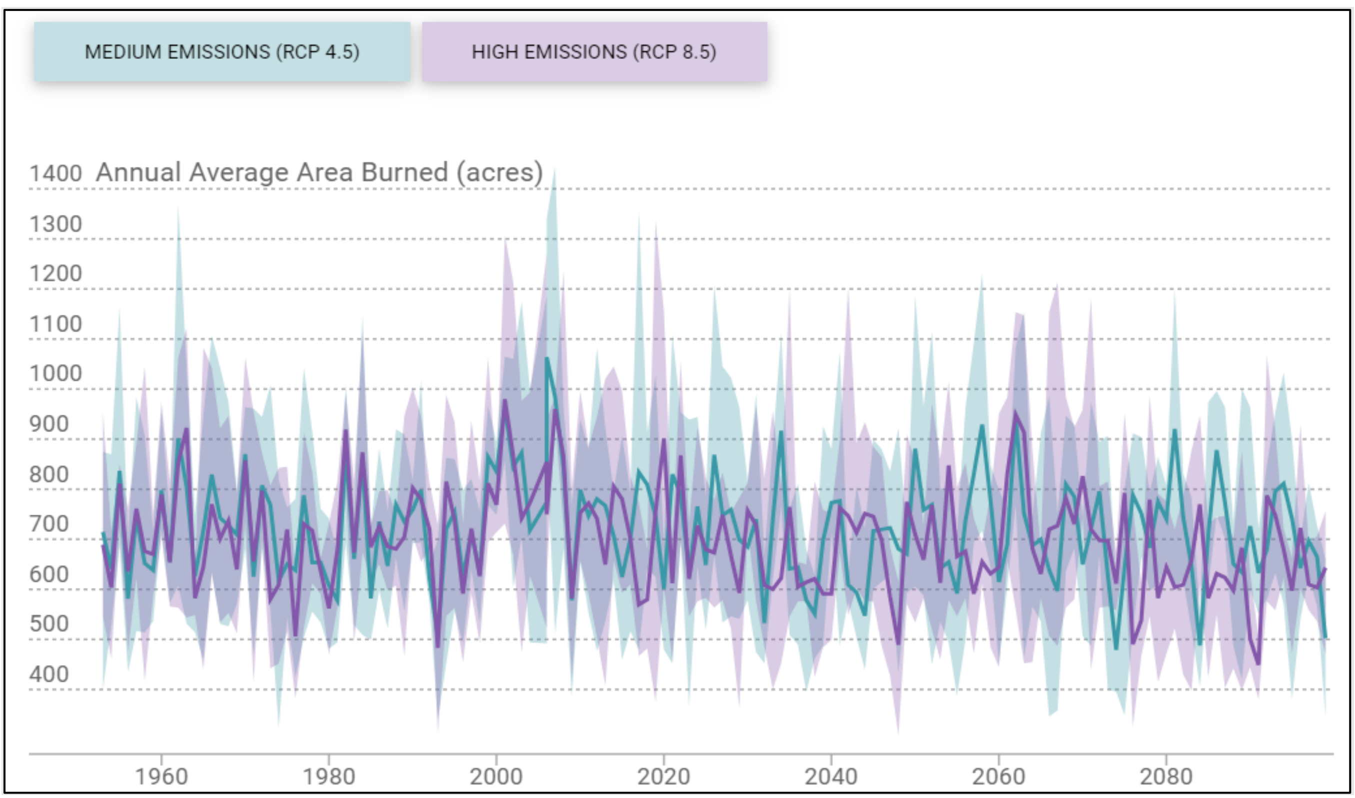


Figure 6-6. Projected Increase in Annual Acres of Land Burned Within the City of Los Angeles

The annual average area Burned can help inform at a high level if wildfire activity is likely to increase. Much of California can expect an increased risk of wildfire, with a wildfire season that starts earlier, runs longer, and features more extreme fire events (Cal-Adapt 2023).

PART 3—RISK ASSESSMENT FOR HAZARDS OF CONCERN

7. Risk Assessment Methodology

7.1 RISK ASSESSMENT TOOLS

7.1.1 Mapping

National, state, county, and city databases were reviewed to locate available spatially based data relevant to this planning effort. Maps were produced using geographic information system (GIS) software to show the spatial extent and location of hazards when such datasets were available. The maps are included in the hazard profile chapters. Data used for this plan represents the best science currently available.

7.1.2 Modeling

Overview

FEMA's standardized GIS-based software program Hazards U.S. (Hazus) estimates losses caused by earthquakes, hurricanes and floods and identifies areas that face the highest vulnerability and potential for loss. Hazus is used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, community lifelines, and transportation and utility infrastructure, and multiple models to estimate potential losses from natural disasters. The program maps and calculates hazard data and damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that they can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

For flood-related hazards, Hazus calculates losses to structures due to inundation by looking at depth of flooding and type of structure. Using historical flood insurance claim data, Hazus estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. The Hazus analysis also estimates the quantity of debris that would be caused by a dam failure.

For earthquake, once the location and size of a hypothetical earthquake are identified, Hazus estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up.

Levels of Detail for Evaluation

Hazus provides default data for inventory, vulnerability, and hazards; these default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. These data are derived from national databases and describe in general terms the characteristic parameters of the planning area.
- **Level 2**—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics, and building inventory, as well as data about utilities and community lifelines. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

7.2 RISK ASSESSMENT APPROACH

7.2.1 Hazard Profile Development

Hazard profiles were developed through web-based research and review of previously developed local and state reports and plans. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists, and others.

7.2.2 Assessment of Vulnerability and Impacts

Flood, Dam Failure, Sea-Level Rise, Tsunami, and Earthquake

Community vulnerability and impacts associated with the following hazards were evaluated using Hazus v6:

- **Flood**—A Level 2 user-defined analysis was performed for general building stock in flood zones and for community lifelines. Current flood mapping for the planning area was used to delineate flood hazard areas and estimate potential losses from the 10 percent-annual-chance, 2 percent-annual chance, 1 percent-annual-chance and 0.2 percent-annual-chance flood events. To estimate damage that would result from a flood, Hazus uses pre-defined relationships between flood depth at a structure and resulting damage, with damage given as a percent of total replacement value. Curves defining these relationships have been developed for damage to structures and for damage to typical contents within a structure. By inputting flood depth data and known property replacement cost values, dollar-value estimates of damage were generated.

- **Dam Failure**—A modified Level 2 riverine analysis was run using the flood methodology described above for the combined very high risk and high risk dam failure inundation hazard area.
- **Sea-Level Rise**—A modified Level 2 coastal analysis was run using the flood methodology described above.
- **Tsunami**—A modified Level 2 coastal analysis was run using the flood methodology described above.
- **Earthquake**—A Level 2 analysis was performed to assess earthquake vulnerability and impacts for five scenario events:
  - A Magnitude 7.2 event on the Newport-Inglewood Fault with an epicenter 32 miles southeast of downtown Los Angeles.
  - A Magnitude 7.3 event on the Palos Verdes Fault with an epicenter 55 miles south southeast of downtown Los Angeles.
  - A Magnitude 7.0 event on the Puente Hills Fault with an epicenter 11.5 miles northeast of downtown Los Angeles.
  - A Magnitude 7.8 event on the San Andreas Fault with an epicenter 150 miles east southeast of downtown Los Angeles.
  - A Magnitude 6.8 event on the Santa Monica Fault with an epicenter 9.5 miles northwest of downtown Los Angeles.

Drought

The risk assessment methodologies used for this plan focus on damage to structures. The risk assessment for drought was more limited and qualitative than the assessment for the other hazards of concern because drought does not affect structures.

All Other Assessed Hazards

Historical datasets were not adequate to model future losses for most of the hazards of concern. However, areas and inventory susceptible to some of the hazards of concern were mapped by other means, and vulnerability was evaluated. A qualitative analysis was conducted for other hazards using the best available data and professional judgment, including the extreme cold or freeze, extreme heat, landslide, high wind, and wildfire hazards.

Socially Vulnerable Populations

The risk assessment for socially vulnerable populations was based on the City's 2021 Community Health and Equity Index. This index identifies areas with the most adverse health conditions based on variables such as physical environment, social and economic factors, access to health care, and health behaviors (Los Angeles City Planning 2021).

Two categories of the Community Health and Equity Index (see Section 4.4.2) were analyzed:

- Index values of 43.56 to 48.57
- Index values greater than 48.57

These thresholds were extracted from the map data and used in the risk assessment by overlaying the inventory data (general building stock and critical facilities) over the thresholds and running an intersection analysis. People, structures, and critical facilities that fall within either threshold were identified as such.

7.3 Sources of Data Used

7.3.1 Building and Cost Data

Replacement cost values and detailed structure information derived from parcel and tax assessor data provided by the City of Los Angeles were loaded into Hazus. Replacement cost is the cost to replace the entire structure with one of equal quality and utility. Replacement cost is based on the industry-standard RSMeans cost-estimation data and models published by Gordian. It is calculated using the RSMeans square foot cost for a structure, which is based on the Hazus occupancy class (i.e., multi-family residential or commercial retail trade), multiplied by the square footage of the structure from tax assessor data. The construction class and number of stories for single-family residential structures also factor into determining the square-foot costs.

7.3.2 Hazus Data Inputs

The following hazard datasets were used for the Hazus Level 2 analysis conducted for the risk assessment:

- **Flood**—The effective Digital Flood Insurance Rate Map (DFIRM) for the planning area was used to delineate flood hazard areas and estimate potential losses from the 10, 2, 1, and 0.2 percent-annual-chance flood events. FEMA 2023 DFIRM floodplain boundaries and USGS 5-foot digital elevation model data were used to generate flood depth grids. These were integrated into the Hazus model for this plan.
- **Dam Failure**—Dam failure inundation area data was collected from California's Division of Safety of Dams and the U.S. Army Corps of Engineers. Inundation area data and depth grids were integrated into the Hazus model to create a combined inundation area for this plan for all state- or federal-regulated HHPD dams with mapped inundation areas at least partly within the Los Angeles city limits, as follows:
    - 10 MG Walteria
    - 18 MG Walteria
    - Big Tujunga No. 1
    - Blanchard Debris Basin
    - Green Verdugo
    - Greystone Reservoir
    - La Tuna Debris Basin
    - Los Angeles Reservoir
    - San Gabriel No 1
    - Santa Ynez Canyon
    - Schoolhouse Debris Basin
    - Silver Lake

- Brand Park
- Chatsworth
- Cogswell
- Devils Gate
- Diederich Reservoir
- Eagle Rock
- Elysian
- Encino
- Glenoaks 968 Reservoir
- Lower Franklin
- Lower San Fernando
- Lower Sunset Debris Basin
- Morris
- Mulholland
- Pacoima
- Palos Verdes Reservoir
- Riviera Reservoir
- Stone Canyon
- Stough Debris Basin
- Wilson Debris Basin
- Haines Canyon Debris Dam
- Hansen
- Lopez
- Sepulveda
- Whittier Narrows

- **Tsunami**—Tsunami inundation zone data provided by the California Department of Conservation and the USGS 1/3 arc-second digital elevation model were used to develop depth grids that were integrated into the Hazus model for this plan.
- **Sea-Level Rise**—Depth grids for sea-level rises of 25 cm and 200 cm with 100-year storm surge, from Our Coast Our Future, were integrated into the Hazus model.
- **Earthquake**—Earthquake ShakeMaps prepared by the USGS were used for the analysis of this hazard. Landslide susceptibility data from the California Geological Survey and the City's liquefaction zones data were also integrated into the Hazus model.

7.3.3 Other Local Hazard Data

Locally relevant information on hazards was gathered from a variety of sources. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists, and others. Data sources for specific hazards were as follows:

- **Extreme Heat**—Extreme heat datasets were provided by the California Heat Assessment Tool (CHAT) and the University of California Los Angeles (UCLA).
- **Landslide**—Data on susceptibility to deep-seated landslides, dated 2018, was acquired from the California Geological Survey. Areas categorized as very high (source data Category X) high (Categories VII, VIII, and IX) and moderate (Categories VI, and V) were used in the vulnerability analysis.
- **Severe Weather**—No GIS format severe weather area datasets were identified for the City of Los Angeles.
- **Wildfire**—Fire severity data was acquired from California Department of Forestry and Fire Protection (CAL FIRE).
- **Climate Change**—Climate change related projections, data and visualization tools were provided by Cal-Adapt, an online resource that provides information on how climate change might affect local communities in California, unless otherwise indicated. The data available on Cal-Adapt is from a variety of organizations in the scientific community and represents peer-reviewed science.

7.3.4 Data Source Summary

Table 7-1 summarizes the data sources used for the risk assessment for this plan.

Table 7-1. Hazus Model Data Documentation

Data	Source	Effective Date	Format
Building footprints	Cal OES	2023	Digital (GIS) format
Address points	Bureau of Engineering	2023	Digital (GIS) format
Property parcels (includes tax roll data such as use code, year built, number of stories, and square footage)	Los Angeles City	2023	Digital (GIS) format
Building replacement cost	RS Means	2022	Paper format
Socially Vulnerable Demographic data – Health Atlas Index	City of Los Angeles	2023	Digital (GIS) format
Total Population data	U.S. Census Bureau Decennial Redistricting Data	2020	Digital (tabular) format
Flood depth grids (created from FEMA effective DFIRM data)	FEMA 2023—06/02/21 effective DFIRM; 2020 City of Los Angeles Floodplain Management Plan	2023; 2020	Digital (GIS) format
Tsunami inundation depth grids (created from CA Dept. of Conservation data)	CA Department of Conservation	2023	Digital (GIS) format
Earthquake ShakeMaps	USGS Earthquake Hazards Program website	2017	Digital (GIS) format
Susceptibility to Deep-Seated Landslides	CA Geological Survey	2018	Digital (GIS) format
Liquefaction zones	CA Department of Conservation	2021	Digital (GIS) format
National Earthquake Hazard Reduction Program Soils	California Department of Conservation	2021	Digital (GIS) format
Dam failure inundation depth grids (created from Los Angeles County data)	U.S. Army Corps of Engineers; DSOD	2023	Digital (GIS) format
Coastal Storm Modeling System Sea-Level Rise data	Our Coast Our Future, Coastal Storm Modeling System, 2023	2023	Digital (GIS) format
Fire Hazard Severity Zones	CAL FIRE	2023	Digital (GIS) format
Digital Elevation Model (5ft resolution)	2020 City of Los Angeles Floodplain Management Plan	2020	Digital (GIS) format
Digital Elevation Model (1/3 arc-second resolution)	USGS	2023	Digital (GIS) format
General Plan Land Use	City of Los Angeles	2015	Digital (GIS) format
Community Lifelines inventory	City of Los Angeles Emergency Management Department; LACO; U.S. Army Corps of Engineers; Los Angeles Unified School District; CA Health; Open Street Map; EPA FRS, CA Open Data Portal; CA Energy; CA EOS	2023	Digital (GIS) format

7.4 Limitations

Vulnerability assessments and hazard-specific impact evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic or economic parameter data
- The unique nature, geographic extent, and severity of each hazard
- Mitigation measures already employed
- The amount of advance notice residents have to prepare for a specific hazard event.

These factors can affect loss estimates by a factor of two or more. Therefore, potential vulnerability and loss estimates are approximate and should be used only to understand relative risk.

8. DAM FAILURE

8.1 General Background

8.1.1 Definition and Classification of Dams

A dam is an artificial barrier that can store water, wastewater, or liquid-borne materials for many reasons—flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control. Many dams fulfill a combination of these functions. They are an important resource in the United States. In California, dams are regulated by the State of California Division of Safety of Dams (DSOD). Additional regulatory oversight of dams is described in Appendix D.

The California Water Code (Division 3) defines a dam as any artificial barrier, together with appurtenant works, which does or may impound or divert water, and that either:

- Has a height of more than 6 feet and it impounds 50 acre-feet or more of water, or
- Has a height of 25 feet or higher and impounds more than 15 acre-feet of water.

Dams can be classified according to their purpose, the construction material or methods used, their slope or cross-section, the way they resist the force of the water pressure, or the means used for controlling seepage. Materials used to construct dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, plastic, rubber, and combinations of these.

8.1.2 The Dam Failure Hazard

Over time, dams decay and require maintenance to retain their level of protection. Despite efforts to provide sufficient structural integrity and to perform inspection and maintenance, problems can develop that lead to failure. The average age of dams in the United States is 53 years. Approximately 15,600 dams pose a significant hazard to life and property if failure occurs. About 2,000 unsafe dams are dispersed throughout the United States in almost every state (FEMA 2021b).

When dams fail or overtop, they can cause catastrophic impacts and lead to major flooding and impacts (Association of State Dam Safety Officials 2023). While most dams have storage volumes small enough that failures would have little or no consequences, the failure of dams with large storage amounts could cause significant flooding downstream (FEMA 2013b).

Complete failure is when internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-filled water that rushes downstream, damaging or destroying anything in its path. A catastrophic failure is characterized by the sudden, rapid, and uncontrolled release of water from a dammed impoundment. Such failure can cause massive destruction to the ecosystems and communities downstream. Throughout history, hundreds of dams have failed in the United States, causing property and environmental damage, injuries, and fatalities.

8.1.3 Causes of Dam Failure

Dam failures occur when the dam is damaged or destroyed, or when the spillway is inadequate and excess flow overtops the dam. Internal erosion, known as piping, through the dam or foundation can also lead to dam failures. According to the Association of State Dam Safety Officials, dam failures are most likely to occur as a result of one or a combination of the following (Association of State Dam Safety Officials 2021):

- Overtopping caused by floods that exceed the dam capacity (inadequate spillway capacity)
- Prolonged periods of rainfall and flooding
- Deliberate acts of sabotage (terrorism)
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate or negligent operation, maintenance, and upkeep
- Failure of upstream dams on the same waterway
- Earthquake (liquefaction/landslides).

Many dam failures in the United States have been secondary results of other disasters. The most common causes are earthquakes, landslides, extreme storms, equipment malfunction, structural damage, foundation failures, and sabotage. Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

8.1.4 Planning Requirements

State of California

All dams whose inundation areas may affect the planning area have emergency action plans (EAPs) on file. The EAPs must include the following (Cal OES 2021):

- Emergency notification flow charts
- Information on a four-step response process
- Description of agencies' roles and actions in response to an emergency incident
- Description of actions to be taken in advance of an emergency

- Inundation maps
- Additional information such as revision records and distribution lists

After the EAPs are approved by the state, the law requires dam owners to send the approved EAPs to relevant stakeholders. Local public agencies can then adopt emergency procedures that incorporate the information in the EAP in a manner that conforms to local needs and includes methods and procedures for alerting and warning the public and other response and preparedness related items (Cal OES 2021).

Federal Energy Regulatory Commission

Dams that fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC) also have specified planning requirements. FERC has the largest dam safety program in the United States. It cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans are designed to serve as an early warning system if there is a potential for, or a sudden release of water from, a dam failure or accident to the dam. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows and procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that in emergency situations everyone knows what to do, thus saving lives and minimizing property damage.

FEMA Guidance for Flood Mapping

FEMA's *Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures* is part of the National Dam Safety Program, a partnership of states, federal agencies, and other stakeholders formed to encourage individual and community responsibility for dam safety. Under this program, states are responsible for regulating non-federal dams. The guidelines provide information for federal and state agencies, local governments, dam owners, and emergency management officials to use for reducing flood hazards and the resulting potential for economic damage and loss of life. It is a resource for developing state-specific guidelines for dam safety and as a reference manual for mapping dam breach inundation zones (FEMA 2013a).

Coordination With Dam Owners and the State

Data and information within this chapter was obtained from the DSOD and the U.S. Army Corps of Engineers. The City Department of Water and Power (LADWP) is the lead agency for dams within city limits or City control, including high-hazard dams, coordinating with DSOD, the Corps of Engineers, and other dam owners.

High Hazard Potential Dam Requirements

FEMA's High Hazard Potential Dams (HHPD) Rehabilitation Grant Program provides assistance for the rehabilitation of dams that fail to meet minimum dam safety standards and pose unacceptable risk to life and property. Any dam whose failure would probably cause a loss of human life is considered an HHPD. To be eligible for HHPD grants, local governments with jurisdiction over the area of an eligible dam must have an approved local hazard mitigation plan that includes all dam risks for at least all state-regulated HHPDs.

The risk assessment in this plan considers the planning area's vulnerability to HHPDs and identifies actions to minimize the associated risks. These actions are prioritized with all other proposed mitigation actions in the plan, following the criteria described in Section 33.3.4. The agencies responsible for implementing and administering each recommended mitigation action are identified in the mitigation action plan in Section 33.2.

8.1.5 Risk Types and Hazard Ratings

Any dam has the potential to adversely affect downstream areas and lives, and many dams, should they fail, can also affect the delivery of essential utilities or flood control. The risk that a dam poses to communities can be split into the following components (FEMA 2022):

- **Non-Breach Risk**—The risk in the reservoir pool area and downstream floodplain due to normal operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or "overtopping of the dam without breaching" scenarios.
- **Incremental Risk**—The risk that can be attributed to the presence of a dam should the dam breach or undergo component malfunction or mis-operation, where the consequences are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but significant consequences in the pool area upstream of the dam can be caused by loss of the pool.
- **Residual Risk**—The risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.

The DSOD has developed a hazard potential classification system for state-jurisdiction dams, as shown on Table 8-1. This system is modified from federal guidelines, which recommend three-tier classification. The California system adds a fourth hazard classification of "extremely high." Dams classified as extremely high hazard may impact highly populated areas or critical infrastructure or have short evacuation warning times.

Table 8-1. State of California Downstream Hazard Potential Classification

Hazard Classification	Potential Downstream Impacts on Life and Property
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 can cause economic loss, environmental damage, impacts on community lifelines, or other significant impacts.
High	Expected to cause loss of at least one human life.
Extremely High	Expected to cause loss of at least one human life and one of the following: result in an inundation area with a population of 1,000 or more; or result in the inundation of facilities or infrastructure, the inundation of which poses a significant threat to public safety as determined by the department on a case-by-case basis.

Source: (DWR 2021)

8.1.6 Cascading and Compounding Impacts

Dam failure events, for both HHPD dams and other ones, are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. The shaking associated with earthquakes may weaken the structure of a dam, particularly earthen dams, and in very rare cases may cause them to fail. Landslides can directly impact a dam, causing damage or failure. Likewise, landslides of the ground around a dam may weaken the ground on which the dam exists, causing the potential for the dam structure to fail. Landslides into the water being impounded by the dam can cause a wave to travel the length of the dam's impoundment area, ultimately crashing on the dam itself. Severe weather can result in large quantities of rain upstream of the dam that will ultimately be impounded by the dam, which could raise water levels behind the dam, resulting in overtopping of the dam or flooding of properties upstream of the dam.

High-hazard potential dams are those whose failure or mis-operation could cause loss of life or significant destruction of property. Failure, partial or complete, of these dams could have catastrophic and compounding impacts in the inundation area much more significant than inundation from a non-HHPD dam:

- Economy—The cost of recovery and removal of debris; the financial impact on residents; and any livestock and property losses
- Environmental—The destruction of plants, trees, and earth; the need to remediate areas inundated by flood waters; the removal of natural debris; the secondary risk of land and mudslides following a dam failure until the earth has been sufficiently stabilized
- Infrastructure—The need to repair damage to the dam and to affected infrastructure such as buildings, critical facilities, energy generation facilities, and transportation routes
- Population—The displacement of residents and removal of victims

8.2 HAZARD PROFILE

8.2.1 Past Events

According to the 2023 California State Hazard Mitigation Plan, there have been only a small number of dam failures in the state since 1950. The failures occurred for a variety of reasons, the most common being overtopping. Other reasons include shortcomings in the dams or an inadequate assessment of surrounding geomorphologic characteristics. The sections below describe significant dam failure events directly relevant to the City of Los Angeles. Only one state or federal disaster declaration related to dam failure has applied to Los Angeles County (see Section 3.1).

St. Francis Dam, 1928

The most catastrophic dam failure in California's history was that of the St. Francis Dam in Los Angeles County in March 1928. This failure resulted in the deaths of more than 450 people and destruction of nearly 1,000 homes and buildings. Numerous roads and bridges were destroyed or damaged beyond repair. The DSOD came into existence as a direct result of this catastrophe.

Baldwin Hills Reservoir Collapse, 1963

On December 14, 1963, the dam at the head of Cloverdale Road broke in the Baldwin Hills section of Los Angeles. Lost homes, ruined property, and even death resulted from a river of rushing water from the broken dam. Automobiles, fragments of houses, and chunks of concrete were carried along the flood's path and deposited on the ruins of Village Green. Eighteen persons were rescued by helicopter and flown out to safety. The Baldwin Hills dam failure caused $5,233,203 in damage.

1971 Earthquake

In 1971, a magnitude 6.7 earthquake affected dams in the Los Angeles area as follows:

- The 142-foot-high, 2,100-foot-long Lower San Fernando Dam held a reservoir 1.6 miles long and as much as 130 feet deep and supplied 80 percent of the City's water supply. The quake shook loose a slide in the upstream slope of the Lower San Fernando Dam that lowered the crest about 30 feet and carried away much of upstream concrete facing of the dam. Resulting severe damage of the dam forced 80,000 residents to evacuate homes in an 11-square-mile area down the valley while the water behind the earthen dam was lowered over a three-day period. The damage was so heavy that the dam could not be repaired to safely hold its water supply in the event of another large earthquake. The $33 million Los Angeles Dam and Reservoir was built in 1975-76 about 3,000 feet up the valley from the old Lower San Fernando Dam, and the old dam was reconstructed to provide a holding basin for stormwater and to back up the new dam.

- Several thousand people were evacuated from homes south of Van Norman Dam in Mission Hills when Van Norman Lake reportedly sank 1 foot. A 60-foot section of the concrete dam at the lake's southern edge collapsed, and portions were reported as still crumbling during the evacuation. The dam holds back more than 6 billion gallons of water and is the largest in the City's water system.
- Cracks were reported in the Hansen Dam on Sepulveda Boulevard in Lakeview Terrace.

1994 Northridge Earthquake

Thirteen dams in the greater Los Angeles area moved or cracked during the 1994 Northridge Earthquake. The most seriously damaged was the Pacoima Dam, about 8 miles from the epicenter. However, none were severely damaged, in part due to completion of retrofitting pursuant to the 1972 State Dam Safety Act. The Los Angeles Dam showed only minor deformation and superficial cracking.

8.2.2 Location

List of High-Hazard Dams

The DSOD and the U.S. Army Corps of Engineers (USACE) both maintain databases of dams in California. The DSOD lists only dams under state regulation; the USACE National Inventory of Dams (NID) includes all dams under state or federal regulation. Based on an analysis of state and federal dam data, Table 8-2 lists the dams that have the potential to impact the City of Los Angeles should they fail. The list includes all State- or federal-regulated HHPD dams with mapped inundation areas at least partly within the Los Angeles city limits.

The following is summary information about dams that are located in Los Angeles County or owned by the City of Los Angeles:

- There are 103 regulated dams in Los Angeles County (see Figure 8-1)—91 regulated by the state and 15 federally regulated (three dams are regulated by both)
- DSOD lists 70 of the state-regulated regulated dams in Los Angeles County as high or extremely high hazard (the highest two state hazard classifications)
- The NID lists 81dams in Los Angeles County as high hazard (the highest USACE hazard classification)
- The City of Los Angeles is the listed owner of 36 dams—28 in Los Angeles County, four in Inyo County, and four in Mono County.
- Of the City-owned dams in the state, 21 are considered to be high hazard, as shown in Table 8-3.

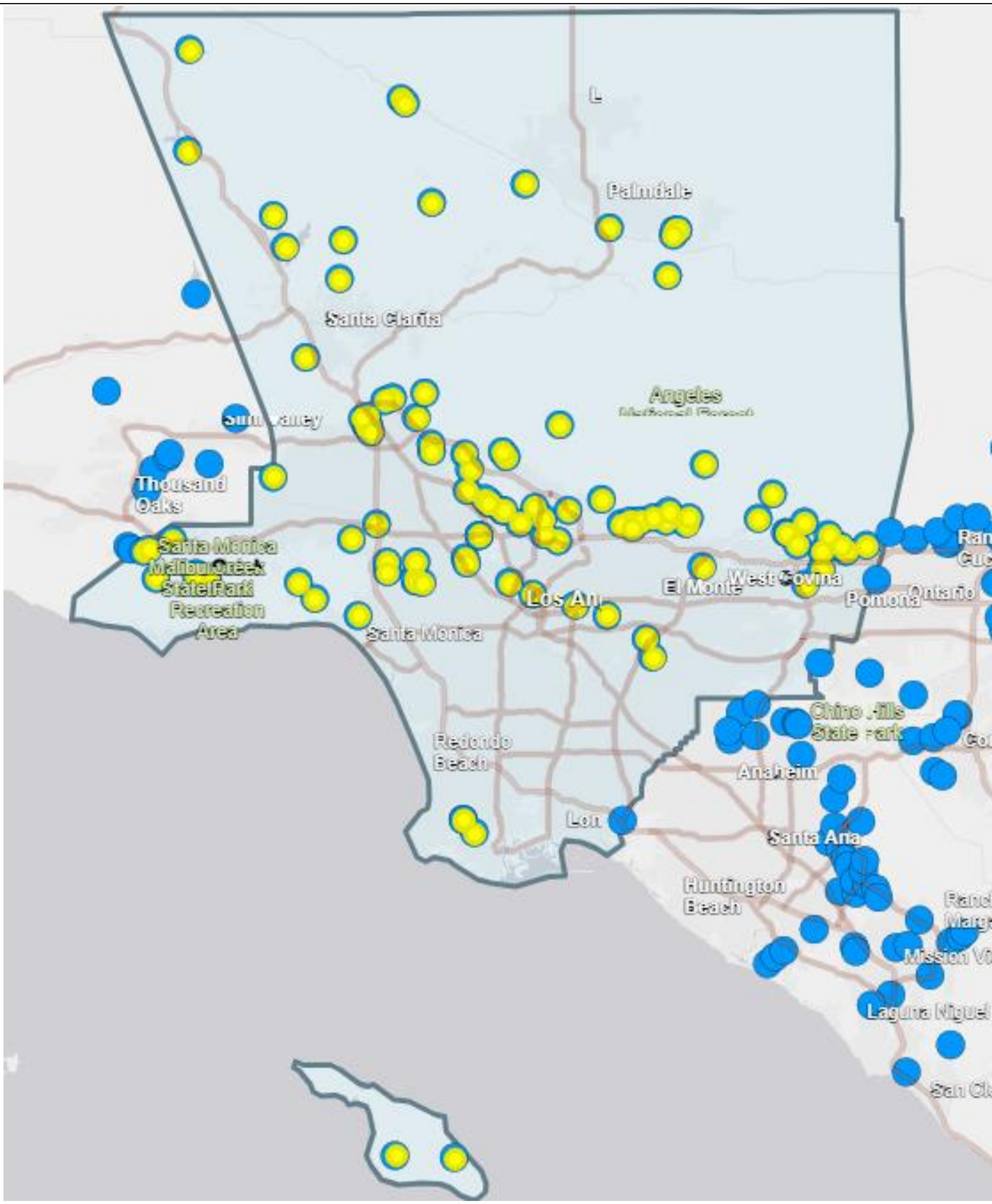
Table 8-2. State or Federally Regulated High Hazard Dams With Mapped Inundation Area Within City of Los Angeles

Dam Name	Owner Names	Regulated		Hazard Potential Classification		Condition Assessment
		State (DSOD)	Federal (USACE)	DSOD	USACE	
10 MG Walteria	City of Torrance	Yes	No	High	High	Satisfactory
18 MG Walteria	City of Torrance	Yes	No	High	High	Satisfactory
Big Tujunga No. 1	Los Angeles County Department Of Public Works	Yes	No	Extremely High	High	Satisfactory
Blanchard Debris Basin	Los Angeles County Department Of Public Works	Yes	No	High	High	Satisfactory
Brand Park	City of Glendale	Yes	No	High	High	Satisfactory
Chatsworth	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Cogswell	Los Angeles County Department Of Public Works	Yes	No	Extremely High	High	Satisfactory
Devils Gate	Los Angeles County Department Of Public Works	Yes	No	Extremely High	High	Satisfactory
Diederich Reservoir	City of Glendale	Yes	No	Extremely High	High	Satisfactory
Eagle Rock	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Elysian	City of Los Angeles Department of Water And Power	Yes	No	High	High	Satisfactory
Encino	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Glenoaks 968 Reservoir	City of Glendale	Yes	No	Extremely High	High	Satisfactory
Green Verdugo	City of Los Angeles Department of Water And Power	Yes	No	High	High	Satisfactory
Greystone Reservoir	City of Beverly Hills	Yes	No	Extremely High	High	Satisfactory
Haines Canyon Debris Dam	USACE - Los Angeles District	No	Yes	n/a	High	Not Available
Hansen Dam	USACE - Los Angeles District	No	Yes	n/a	High	Not Available
La Tuna Debris Basin	Los Angeles County Department Of Public Works	Yes	No	Extremely High	High	Satisfactory
Lopez Dam	USACE - Los Angeles District	No	Yes	n/a	High	Not Available

Dam Name	Owner Names	Regulated		Hazard Potential Classification		Condition Assessment
		State (DSOD)	Federal (USACE)	DSOD	USACE	
Los Angeles Reservoir	City of Los Angeles Department of Water And Power	Yes	No	High	High	Satisfactory
Lower Franklin	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Lower San Fernando	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Lower Sunset Debris Basin	Los Angeles County Department Of Public Works	Yes	No	High	High	Satisfactory
Morris	Los Angeles County Department Of Public Works	Yes	No	Extremely High	High	Satisfactory
Mulholland	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Pacoima	Los Angeles County Department Of Public Works	Yes	No	Extremely High	High	Satisfactory
Palos Verdes Reservoir	Metropolitan Water District Of Southern California	Yes	No	Extremely High	High	Satisfactory
Riviera Reservoir	City of Santa Monica Department Of Public Works	Yes	No	High	High	Satisfactory
San Gabriel	Los Angeles County Flood Control District	Yes	Yes	Extremely High	High	Satisfactory
Santa Ynez Canyon	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Schoolhouse Debris Basin	Los Angeles County Department Of Public Works	Yes	No	High	High	Satisfactory
Sepulveda Dam	USACE - Los Angeles District	No	Yes	n/a	High	Not Available
Silver Lake	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Stone Canyon	City of Los Angeles Department of Water And Power	Yes	No	Extremely High	High	Satisfactory
Stough Debris Basin	Los Angeles County Department Of Public Works	Yes	No	Extremely High	High	Satisfactory
Whittier Narrows Dam	USACE - Los Angeles District	No	Yes	n/a	High	Not Available
Wilson Debris Basin	Los Angeles County Department Of Public Works	Yes	No	High	High	Satisfactory

Sources: (DWR 2023a, U.S. Army Corps of Engineers 2024)

Source: (U.S. Army Corps of Engineers 2024)



Yellow = in Los Angeles County; Blue = outside county

Figure 8-1. Dam Locations Within the Planning Area

Table 8-3. High Hazard Dams Owned by the City of Los Angeles

Dam Name	Location	Hazard Potential Classification	
		NID	DSOD
Big Pine Creek	Inyo County	High	High
Bouquet Canyon	Los Angeles County	High	Extremely High
Chatsworth	Los Angeles County	High	Extremely High
Dry Canyon	Los Angeles County	High	Extremely High
Eagle Rock	Los Angeles County	High	Extremely High
Elysian	Los Angeles County	High	High
Encino	Los Angeles County	High	Extremely High
Fairmont	Los Angeles County	High	Extremely High
Grant Lake	Mono County	High	High
Green Verdugo	Los Angeles County	High	High
Haiwee	Inyo County	High	High
Long Valley	Mono County	High	High
Los Angeles Reservoir	Los Angeles County	High	High
Lower Franklin	Los Angeles County	High	Extremely High
Lower San Fernando	Los Angeles County	High	Extremely High
Mulholland	Los Angeles County	High	Extremely High
Pleasant Valley	Inyo County	High	High
Santa Ynez Canyon	Los Angeles County	High	Extremely High
Silver Lake	Los Angeles County	High	Extremely High
Stone Canyon	Los Angeles County	High	Extremely High
Tinemaha	Inyo County	High	High

Inundation Mapping

A key element of EAPs required for dams in California is a map defining the potential downstream inundation should the dam fail. The "inundation zone" is the area downstream of the dam that would be flooded in the event of a failure or uncontrolled release of water and is generally much larger than the area for the normal river or stream flood event. Downstream development increases the potential consequences of a dam's failure (FEMA 2013b).

The DSOD approves inundation maps prepared by licensed civil engineers and submitted by dam owners for extremely high, high, and significant hazard dams and their critical appurtenant structures. Inundation maps approved by DSOD provide general information for emergency planning and are used to develop emergency action plans. Evacuation zones and timing are determined by local emergency managers who are responsible for specific evacuation planning. Dam failure inundation areas throughout the City of Los Angeles are shown in Figure 8-2 through Figure 8-8.

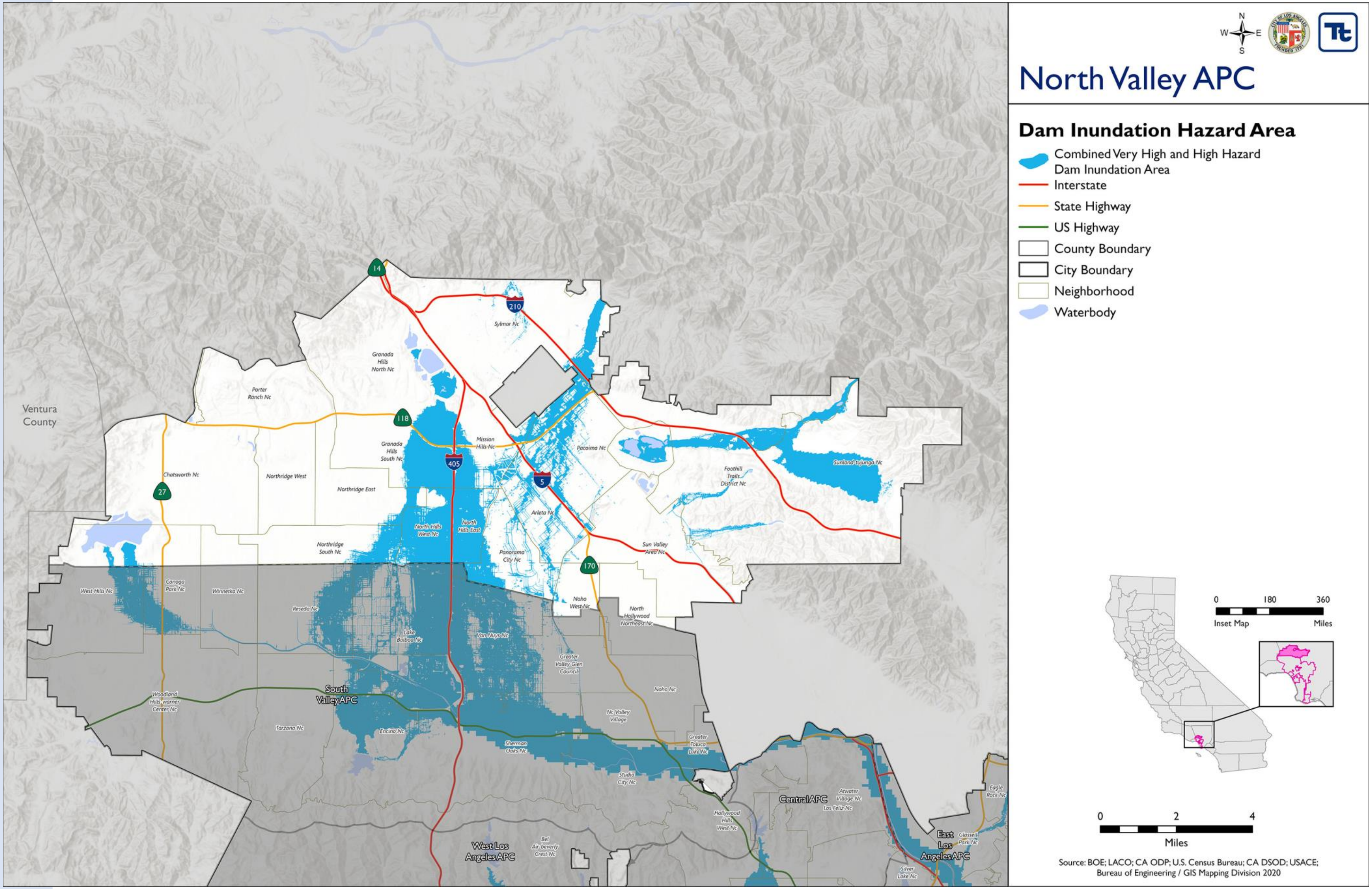


Figure 8-2. North Valley APC Combined Dam Failure Inundation Area

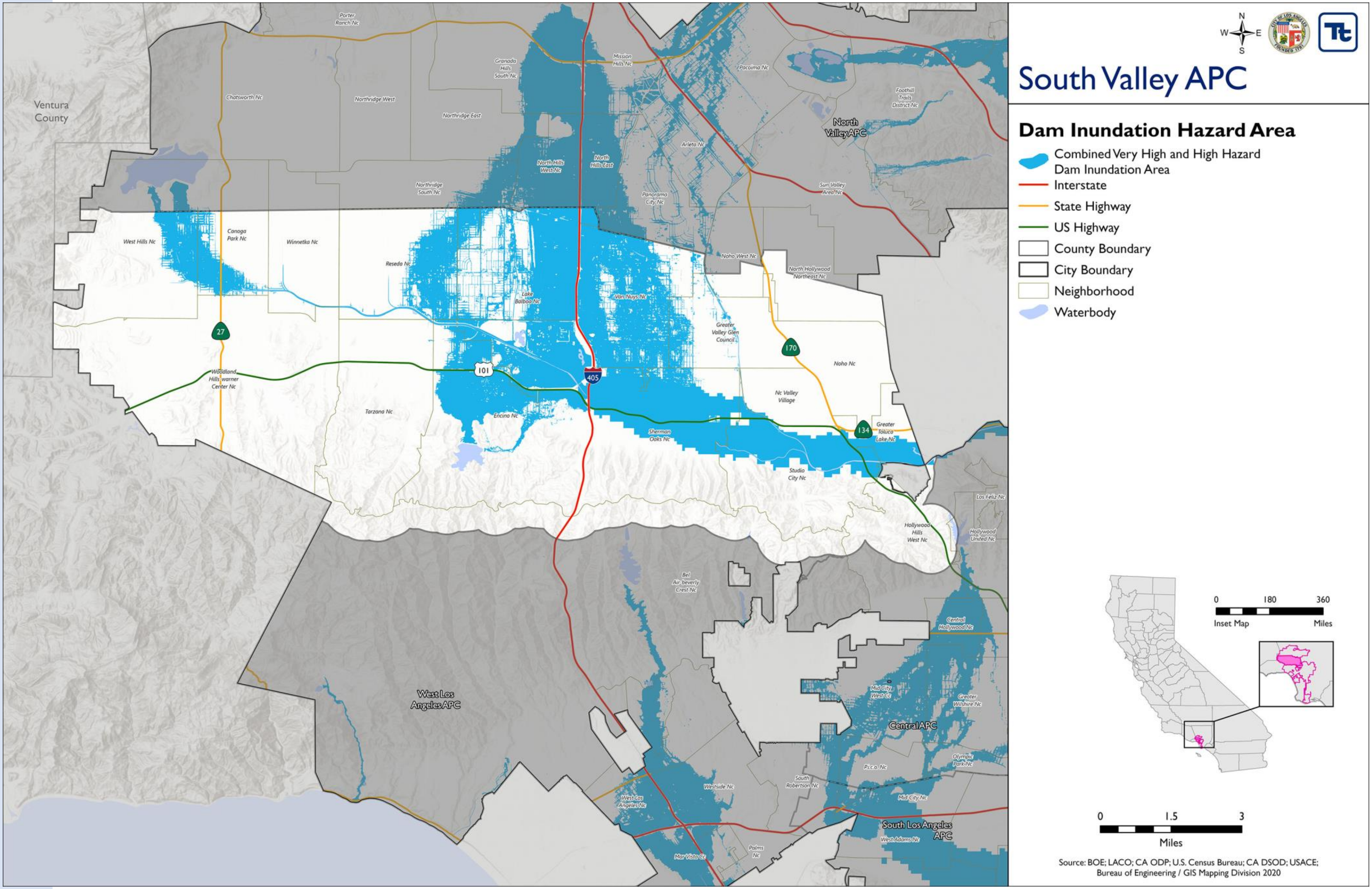


Figure 8-3. South Valley APC Combined Dam Failure Inundation Area

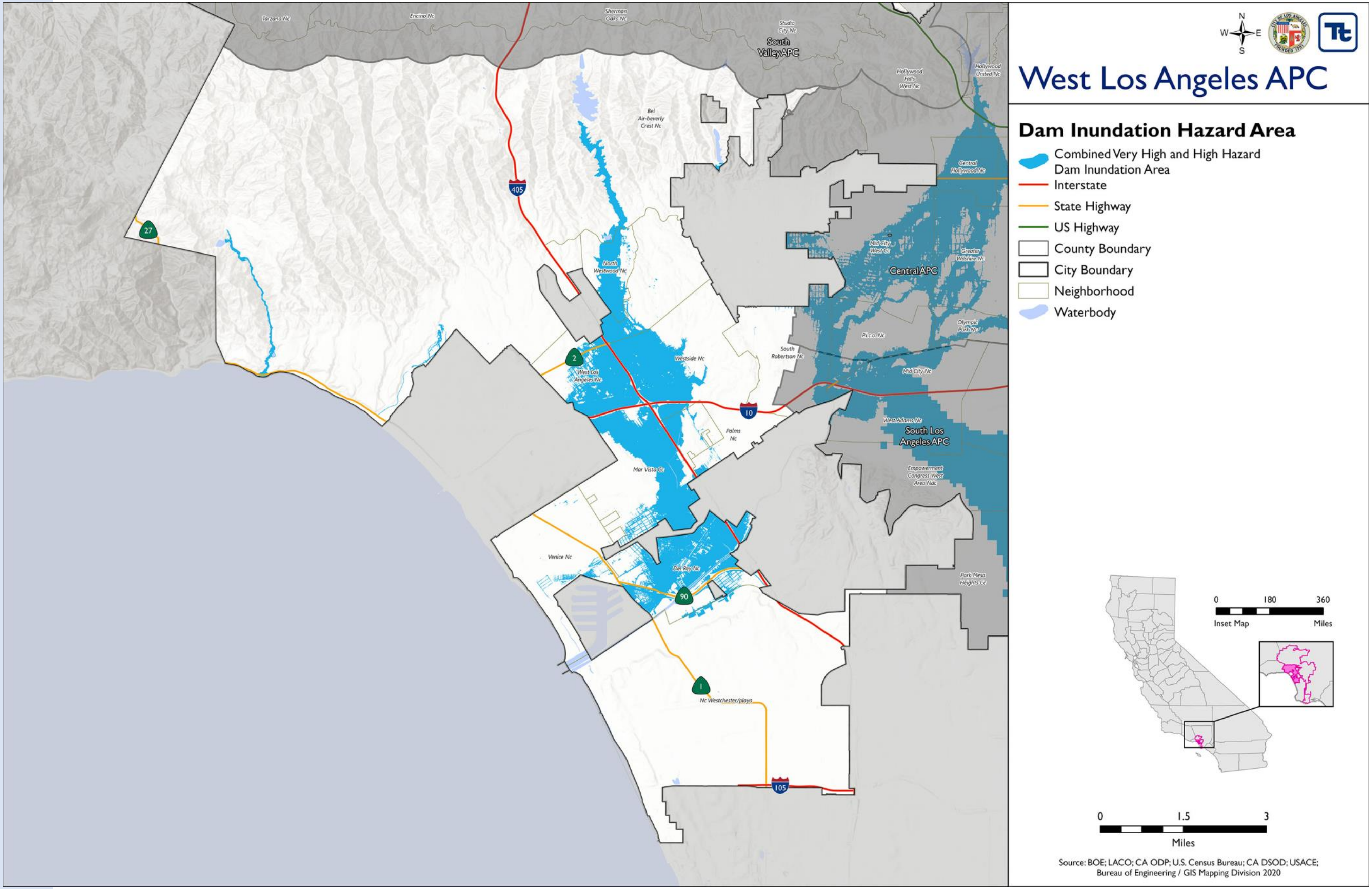


Figure 8-4. West Los Angeles APC Combined Dam Failure Inundation Area

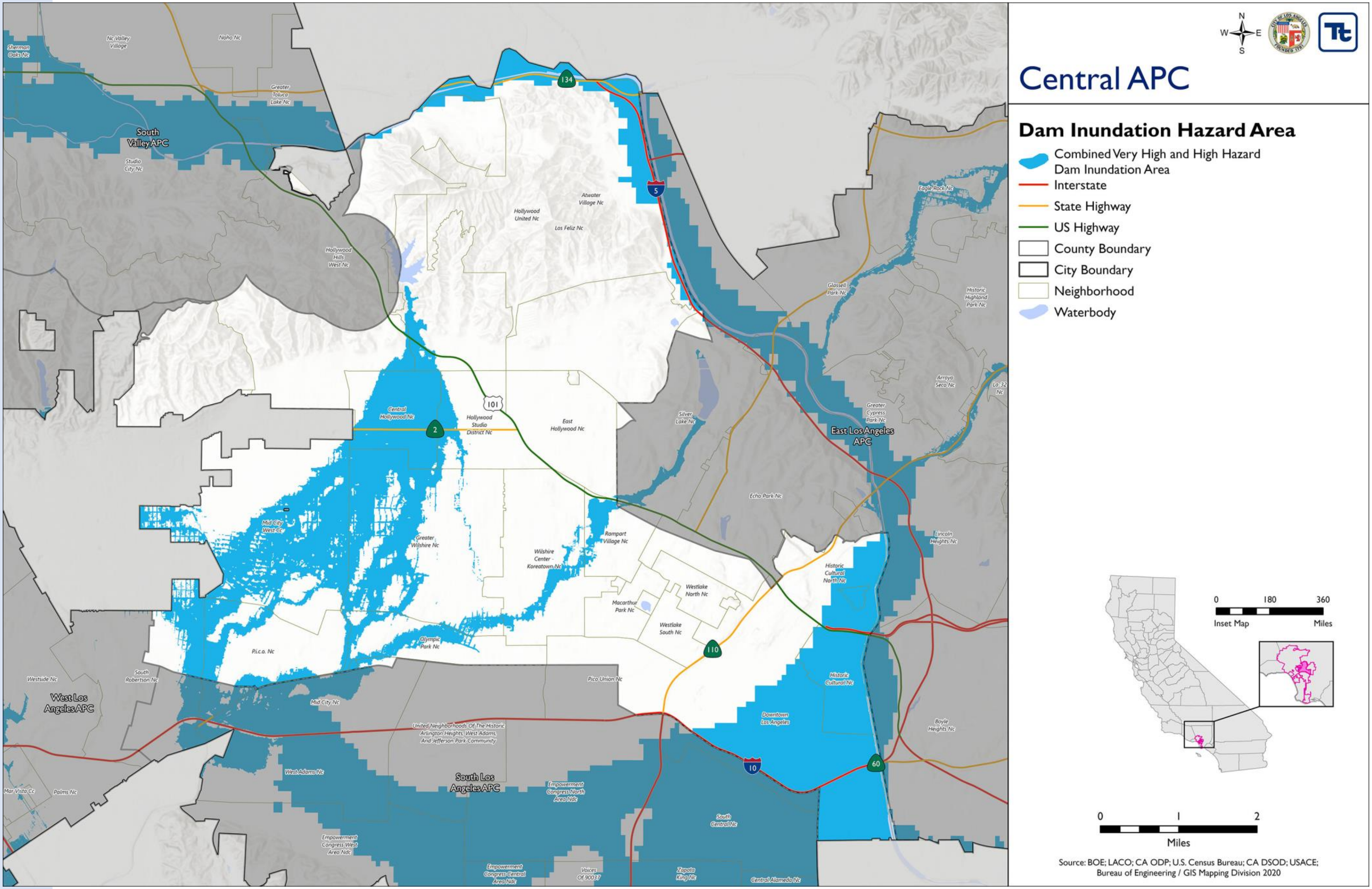


Figure 8-5. Central APC Combined Dam Failure Inundation Area

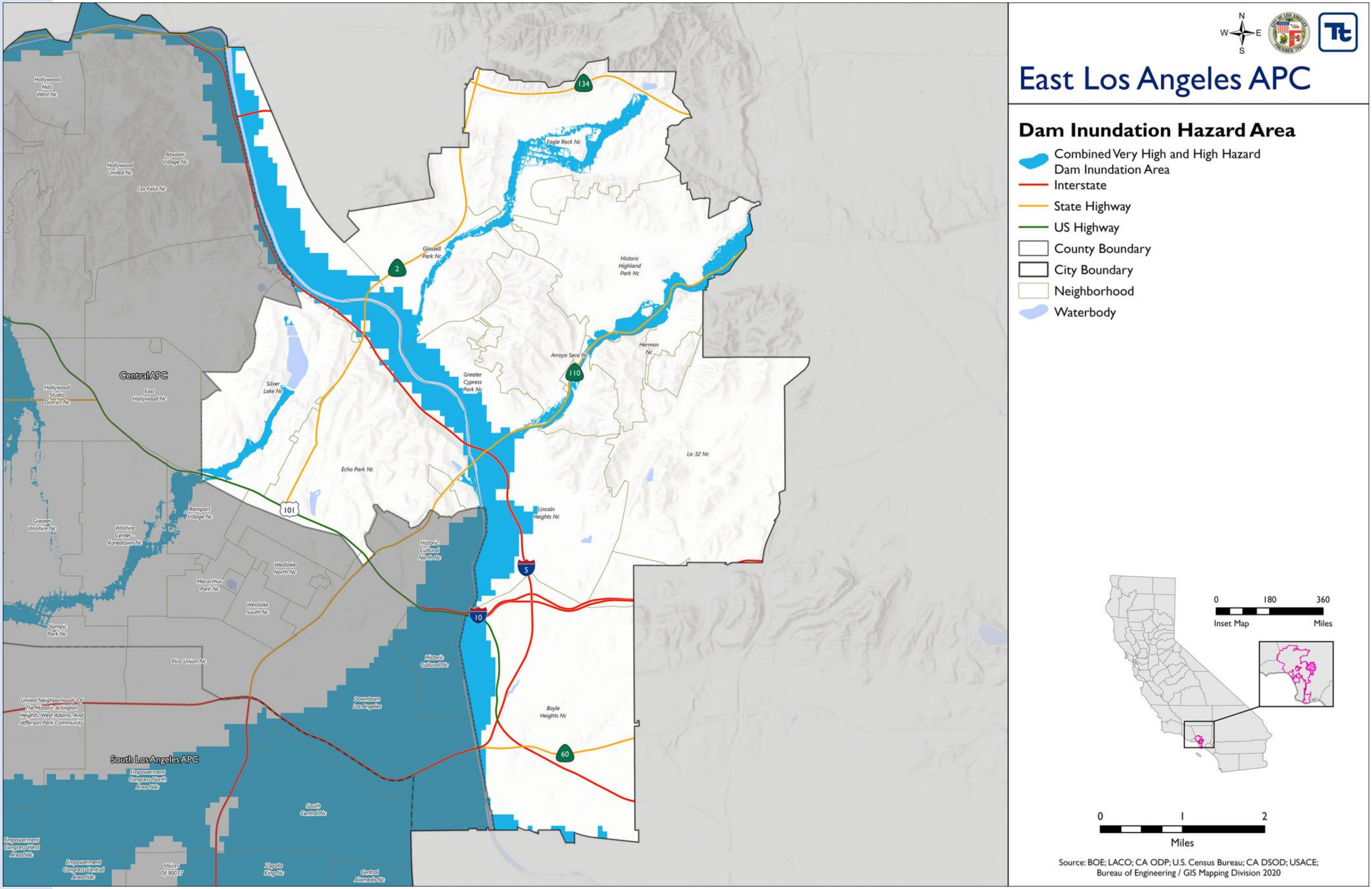


Figure 8-6. East Los Angeles APC Combined Dam Failure Inundation Area

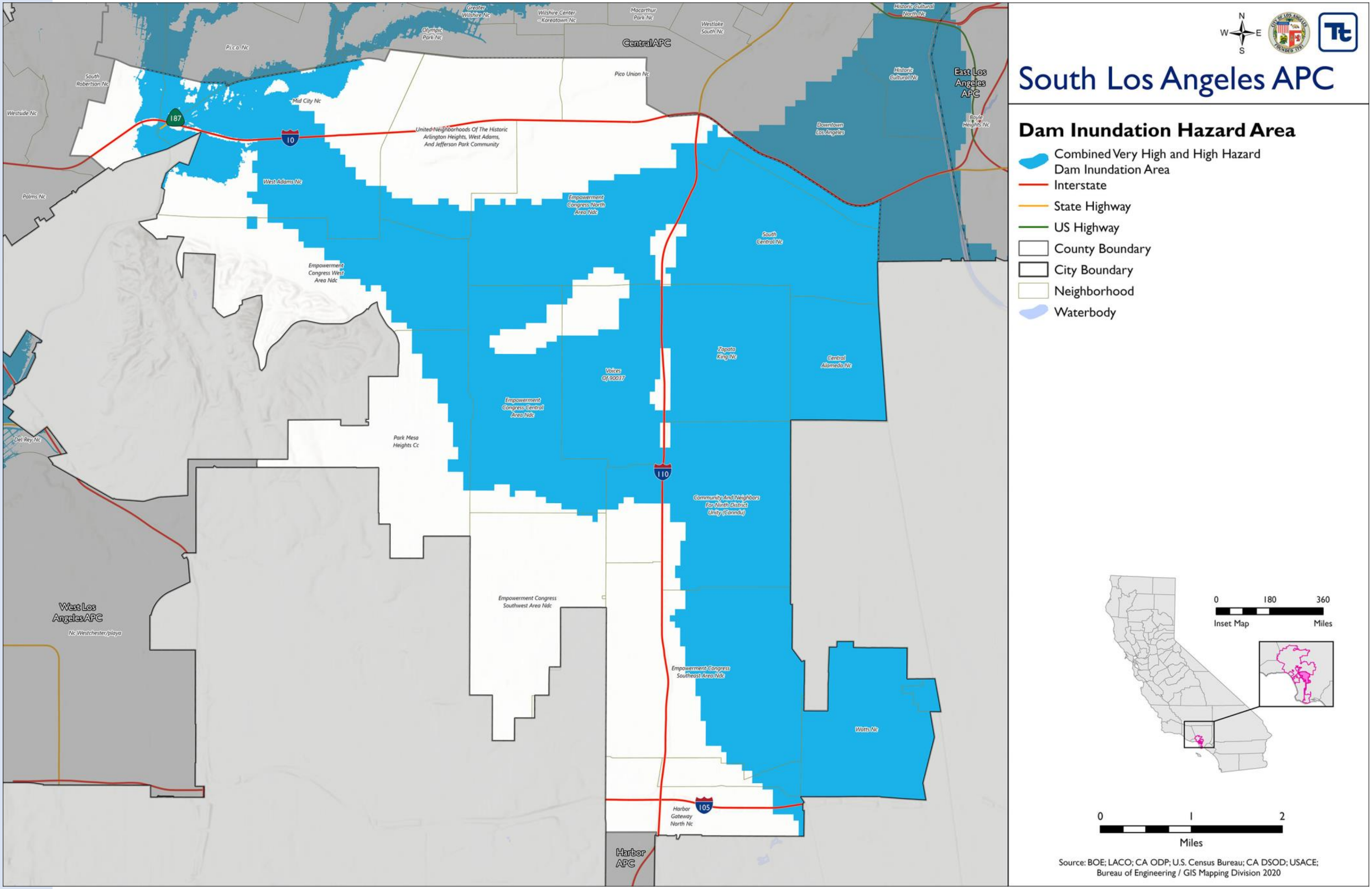


Figure 8-7. South Los Angeles APC Combined Dam Failure Inundation Area

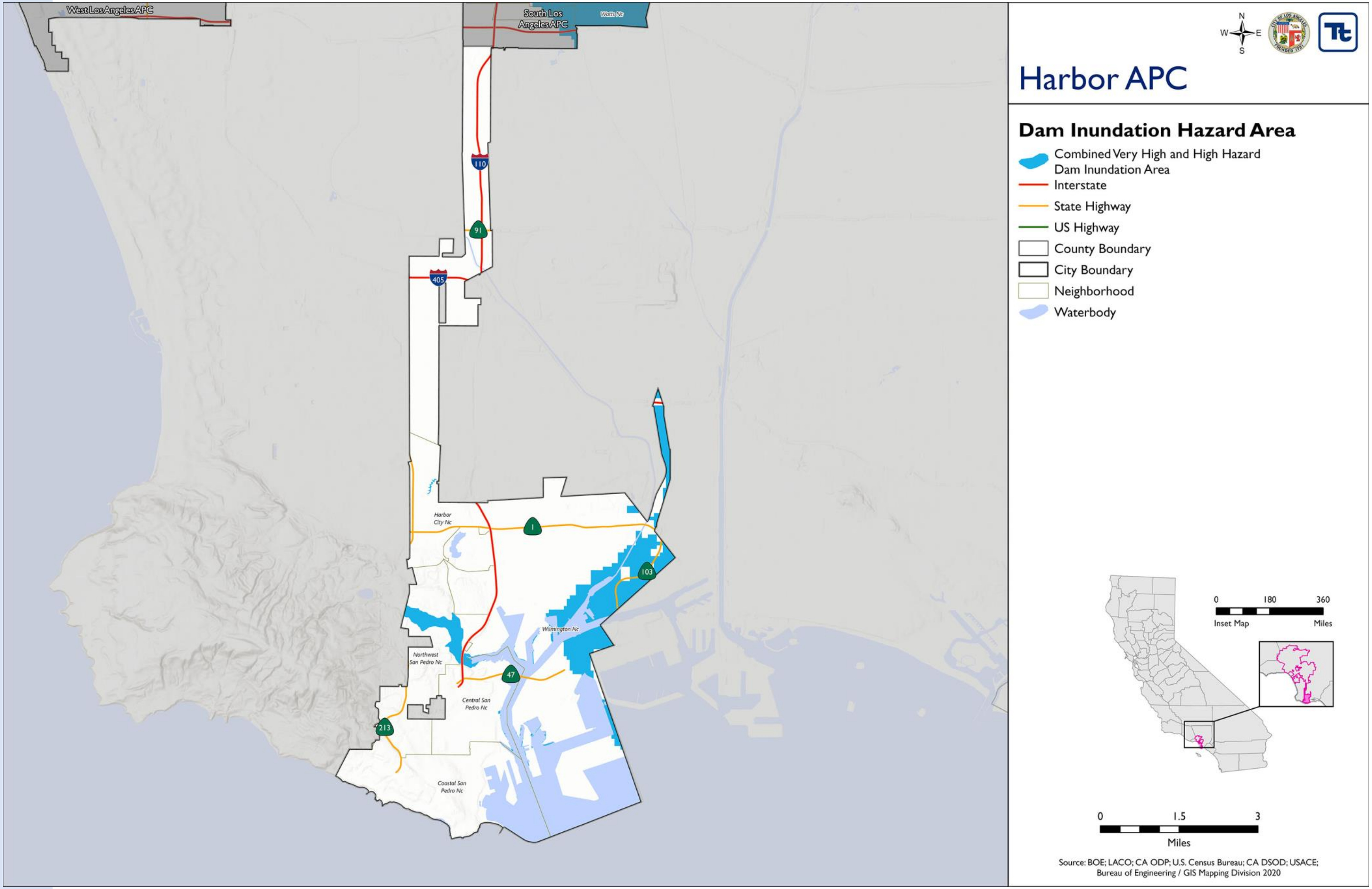


Figure 8-8. Harbor APC Combined Dam Failure Inundation Area

Inundation Area Used for Risk Assessment

Digital data indicating worst-case inundation areas for dams that affect the planning area was used for the dam failure risk assessment for this hazard mitigation plan. Dam failure inundation areas for which inundation mapping was available were combined into a single inundation area. The combined dam failure inundation area includes the dams listed in Table 8-2.

For the Palos Verdes Reservoir dam and the Blanchard, Stough, and Wilson Debris Basin dams, there are two depth grid scenarios. The two scenarios for each of these dam failure inundation areas are shown in Figure 8-9 through Figure 8-12. The inundation area for Palos Verdes Reservoir dam was not included in the Hazus analysis to determine impacts, but it was included in the combined dam failure inundation layer for assessing location of assets within the hazard area.

8.2.3 Frequency

Assessment Based on Past Events

Large-scale dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes landslides, flooding, and excessive rainfall. A Stanford University study found an average of about 10 dam failures per year nationwide over a period of record from 1848 through 2017 (Stanford University 2018).

Minor dam failures can occur frequently across the country; however, they often have minimal impact and cause little or no harm to the general population. Given certain circumstances, a dam failure can occur at any time. However, the probability of future occurrence can be reduced through proper design, construction, and maintenance measures. Without proper maintenance, the age of a dam can increase the potential for failures. Further documentation of dams and their failures will, over time, provide more information on this hazard.

Residual Risk

All dams face a "residual risk" of failure, which represents the risk that conditions may exceed those for which the dam was designed. For example, dams may be designed to withstand a probable maximum precipitation, defined as "the maximum depth of precipitation at a location for a given duration that is meteorologically possible" (Sarkar and Maity 2020). The chance of a precipitation event of a greater magnitude than that represents residual risk for such dams. This represents a theoretical probability of future occurrence for a dam failure event, though the probability of an event exceeding the assumed maximum is not generally calculated as part of dam design.

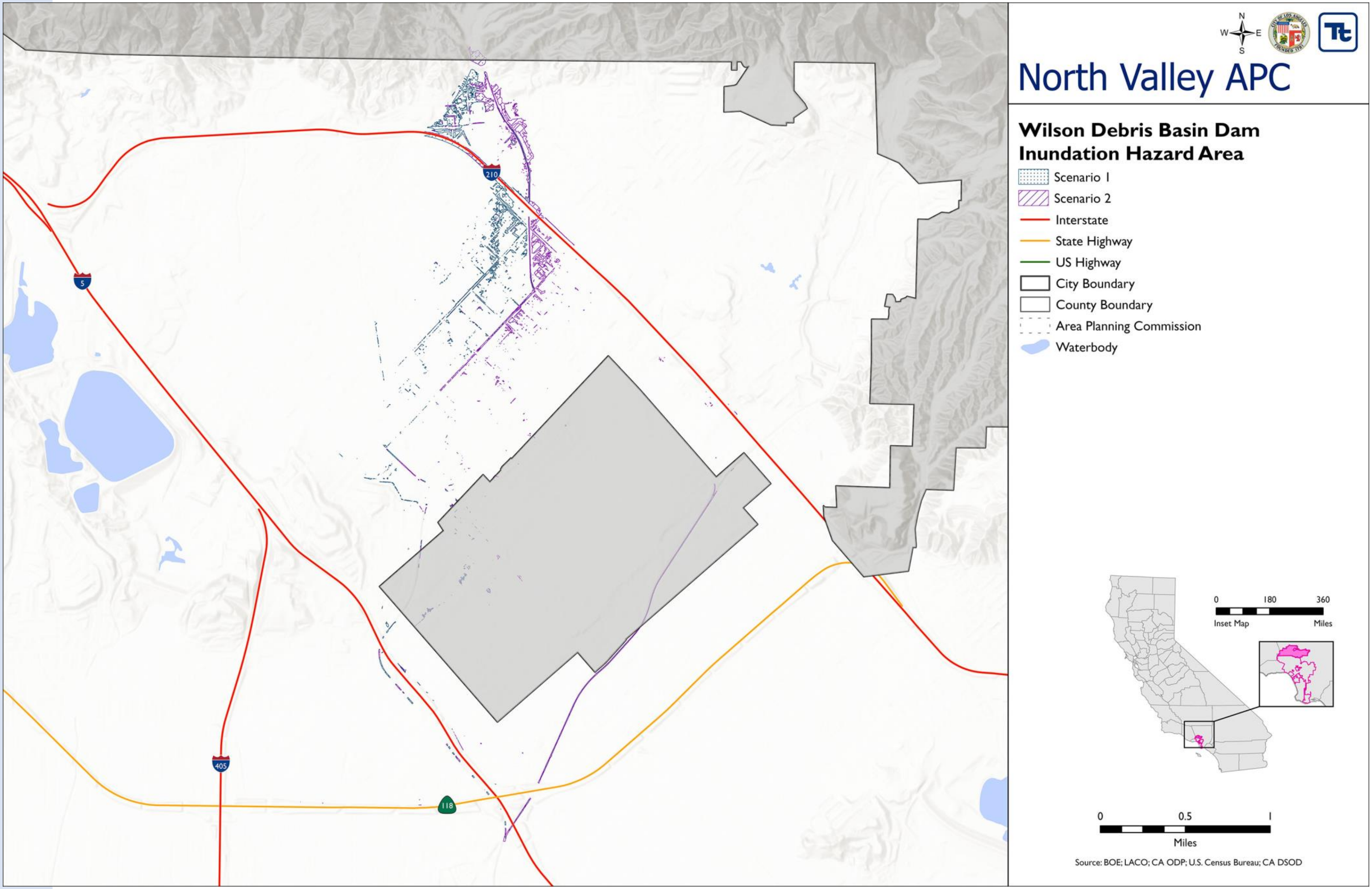


Figure 8-9. Wilson Debris Basin Dam Failure Inundation Area

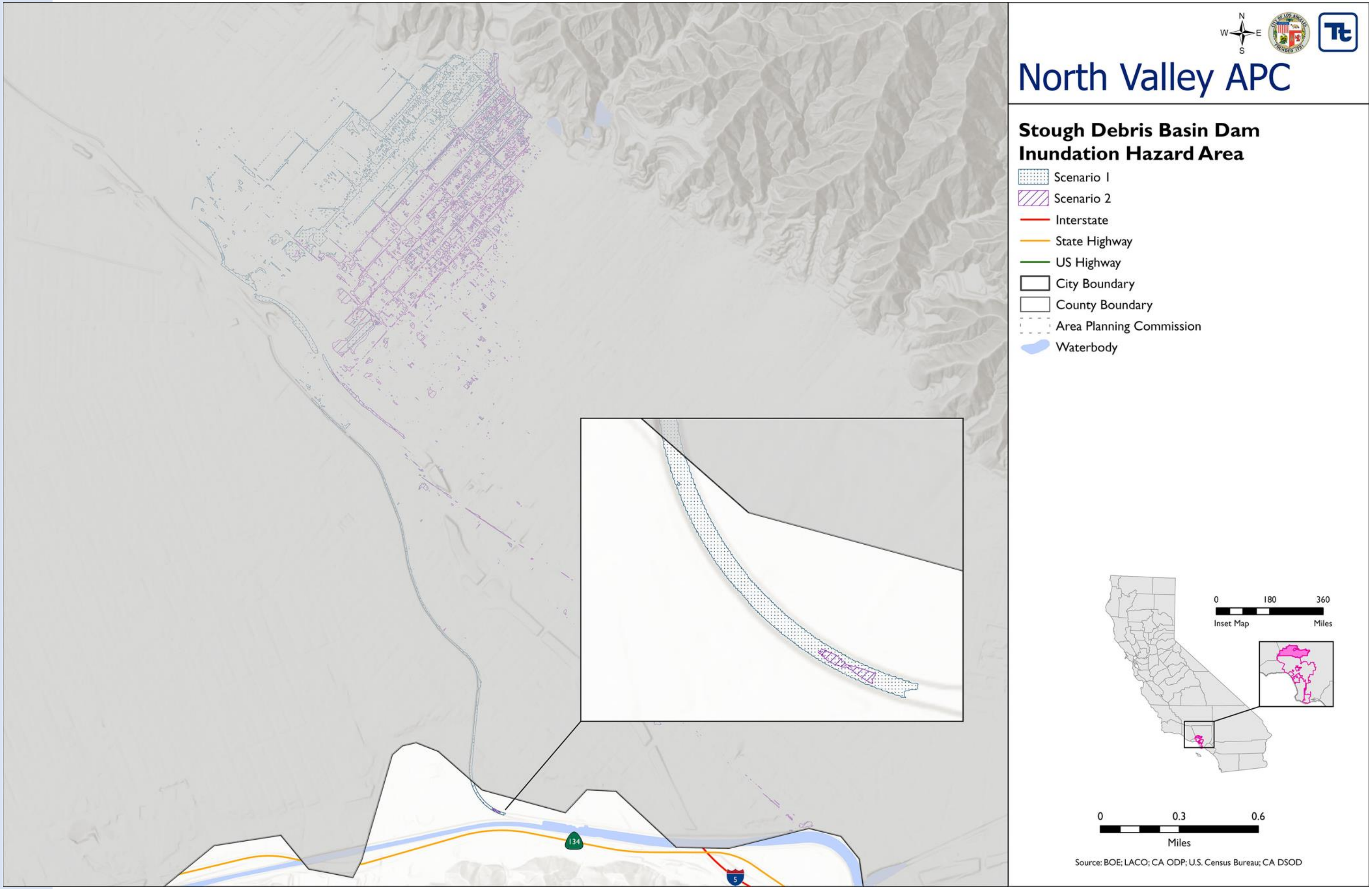


Figure 8-10. Stough Debris Basin Dam Failure Inundation Area

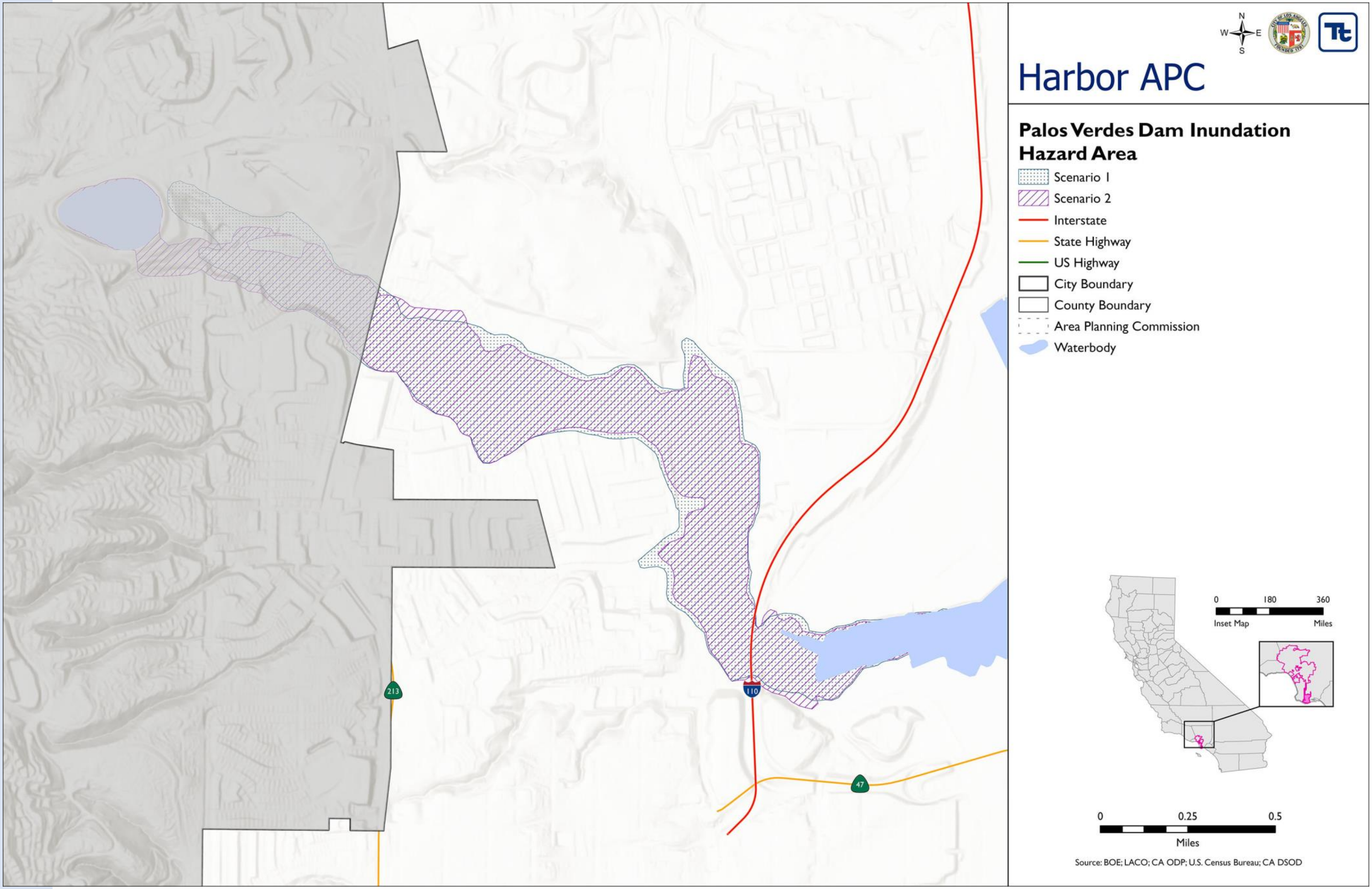


Figure 8-11. Palos Verdes Dam Failure Inundation Area

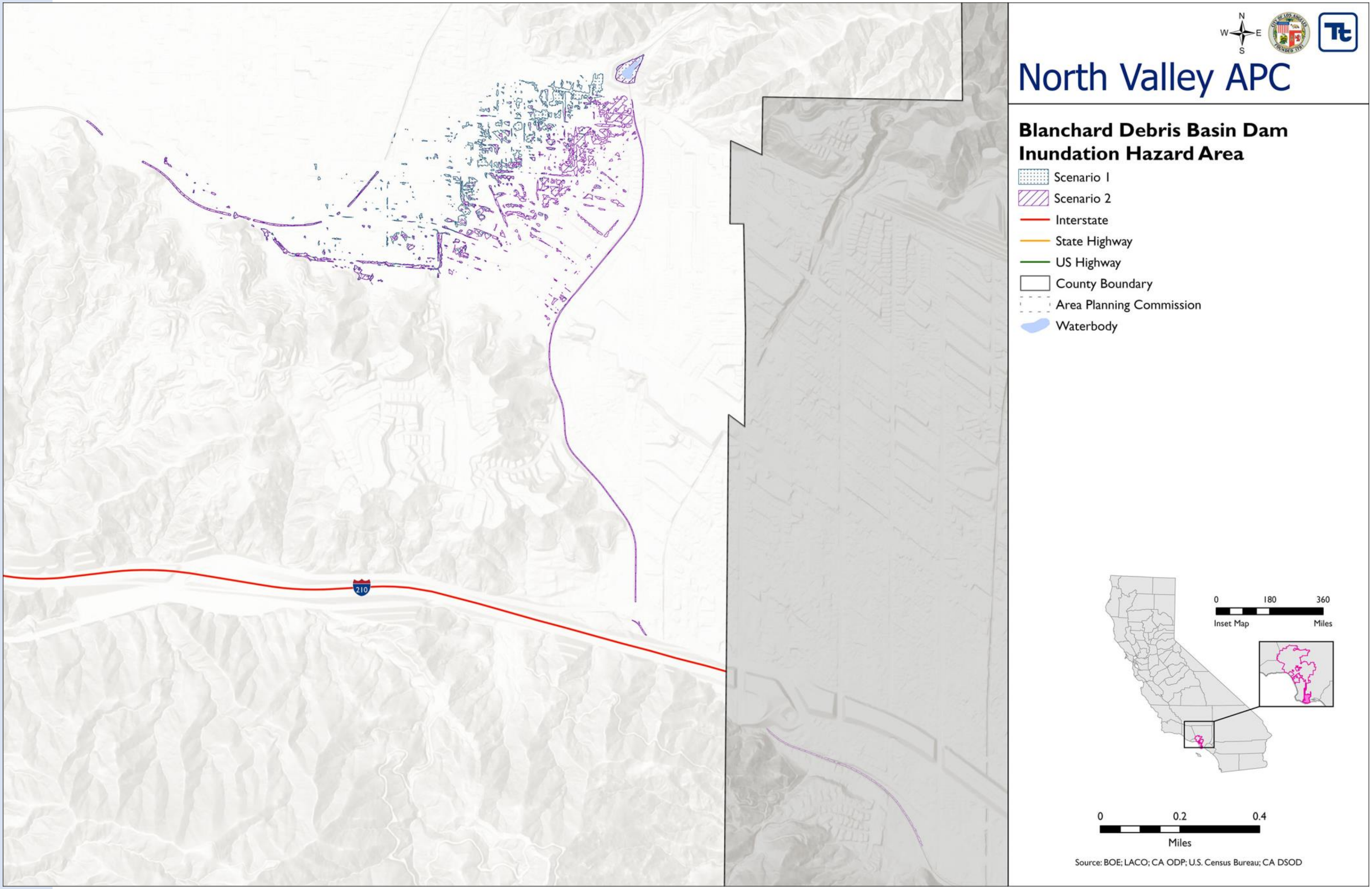


Figure 8-12. Blanchard Debris Basin Dam Failure Inundation Area

Potential Effect of Future Conditions on Hazard Probability

Dams are designed based on assumptions about a river's flow behavior, which is expressed as a hydrograph. With changing weather patterns, a river's hydrograph may no longer match what the dam was designed to accommodate.

Dams incorporate a safety feature known as a spillway that allows for controlled overflow when the reservoir reaches a set level. This ensures that the level of the dam's reservoir does not come within a designed margin of safety (known as freeboard) from the top of the dam. Such spillway overflow events, referred to as design failures, result in increased flooding potential downstream. If changing hydrographs change how quickly the reservoir level rises during a storm, then dam operators may be forced to release increased volumes over the spillway earlier in the storm cycle to maintain the required freeboard.

Although it is unclear how climate change may affect the probability of catastrophic dam failure, a changing hydrograph is likely to change the probability of these design failures. The DSOD has indicated that climate change may result in the need for increased safety precautions to address higher winter runoff, frequent fluctuations of water levels, and increased potential for sedimentation and debris accumulation from changing erosion patterns and increases in wildfires. According to the DSOD, climate change also will affect the ability of dam operators to predict extreme flood events (DWR 2022b).

8.2.4 Severity

The Stanford University study of dam failures nationwide found that many failures were of small dams, with limited flooding or downstream effect. More than 96 percent of the failures did not result in life-safety consequences or significant property damage (Stanford University 2018). However, dam failure can be catastrophic to all life and property downstream. If a dam failure is severe, a large amount of water will enter the downstream body of water and overflow the stream banks for miles. Flooding is the most common effect of dam failure. Communities downstream are at the greatest risk for dam failure.

California's dam hazard ratings, as described in Table 8-1, describe the potential consequences of dam failure. For the dams assessed in this plan, with hazard ratings of extremely high, complete failure is expected to cause loss of at least one human life and inundate an area with a population of 1,000 or more or community lifelines whose inundation poses a significant threat to public safety.

8.2.5 Warning Time

The potential for personal injury or loss of life in the event of a dam failure is affected by the amount of warning time and the capacity of evacuation routes available to those living in inundation areas. Warning time depends on the cause of the failure. Seepages in earthen dams usually develop gradually, and if detected early, downstream residents have anywhere from a few hours to a few days to evacuate. In case of extreme precipitation, evacuations can be implemented with sufficient time. Overtopping of a dam normally gives enough time for evacuation. In the event of a structural failure due to earthquake, there may be no warning time.

A dam’s structural type affects warning time. Earthen dams do not tend to fail completely or instantaneously. Once a breach is initiated, discharging water erodes the breach until the reservoir is empty or the erosion stops. Concrete dams also tend to begin with a partial breach. The time of breach formation ranges from a few minutes to a few hours (U.S. Army Corps of Engineers 2014).

The USGS Earthquake Hazards Program has several dam-safety related earthquake programs, including dam-specific earthquake monitoring programs in California to help monitor safety concerns following seismic events.

8.2.6 Scenario

An earthquake in the region could lead to liquefaction of soils around a dam. This could occur without warning during any time of the day. Human activity such as a terrorist attack also could trigger a catastrophic failure of a dam that impacts the planning area.

8.2.7 Data Limitations

The data on high-hazard dams available for this risk assessment are generally suitable for the analyses required. Future opportunities for acquiring better data should consider the following (U.S. Army Corps of Engineers 2024):

- Of the dams used to establish a combined dam failure inundation area, all have had data updates in the NID as of December 2023. Future assessments should check for any more current information that may become available.
- Two of the dams used to establish a combined dam failure inundation area do not currently have EAPs. Of the dams that do have EAPs, the oldest was last updated in February 2018. Future HMP updates should check for any new or updated EAPs for dams used in risk assessment.
- Condition assessment information is not available for five of the dams used to establish a combined dam failure inundation area. Of the others, one condition assessment was performed in 2023 and the rest were performed in 2017. Any more current assessment information should be included in future risk assessments.

8.3 VULNERABILITY

The risk assessment for this hazard profile provides information on the areas, people, buildings, critical facilities, and other resources at risk from dam failures in the City of Los Angeles. Summary findings of the risk assessment for dam failure, showing vulnerability results for the entire planning area, are provided in the sections below. A breakdown by APC is provided in Appendix E.

8.3.1 Population and Property

Table 8-4 summarizes the estimated population, land area, and buildings located in the combined dam failure inundation area used for this assessment. Within the City of Los Angeles, the South Los Angeles APC has the highest number of individuals (460,366) exposed to dam failure; this accounts for 60.4 percent of the total population within the APC.

Table 8-4. Population and Property in the High and Very High Combined Dan Inundation Hazard Area

Total Population	
Population in the Hazard Area	1,068,526
% of Total Planning Area Population	27.6%
Socially Vulnerable Population (see Section 4.4.2)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	208,309
% of Total Planning Area Population	5.4%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	380,064
% of Total Planning Area Population	9.8%
Property	
Number of Buildings in the Hazard Area	210,812
Total Property Value in the Hazard Area	$247,725,408,602
Total Value in the Hazard Area as % of Planning Area Total Value	31.7%

The distribution of structures located within the combined dam failure inundation zone by occupancy class is shown in Figure 8-13.

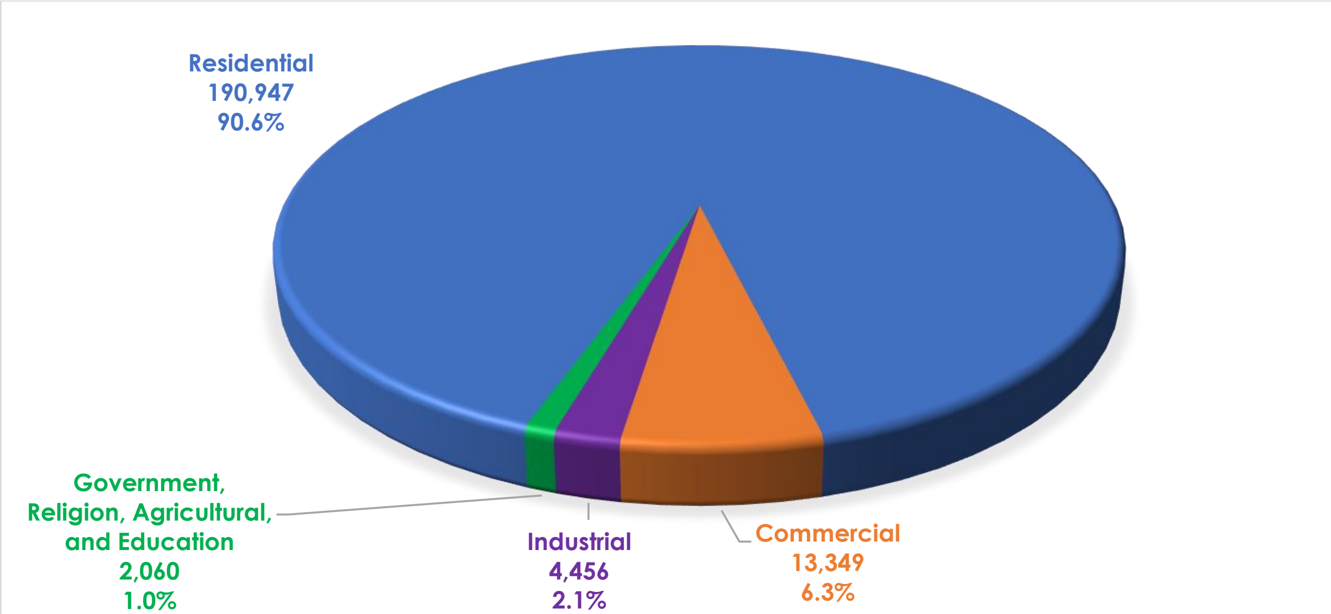


Figure 8-13. Structures in Dam Failure Inundation Zone by Occupancy Class

8.3.2 Community Lifelines

The total count of community lifelines in the dam failure inundation zone (2,093) represents 31.8 percent of the planning area total of 6,574. Figure 8-14 summarizes community lifelines located in the dam failure inundation zone by category.

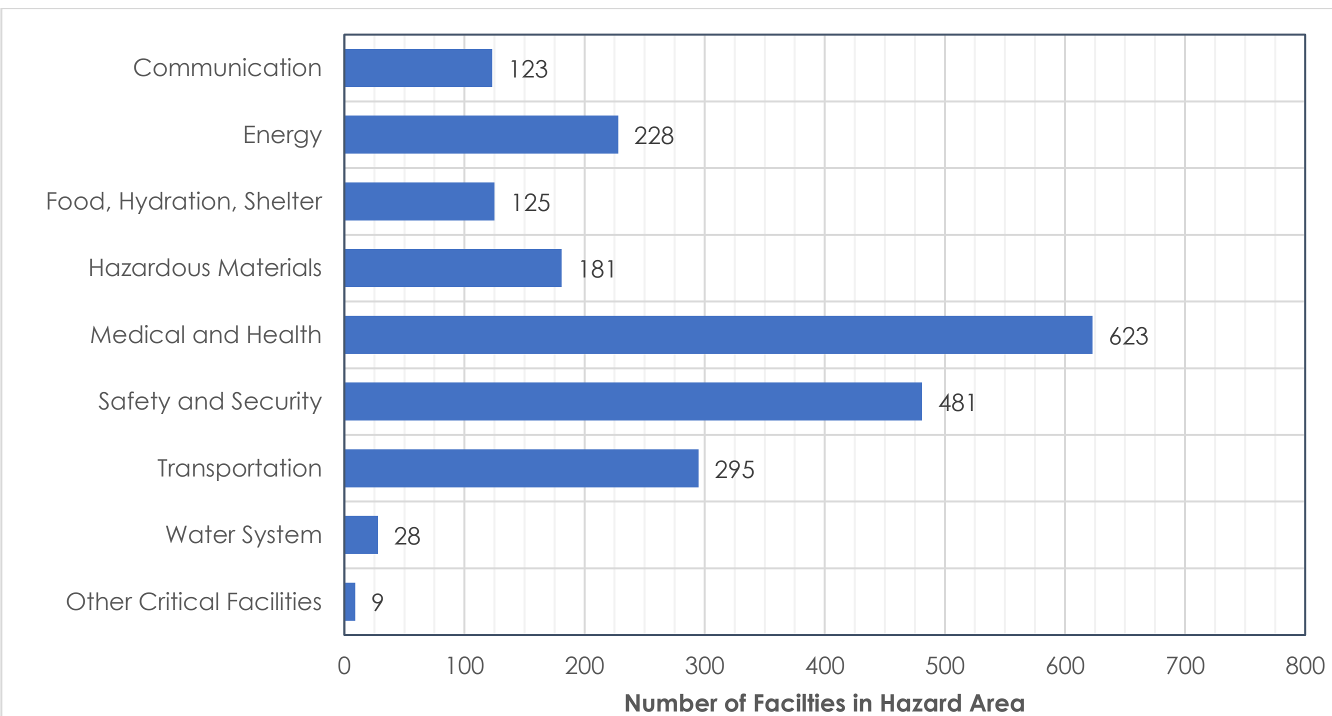


Figure 8-14. Community Lifelines in Dam Failure Inundation Zones

8.3.3 Environment

Dam failures can cause downstream flooding and can transport large volumes of sediment and debris. Other examples of environmental impacts include pollution from septic system failures, pollution of potable water supplies, changes in configurations of streams, loss of wildlife habitats, and degradation of wetlands (FEMA 2012).

8.3.4 Historic and Cultural Resources

Depending on severity, dam failure events affecting the City of Los Angeles could bring devastating loss of life, property damage, and business disruption to the area in and around historical and cultural landmarks. All historic and cultural landmarks within the City are considered vulnerable to the effects of a dam failure event.

8.4 IMPACTS

Summary findings of the risk assessment for dam failure, showing estimated impacts for the entire planning area, are provided below. A breakdown by APC is provided in Appendix E.

Potential impacts in the dam failure inundation areas are dependent on population density, critical infrastructure, and mitigation actions and plans implemented within these areas. Populations without adequate warning of the event are highly vulnerable to this hazard. Evacuation plans are important to protect the population of these communities. Additionally, maintenance and enhancement of infrastructure is important to reduce the risk of downstream flooding and impact on structures within the affected communities.

8.4.1 Population

Impacts on all vulnerable persons and households were estimated through Hazus as follows:

- Number of Displaced Residents: 1,312,711
- Number of Residents Requiring Short-Term Shelter: 118,699

People downstream from dam failures who are incapable of escaping the area quickly are most likely to experience impacts. This population includes older adults and young people who may be unable to get themselves out of the inundation area. The socially vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system, and households without personal modes of transportation.

8.4.2 Property

Dam failure can result in significant damage to structures in the dam failure inundation area, due to the flooding associated with failures. In some cases, intense flooding may require restorative measures. Table 8-5 lists estimated impacts to buildings due to dam failure. The estimated amounts of debris that would be generated are listed in Table 8-6.

Table 8-5. Estimated Impacts of Dam Failure to Buildings

Estimated Loss	
Residential	$13,988,225,450
Commercial	$28,970,180,570
Other	$12,568,259,743
Total	$55,526,665,763
% of Total Planning Area Replacement Cost Value (RCV)	**7.1%**

Table 8-6. Estimated Debris Created by Dam Failure

Finish Debris (tons)	892,185.4
Structure Debris (tons)	439,944.0
Foundation Debris (tons)	383,569.5
Total Debris (tons)	**1,715,698.9**

Finish debris = carpeting, drywall, etc. Foundation debris = basement, crawlspace, pier, pile, etc.
Structure debris = framing, roof, etc.

8.4.3 Community Lifelines

Transportation routes have the potential to be destroyed by inundation from dam failure, trapping evacuees in the dam failure inundation zone. This includes all roads, railroads, and bridges in the path of the dam failure inundation. Bridges in need of repair may be unable to withstand the water surge. Critical electrical, communications, gas, and water infrastructure also could be damaged.

8.4.4 Environment

The environment would face a number of risks in the event of dam failure. The inundation could introduce foreign elements into local waterways, resulting in destruction of downstream habitat and detrimental effects on many species of animals, especially endangered species such as the Santa Ana sucker and arroyo chub.

Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals may be added to flood waters. Hazardous materials may be released and distributed widely across the floodplain. Water supply and wastewater treatment facilities could be offline for weeks. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties.

8.4.5 Historic and Cultural Resources

The historic and cultural resources within the City face significant risk in the event of a dam failure event. The impacts of dam failure carry the potential to severely damage or entirely destroy these precious City resources. The monitoring and management of restoration activities have been an ongoing effort led by the City to mitigate impacts from hazard events such as dam failure (Los Angeles City Planning 2023a).

8.4.6 Economy

Severe flooding that follows a dam failure can cause extensive structural damage and withhold essential services. The cost to recover from flood damage after a dam failure will vary depending on the hazard risk of each dam.

8.5 Effects of Future Change on Vulnerability and Impacts

8.5.1 Future Development

Dam failures are low-probability, high-consequence events. Because of this, it is not typically practical for local governments to regulate new development in dam failure inundation areas. Land use will be directed by the City of Los Angeles General Plan and zoning ordinance adopted under state law. The Safety Element of the General Plan establishes standards and plans for the protection of the community from hazards. Dam failure is currently not addressed as a stand-alone hazard in the Safety Element, but flooding is. The City of Los Angeles has established comprehensive policies regarding sound land use in identified flood hazard areas. Most of the areas vulnerable to the more severe impacts from dam failure intersect the mapped flood hazard areas. Flood-related policies in the General Plan will help to reduce the risk associated with the dam failure hazard for all future development in the City. Any new development outside of a flood hazard area will most likely not include provisions that would mitigate the impacts from a dam failure.

8.5.2 Climate Change

The probability of flooding associated with changes in dam operational parameters in response to extreme rainfall events will be higher with a changing climate. Dam designs and operations are based on hydrographs from historical records. If these hydrographs change significantly over time due to effects of climate change, current dam designs and operations may become overwhelmed. Specified release rates and impound thresholds may have to be changed, which could result in increased discharges downstream of these facilities, thus increasing the probability and severity of inundation.

Population

Population vulnerability and impacts associated with the dam failure hazard may change as a result of climate change. The projected increase in precipitation and occurrence of severe weather raises the risk of dam failure occurrence, as dams could overtop from high water levels and/or clogs caused by debris. Any increase in risk associated with the dam failure hazard increases the vulnerability of populations near the dam, particularly those in the dam inundation area.

Property

Property vulnerability and impacts associated with the dam failure hazard may change as a result of climate change. The anticipated increase in precipitation and occurrence of severe weather increases the risk of dam failure occurrence, as dams could overtop from high water levels and/or clogs caused by debris. Any increase in risk associated with the dam failure hazard increases the vulnerability of property near the dam, particularly those in the dam inundation area.

Community Lifelines

Community lifeline vulnerability and impacts associated with the dam failure hazard are likely to change as a result of climate change. Dam owners and operators are sensitive to the risk and may need to alter maintenance and operations to account for changes in the hydrograph and increased sedimentation. The anticipated increase in precipitation and occurrence of severe weather may cause dams to more frequently experience overtopping from high water levels and/or clogs caused by debris.

Environment

Environmental vulnerability and impacts associated with the dam failure hazard may change as a result of climate change. Ecosystem services may be used to mitigate some factors that could increase the risk of design failures, such as increasing the natural water storage capacity in watersheds above dams.

8.5.3 Ongoing Practices

Minimizing risks associated with dam failure requires ongoing practices to ensure the safety of the dams themselves as well as the communities that surround them. Table 8-7 lists potential deficiencies in operational practices that could affect dam safety, along with appropriate remediations to address any such deficiencies should they arise.

Table 8-7. Potential Deficiencies in Dam Safety Practices and Appropriate Remediation

Deficiency	Remediation
Failure to maintain regular inspection schedules	Create regular inspection schedule as directed by codes and regulations
Failure or delay in making repairs or upgrading a deficiency	If repair or upgrade is warranted, ensure timely schedule and follow up to make sure it has been completed
Failure to use state of the art inspection equipment	Use proper inspection and testing equipment as directed by codes and regulations
Failure to maintain accurate records and documentation	Ensure all repairs, concerns, inspections, and the like are thoroughly documented
Failure to communicate with local authorities regarding concerns, including an alert and warning system	Maintain regular communication between dam operators and public safety and emergency services. Regularly test alert and warning system.
Failure to ensure adequate and clear evacuation routes	Regularly inspection, and if necessary remediate, evacuation routes. Make sure residents are aware of them

9. DROUGHT

9.1 General Background

Drought is a significant decrease in water supply relative to what is typical in a given location. It is a normal phase in the climate cycle of most regions, originating from a deficiency of precipitation over an extended period of time, usually a season or more. This leads to a water shortage for some activity, group, or environmental sector. Drought can be characterized based on the following (NOAA 2024a):

- Meteorological measurements such as rainfall deficit compared to normal or expected rainfall
- Agricultural impacts due to reduced rainfall and water supply (e.g., crop loss, herd culling, etc.)
- Hydrological measurements of stream flows, groundwater, and reservoir levels relative to normal conditions
- Direct and indirect socio-economic impacts on society and the economy (e.g., increased unemployment due to failure of an industry because of drought)

Droughts are climatic patterns that occur over long periods of time as the result of many causes. Global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast result in warm, dry air and reduced precipitation. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depend on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of global weather systems.

9.1.1 Monitoring and Rating Drought

NOAA Drought Indices

The National Oceanic and Atmospheric Administration (NOAA) has developed several indices to measure drought impacts and severity and to map their extent and locations (NWS 2024):

- The ***Palmer Crop Moisture Index*** measures short-term drought weekly to assess impacts on agriculture.
- The ***Palmer Z Index*** measures short-term drought on a monthly scale.
- The ***Palmer Drought Index*** is based on long-term weather patterns. The intensity of drought in a given month is dependent on current weather plus the cumulative patterns of previous months. Weather patterns can change quickly, and the Palmer Drought Severity Index can respond fairly rapidly.
- The ***Palmer Hydrological Drought Index*** quantifies hydrological effects (reservoir levels, groundwater levels, etc.), which take longer to develop and last longer. This index responds more slowly to changing conditions than the Palmer Drought Index.

- The ***Standardized Precipitation Index*** considers only precipitation. A value of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The Standardized Precipitation Index is computed for time scales ranging from one month to 24 months.

Maps of these indices show drought conditions nationwide at a given point in time. They are not necessarily indicators of any given area's long-term susceptibility to drought. Figure 9-1 shows examples of recent versions of these maps. The most current versions are available online at the National Centers for Environmental Information website (NCEI 2024)

U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a map that is updated weekly to show the location and intensity of drought across the country. The USDM uses a five-category system (National Integrated Drought Information System 2022):

- D0—Abnormally Dry
  - Short-term dryness slowing planting, growth of crops
  - Some lingering water deficits
  - Pastures or crops not fully recovered
- D1—Moderate Drought
  - Some damage to crops, pastures
  - Some water shortages developing
  - Voluntary water-use restrictions requested
- D2—Severe Drought
  - Crop or pasture loss likely
  - Water shortages common
  - Water restrictions imposed
- D3—Extreme Drought
  - Major crop/pasture losses
  - Widespread water shortages or restrictions
- D4—Exceptional Drought
  - Exceptional and widespread crop/pasture losses
  - Shortages of water creating water emergencies

The USDM categories show experts' assessments of conditions related to drought. These experts check variables including temperature, soil moisture, water levels in streams and lakes, snow cover, and meltwater runoff. They also check whether areas are showing drought impacts such as water shortages and business interruptions. Associated statistics show what proportion of various geographic areas are in each category of dryness or drought, and how many people are affected. USDM data goes back to 2000.

Source: (NWS 2024)

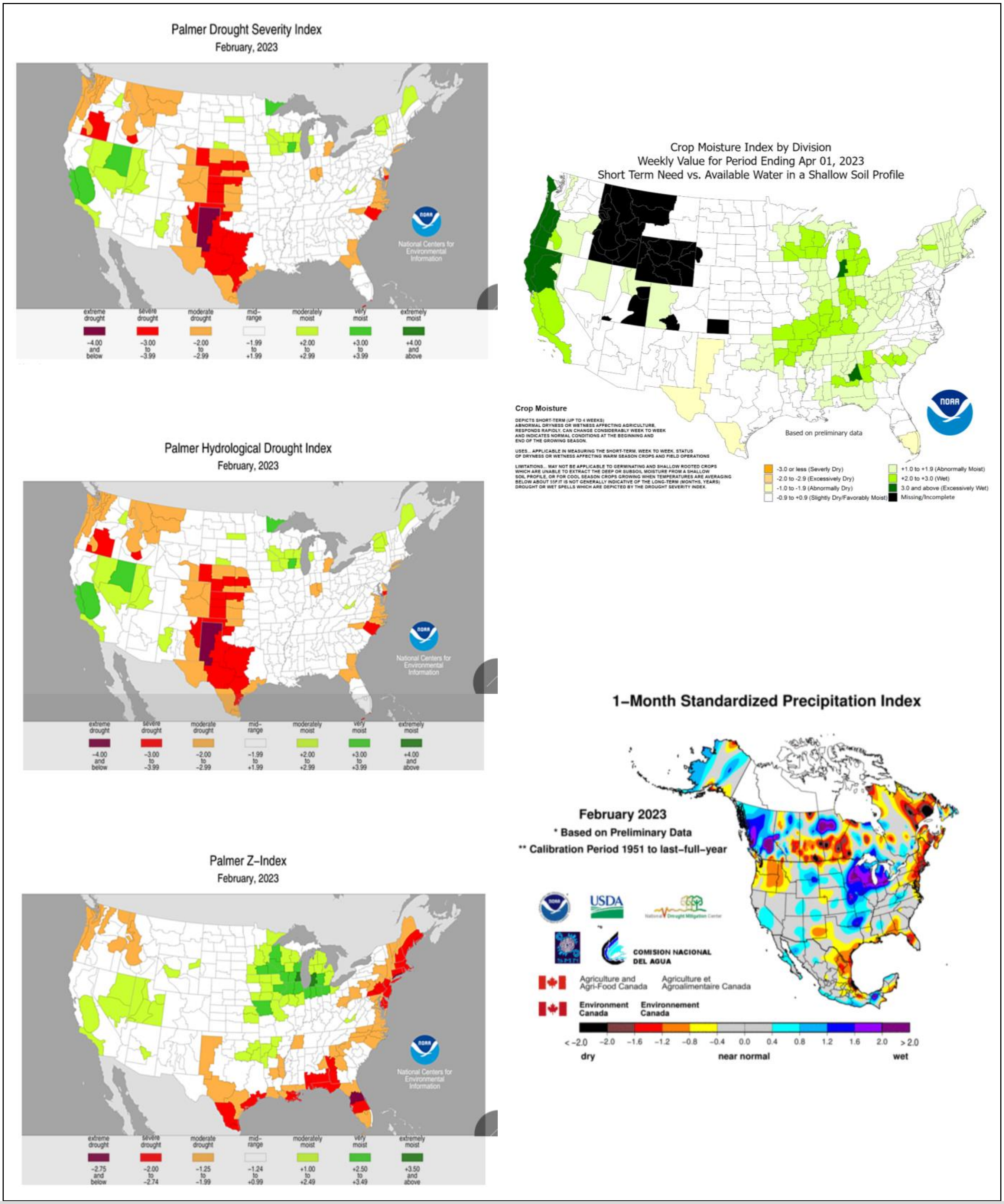


Figure 9-1. Example Drought Index Maps (February and April 2023)

9.1.2 Drought Effects

Drought can have a widespread effect on the environment and the economy, although it typically does not result in loss of life or damage to structures, as do other natural disasters. The National Drought Mitigation Center (NDMC) uses three categories to describe likely drought effects (NDMC 2024):

- **Economic Effects**—These effects of drought cost people (or businesses) money. Farmers' crops are destroyed; low water supply necessitates spending on irrigation or drilling of new wells; water-related businesses (such as sales of boats and fishing equipment) may experience reduced revenue.
- **Environmental Effects**—Plants and animals depend on water. When a drought occurs, their food supply can shrink, and their habitat can be damaged.
- **Social Effects**—Social effects include public safety, health, conflicts between people when there is not enough water to go around, and changes in lifestyle.

The demand that society places on water systems and supplies—such as expanding populations, irrigation, and environmental protection—contributes to drought effects. Drought can lead to difficult decisions regarding the allocation of water, as well as stringent water use restrictions, water quality problems, and inadequate water supplies for fire suppression. There are also issues such as growing conflicts between agricultural uses of surface water and in-stream uses, surface water and groundwater interrelationships, and the effects of growing water demand on uses of water.

The likelihood that an activity will experience impacts from drought depends on its water demand and the water supplies available to meet the demand. The effects of drought vary between sectors of the community in both timing and severity:

- **Water supply**—The water supply sector encompasses urban and rural drinking water systems that are affected when a drought depletes groundwater supplies due to reduced recharge from rainfall.
- **Agriculture and commerce**—Effects on the agriculture and commerce sectors include the reduction of crop yield and livestock sizes due to insufficient water supply for crop irrigation and maintenance of ground cover for grazing.
- **Environment, public health, and safety**—The environmental, public health, and safety sector focuses on wildfires that are both detrimental to the forest ecosystem and hazardous to the public. It also includes the effects of desiccating streams, such as the reduction of in-stream habitats for native species.

9.1.3 California Drought Response

Defined Drought Stages

During critically dry years, the California State Water Resources Control Board can mandate water entitlements on water rights holders to address statewide water shortages. Table 9-1 shows the state drought management program stages mandated to water rights holders.

Table 9-1. State of California Drought Management Program

Drought Stage	State-Mandated Customer Demand Reduction	Rate Impacts
Stage 0 or 1	<10 percent	Normal rates
Stage 2	10 to 15 percent	Normal rates; Drought surcharge
Stage 3	15 to 20 percent	Normal rates; Drought surcharge
Stage 4	>20 percent	Normal rates, Drought surcharge

Source: wterboards.ca.gov

Los Angeles Department of Water and Power (LADWP) defined Emergency Water Conservation Plan Ordinance restrictions by phases in the *2020 Urban Water Management Plan* (Chapter 3, Water Conservation). These restrictions enact the state's mandates by activating Phases 1 through 4, with water conservation, prohibited uses, and penalties for violation that steadily increase by phase.

Future Water Conservation in California

The State of California's 2020 Water Plan Update projects that water demand in the state will increase through 2045. The California Department of Water Resources (DWR) predicts a modest decrease in single-family water demand from 2020 through 2045, a slight increase in commercial/government water demand, and a moderate increase in multifamily water demand. The new 2023 Water Plan Update public review period ended on October 19, 2023.

In a report prepared by DWR and the California State Water Resources Board "Making Water Conservation a California Way of Life," (DWR 2018) permanent changes are directed to use water more wisely, eliminate water waste, strengthen local drought resistance, and improve agricultural water use efficiency and drought planning. With an aim to make water conservation a way of life in California, Executive Order B-37-16 requires the following (State of California 2016):

- The State Water Resources Control Board will maintain urban water use reporting requirements and prohibitions on wasteful practices such as watering during or after rainfall, hosing off sidewalks, and irrigating ornamental turf on public street medians.
- The state will continue its work to coordinate a statewide response to the bark beetle outbreak in drought-stressed forests that has killed millions of trees across California.

The State of California Legislature enacted two bills in response to Executive Order B-37-16 to overhaul the State's approach to conserving water (DWR 2020):

- Senate Bill 606 requires the State Water Resources and Control Board and DWR to adopt water efficiency regulations, outlines requirements for urban water suppliers, including urban drought risk assessments, and implements penalties for violations. The law contains directives on water shortage planning and water loss reporting for urban wholesale water suppliers and offers a bonus incentive for potable reuse water.
- Assembly Bill 1668 requires the State Water Resources Control Board, in coordination with the DWR, to adopt water efficiency standards and regulations; drought and water shortage contingency plan guidance; specified standards for per capita daily indoor residential water use; and performance measures for commercial, industrial, and institutional water use.

The bills required new long-term urban water use efficiency standards with components for indoor residential use, outdoor residential use, water losses, and other uses. Regarding indoor residential use, the new laws set a standard of 55 gallons per person, per day through January 1, 2025. After that date, the amount will be incrementally reduced over time. The legislation also specifies penalties on local water suppliers for violations of these standards. Starting in 2027, local water suppliers' failure to comply with the Water Resources Control Board's adopted long-term standards could result in fines of $1,000 per day during non-drought years and $10,000 per day during declared drought emergencies and certain dry years.

9.1.4 Cascading and Compounding Impacts

The cascading or compounding impact most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. Drought is also often accompanied by extreme heat, exposing people to the risk of sunstroke, heat cramps, and heat exhaustion.

9.2 HAZARD PROFILE

9.2.1 Local Water Supply

LADWP, which operates water and power for the City, reports the following sources of local water supply for 2016-2020 (see Figure 9-2) (LADWP 2021b):

- The Los Angeles Aqueduct from the eastern Sierra Nevada Mountains provided 48 percent of local water.
- The City purchased 41 percent of its water from the Metropolitan Water District of Southern California.
- 9 percent was from groundwater.
- 2 percent was from recycled water.

Source: (LADWP 2023)

Figure 9-2. Primary Water Supply Sources for City of Los Angeles

As of April 2022, residential and commercial customers in the City are using an average of 112 gallons per person per day. The City aims to reduce this usage to 105 gallons per person per day for all water use in the City. Residents of Los Angeles are now using 40 percent less water per year than they were just 40 years ago thanks to conservation efforts (LADWP n.d.).

Through Operation Next and New Conservation, the City plans to dramatically shift away from a reliance on imported water and aim for a ratio of 30 percent imported water and 70 percent local water supply (groundwater, recycled water, stormwater) (LADWP 2021a).

9.2.2 Past Events

The sections below describe prolonged periods of drought in California over the past 50 years, all of which affected the City of Los Angeles to some degree. California DWR hydrologic data dating to the early 1900s also show multi-year droughts from 1912 to 1913, 1918 to 1920, 1922 to 1924 and 1928 to 1934 (DWR 2023c). There have been no federal disaster declarations related to drought in Los Angeles County, but since 1991 there have been two state emergency proclamations for drought that included Los Angeles County (see Section 3.1).

2020 to Present

California's most recent drought set new records. The California DWR reported that the 2021-2022 water year was the driest on record since 1924 (DWR 2023b). In October 2021, Governor Gavin Newson issued a proclamation applying the state's drought state of emergency to all counties not previously included. In addition, the proclamation required local water suppliers to implement water shortage contingency plans that are responsive to local conditions and prepare for the possibility of a third dry year. At the time of preparing this plan, 44 percent of California is no longer in a drought, 100 percent of Los Angeles County is drought-free, and zero people in the City of Los Angeles are currently affected by drought (Drought.gov 2023).

2012 to 2016 Drought

This drought set several records at the time:

- The period from 2012 to 2014 ranked as the driest three consecutive years for statewide precipitation.
- 2014 set new climate records for statewide average temperatures and for record-low water allocations in the State Water Project and federal Central Valley Project.
- 2013 set minimum annual precipitation records for many communities.

On January 17, 2014, Governor Gavin Newsom declared a state of emergency for drought throughout the State California. During this dry season in 2014, California experienced the least amount of rainfall in its 163-year history (NOAA 2015). State Residents were asked to voluntarily reduce their water consumption by 20 percent. Drought conditions worsened into 2015. On April 1, 2015, following the lowest snowpack ever recorded, the governor announced actions to save water, increase enforcement to prevent wasteful water use, streamline the state's drought response, and invest in new technologies to make California more drought resilient. The governor directed the State Water Resources Control Board to implement mandatory water reductions in cities and towns across California to reduce water usage by 25 percent on average. The LADWP was assigned a 16 percent water conservation target by the State Water Resources Control Board.

2007 to 2009 Drought

The governor issued an Executive Order that proclaimed a statewide drought emergency on June 4, 2008, after spring 2008 was the driest spring on record and snowmelt runoff was low. On February 27, 2009, the governor proclaimed a state of emergency for the entire state as the severe drought conditions continued widespread impacts and the largest court-ordered water restriction in state history (at the time).

1987 to 1992 Drought

California received precipitation well below average levels for four consecutive years. While the Central Coast was most affected by the lack of rainfall and low runoff, the Sierra Nevada range in Northern California and City of Los Angeles was also affected. During this drought, only 56 percent of average runoff for the Sacramento Valley was received, totaling just 10 million acre-feet. By February 1991, all 58 counties in California were suffering from drought conditions. Urban areas as well as rural and agricultural areas were affected. In 1988, the City adopted a plumbing retrofit ordinance to mandate the installation of conservation devices in all properties and require water-efficient landscaping in new construction. An amendment to the ordinance in 1999 required the installation of ultra-low-flush toilets in single-family and multifamily residences prior to resale.

1976 to 1977 Drought

California had one of its most severe droughts due to lack of rainfall during the winters of 1976 and 1977. 1977 was the driest period on record in California to that time, with the previous winter recorded as the fourth driest. The cumulative impact led to widespread water shortages and severe water conservation measures throughout the state. Only 37 percent of the average Sacramento Valley runoff was received, with just 6.6 million acre-feet recorded. A federal disaster declaration was declared, but it did not apply to Los Angeles County.

9.2.3 Location

Drought is a regional phenomenon. A drought that affects the planning area would affect the entirety of the area simultaneously and has the potential to directly or indirectly affect every person in the City as well as adversely affect the local economy. According to the most recent NOAA National Integrated Drought Information System mapping for the City of Los Angeles and surrounding Los Angeles County, the northeastern area of the City (near the City of Pasadena) presently faces the greatest threat of extreme drought conditions (NOAA 2024b).

9.2.4 Frequency

Assessment Based on Past Events

Drought has a high probability of occurrence in the planning area. From January 2000 to August 2023, some part of Los Angeles County experienced a USDM rating of D1 or higher in 736 out of 1,235 weeks—nearly two-thirds of the weeks (see Figure 9-3). The planning area has also been included in USDA drought disaster declarations in each of the last 10 years. Historical drought data for the planning area indicate there have been four significant multi-year droughts in the last 37 years (1987 to 2023), amounting to a severe drought every 9 years on average.

Source: (US Drought Monitor 2023)

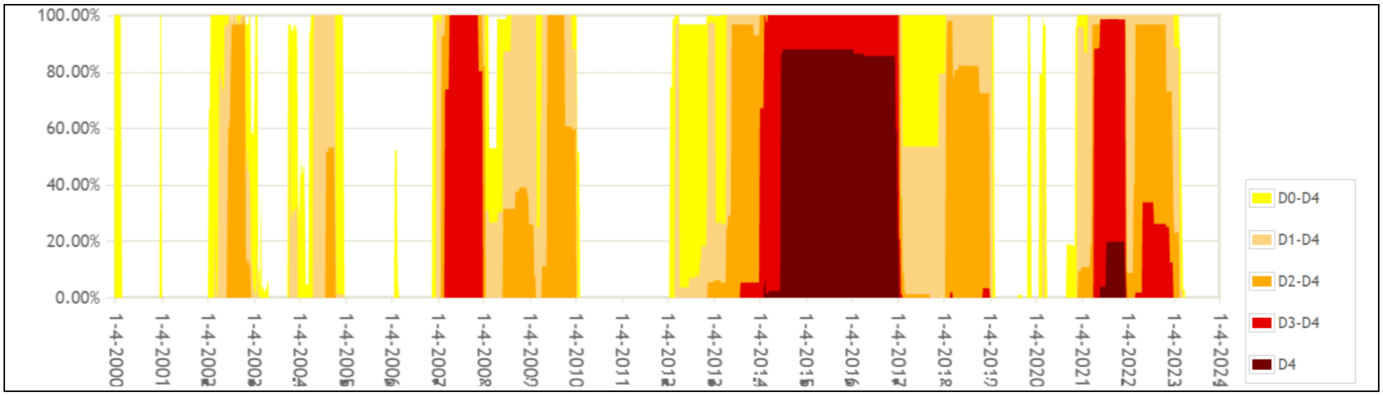


Figure 9-3. Percent of Los Angeles County Affected by USDM Ratings, 2000 – 2023

Potential Effect of Future Conditions on Hazard Probability

The long-term effects of climate change on regional water resources are unknown, but global water resources are already experiencing the following stresses without climate change:

- Growing populations
- Increased competition for available water
- Poor water quality
- Environmental claims
- Uncertain reserved water rights
- Groundwater overdraft
- Aging urban water infrastructure

With a warmer climate, droughts could become more frequent, more severe, and longer lasting. The entire City will remain vulnerable to drought impacts. Additionally, changing irrigation regulations for lawns, plants, trees, and more may decrease the green areas within the City, which could contribute to and/or modify other conditions. The *Third National Climate Assessment Report for the United States* indicates that "higher surface temperatures brought about by global warming increase the potential for drought. Evaporation and the higher rate at which plants lose moisture through their leaves both increase with temperature. Unless higher evapotranspiration rates are matched by increases in precipitation, environments will tend to dry, promoting drought conditions" (U.S. Climate Resilience Toolkit 2021).

Because expected changes in precipitation patterns are still uncertain, the potential effects and likelihood of drought are uncertain. DWR has noted effects of climate change on statewide water resources by charting changes in snowpack, sea level, and river flow. As temperatures rise and more precipitation comes in the form of rain instead of snow, these changes will likely continue or grow even more significant (DWR 2022a).

In addition to snowpack resources, the City's water supply is derived from groundwater and surface water resources, including water imported through the State Water Project (SWP) and the Colorado River Aqueduct (CRA) (University of Southern California 2016). Increased incidence of drought may cause a drawdown in groundwater resources without allowing for the opportunity for aquifer recharge.

9.2.5 Severity

The severity of any given drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area affected, the more severe the potential effects. The effects of climate change, such as extreme heat, may greatly increase the severity of drought events affecting the City.

U.S. Drought Monitor Ratings

The City of Los Angeles and Los Angeles County as a whole have a history of severe droughts. As shown in Figure 9-3, at least part of the county has experienced extreme (D3) or exceptional (D4) droughts more than once since 2000.

Drought Impact Reporter

The National Drought Mitigation Center's Drought Impact Reporter is a historic archive of the effects of drought, based mainly on media reports back to 2005 (NDMC n.d.).

The Drought Impact Reporter contains information on 191 impacts from droughts that specifically affected the City of Los Angeles from 2010 through April 2023 The following are the categories and reported number of impacts (note that some impacts have been assigned to more than one category) (NDMC 2023):

- Agriculture—33
- Business and Industry—15
- Energy—3
- Fire—18
- Plants and Wildlife—34
- Relief, Response, and Restrictions—111
- Society and Public Health—48
- Tourism and Recreation—15
- Water Supply and Quality—123

9.2.6 Warning Time

Droughts are climatic patterns that occur over long periods of time. Due to rapidly changing variables that determine how and when scientists are able to detect drought conditions, only generalized warning is available for the drought hazard at this time.

Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.

At this time, scientists do not know how to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades.

9.2.7 Scenario

An extreme, multiyear drought associated with record-breaking rates of low precipitation and high temperatures—such as the most recent drought across the State of California——is the worst-case scenario. Combinations of low precipitation and high temperatures could occur over several consecutive years. Intensified by such conditions, extreme wildfires could break out throughout the planning area, increasing the need for water. Surrounding communities, also in drought conditions, could increase their demand for water supplies relied upon by the City of Los Angeles, causing social and political conflicts. If such conditions persisted for several years, the economy of the City of Los Angeles could experience setbacks, especially in water dependent industries.

9.3 Vulnerability and Impacts

Drought can affect a wide range of economic, environmental, and social activities. Its effects can span many sectors of the economy because water is integral to the ability to produce goods and provide services. The impacts can reach well beyond the area undergoing physical drought. Because drought affects regional areas larger than the planning area for this HMP, all people and property in the planning area are considered to be vulnerable to the hazard, as summarized in Table 9-2. The following sections provide qualitative descriptions of potential impacts.

Table 9-2. Population and Property Vulnerable to the Drought Hazard

Total Population	
Population in the Hazard Area	3,766,109
% of Total Planning Area Population	100%
Socially Vulnerable Population (see Section 4.4.2 for explanation of index values)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	831,919
% of Total Planning Area Population	21.5%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	844,409
% of Total Planning Area Population	21.8%
Property	
Number of Buildings in the Hazard Area	739,644
Total Property Value in the Hazard Area	$781,603,700,869
Total Value in the Hazard Area as % of Planning Area Total Value	100%

9.3.1 Population

Drought can affect people's health and safety, including health problems related to low water flows, poor water quality, or dust and pollution. Drought may also lead to loss of life (National Drought Mitigation Center 2022). Other possible impacts include recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and hygiene; compromised food and nutrition; and increased incidence of illness and disease (CDC 2020). Droughts can also lead to reduced local firefighting capabilities. As drought conditions cause water sources to dry up, firefighters have less available water sources to pull from to extinguish fires. In the event of extreme drought, firefighters may have to dedicate significant time and resources to bring water in from other areas of the state (Western Fire Chiefs Association 2023).

LADWP and other regional stakeholders have devoted considerable time and effort to protect life, safety, and health during times of consecutive dry years. Provisions and measures have been taken to analyze and account for anticipated water shortages. With coordination with residents in the planning area, the LADWP has the ability to minimize and reduce impacts on residents and water consumers in the City.

Socially Vulnerable Populations

Vulnerable populations could be particularly susceptible to the drought hazard and cascading impacts due to age, health conditions, and limited ability to mobilize to shelter, cooling, and medical resources (CDC 2021).

9.3.2 Property

Structures, particularly historic, may experience foundational issues from the shrink-swell cycle of expansive soils. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

9.3.3 Community Lifelines

Droughts have the potential to impact agriculture-related facilities and critical facilities that are associated with water supplies such as potable water used with firefighting, emergency response, and medical services. Critical facilities in and adjacent to wildfire hazard areas are considered vulnerable to wildfires, which can become more frequent during droughts.

Community lifelines as defined for this plan will continue to be operational during a drought. Community lifeline elements such as landscaping may not be maintained due to limited resources, but the risk to the planning area's community lifelines inventory will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

9.3.4 Environment

Groundwater and Streams

Drought generally does not affect groundwater sources as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest. Where stream flows are reduced, development that relies on surface water may seek to establish new groundwater wells, which could further increase groundwater depletion.

Other Potential Losses

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects. The following are potential impacts of drought:

- Wildlife habitat may be degraded through the loss of wetlands, lakes and vegetation. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity.
- Drought conditions greatly increase the likelihood of wildfires, the major threat to timber resources.
- Scenic resources in the City are at risk from the increased likelihood of wildfires associated with droughts.
- Drying up or dying off of urban forests could reduce ecological and eco-tourist values.
- Any shortage of water supply can have significant economic impacts.

9.3.5 Historic and Cultural Resources

The primary impacts on historic and cultural assets from drought would be an increased risk of wildfires, which could threaten these assets, and impacts on structure foundations from the shrink-swell cycle of expansive soils.

Droughts may impact the traditional and customary practices of Indigenous persons, who rely on healthy terrestrial ecosystems. These practices may include the collection of plants, animals, and minerals and other practices. Drought and its secondary impacts on watersheds and nearshore waters may impair, diminish, or impede the exercise of traditional and customary practices.

9.3.6 Economy

A prolonged drought can have a serious economic impact on a community. For instance, drought affects water supply. When drought conditions persist with little to no relief, water restrictions may be put into place by local or state agencies. These restrictions may include placing limitations on when or how frequently lawns can be watered, car washing services, or any other recreational/commercial outdoor use of water supplies. In exceptional drought conditions, watering of lawns and crops may not be an option. If crops are not able to receive water, farmland will dry out and crops will die. This can lead to crop shortages, which, in turn, increases the price of food.

Increased demand for water and electricity can also result in shortages and higher costs for these resources. Industries that rely on water for business could be impacted the most (e.g., landscaping businesses). Although most businesses will still be operational, they may be impacted aesthetically. These aesthetic impacts are most significant within the recreation and tourism industry. Moreover, droughts within another area could impact the food supply and price of food for residents within the county.

Direct impacts of drought include reduced crop yield, increased fire hazard, reduced water levels, and damage to wildlife and fish habitat. The many impacts of drought can be listed as economic, environmental, or social. Direct and indirect losses include the following (FAO 2019):

- Damage to crop quality and crop losses
- Insect infestation leading to crop and tree losses
- Plant diseases leading to loss of agricultural crops and trees
- Reduction in outdoor activities
- Increased risk of brush fires and wildfires due to dried crops, grasses, and dying trees

When a drought occurs, the agricultural industry is most at risk in terms of economic impact and damage. For example, crops may not mature, leading to a lessened crop yield, wildlife and livestock may become undernourished, land values could decrease, and ultimately there could be a financial loss for farmers (IPCC 2016). Based on the 2017 Census of Agriculture, there were 1,035 farms in Los Angeles County, a 20 percent decrease from the 2012 reports. The average farm size was 56 acres. Los Angeles County farms had a total market value of products sold of $133.8 million in crop sales and $20.8 million in livestock sales (USDA 2019).

9.4 Effects of Future Change on Vulnerability and Impacts

9.4.1 Future Development

The City of Los Angeles General Plan includes policies directing land use and dealing with water supply and the protection of water resources. This plan provides local capability to protect the whole community from experiencing worsened drought due to increased water demand. The City of Los Angeles reviewed its General Plan under the capability assessment performed for this effort. Deficiencies identified by this review can be addressed by mitigation actions to increase the capability to deal with future trends in development.

9.4.2 Climate Change

Population

Population vulnerability and impacts associated with drought are unlikely to increase as a result of climate change. While greater numbers of people may need to engage in behavior change, such as water saving efforts, significant life or health impacts are unlikely.

Property

Property vulnerability and impacts associated with drought may increase as a result of increased drought resulting from climate change, although this would most likely occur in non-structural property such as crops and landscaping. It is unlikely that structure vulnerability and impacts would increase as a direct result of drought, although secondary effects of drought, such as wildfire, may increase and threaten structures.

Community Lifelines

Community lifeline vulnerability and impacts associated with drought are unlikely to increase as a result of climate change; however, community lifeline operators may be sensitive to changes and need to alter standard management practices and actively manage resources, particularly in water-related service sectors.

Environment

Impacts on the environment may increase as a result of increased drought resulting from climate change. Ecosystems and biodiversity are already under stress from development and water diversion activities. Prolonged or more frequent drought resulting from climate change may further stress the ecosystems in the region, which include both animal and plant groups.

10. EARTHQUAKE

10.1 GENERAL BACKGROUND

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.

In 2022, Cal OES, in collaboration with FEMA, developed the Southern California Catastrophic Earthquake Plan, which includes Los Angeles County. The City participates in the planning, response, and recovery efforts outlined in this plan (Cal OES 2023a).

10.1.1 Earthquake Location

The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter.

10.1.2 Earthquake Geology

<u>Tectonic Plates</u>

The Earth's crust, which is the rigid outermost shell of the planet, is broken into seven or eight major tectonic plates (depending on how they are defined) and many minor plates. Where the plates meet, they move in one of three ways along their mutual boundary: convergent (two plates moving together), divergent (two plates moving apart), or transform (two plates moving parallel to one another). Earthquakes, volcanic activity, mountain-building, and oceanic trench formation occur along these plate boundaries. Subduction is a geological process that takes place at convergent boundaries of tectonic plate, in which one plate moves under another. Regions where this process occurs are known as subduction zones, and they have the potential to generate highly damaging earthquakes.

California is seismically active because of movement of the North American Plate, east of the San Andreas Fault, and the Pacific Plate to the west, which includes the state's coastal communities. The transform (parallel) movement of these tectonic plates against one another creates stresses that build as the rocks are gradually deformed. The rock deformation, or strain, is stored in the rocks as elastic strain energy. When the strength of the rock is exceeded, rupture occurs along a fault. The rocks on opposite sides of the fault slide past each other as they spring back into a relaxed position. The strain energy is released partly as heat and partly as elastic waves called seismic waves. The passage of these seismic waves produces the ground shaking in earthquakes.

Faults

Geologists have found that earthquakes reoccur along faults, which are zones of weakness in the earth's crust. When a fault experiences an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake can still occur. In fact, relieving stress along one part of a fault may increase it in another part.

Faults are more likely to have future earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). "Potentially active" faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years) (California Department of Conservation 2019).

Determining if a fault is "active" or "potentially active" depends on geologic evidence, which may not be available for every fault. The majority of the seismic hazards are on well-known active faults. However, inactive faults, where no displacements have been recorded, also have the potential to reactivate or experience displacement along a branch sometime in the future. An example of a fault zone that has been reactivated is the Foothills Fault Zone. The zone was considered inactive until evidence of an earthquake (approximately 1.6 million years ago) was found near Spenceville, California. Then, in 1975, an earthquake occurred on another branch of the zone near Oroville, California (now known as the Cleveland Hills Fault). The State Division of Mines and Geology indicates that increased earthquake activity throughout California may cause tectonic movement along currently inactive fault systems.

10.1.3 Earthquake-Related Hazards

According to the U.S. Geological Survey (USGS) Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect people's normal activities. This includes the following:

- **Surface Faulting**—Displacement that reaches the earth's surface during slip along a fault. Commonly occurs with shallow earthquakes, those with an epicenter less than 20 kilometers.
- **Ground Motion (shaking)**—The movement of the earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by sudden slip on a fault or sudden pressure at the explosive source and travel through the earth and along its surface.
- **Landslide**—A movement of surface material down a slope.

- **Liquefaction**—A process by which water-saturated sediment temporarily loses strength and acts as a fluid. Earthquake shaking can cause this effect.
- **Tectonic Deformation**—A change in the original shape of a material due to stresses.
- **Tsunami**—A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or violent underwater volcanic eruptions.

10.1.4 Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity.

Magnitude

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. Magnitude is commonly expressed by ratings on the moment magnitude scale (M_W), the most common scale used today. The moment magnitude scale is a more accurate measure of earthquake size than the better-known Richter scale (M_L) (U.S. Geological Survey 2021). This scale is based on the total moment release of the earthquake (the product of the distance a fault moved, and the force required to move it). The scale is as follows:

- Great—Mw > 8
- Major—Mw = 7.0 – 7.9
- Strong—Mw = 6.0 – 6.9
- Moderate—Mw = 5.0 – 5.9
- Light—Mw = 4.0 – 4.9
- Minor—Mw = 3.0 – 3.9
- Micro—Mw < 3

Intensity

The most commonly used intensity scale is the modified Mercalli intensity scale. Ratings of the scale as well as the perceived shaking and damage potential for structures are shown in Table 10-1.

The modified Mercalli intensity scale is generally represented visually using a USGS product called a ShakeMap (see Section 10.1.6), which shows the expected ground shaking at any given location produced by an earthquake with a specified magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A ShakeMap shows the variation of ground shaking in a region immediately following significant earthquakes (for technical information about ShakeMaps see (USGS 2021).

Table 10-1. Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X – XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA = peak ground acceleration. Measured in percent of g, where g is the acceleration of gravity

Sources: (USGS 2021); (USGS 2011)

10.1.5 Ground Motion

Earthquake hazard assessment is based on expected ground motion. During an earthquake when the ground is shaking, it experiences acceleration. The peak acceleration is the largest acceleration recorded at a particular station during an earthquake. Estimates are developed of the annual probability that certain ground motion accelerations will be exceeded; the annual probabilities can then be summed over a time period of interest.

The most commonly mapped ground motion parameters are horizontal and vertical peak ground accelerations (PGA) for a given soil type. PGA is a measure of how hard the earth shakes, or accelerates, in a given geographic area. Instruments called seismometers record levels of ground motion due to earthquakes at stations throughout a region. PGA is measured in g (the acceleration due to gravity) or expressed as a percent of gravity (%g). These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage structures. Short-period seismic motions are of concern for smaller structures such as single-family dwellings. Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 10-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

10.1.6 USGS Earthquake Mapping Programs

National Seismic Hazard Map

National maps of earthquake shaking hazards provide information for creating and updating seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities and land use planning. After thorough review of the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown, et al. 2001). The USGS updated the National Seismic Hazard Maps in 2023 (Petersen, et al 2023). New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. The 2023 map, shown in Figure 10-1, represents the best available data as determined by the USGS.

ShakeMaps

The USGS Earthquake Hazards Program produces maps called ShakeMaps that map ground motion and shaking intensity following significant earthquakes. ShakeMaps focus on the ground shaking caused by the earthquake, rather than on characteristics of the earthquake source, such as magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust.

A ShakeMap shows the extent and variation of ground shaking immediately across the surrounding region following significant earthquakes. Such mapping is derived from peak ground motion amplitudes recorded on seismic sensors, with interpolation where data is lacking based on estimated amplitudes. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. In addition to the maps of recorded events, the USGS creates the following:

- Scenario ShakeMaps of hypothetical earthquakes of an assumed magnitude on known faults.
- Probabilistic ShakeMaps, based on predicted shaking from all possible earthquakes over a 10,000-year period. In a probabilistic map, information from millions of scenario maps is combined to make a forecast for the future. The maps indicate the ground motion at any given point that has a given probability of being exceeded in a given timeframe, such as a 100-year (1 percent-annual chance) event.

Source: (USGS 2024)

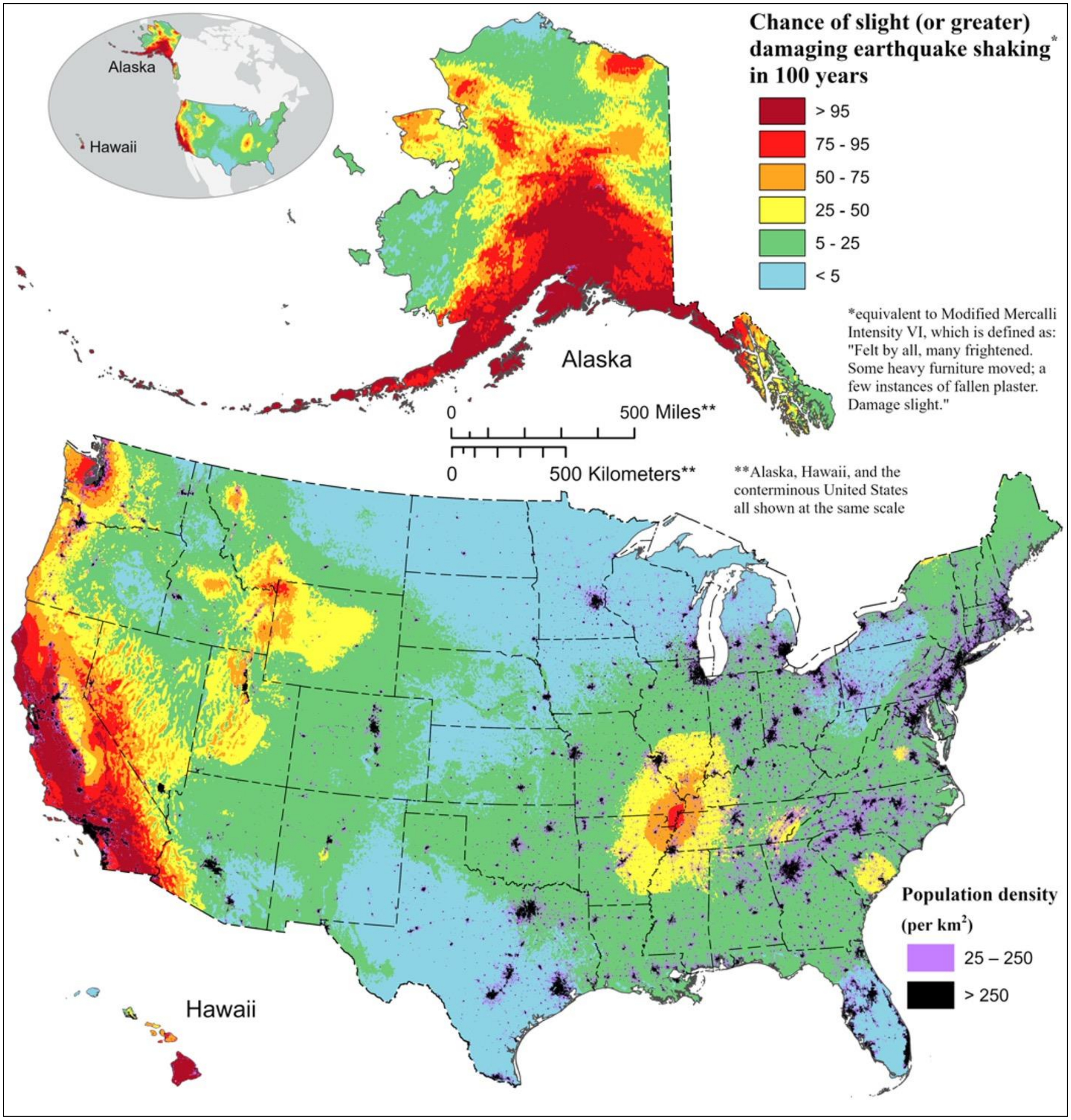


Figure 10-1. 2023 National Seismic Hazard Map (Petersen, et al 2023

10.1.7 Liquefaction and Soil Types

Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into the ground.

A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. NEHRP soil types define the locations that will be significantly affected by an earthquake. Table 10-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F. In general, these areas are also most susceptible to liquefaction.

Table 10-2. NEHRP Soil Classification System

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

10.1.8 Cascading and Compounding Impacts

Earthquakes can cause large and sometimes disastrous mudslides. Building and road foundations can lose load-bearing strength and may sink into what was previously solid ground. Earthen dams and levees are highly susceptible to seismic events, and the effects of their failures can be considered secondary risks for earthquakes.

Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment.

10.2 Hazard Profile

10.2.1 Past Events

Los Angeles County has been included in three federal declarations for earthquakes: the 1994 Northridge Earthquake (DR-1008), the 1987 Whittier Narrows Earthquake and Aftershocks (DR-799), and the 1971 San Fernando Earthquake (DR-299). The county also was included in a state emergency proclamation for the Northridge Earthquake.

The planning area has experienced many earthquakes other than those that received state or federal declarations. Table 10-3 lists earthquakes of magnitude 5.0 or greater within a 100-mile radius of the planning area.

Table 10-3. Earthquakes Magnitude 5.0 or Larger Within 100-mile Radius of the Planning Area

Date	Magnitude	Epicenter Location	Fault Line
07/04/2019 Ridgecrest Earthquakes	7.1	11 miles west-southwest of Ridgecrest	Airport Lake Fault Zone
04/05/2018 Santa Cruz Island Earthquake	5.3	19 miles southwest of Santa Cruz Island	Santa Cruz Island Fault
03/29/2014 Brea Earthquake	5.1	Near Brea, CA	Puente Hills fault
07/29/2008	5.44	Near Chino Hills, CA	Whittier fault
01/17/1994 Northridge Earthquake	6.7	20 miles west-northwest of Los Angeles	Northridge Thrust
06/28/1991 Sierra Madre Earthquake	5.8	12 miles northeast of Pasadena, CA	Clamshell-Sawpit Canyon fault
02/28/1990 Upland Earthquake	5.7	30 miles east of Los Angeles	San Jose fault
01/18/1989 Malibu Earthquake	5.0	20 miles south of Malibu, CA	N/A
12/03/1988 Pasadena Earthquake	5.0	Below City of Pasadena, CA	Raymond fault
06/10/1988 Tejon Ranch Earthquake	5.4	Northeast of Frazier Park, CA	N/A
10/01/1987 Whittier Narrows Earthquake	5.9	Southeast of Pasadena	Puente Hills fault
01/01/1979 Malibu Earthquake	5.2	South of Malibu, CA	N/A
08/13/1978 Santa Barbara Earthquake	5.1	Southeast of Santa Barbara, CA	Unknown
02/21/1973 Point Mugu Earthquake	5.3	Near Oxnard, 45 miles west of Los Angeles	San Fernando fault
02/09/1971 San Fernando Earthquake	6.5	Near Sylmar, CA	San Fernando fault
12/4/1948 Desert Hot Springs Earthquake	6.0	Near Desert Hot Springs, 100 miles east of Los Angeles	S. Branch San Andreas fault
6/30/1941 Santa Barbara Earthquake	5.5	6 miles ESE of Santa Barbara, CA	N/A
3/10/1933 Long Beach Earthquake	6.4	3 miles south of Huntington Beach, CA	Newport-Inglewood fault

Source: (Southern California Earthquake Data Center 2023)

The 1994 Northridge Earthquake was the most recent earthquake to greatly affect the city. It was the costliest seismic event in California since the 1906 San Francisco Earthquake. The infrastructure of the metropolitan area was severely disrupted. Freeways collapsed, power systems for the city and linked communities as far away as Oregon were temporarily blacked out, and communications were disrupted.

Officially lasting approximately 30 seconds, and with a magnitude of M6.7, this earthquake caused significant damage to buildings in every area of the city. Of 57 fatalities attributed to this quake, 16 were a result of the collapse of a single structure—the Northridge Meadows apartment building. The ground motion was measured throughout Southern California, including intensity readings of 1.82 g near the Ventura Freeway in the Tarzana area. Ground motions as strong as 1.21 g were measured as far away as Inglewood (approximately 25 miles from Northridge). One "g" of ground motion is enough to make unsecured buildings hop off their foundations.

According to the scientists of the U.S. Geological Survey (USGS) and the Southern California Earthquake Center, the Northridge Earthquake raised nearby mountains by as much as 70 centimeters. The fault, which was previously unknown, appears to be truncated by the fault that broke in the similarly sized 1971 San Fernando Earthquake, the two faults abutting at a depth of 5 miles. The Northridge Earthquake caused many times more damage than the 1971 event, primarily because its fault is directly under the densely populated valley, whereas the 1971 fault lies under the mountains.

10.2.2 Location

Major Faults

The City of Los Angeles is located in a region of high seismicity with numerous local faults, as shown on Figure 10-2. The primary seismic hazard for the City is potential ground shaking from these major known faults, especially the Newport-Inglewood, Palos Verdes, Puente Hills, San Andreas, and Santa Monica faults, which are further described in the sections below.

Newport-Inglewood

The Newport-Inglewood fault is a right-lateral strike-slip fault that extends for 47 miles from Culver City southeast through Inglewood and other coastal communities to Newport Beach, at which point the fault extends east-southeast into the Pacific Ocean where it is known as the Rose Canyon Fault. The fault can be inferred on the Earth's surface as passing along and through a line of hills extending from Signal Hill to Culver City. This is one of the most active faults in California and is capable of producing an earthquake with a magnitude of 6.0 to 7.4 (Southern California Earthquake Data Center 2023).

Palos Verdes

The Palos Verdes fault extends from the Pacific Ocean and comes ashore near the southwest point of the Redondo Beach-Torrance border. The fault then curves around the base of the Palos Verdes Peninsula roughly midway between the Pacific Coast Highway and the peninsula. It continues this southerly course until it runs into the Los Angeles Harbor.

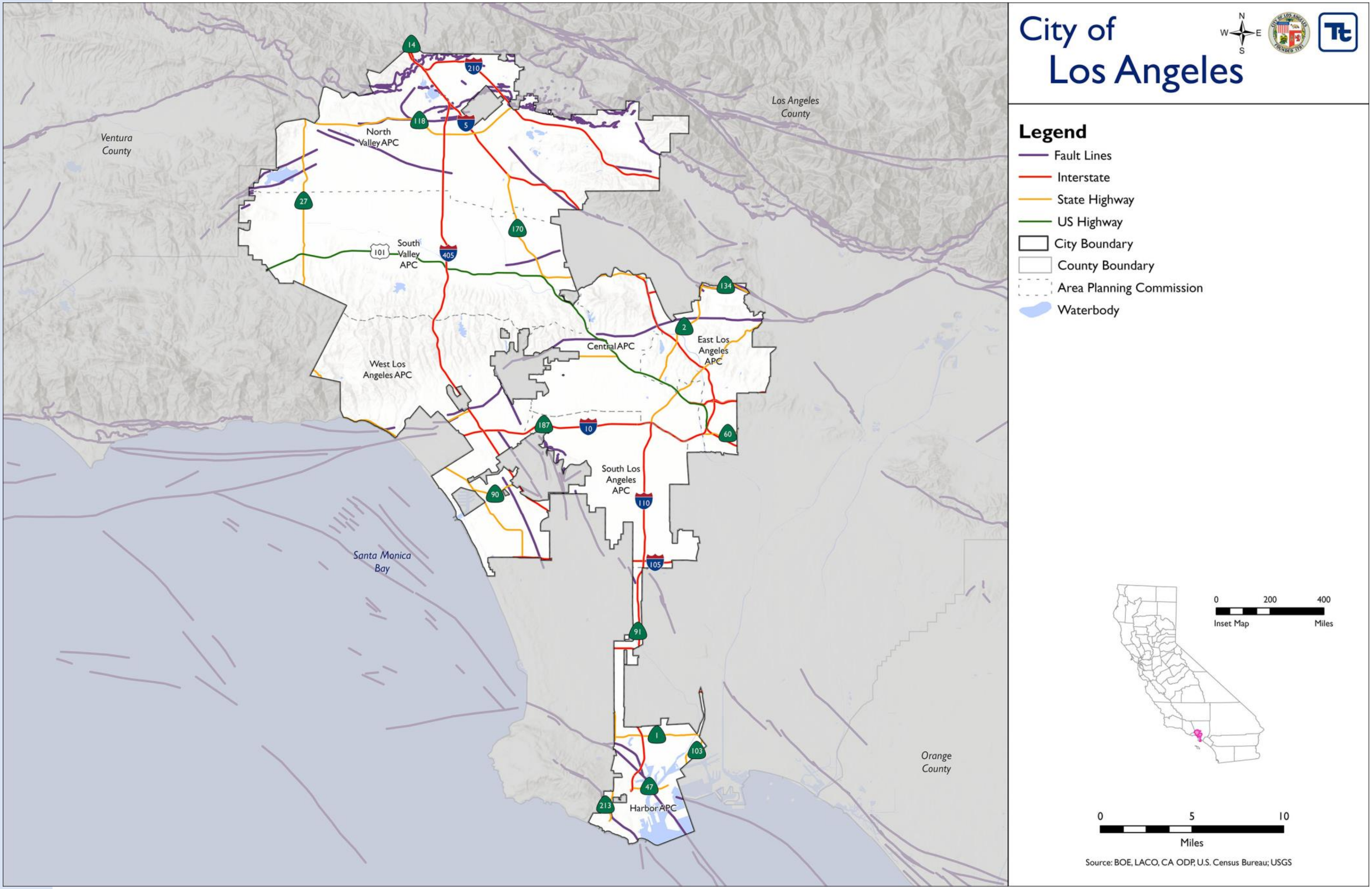


Figure 10-2. Planning Area Earthquake Fault Locations

Puente Hills

The Puente Hills fault, also known as the Puente Hills thrust system, is an active geological fault that runs about 25 miles in three discrete sections from the Puente Hills region in the southeast to just south of Griffith Park in the northwest. The fault is known as a blind thrust fault due to the lack of surface features normally associated with thrust faults. This fault is capable of producing an earthquake with a magnitude between 7.0 and 7.5.

San Andreas

The San Andreas fault extends roughly 800 miles through California. It forms the tectonic boundary between the Pacific Plate and the North American Plate, and its motion is right-lateral strike-slip (horizontal). The fault divides into three segments, each with different characteristics and a different degree of earthquake risk, the most significant being the southern segment, which passes within about 35 miles of Los Angeles.

Santa Monica

The Santa Monica fault is one of several northeast-southwest-trending, north-dipping, reverse faults that extend through the Los Angeles metropolitan area for approximately 50 miles. This fault is capable of producing an earthquake with a magnitude of 6.0 to 7.0.

Liquefaction Mapping

Areas that have been identified as susceptible to liquefaction in the planning area are shown on Figure 10-3 through Figure 10-9.

10.2.3 Frequency

Assessment Based on Past Events

California experiences hundreds of earthquakes each year, most with minimal damage and magnitudes below 3.0 on the Richter Scale. Earthquakes that cause moderate damage to structures occur several times a year. According to the USGS, a strong earthquake measuring greater than 5.0 on the Richter Scale occurs every two to three years and major earthquakes of more than 7.0 on the Richter Scale occur once a decade. The San Andreas Fault has the potential for experiencing major to great events.

Based on the most recent earthquake forecast model for California, scientists estimate that in the next 30 years the Los Angeles region has a 60 percent probability of an earthquake of Magnitude 6.7 or greater, a 46 percent probability of an earthquake of Magnitude 7 or greater, and a 31 percent probability of an earthquake of Magnitude 7.5 (USGS n.d.).

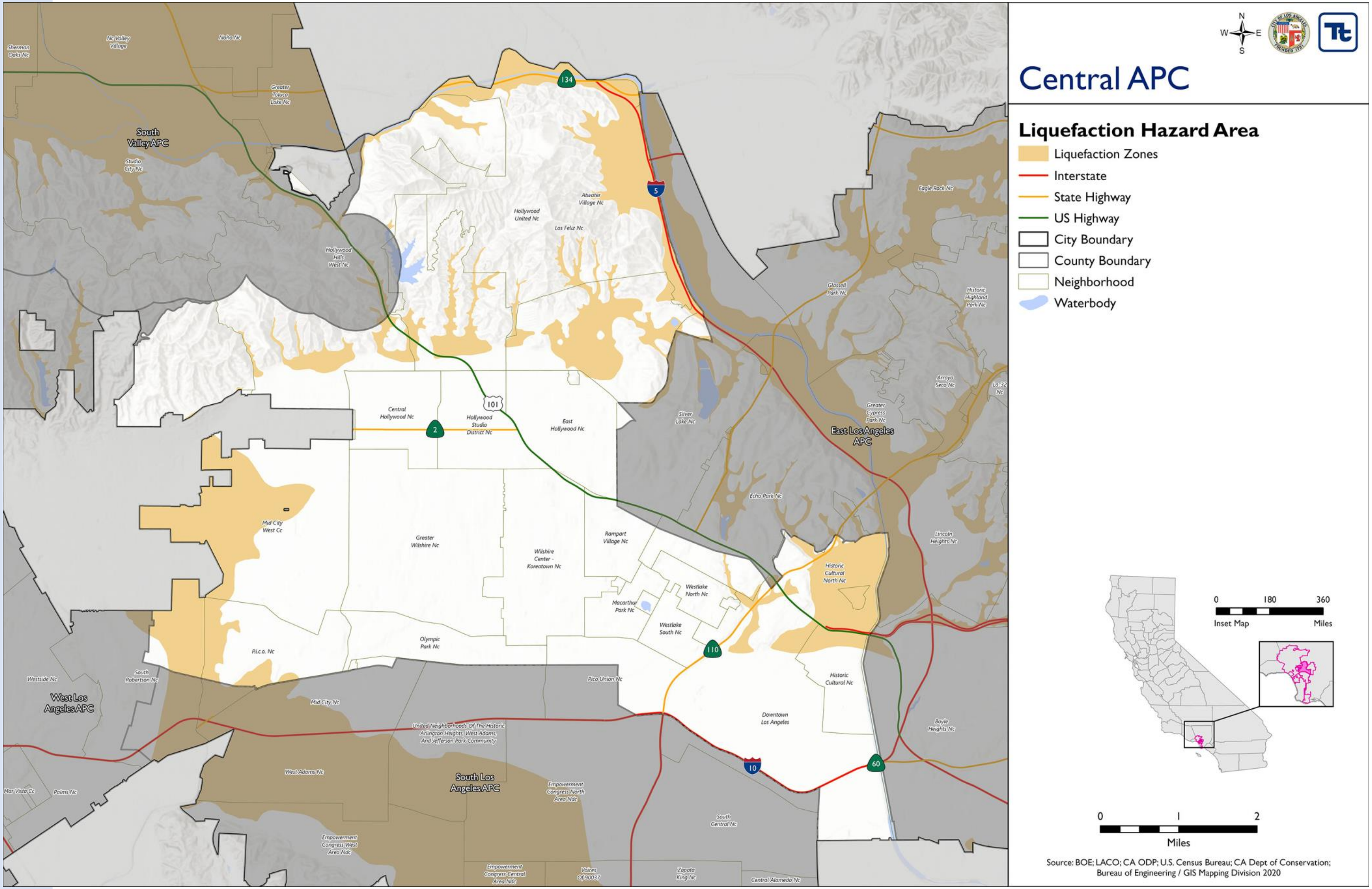


Figure 10-3. Liquefaction Zones in the central APC

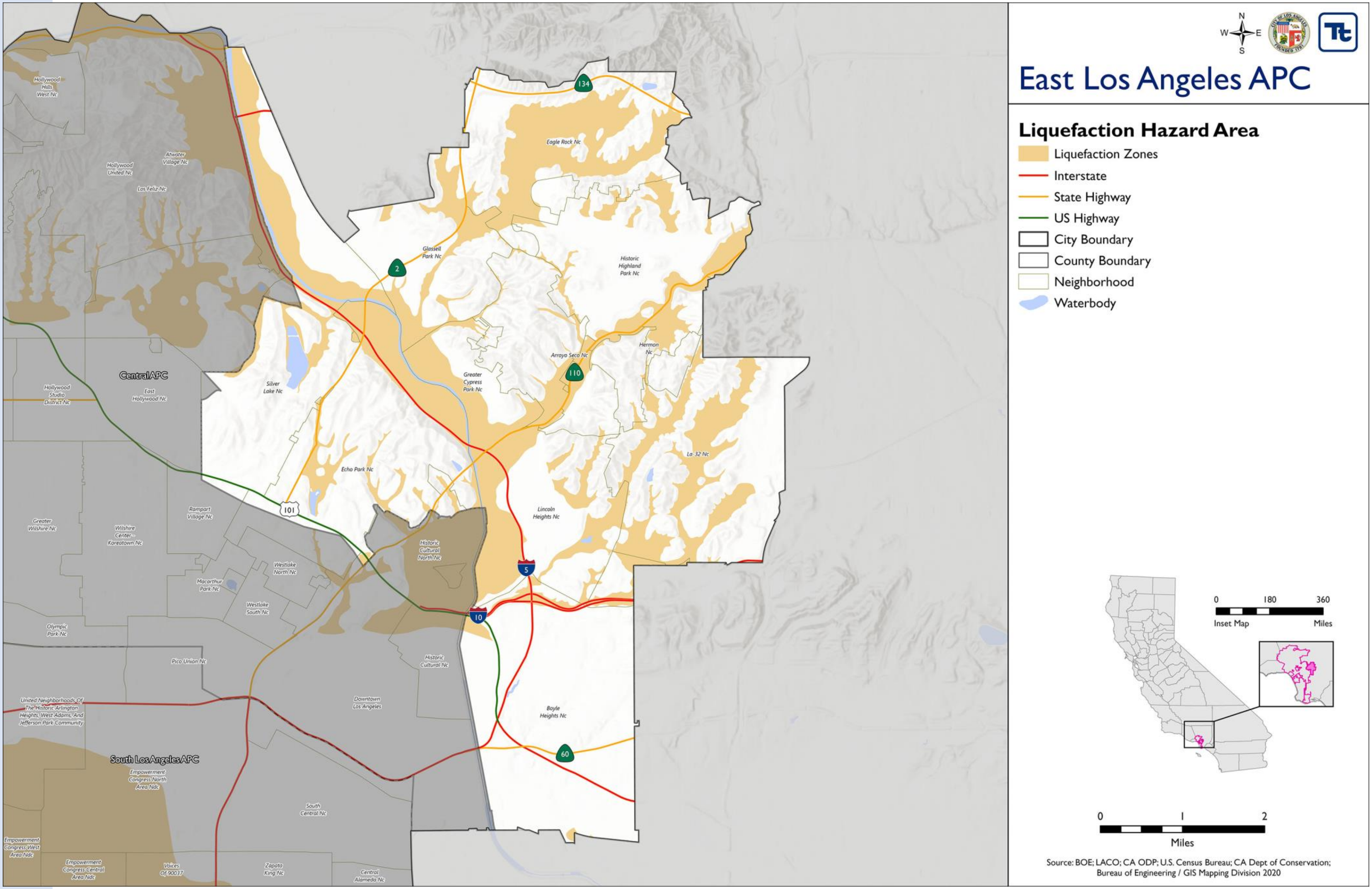


Figure 10-4. Liquefaction Zones in the East Los Angeles APC

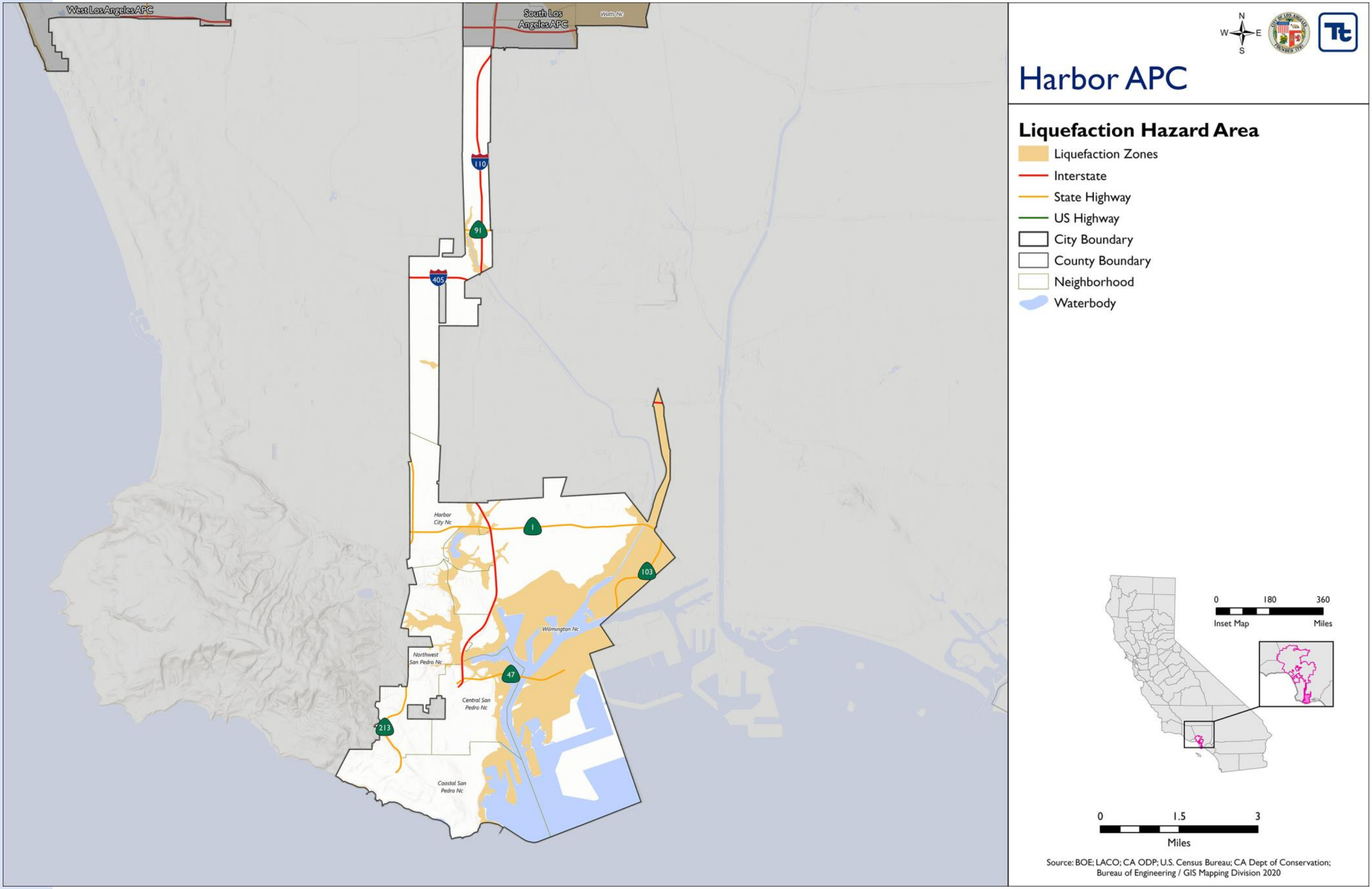


Figure 10-5. Liquefaction Zones in the Harbor APC

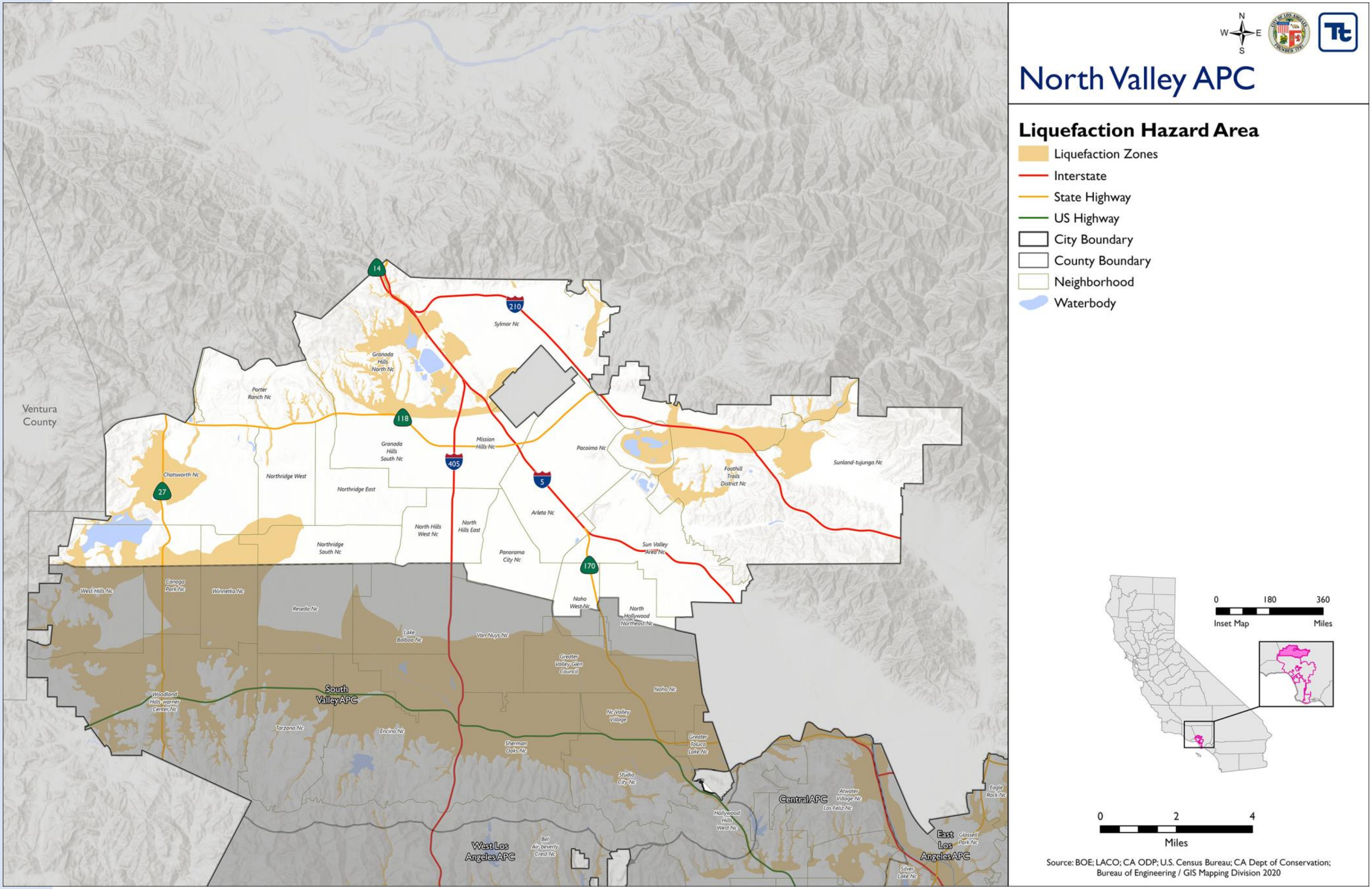


Figure 10-6. Liquefaction Zones in the North Valley APC

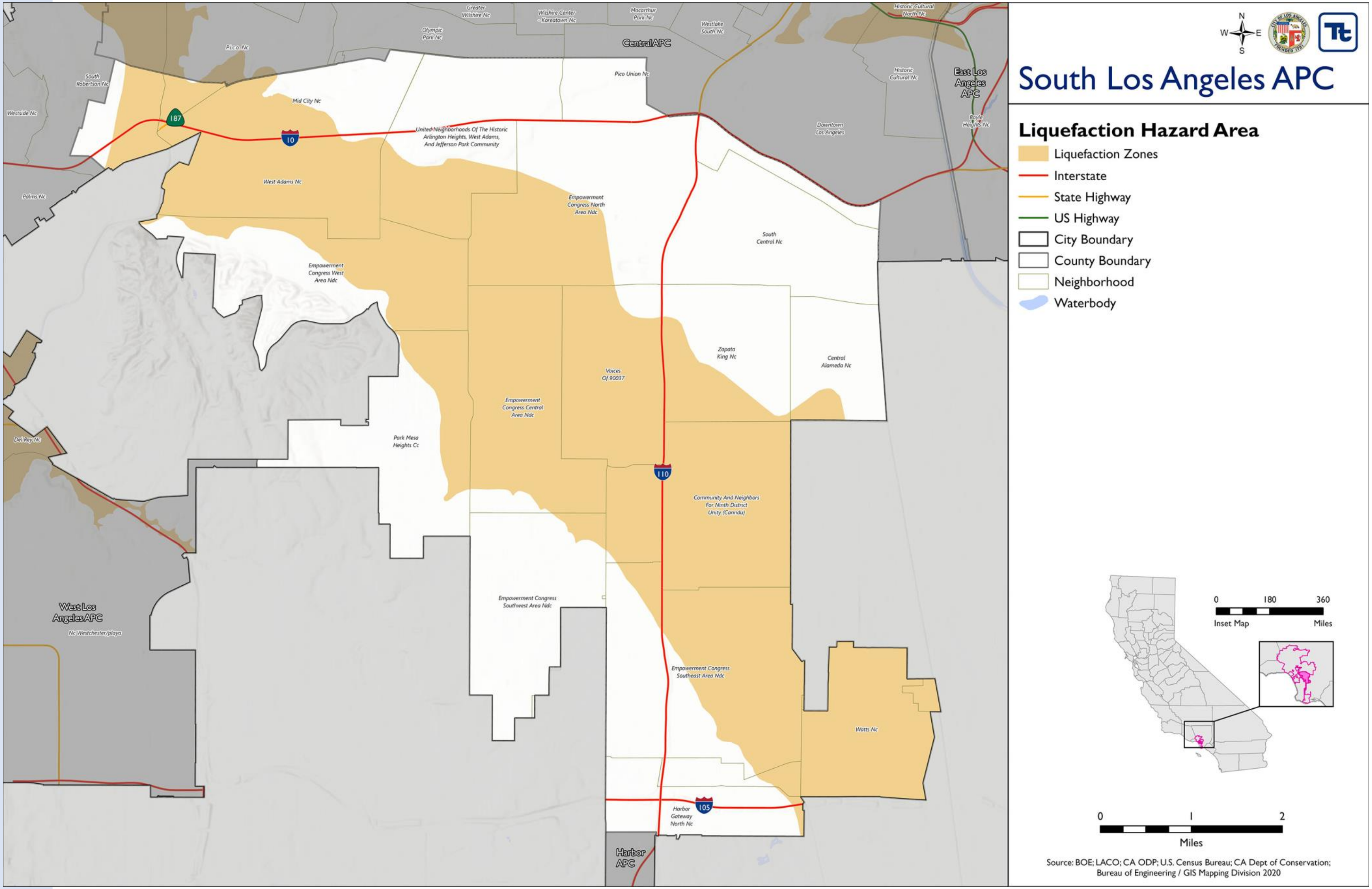


Figure 10-7. Liquefaction Zones in the South Los Angeles APC

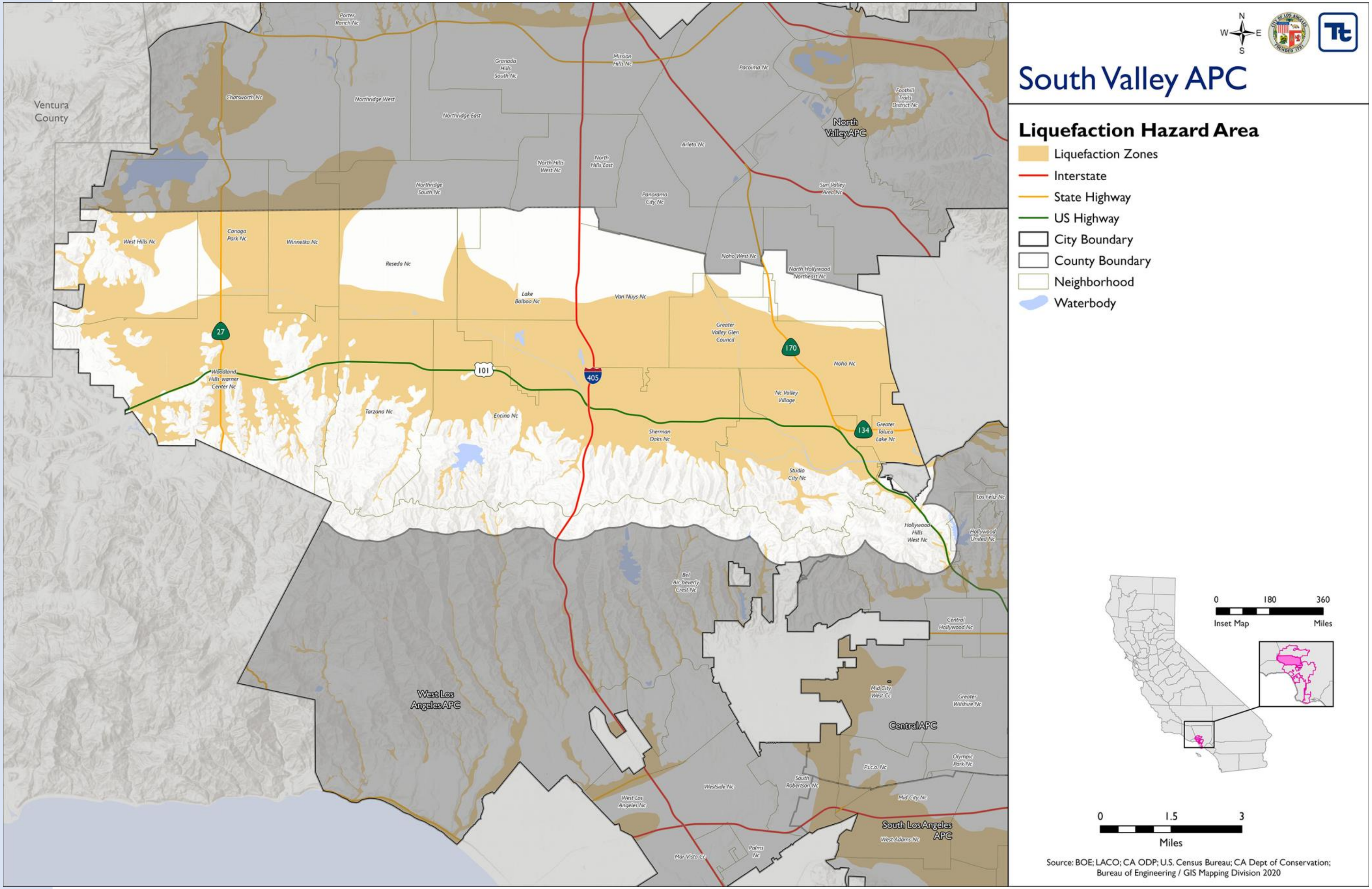


Figure 10-8. Liquefaction Zones in the South Valley APC

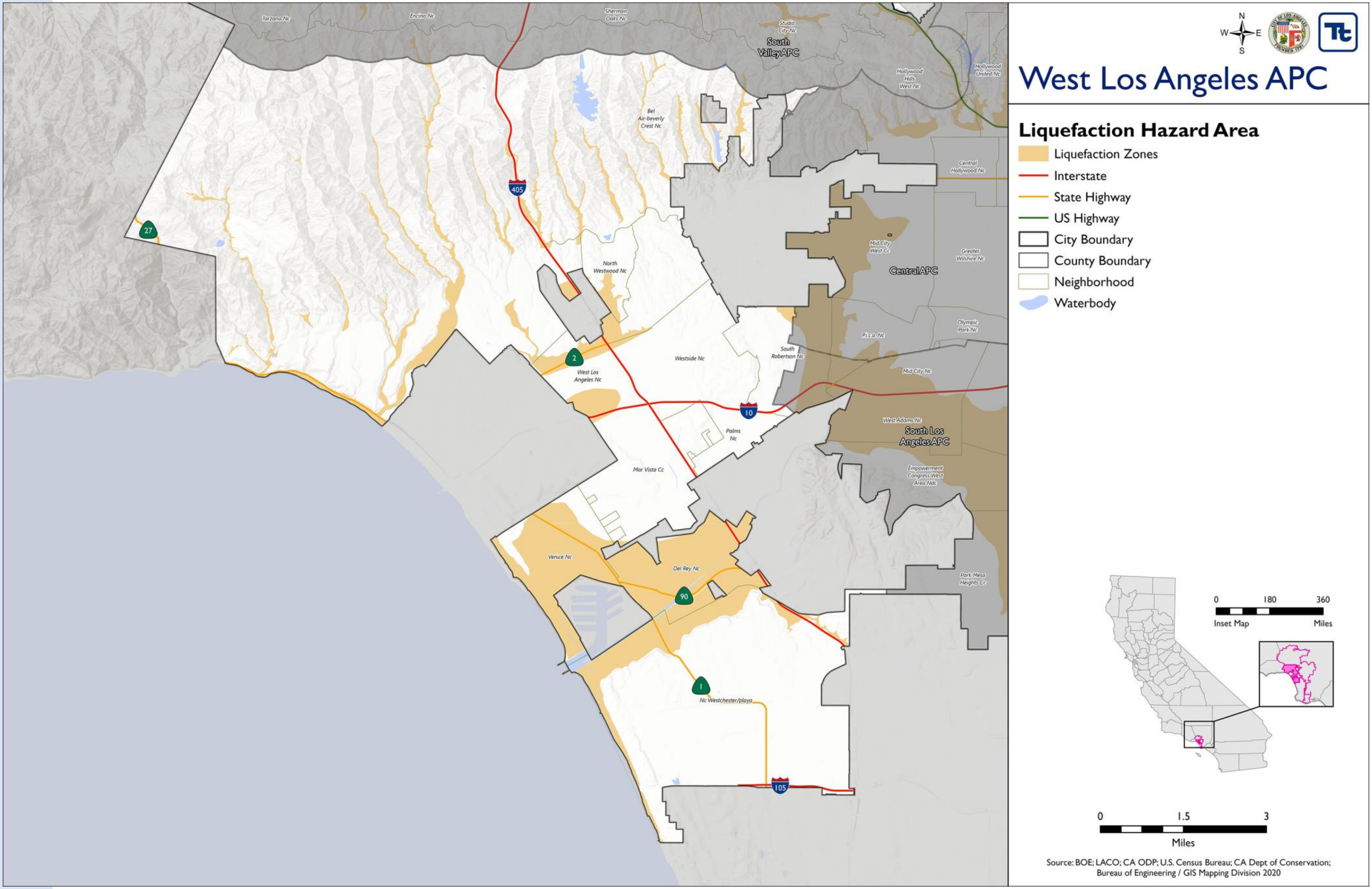


Figure 10-9. Liquefaction Zones in the West Los Angeles APC

The Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) (Field, et al. 2013) predicts the probability of an earthquake of Magnitude 6.7 or greater over the next 30 years as shown in Figure 10-10. The UCERF3 also defined the following recurrence intervals for four of the deterministic earthquake scenarios used for the risk assessment in this hazard mitigation plan:

- Newport-Inglewood M 7.2 = 1,906 years
- Palos Verdes M 7.3 = 3,094 years
- Puente Hills (DTLA direct hit) M 7.0 = 1,403 years
- San Andreas (ShakeOut scenario) M7.8 = 1 percent-annual-chance
- Santa Monica Fault Scenario M6.8

Source: (Southern California Earthquake Center 2022)

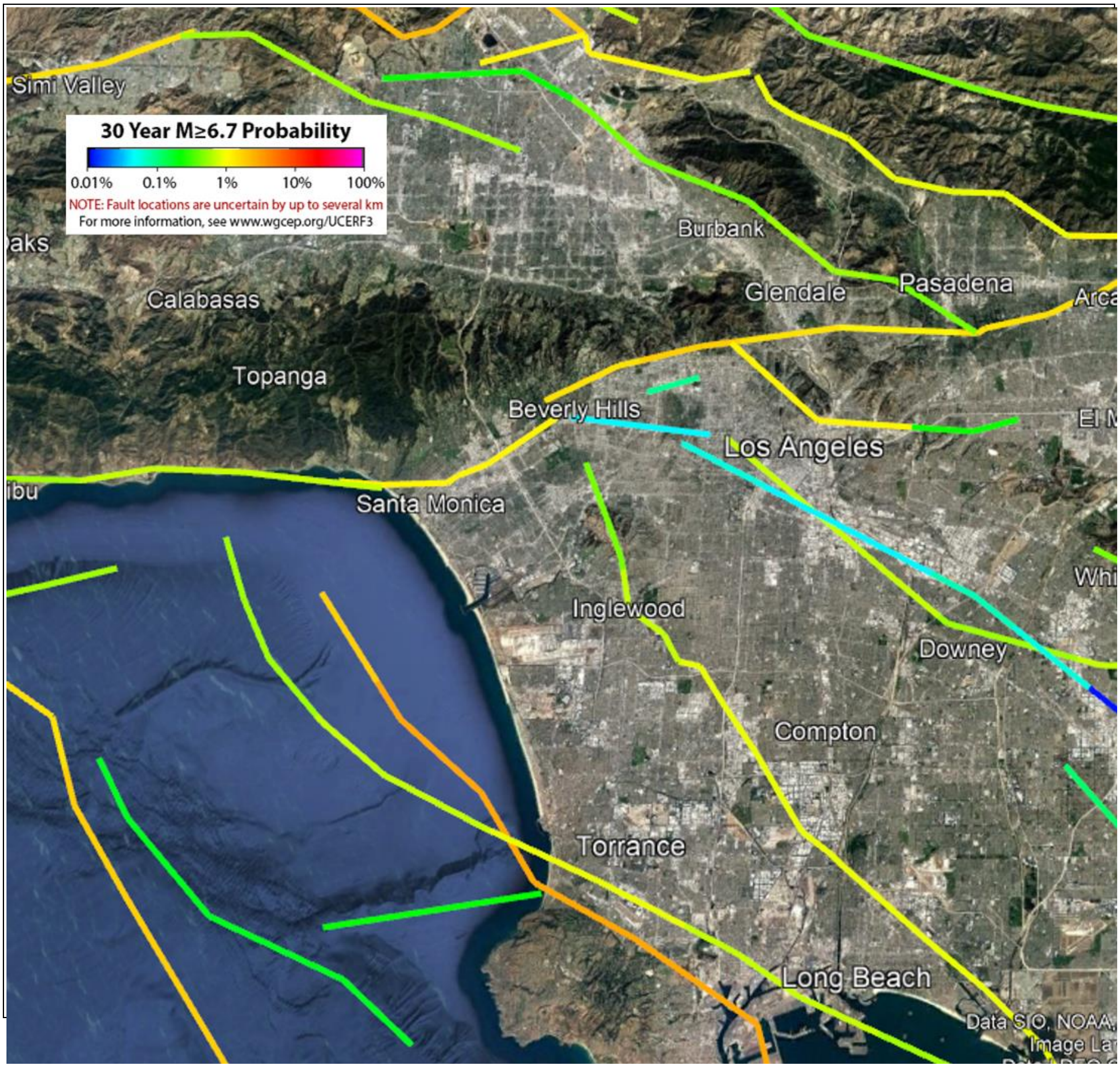


Figure 10-10. Probability of Magnitude 6.7 or Larger Los Angeles Area Earthquake in Next 30 Years

Potential Effect of Future Conditions on Hazard Probability

The effects of global climate change on earthquake probability are unknown, although scientists have identified tiny earthquakes triggered by the change of fault stress loads from rain and snow. Similarly, long-term drought can result in a significant change in the stress load on the Earth's crust. Current science does not provide information on how such changes could affect what areas are vulnerable to earthquake impacts. Generally, all of Los Angeles will remain vulnerable to the earthquake hazard.

Pumping groundwater from underground aquifers, which increases during times of drought, has also been shown to affect stress loads by "unweighting" the Earth's crust. A 2014 study looked at the effects of groundwater extraction in California's Central Valley on seismicity on the San Andreas Fault. The researchers found that such extractions can promote lateral changes in stress to the two sides of the San Andreas, which move horizontally against each other along the boundary of two major tectonic plates. This could cause them to unclamp and slip, resulting in an earthquake (NASA 2019).

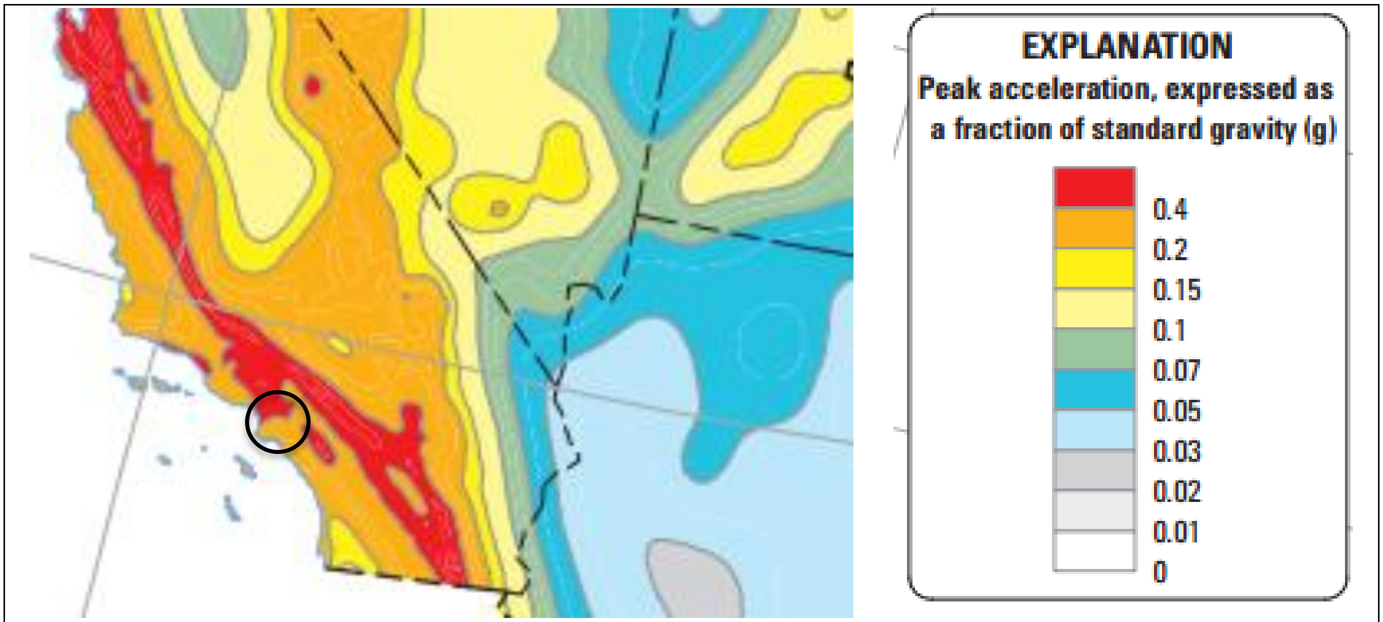
Secondary effects of earthquakes could be magnified by climate change. Soils saturated by repetitive or heavy precipitation could experience liquefaction or an increased propensity for slides during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events.

10.2.4 Severity

Based on current information about faults, the USGS has created maps that show the PGA that has a certain probability (2 percent or 10 percent) of being exceeded in a 50-year period. The maps were most recently updated in 2023 National Seismic Hazard Maps with new seismic, geologic, and geodetic information on earthquake rates and ground shaking, representing the best currently available data. The 2023 map for California shows that for the greater Los Angeles area, the PGA with a 10 percent probability of exceedance in 50 years is 0.2g to 0.4g (see Figure 10-11). USGS scenario based and probabilistic ShakeMaps also indicate expected ground acceleration for earthquake events that have the potential to occur for a given area.

10.2.5 Warning Time

There is currently no reliable way to predict when an earthquake will occur at any given location. Earthquake early warning systems use earthquake science and the technology of monitoring systems to alert devices and people when shaking waves generated by an earthquake are expected to arrive at their location. Strong seismic shaking from an earthquake travels at about 2 miles per second, so it is possible to detect a large earthquake near its source and broadcast a warning of imminent strong shaking to more distant areas before the shaking arrives. The seconds to minutes of advance warning can allow people and systems to take actions to protect life and property from destructive shaking.



Oval is approximate location of City of Los Angeles

Figure 10-11. PGA with 2 percent Probability of Exceedance in 50 Years

New technology is being developed for early warnings. ShakeAlert uses data from regional seismic networks to generate earthquake early warning alerts. MyShake is a global smartphone seismic network for early warning that can keep users informed about earthquakes using data from smartphone sensors.

10.2.6 Scenario

With the abundance of fault exposure in southern California, the potential scenarios for earthquake activity are many, including the San Andreas Scenario, discussed in the Southern California Catastrophic Earthquake Plan. Any earthquake above a magnitude of 5.0 or greater on faults near the planning area would have significant impacts throughout the city. With the added factor of the liquefaction potential throughout the entire city, structural failure of buildings, damage to utilities such as water pipes and wells, and sources of power are likely. Earthquake early warning systems can give some warning before dangerous shaking occurs. The exact timing is dependent on the location of the earthquake in relation to the alert but could be as long as a minute of warning. Automated systems can be designed to safely stop operations to prevent damage from shaking. People can also be warned to take protective actions, such as moving from a hazardous location and sheltering in an appropriate safe spot.

10.3 Vulnerability

The entire planning area is vulnerable to the earthquake hazard, so all people and property in the planning area are considered to be vulnerable to the hazard, as summarized in Table 10-4.

Table 10-4. Population and Property Vulnerable to the Earthquake Hazard

Total Population	
Population in the Hazard Area	3,766,109
% of Total Planning Area Population	100%
Socially Vulnerable Population (see Section 4.4.2 for explanation of index values)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	831,919
% of Total Planning Area Population	21.5%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	844,409
% of Total Planning Area Population	21.8%
Property	
Number of Buildings in the Hazard Area	739,644
Total Property Value in the Hazard Area	$781,603,700,869
Total Value in the Hazard Area as % of Planning Area Total Value	100%

10.4 Impacts

Earthquake impact data for the risk assessment was generated using a Hazus Level 2 (user-defined) analysis for the scenario events listed in Table 10-5. Summary findings of the risk assessment, showing estimated impacts for the entire planning area, are provided in the sections below. A breakdown by APC is provided in Appendix E.

Table 10-5. Earthquakes Modeled for Risk Assessment

Scenario Event	Focal Depth	Epicenter Location	Map Figure
Magnitude 7.2 Newport-Inglewood Fault Scenario	7.5 miles	32 miles southeast of downtown Los Angeles	Figure 10-12.
Magnitude 7.3 Palos Verdes Fault Scenario	7.0 miles	55 miles south-southeast of downtown Los Angeles	Figure 10-13.
Magnitude 7.0 Puente Hills Fault Scenario	7.6 miles	11.5 miles northeast of downtown Los Angeles	Figure 10-14.
Magnitude 7.8 San Andreas Fault Scenario	4.7 miles	150 miles east-southeast of downtown Los Angeles	Figure 10-15.
Magnitude 6.8 Santa Monica Fault Scenario	5.7 miles	9.5 miles northwest of downtown Los Angeles	Figure 10-16.

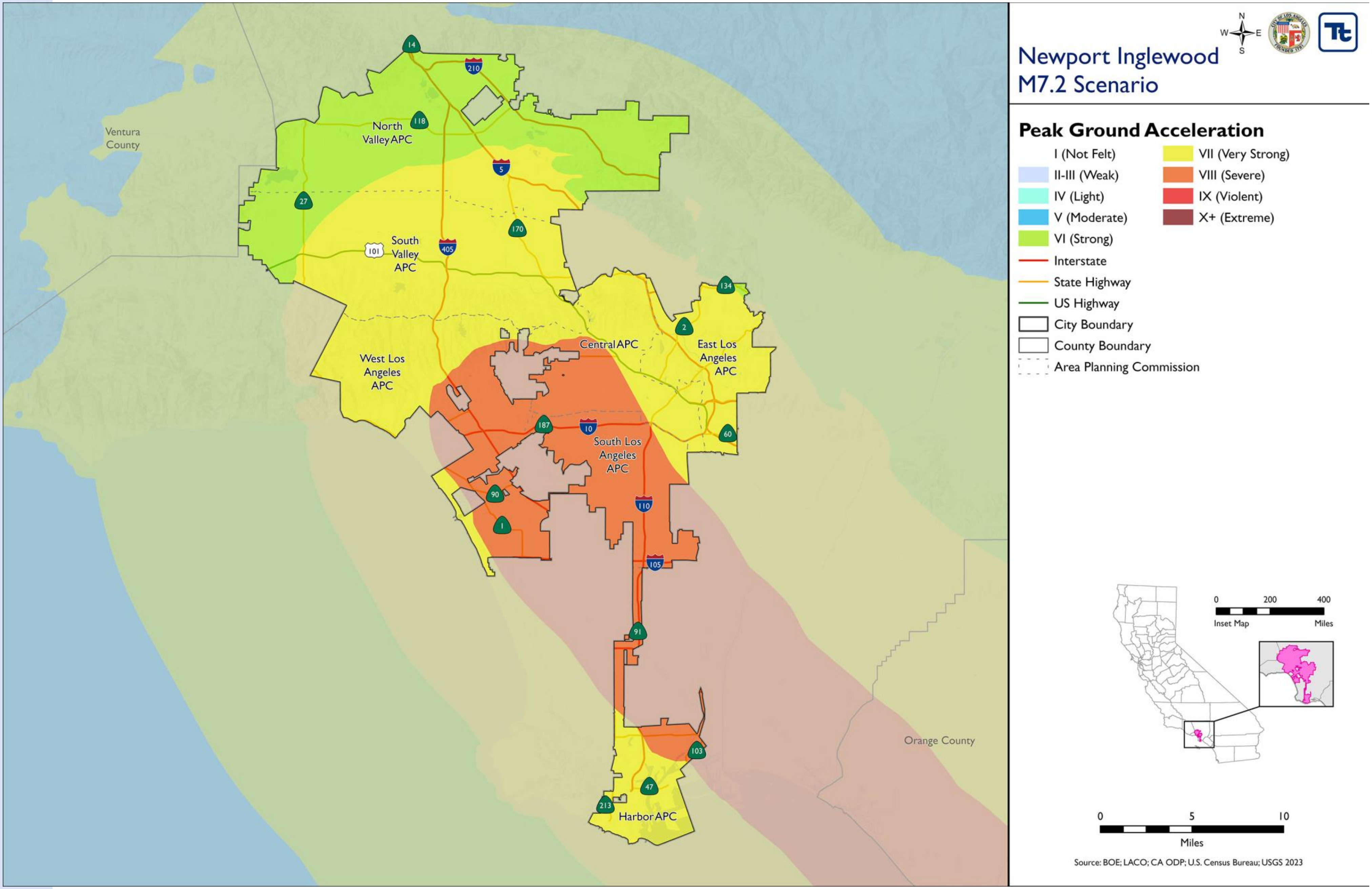


Figure 10-12. Newport-Inglewood Fault Scenario Peak Ground Acceleration

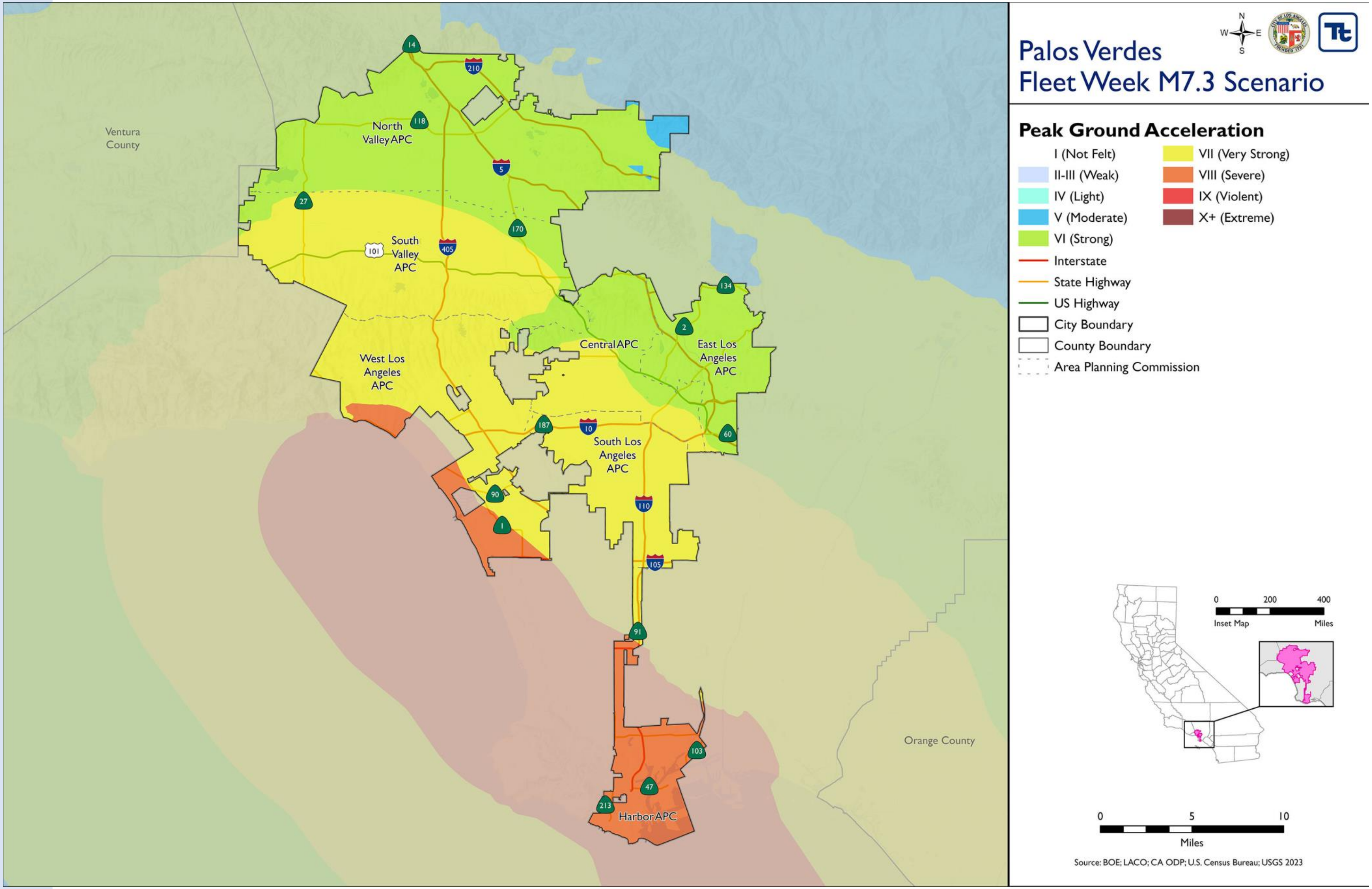


Figure 10-13. Palos Verdes Fault Scenario Peak Ground Acceleration

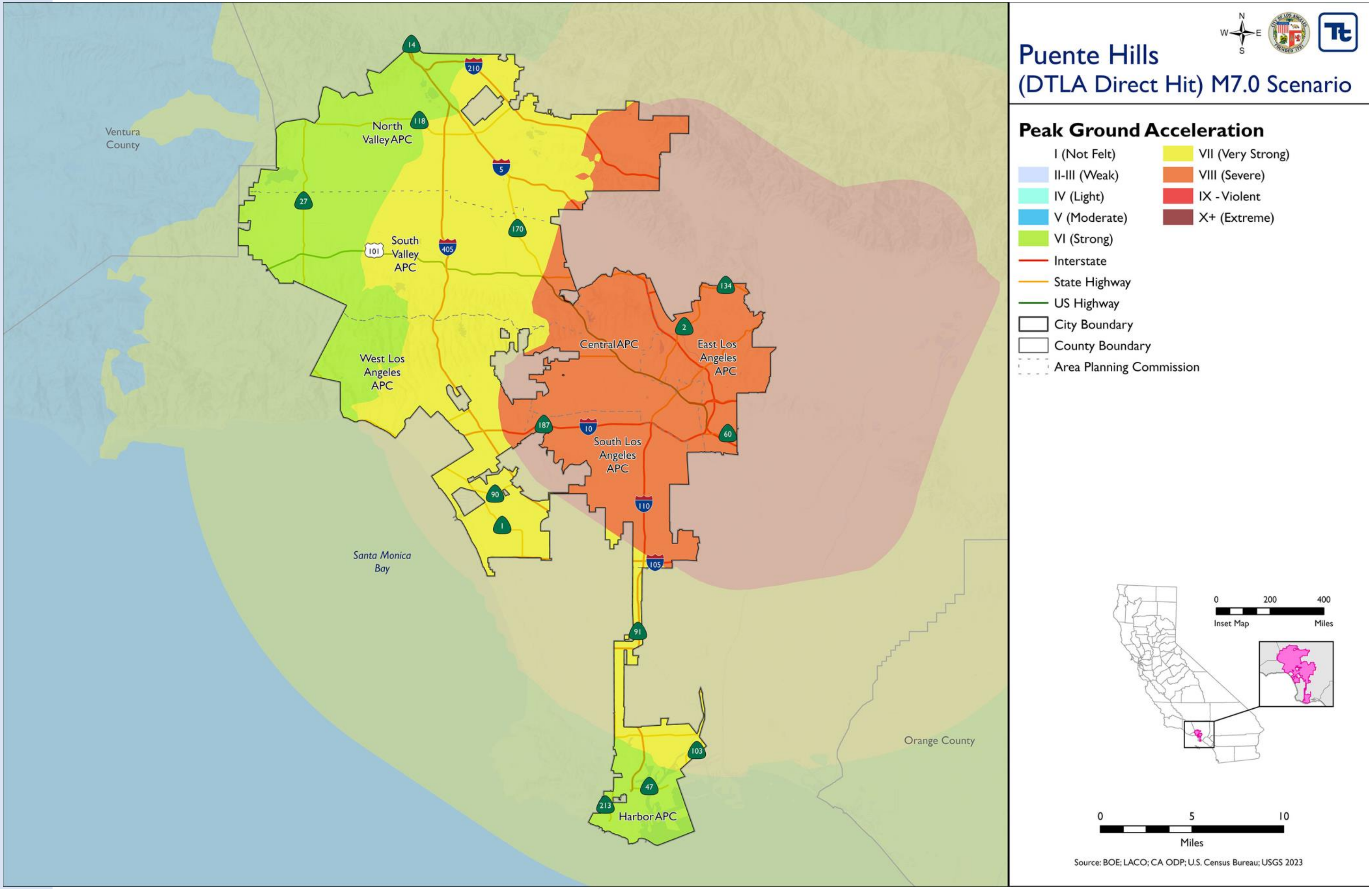


Figure 10-14. Puente Hills Fault Scenario Peak Ground Acceleration

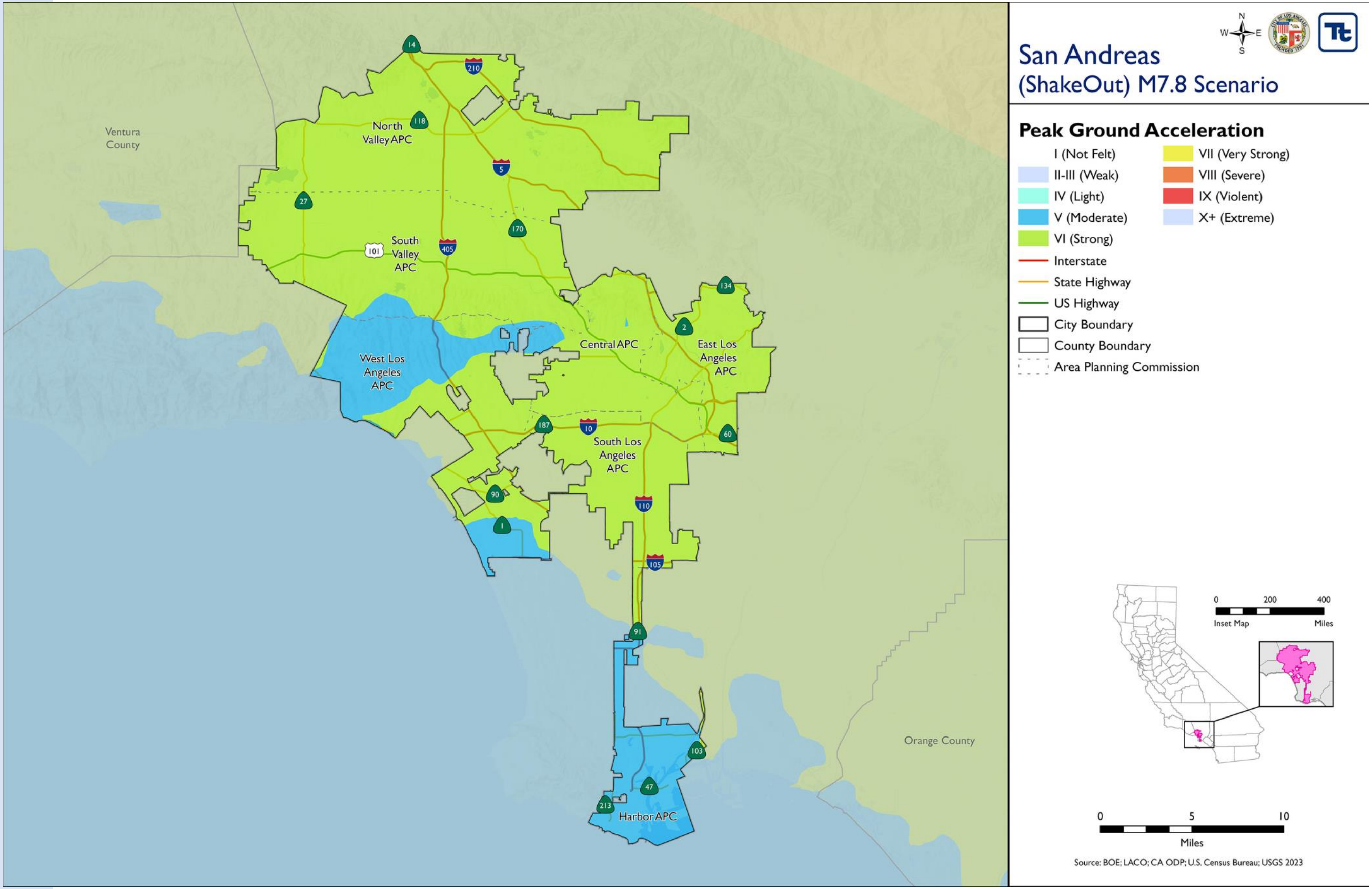


Figure 10-15. San Andreas Fault Scenario Peak Ground Acceleration

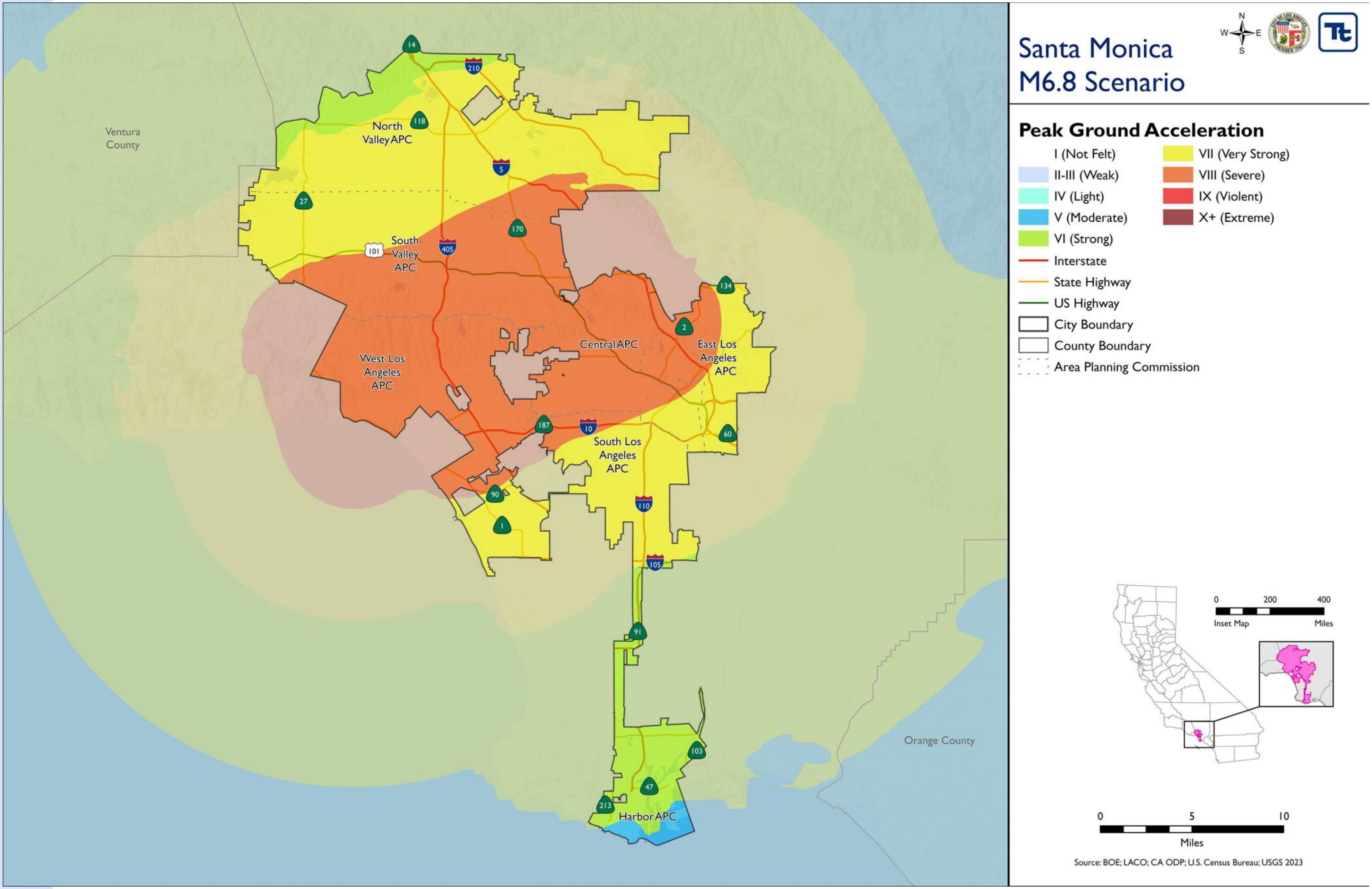


Figure 10-16. Santa Monica Fault Scenario Peak Ground Acceleration

10.4.1 Population

Impacts on persons and households in the planning area were estimated for the five scenario events through the Hazus analysis. Table 10-6 summarizes the estimates of households that would be displaced by the evaluated earthquake scenarios and the number of persons who would require short-term shelter following the event. Hazus also determines casualties (non-hospitalized injuries, hospitalizations, and fatalities) that would result from an earthquake event, depending on the time of day that the event occurs.

Table 10-6. Estimated Earthquake Impact on Persons and Households

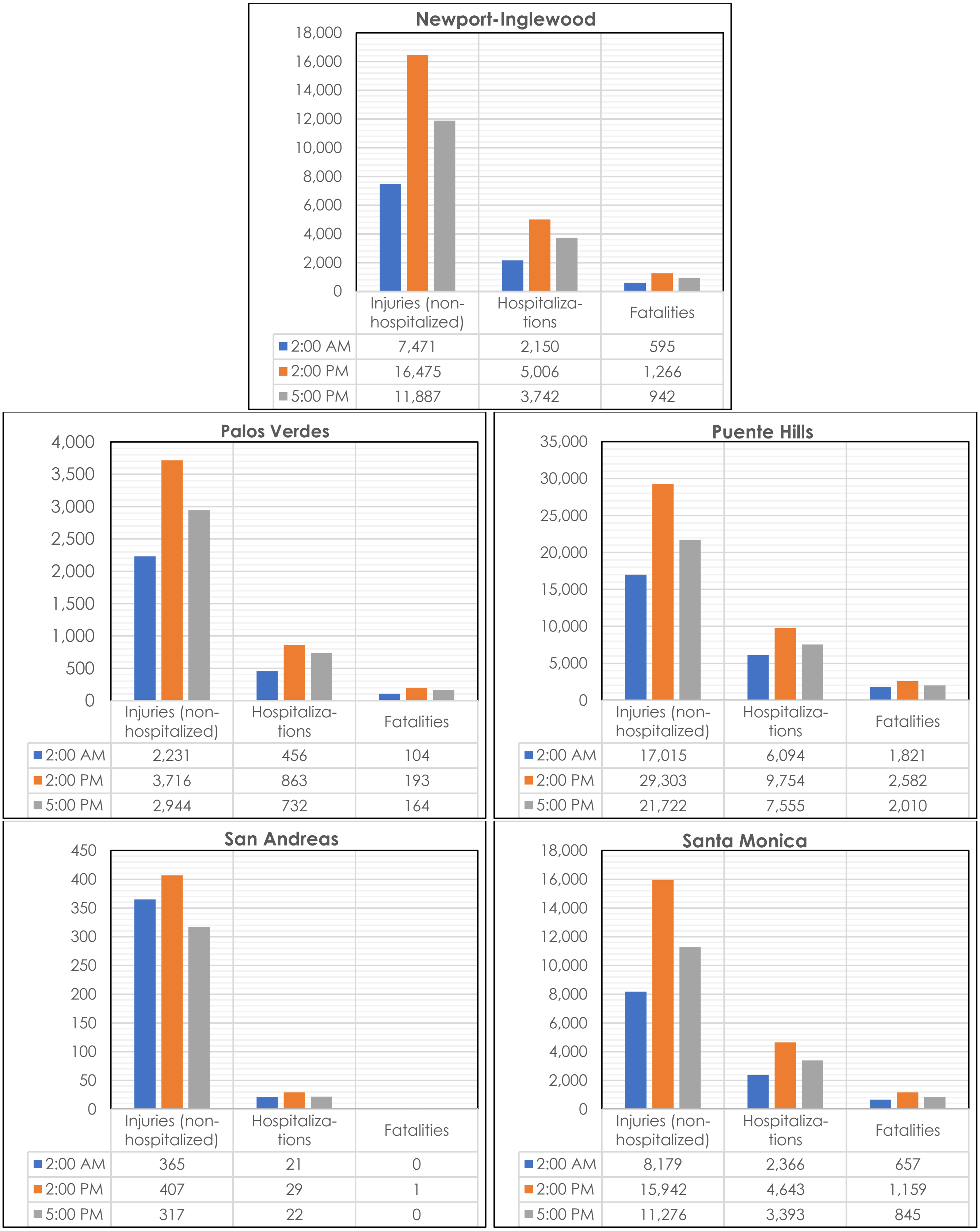
Earthquake Scenario	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
Newport-Inglewood	76,519	46,566
Palos Verdes	13,003	8,343
Puente Hills	118,192	72,950
San Andreas	1,047	653
Santa Monica	88,167	47,180

An earthquake can have widespread effects through the region, and marginalized or socially vulnerable communities and areas may experience greater impacts than other areas. This may include people without homes or places to stay, lower income populations, linguistically isolated people, elderly individuals or children, or people with access and functional needs or disabilities. Also impacted may be the facilities that assist these individuals or access to such facilities.

In addition to the initial earthquake, the area my incur one or multiple aftershocks. These could compound impacts on the population (including socially vulnerable communities), transportation systems, access to essential services, emergency response, alerts, and notification.

The overall impact of a sizable earthquake and any aftershocks could be monumental. The City is part of the Southern California Catastrophic Earthquake Plan 2022 planning process (Cal OES 2024). Included in the planning process is consideration for socially vulnerable communities and the potential impact such a disaster might have on them.

Figure 10-17 shows the casualty results for the scenarios evaluated in this plan. The times evaluated represent when the greatest number of people are at home (2 a.m.), at school or work (2 p.m.), or commuting (5 p.m.)



Newport-Inglewood

	Injuries (non-hospitalized)	Hospitaliza-tions	Fatalities
2:00 AM	7,471	2,150	595
2:00 PM	16,475	5,006	1,266
5:00 PM	11,887	3,742	942

Palos Verdes

	Injuries (non-hospitalized)	Hospitaliza-tions	Fatalities
2:00 AM	2,231	456	104
2:00 PM	3,716	863	193
5:00 PM	2,944	732	164

Puente Hills

	Injuries (non-hospitalized)	Hospitaliza-tions	Fatalities
2:00 AM	17,015	6,094	1,821
2:00 PM	29,303	9,754	2,582
5:00 PM	21,722	7,555	2,010

San Andreas

	Injuries (non-hospitalized)	Hospitaliza-tions	Fatalities
2:00 AM	365	21	0
2:00 PM	407	29	1
5:00 PM	317	22	0

Santa Monica

	Injuries (non-hospitalized)	Hospitaliza-tions	Fatalities
2:00 AM	8,179	2,366	657
2:00 PM	15,942	4,643	1,159
5:00 PM	11,276	3,393	845

Figure 10-17. Estimated Casualties Due to Earthquake, by Time of Day

10.4.2 Property

Loss Potential

Hazus generated loss estimates for the evaluated earthquake scenarios, as reflected in Table 10-7. Table 10-8 describes the estimated amount of debris created during the evaluated earthquake events. Figure 10-18 shows the estimated percent of buildings in each occupancy class that would experience defined damage levels—ranging from none to total—for each earthquake scenario.

Table 10-7. Estimated Earthquake Impacts on Buildings

Earthquake Scenario	Estimated Loss				% of Total Planning Area RCV
	Residential	Commercial	Other	Total	
Newport-Inglewood	$12,876,959,838	$20,903,081,825	$6,644,856,021	**$40,424,897,683**	***5.20%***
Palos Verdes	$5,842,898,157	$7,107,003,206	$2,731,711,974	**$15,681,613,336**	***2.00%***
Puente Hills	$19,098,533,289	$34,693,008,553	$12,337,824,853	**$66,129,366,694**	***8.50%***
San Andreas	$1,212,928,991	$1,603,095,143	$846,979,774	**$3,663,003,908**	***0.50%***
Santa Monica	$15,041,399,289	$21,158,464,673	$6,012,584,372	**$42,212,448,333**	***5.40%***

Table 10-8. Estimated Debris Generated by Earthquake

Earthquake Scenario	Brick/Wood Debris (tons)	Concrete/Steel Debris (tons)
Newport-Inglewood	4,661,744	6,819,615
Palos Verdes	1,792,102	1,945,063
Puente Hills	6,610,592	11,740,883
San Andreas	346,146	340,039
Santa Monica	4,525,598	6,270,728

10.4.3 Community Lifelines

Level of Damage

Hazus classifies earthquake impacts on community lifelines as no damage, slight damage, moderate damage, extensive damage, or complete damage. The model was used to assign a category to each community lifeline in the planning area for the five earthquake fault scenarios. Figure 10-19 summarizes the results. Two lifeline categories—hazardous materials and food, hydration, and shelter—are not included in the results because the Hazus model for earthquake impact does not have formulas for them.

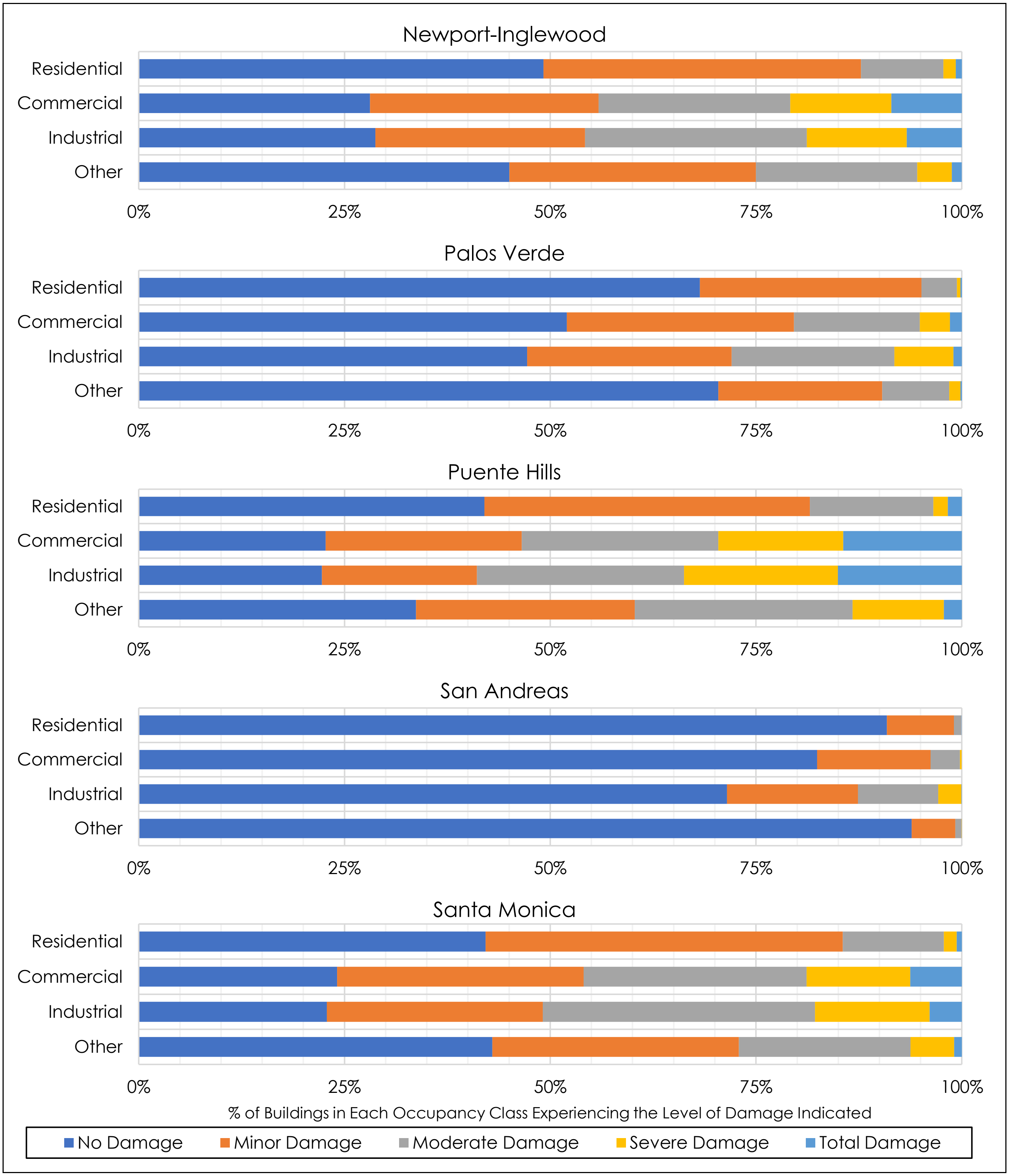


Figure 10-18. Estimated Percent of Buildings Experiencing Defined Levels of Damage Due to Earthquake

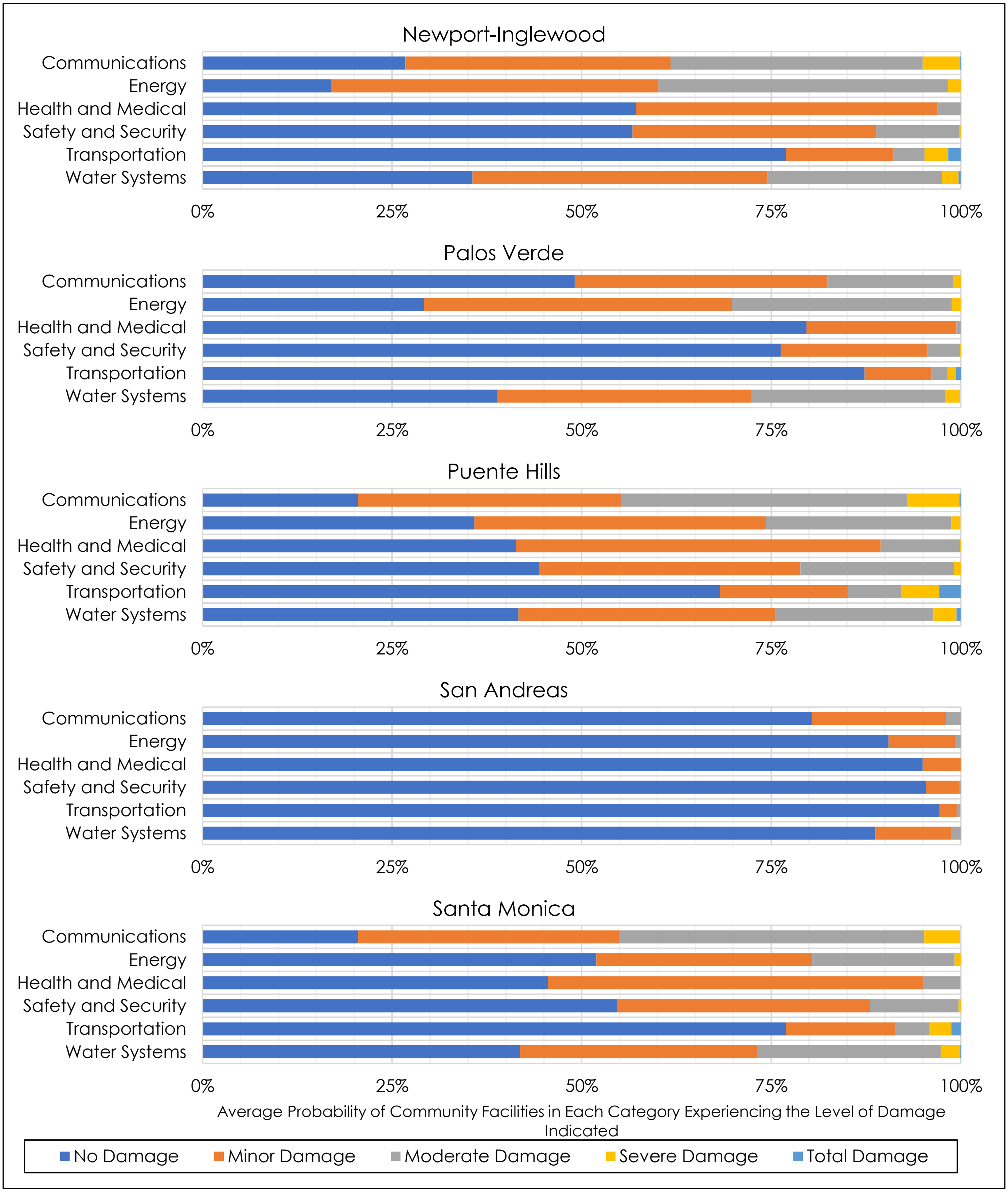


Figure 10-19. Probability of Community Lifelines Experiencing Defined Levels of Damage Due to Earthquake

Time to Return to Functionality

Hazus estimates the time to restore community lifelines to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 7, 30, and 90 days after the event. For example, Hazus may estimate that a facility has a 5 percent chance of being fully functional on Day 7 and a 95 percent chance of being fully functional on Day 90. The analysis of community lifelines in the planning area was performed for the five scenario events assessed. The results are summarized in Figure 10-20.

10.4.4 Environment

Secondary effects associated with earthquakes will likely have damaging impacts on the environment. Streams can be rerouted after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology.

10.4.5 Historic and Cultural Resources

Depending on the magnitude, earthquakes affecting Los Angeles could bring devastating loss of life and property to the area in and around historical and cultural landmarks.

10.4.6 Economy

Earthquake events have the potential to cause devastating impacts to the City's local economy, including small businesses. Destruction from ground shaking and other cascading impacts of earthquake events are likely to cause the closure of businesses and a disruption in the local economy following a major earthquake. Other drivers of the local economy, such as tourism, are likely to be impacted due to damaged transportation routes, structural damage, and other secondary impacts of earthquake events.

10.5 Effects of Future Change on Vulnerability and Impacts

10.5.1 Future Development

Since all of the planning area is in earthquake hazard zones, all future development will, to some extent, be vulnerable to the earthquake hazard. The City of Los Angeles has earned the second highest possible classification on the Building Code Effectiveness Grading Schedule scale. This indicates that the City strictly enforces all seismic building codes and design standards to prevent loss of life and property from earthquakes. Public education, cooperation with the development community, and individual preparedness are essential.

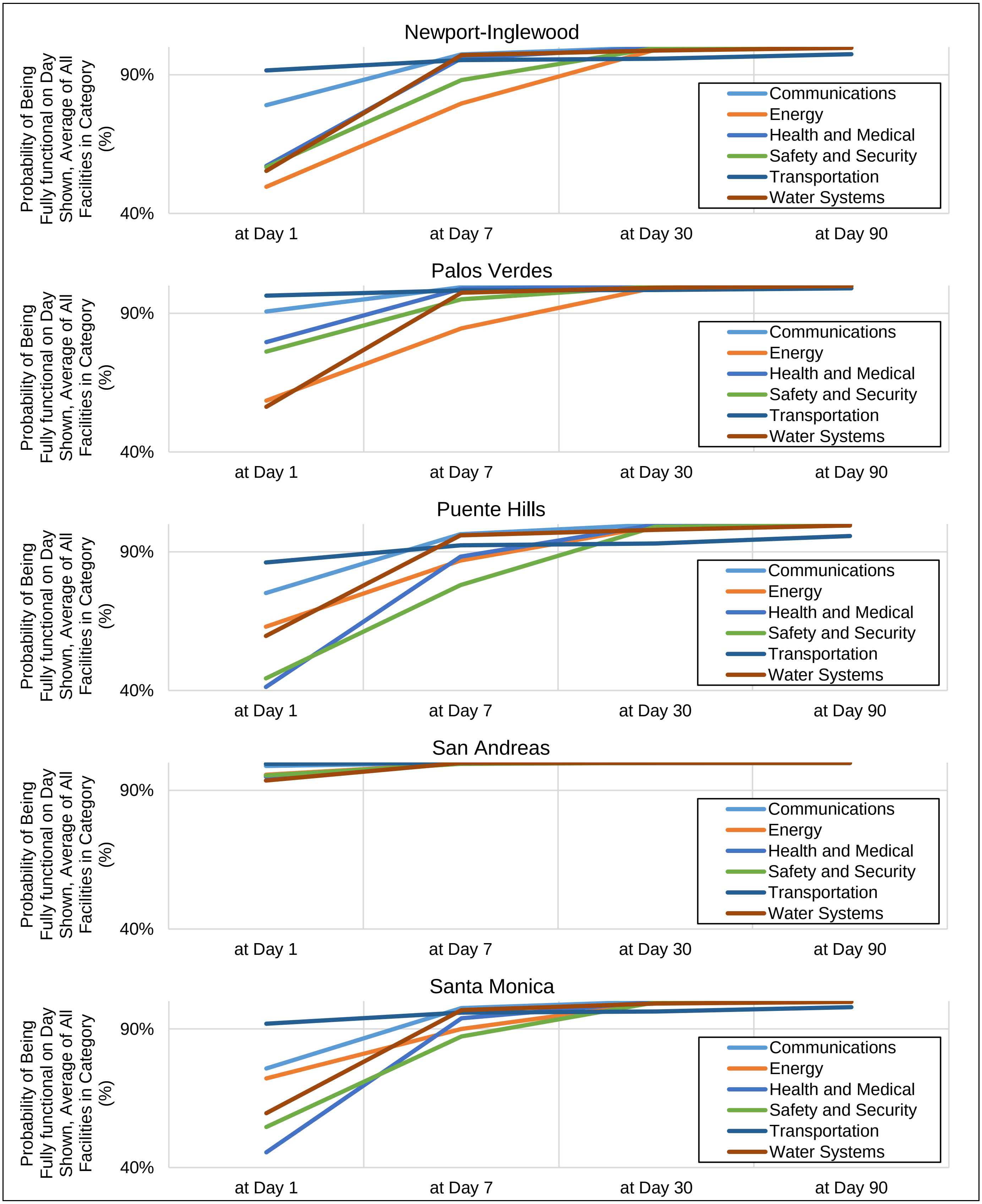


Figure 10-20. Community Lifeline Functionality Following Earthquake Scenario Events

The City has a General Plan with policies directing land use and dealing with issues of geologic and seismic safety. This plan provides the capability to protect future development from the impacts of earthquakes. Deficiencies identified by development reviews can be identified as mitigation actions to increase the capability to deal with future trends in development.

10.5.2 Climate Change

The potential direct impacts of climate change on earthquake vulnerability and impacts are unknown. Climate change may increase the risk of cascading impacts related to earthquakes, including landslides. Rising air temperatures can facilitate soil breakdown, allowing more water to penetrate soils and affecting erosion rates, sediment control, and the likelihood of landslides. Climate change may also increase the probability of more frequent, intense rainstorms. This can result in more significant erosion, higher sediment transport in rivers and streams, and a higher probability of landslides, primarily from higher water content.

Because the effect of climate change on the earthquake hazard is not well understood, changes in vulnerability and impacts are not able to be determined.

11. Extreme Cold or Freeze

11.1 GENERAL BACKGROUND

Extreme cold events occur when temperatures drop well below normal temperatures expected for an area. For example, near-freezing temperatures are considered "extreme cold" in regions relatively unaccustomed to winter weather. Conversely, "extreme cold" might be used to describe temperatures below 0°F in regions that are subjected to temperatures below freezing on more of a regular basis.

11.1.1 Hazards Associated with Extreme Cold

Extensive exposure to extremely cold temperatures can cause frostbite or hypothermia and become life-threatening. Extreme cold also can cause emergencies in susceptible populations, such as those without shelter, those who are stranded, or those who live in a home that is poorly insulated or without heat (such as mobile homes). Infants and older adults are most susceptible to the effects of extreme changes in temperatures and are particularly at risk, but anyone can be affected (CDC 2012b).

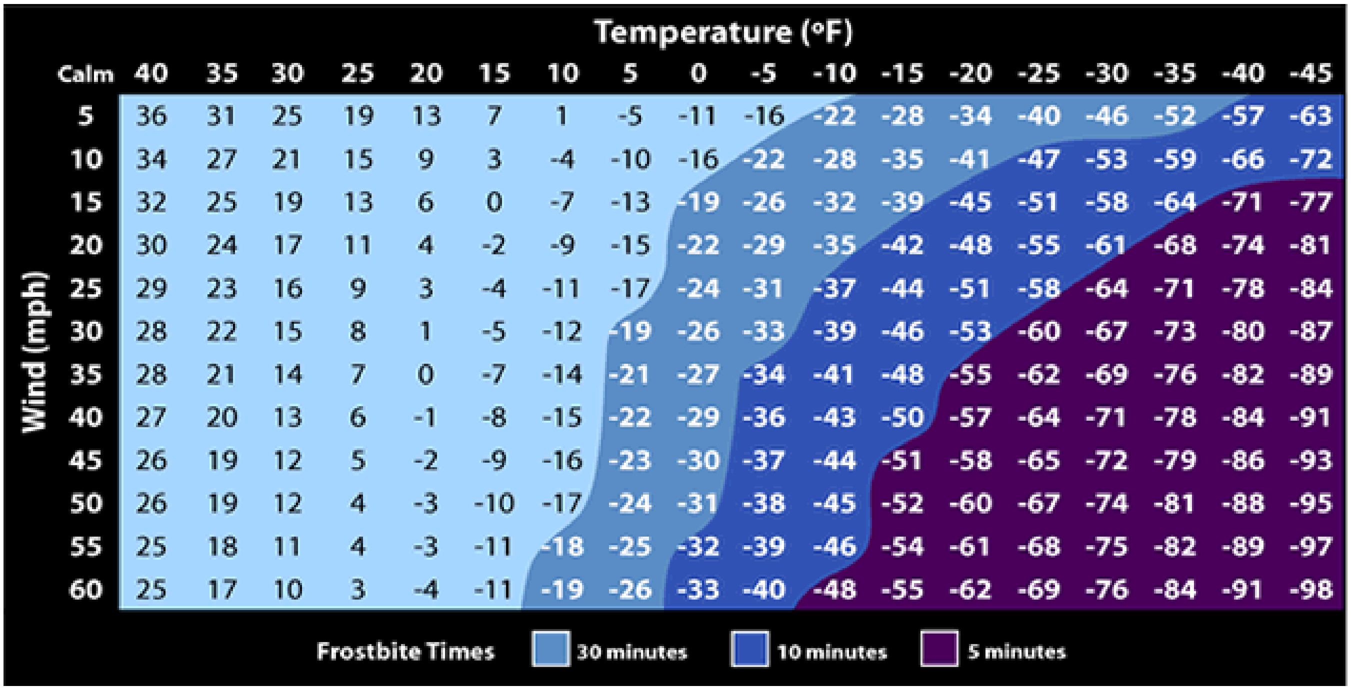
Several health hazards associated with extreme cold temperatures are related to the following factors (Mayo Clinic 2022):

- Wind chill is a measure of how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. Figure 11-1 shows the National Weather Service wind chill temperature index. This index describes the relative discomfort or danger resulting from the combination of wind and temperature.
- Frostbite is damage to body tissue caused by extreme cold. A wind chill of -20°F will cause frostbite in just 30 minutes. Frostbite can cause a loss of feeling and a white or pale appearance in extremities.
- Hypothermia is a potentially fatal condition brought on when the body temperature drops to less than 95°F. Warning signs of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.

11.1.2 Cascading and Compounding Impacts

The most significant hazards associated with extreme cold temperatures are falling and downed trees, landslides, broken pipes, and downed power lines. Heavy rain and icy conditions can overwhelm both natural and manufactured drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails. Extreme cold temperatures may result in closed highways and blocked roads if any residual standing water freezes and forms black ice. Icy conditions and frozen pipes cause damage to residences and businesses. Extreme cold and freeze events may cause some plant and crop damage.

Source: (NWS 2019)



Wind (mph) \ Temperature (°F) Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes; 10 minutes; 5 minutes

Figure 11-1. NWS Wind Chill Index

11.2 Hazard Profile

11.2.1 Past Events

There have been few occurrences of extreme cold or freeze in Los Angeles and surrounding areas. There have been two federal disaster declarations for severe freeze in Los Angeles County (January 2007 and December 1990), and one state emergency proclamation (January 2007). The Section 3.1 provides details on the historical declarations.

The list below details additional occurrences (Liss 2014, NWS 2023, Masters 2012):

- On January 15, 1932, up to 2 inches of snow fell all over the Los Angeles Basin (called the heaviest on record), with 1 inch recorded at the Los Angeles Civic Center.
- A snowstorm passed over Hollywood on Jan. 22, 1921, dusting rooftops with snow and covering streets with snow and slush.
- Los Angeles experienced its lowest temperature on record, 28°F, in 1949. Snowfall lasted for three days.
- A cold storm system brought thunderstorms and snow to Los Angeles County on November 22, 1973.
- Snow fell at the beaches in Los Angeles and the desert in Palm Springs from February 7 to 9, 1989. Major road closures and numerous traffic accidents were reported. At one point all the principal highways in and out of the Los Angeles Basin (including Interstates 5, 10, 15 and Highway 14) were closed due to snow.

- On January 17, 2007, it snowed lightly in West Los Angeles and Malibu. A stronger-than-expected storm system produced snow, rain, and hail. The conditions were later blamed for damaging local orange groves.
- In the winter of 2013, it got as cold as 34°F.
- In December 2014, temperatures dipped to 35°F in Woodland Hills and 30°F in the Inland Empire.

11.2.2 Location

In general, cold events could affect the planning area in its entirety.

11.2.3 Frequency

Assessment Based on Past Events

Table 11-1 summarizes search results from the National Centers for Environmental Information (NCEI) Storm Events Database for extreme cold or freeze events in Los Angeles County over the 20-year period from 2003 through 2023. Based on these results, extreme cold or freeze events happen approximately once every 20 years.

Table 11-1. Los Angeles County Extreme Cold or Freeze Events, January 2003 – May 2023

Event Types Included[a]	Total Number of Events	Number of Days with: Event	Number of Days with: Event and Death or Injury	Number of Days with: Event and Property Damage	Average Years Between Days with Event
Cold and Wind Chill	0	0	0	$0	0
Extreme Cold and Wind Chill	0	0	0	$0	0
Frost/Freeze	2	1	0	$8 million	20
Total	**2**	**1**	**0**	**$8 million**	**20**

Source: (NOAA 2023b)

a. Event types are the categories available for search in the NCEI Storm Events Database

Potential Effect of Future Conditions on Hazard Probability

With a changing climate, increased average surface temperatures can lead to fewer days of extreme cold or freeze. Extreme cold days in the planning area are likely to decrease, and the temperatures may be less extreme. Temperatures may be warmer at the coast than inland.

11.2.4 Severity

According to the National Oceanic and Atmospheric Administration (NOAA), the City has an average winter temperature of 58.4 °F and an average winter minimum temperature of 49 °F. The lowest temperature on record in the City is 28 °F.

11.2.5 Warning Time

The NWS provides alerts when wind chill indices approach hazardous levels; refer to Table 11-2.

Table 11-2. NWS Alerts for Extreme Cold

Alert	Criteria
Wind Chill	
Wind Chill Warning: Take Action!	NWS issues a wind chill warning when dangerously cold wind chill values are expected or occurring. If you are in an area with a wind chill warning, avoid going outside during the coldest parts of the day. If you do go outside, dress in layers, cover exposed skin, and make sure at least one other person knows your whereabouts. Update them when you arrive safely at your destination.
Wind Chill Watch: Be Prepared	NWS issues a wind chill watch when dangerously cold wind chill values are possible. As with a warning, adjust your plans to avoid being outside during the coldest parts of the day. Make sure your car has at least half a tank of gas and update your winter survival kit.
Wind Chill Advisory: Be Aware	NWS issues a wind chill advisory when seasonably cold wind chill values, but not extremely cold values are expected or occurring. Be sure you and your loved ones dress appropriately and cover exposed skin when venturing outdoors.
Freeze	
Hard Freeze Warning: Take Action!	NWS issues a hard freeze warning when temperatures are expected to drop below 28°F for an extended period of time, killing most types of commercial crops and residential plants.
Freeze Warning: Take Action!	When temperatures are forecasted to go below 32°F for a long period of time, NWS issues a freeze warning. This temperature threshold kills some types of commercial crops and residential plants.
Freeze Watch: Be Prepared	NWS issues a freeze watch when there is a potential for significant, widespread freezing temperatures within the next 24-36 hours. A freeze watch is issued in the autumn until the end of the growing season and in the spring at the start of the growing season.
Frost Advisory: Be Aware	A frost advisory means areas of frost are expected or occurring, posing a threat to sensitive vegetation.

Source: (NWS 2023)

11.2.6 Scenario

A worst-case event would involve prolonged high winds during an extreme cold event. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and potentially downed tree obstructions. Some portions of the City could experience limited ingress and egress.

11.3 VULNERABILITY

All people and property and the entire environment of the planning area are vulnerable to some degree to extreme cold or freeze hazard, as summarized in Table 11-3.

Table 11-3. Population and Property Vulnerable to the Extreme Cold/Freeze Hazard

Total Population	
Population in the Hazard Area	3,766,109
% of Total Planning Area Population	100%
Socially Vulnerable Population (see Section 4.4.2 for explanation of index values)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	831,919
% of Total Planning Area Population	21.5%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	844,409
% of Total Planning Area Population	21.8%
Property	
Number of Buildings in the Hazard Area	739,644
Total Property Value in the Hazard Area	$781,603,700,869
Total Value in the Hazard Area as % of Planning Area Total Value	100%

11.4 IMPACTS

11.4.1 Population

Individuals who experience prolonged exposure to extreme cold or freeze risk frostbite or hypothermia.

Socially Vulnerable Populations

According to the CDC, those at greater risk of the adverse effects of extreme cold or freeze events are individuals with physical or mobility constraints, cognitive impairments, economic constraints, and social isolation (CDC 2012a). Such populations include the elderly, young children, low-income people, and people with life-threatening illnesses. Power outages can be life-threatening to those dependent on electricity for life support, can hinder communication services, and can disrupt utility usage.

Those experiencing homelessness are particularly likely to experience the impacts of extreme cold or freezing temperatures. The cumulative effects over several days of continuous exposure to cold temperatures, without relief, pose additional risks for the homeless, especially those with underlying medical conditions.

11.4.2 Property

Typically, the only impact extreme cold or freeze has on general building stock is increased demand for heating equipment, which may strain electrical systems. Extreme cold events may also affect building mechanics, such as causing pipes to burst.

11.4.3 Community Lifelines

Extreme cold and freeze pose a risk to ground transportation infrastructure, such as potential damage to railway lines and tracks, pavement, bridges, and other transportation avenues.

Power outages or rolling blackouts may occur as a result of extreme cold events that strain and freeze circuits. During a blackout, all community lifelines that rely upon electricity will be severely impacted unless they are connected to a backup power source.

11.4.4 Environment

Extreme cold or freeze events can have a major impact on the environment. For example, freezing weather patterns create changes in natural processes. Intense cooling periods can affect crop growth. An excess amount of snowfall and earlier warming periods may affect natural processes such as flow within water resources (USGS n.d.). Likewise, when heavy rains fall on snow-covered ground, runoff rates may be exacerbated by warming winter weather.

11.4.5 Historic and Cultural Resources

Historic sites are at risk from the extreme cold or freeze hazard. Historic buildings may be susceptible to damage from extreme temperature conditions. Proper strategies help safeguard buildings and their contents. Sudden and dramatic fluctuations in heating or cooling should be minimized. Slower heating and cooling give building materials and stored contents time to acclimate to new temperatures in the building and corresponding new humidity levels (CCAHA 2019).

Cultural heritage sites, particularly those exposed to the elements, are subject to weathering. Climate change is a potential threat to these sites as it exacerbates the expected rates of decay and contributes to the appearance of new decay. Climatic changes may aggravate the physical, chemical, and biological mechanisms causing degradation by affecting the structure or composition of building materials. Changes in temperature, precipitation, atmospheric moisture, and wind intensity, in addition to sea-level rise, desertification, and the interaction between climatic changes and air pollution, have been identified as concerns by the United Nations Educational, Scientific and Cultural Organization (Sesana, et al. 2021).

11.4.6 Economy

Extreme cold or freeze events can affect the economy, including loss of business function and damage and loss of inventory. Business owners may be faced with increased financial burdens due to unexpected repairs to the building or a loss or delay in inventory.

The agricultural industry is most at risk in terms of economic impact and damage caused by extreme cold or freeze events. Such events can directly affect livestock and crop production.

11.5 Effects of Future Change on Vulnerability and Impacts

11.5.1 Future Development

The ability of new development to withstand extreme cold or freeze impacts can be enhanced through land use practices and consistent enforcement of codes and regulations for new construction. New development will change the landscape where buildings, roads, and other infrastructure potentially replace open land and vegetation. As new buildings, roads, and infrastructure are constructed, structures must be up to code to reduce the risk of cascading effects of extreme cold such as impacts on pipes and utilities, which may discourage development due to the high cost of repairs.

11.5.2 Climate Change

As the climate warms, extreme cold or freeze events may decrease in frequency. When comparing average annual temperatures from 1901 to 1960 to those of 1986 to 2016, most of the State of California has experienced increases exceeding 1°F, with some areas exceeding 2 °F (OPR 2022). This general warming trend has the potential to reduce the occurrence and range of anticipated intensities of extreme cold or freeze events in the future.

12. Extreme Heat

12.1 General Background

FEMA's National Risk Index, which ranks all counties in the United States based on their vulnerability to natural disasters and risks, includes heat waves as one of its 18 primary risks. Around the country and the world, extreme heat is an increasingly severe climate hazard, with annual average maximum temperatures and the number of high-heat days in a year on the rise. Rising temperatures are exacerbated by the urban heat island effect, through which urban areas are found to be warmer due to a lack of tree canopy cover, shade, and cool spaces or landscapes.

Extreme heat exposure is tied to negative socioeconomic and infrastructural impacts, with certain populations and geographies being more vulnerable than others (e.g., the elderly, outdoor workers, low-income areas, etc.). Extreme heat is a public health concern, as it is tied to heat-induced illness, hospitalizations, and mortality. Extreme heat is also tied to increased electricity demand for cooling, as well as to wildfire, both of which threaten grid infrastructure and lead to outages that can threaten livelihoods in a multitude of ways.

In response, communities where extreme heat is an increasingly severe climate hazard are responding by appointing chief heat officers, developing heat-specific action plans, and addressing heat as an ongoing threat to their communities. Heat officers and heat action plans are aimed toward mitigating heat and its impacts on people and infrastructure, as well as creating programs for communities to raise awareness and enable them to protect themselves during high-heat days or heat waves. Given the disproportionate impact of extreme heat on certain populations, equity is central to many of these plans, prompting officials to direct efforts to support the most vulnerable.

Extreme heat is defined as temperatures that are consistently 10 °F or more above the average high temperature for a region and that last for several weeks (CDC 2012); the average high temperature for the City of Los Angeles in August (the hottest month of the year) is 79 °F (U.S. Climate Data 2023). Humid or muggy conditions occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. A heat wave is a period of abnormally and uncomfortably hot and unusually humid weather that lasts two or more days (NOAA 2009).

This HMP provides a baseline hazard assessment of extreme heat. The City is developing additional products dedicated to assessing extreme heat and its impacts on the City. These initiatives include the Climate Vulnerability Assessment and Heat Action and Resilience Plan (see Section 6.5).

12.1.1 Hazards Associated with Extreme Heat

Extreme heat is the number one weather-related cause of death in the United States. During 1999–2020, the annual number of deaths from excessive heat ranged from a low of 297 in 2004 to a high of 1,153 in 2020 (CDC 2022). Heat has claimed an average of 164 lives per year in the United States over the last 30 years (Donegan 2023). According to the *California Climate Adaptation Strategy*, heat waves have claimed more lives in California than all other declared disaster events combined. The potential impacts of extreme heat include:

- Increased energy demand and subsequent power failures due to increased demand
- Adverse health impacts in vulnerable populations, such as older adults and persons experiencing homelessness
- Damage to aging infrastructure and buildings such as highways and roads being damaged by excessive heat as asphalt softens
- Drought and limited drinking water supply for residents

Heat waves do not strike victims immediately, but their cumulative effects slowly cause harm, especially to socially vulnerable populations. Extreme heat can cause heat exhaustion, in which the body becomes dehydrated and the body overheats, 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.

Heat exacerbates the health impacts of air pollution and Air pollution has the potential over time to be highly hazardous to the health of people in the short term and the long term, and especially to those with pre-existing health conditions.

Heat waves are occurring more often and with more intensity than they used to in major U.S. cities. The frequency of heat waves "has increased steadily, from an average of two per year during the 1960s to six per year during the 2010s and 2020s," according to data from the Environmental Protection Agency (EPA 2022a).

The National Weather Service (NWS) has created a heat index chart that considers the temperature and relative humidity to estimate the likelihood of heat disorders with prolonged exposure. The heat index is given in degrees Fahrenheit and corresponds with the temperature that the body feels (NWS 2023). Figure 12-1 shows the heat index value for shaded areas; full sun exposure can increase the index by up to 15 °F. Table 12-1 describes the adverse effects on an individual of prolonged exposure to heat as measured by the heat index.

Source: NWS 2015

Temperature (°F)

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										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution — Extreme Caution — Danger — Extreme Danger

Figure 12-1. NWS Heat Index Chart

Table 12-1. Adverse Effects of Prolonged Exposure to Direct Sunlight

Category	Heat Index	Effects on the Body
Caution	80°F–90°F	Fatigue is possible with prolonged exposure and/or physical activity
Extreme Caution	90°F–103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F–124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

Source: NWS

12.1.2 Cascading and Compounding Impacts

A secondary effect of extreme heat is poor air quality, which can occur during summer when stagnant atmospheric conditions trap humid air and pollutants near the ground, closer to residents. Hot weather can increase levels of ozone, which is created in the presence of sunlight via reactions between chemicals in gasoline vapors and industrial smokestacks. High ozone levels often cause or worsen respiratory problems. The longer a heat wave lasts and the hotter the temperature is, the greater the risk of adverse effects on human health or infrastructure. High temperatures can set off inflammatory responses in the body and lead to increased blood clotting, which may lead to a heart attack. High levels of pollution can also cause inflammation, increased blood clotting, and dysfunction of the lining of the blood vessels that supply the heart. Heat exacerbates the health impacts of air pollution and is hazardous to the health of people in the short term and the long term, especially to those with pre-existing health conditions.

12.2 HAZARD PROFILE

FEMA's National Risk Index ranks Los Angeles County as the county with the greatest level of climate risk in the United States, due to the county's population density and widespread social vulnerability. In the County's 2021 Climate Vulnerability Assessment, extreme heat was listed as one of the most substantive threats to communities and physical infrastructure. In 2022, the City of Los Angeles became the largest city in the world to designate a chief heat officer and add the role into the City's existing leadership. The chief heat officer oversees the City's response to extreme heat events, including a campaign to improve early warning systems and develop a heat action plan with long-term strategies for reducing heat exposure.

12.2.1 Past Events

Los Angeles experiences almost 10 days a year with an average temperature of 81 °F or higher, with peaks of up 113 °F in recent years. There have been no federal or state disaster declarations for extreme heat in Los Angeles County. NOAA's National Centers for Environmental Information (NCEI) storm event database lists three excessive heat events in the planning area:

- **July 2006**—In July 2006, California and Nevada were affected by a heat wave that was unprecedented with respect to the magnitude and duration of high temperatures, especially high nighttime minimums, and very high humidity levels. This event simultaneously affected both Northern and Southern California (Cone and Guccione 2006). A temperature of 119 °F was recorded in Woodland Hills, with high humidity. The event was credited with 163 deaths in California.
- **August 30 – September 3, 2007**—The combination of above-normal temperatures and relative humidity produced excessive heat across the planning area. Eight fatalities occurred related to the heat. Heat index values were between 105 and 112 °F.
- **June 20 – 21, 2008**—The combination of strong high pressure centered over Arizona and weak offshore flow generated extreme heat conditions across Central and Southern California. Across many sections of the area, afternoon temperatures climbed to between 100°F and 114°F, setting numerous high-temperature records. The extreme heat resulted in several power outages due to excessive electrical use.

- **August 30– September 6, 2022**— An extreme heat event affected Los Angeles, with temperatures across the State of California exceeding 10 to 20 °F above normal. In August 2022, Governor Gavin Newsom declared a State of Emergency due to the extreme heat wave statewide, with temperatures exceeding 100 °F (CA Office of the Governor 2022).

12.2.2 Location

Extreme heat events may occur anywhere in the City and may be exacerbated where low airflow, low vegetation, and high generation of waste heat can contribute to temperatures that are several degrees higher than in surrounding less urbanized areas. Neighborhoods that are closer to urban areas are more exposed to high heat conditions due to the urban heat island (UHI) effect. UHIs are created by a combination of heat-absorptive surfaces (such as dark pavement and roofing), heat-generating activities (such as engines and generators), and the absence of vegetation (which provides evaporative cooling) (CalEPA 2022). Radiation from the sun is absorbed by these surfaces during the day and re-radiated at night, raising ambient temperatures. The UHI effect, coupled with the impacts of climate change, drives temperature increases and contributes to extreme heat events in Los Angeles. UHIs have high nighttime minimum temperatures compared to neighboring areas. Waste heat from air conditioners, vehicles, and other equipment contributes to the UHI effect. Figure 12-2 depicts how heat varies depending on land use.

Source: Climate Central 2012

Figure 12-2. Urban Heat Island

Los Angeles exemplifies the UHI effect. Larger urbanized areas can magnify the impacts of the extreme heat hazard due to the increased baseline temperatures resulting from the UHI effect. According to the U.S. Environmental Protection Agency (EPA), a review of research and data found that in the United States, the UHI effect results in urban daytime temperatures of 1 to 7 °F higher than in outlying areas and nighttime temperatures about 2 to 5 °F higher (EPA 2022).

12.2.3 Frequency

Assessment Based on Past Events

Overall, the frequency of extreme heat events is increasing based on both past events and future heat projections. According to the Western Regional Climate Center, the planning area averages 19 days a year with temperatures exceeding 90 °F.

Table 12-2 summarizes results from the National Center for Environmental Information Storm Events Database for Los Angeles County extreme heat events over the 20 years from 2003 through 2023. Based on these results, extreme heat events occur approximately once every three years.

Table 12-2. Los Angeles County Extreme Heat Events, January 2003 – May 2023

Event Types	Total Number of Events	Number of Days with: Event	Event and Death or Injury	Event and Property Damage	Average Years Between Days with Event
Heat	7	2	0	0	10
Excessive Heat	10	5	8	0	4
Total	**17**	**7**	**8**	**0**	**3**

Source: (NOAA 2023)

a. Event types are the categories available for search in the National Center for Environmental Information Storm Events Database

Potential Effect of Future Conditions on Hazard Probability

A recent study by the EPA indicates that heat waves are occurring more frequently in all major cities across the United States, especially in western states (EPA 2022). Heat waves are also increasing in duration and intensity, creating a major cause for concern in Los Angeles.

The increase in average surface temperatures can lead to more intense heat waves that can be exacerbated in the City of Los Angeles by its UHI effect. Heat waves in Los Angeles have increased by more than three per century and extreme heat days have increased by 23 per century. Both have more than tripled over the past 100 years as a consequence of the steady warming of Los Angeles.

The average annual maximum temperature in Los Angeles has warmed by 5.0 °F, and the average annual minimum temperature has warmed by 4.2 °F. The greatest rate of change was during the summer for both maximum and minimum temperature, with late fall and early winter having the least rates of change. There was also an increase in heat wave duration. Heat waves lasting longer than six days occurred regularly after the 1970s but were nonexistent from 1906 until 1956, when the first six-day heat wave was recorded (Tamrazian, et al. 2008).

As Los Angeles is experiencing more heat waves and more extreme heat days, expected health impacts across the planning area are not uniform. According to a recent study from the California Department of Public Health and information from NOAA, increased rates of mortality and heat-related injuries have been recorded during heat waves over the last few years (CDPH 2023, Di Liberto 2021). Vulnerabilities exist where there is a higher pollution burden, higher chronic health conditions, and low-income housing. Heat creates hazardous conditions in microclimates and urban areas with higher vulnerabilities. These conditions do not always correlate with where the highest temperatures are. Rural areas with higher temperatures, for example, experience less harm to health, because there is more permeable soil and open space.

12.2.4 Severity

The average high temperature for the City of Los Angeles in August (hottest month of the year) is 79 °F (U.S. Climate Data 2023). In 2020, parts of Los Angeles County hit 121 °F (Carpenter 2022).

12.2.5 Warning Time

To better address heat risk and allow people to prepare for upcoming heat events, the NWS has developed the Heat Risk forecast (see Table 12-3), which provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale. It provides one value each day that indicates the approximate level of heat risk for any location, along with identifying the groups who are most at risk.

The NWS uses the Heat Risk Forecasting System to determine if an excessive heat watch/warning or heat advisory is warranted. The NWS issues excessive heat watches, excessive heat warnings and heat advisories to warn of an extreme heat event within the next 36 hours. If NWS forecasters predict an excessive heat event beyond 36 hours, then the NWS will issue messaging in the form of a special weather statement, emails, and social media in the three- to seven-day timeframe.

Table 12-3. NWS Heat Risk Forecasting System

Category	Level	Meaning
Green	0	No Elevated Risk
Yellow	1	Low Risk for those extremely sensitive to heat, especially those without effective cooling and/or adequate hydration
Orange	2	Moderate Risk for those who are sensitive to heat, especially those without effective cooling and/or adequate hydration
Red	3	High Risk for much of the population, especially those who are heat sensitive and those without effective cooling and/or adequate hydration
Magenta	4	Very High Risk for entire population due to long duration heat, with little to no relief overnight

Source: NWS

The NWS issues the following types of heat-related advisories:

- **Heat Advisory**—Tied to events where Heat Risk at the orange/red (Level 2-3) thresholds (orange will not be an automatic heat advisory).
- **Excessive Heat Watch/Warning**— Tied to events where Heat Risk is at the red/magenta (Level 3-4) thresholds.

The NWS will issue an excessive heat watch generally two to three days in advance. An excessive heat watch is a way to give the public and emergency officials a warning that extreme temperatures are expected. If significantly hot temperatures remain in the forecast for 24 to 28 hours, the excessive heat watch will be upgraded to an excessive heat warning, indicating that extreme heat has either arrived or is expected soon.

Meteorologists are able to accurately forecast extreme heat events and the severity of the associated conditions with several days of lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations, implement short-term emergency response actions, and focus surveillance and relief efforts on those at greatest risk. Adhering to extreme temperature warnings can significantly reduce the risk of temperature-related deaths.

12.2.6 Scenario

A worst-case extreme heat event for Los Angeles would involve extreme heat over 90 °F for multiple days, becoming a heat wave. This extreme heat event would lead to dried conditions in natural areas, increasing risk of wildfire, and deteriorating air quality. Increased ozone in the air could cause or worsen respiratory problems. Evaporation from the heat would lead to a loss of stored water in reservoirs and aqueducts, potentially leading to water use restrictions to conserve the available water.

12.3 VULNERABILITY

All people and property and the entire environment of the planning area are vulnerable to some degree to extreme heat hazard, as summarized in Table 12-4.

Table 12-4. Population and Property Vulnerable to the Extreme Heat Hazard

Total Population	
Population in the Hazard Area	3,766,109
% of Total Planning Area Population	100%
Socially Vulnerable Population (see Section 4.4.2 for explanation of index values)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	831,919
% of Total Planning Area Population	21.5%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	844,409
% of Total Planning Area Population	21.8%
Property	
Number of Buildings in the Hazard Area	739,644
Total Property Value in the Hazard Area	$781,603,700,869
Total Value in the Hazard Area as % of Planning Area Total Value	100%

12.4 IMPACTS

12.4.1 Population

According to the CDC, populations most at risk from extreme heat events include the following (CDC 2022):

- Older adults, who are less able to withstand temperature extremes due to their age, health conditions, and limited mobility to access shelters – identified as a socially vulnerable group
- infants and children up to age 4 – identified as a socially vulnerable group
- Individuals with chronic medical conditions (e.g., heart disease, high blood pressure) – may include socially vulnerable individuals
- Individuals experiencing economic hardships that cannot afford proper heating and cooling – identified as a socially vulnerable group
- The general public may overexert themselves during work or exercise during extreme heat events.

Individuals experiencing homelessness (identified as a socially vulnerable group) are particularly likely to experience impacts from extreme heat during the summer when increased humidity keeps nighttime temperatures above 80 °F. The cumulative effects over several days of continuous exposure to heat, without relief, put individuals experiencing homelessness at serious risk of heat stroke or worse. Others at significant risk are low-income populations who do not have access to air conditioning. This population, like those experiencing homelessness, would lack nighttime relief from the heat, elevating their risk of heat stroke or other complications. According to the Los Angeles County Climate Vulnerability Survey, the frequency, severity, and duration of extreme heat events are expected to increase (LA County 2021).

Some studies have indicated that extreme heat has negative impacts on mental health. A study in New York found that hot days are associated with a higher risk of emergency room visits for substance abuse, mood and anxiety disorders, schizophrenia, and dementia. Extreme heat is also associated with increases in depression, suicide, aggression, and domestic violence. Those with severe mental illnesses or currently on psychiatric medications may be more vulnerable to exacerbated mental or physical health impacts of extreme heat (Clayton, et al. 2017, Dodgen, et al. 2016).

A 2023 study investigated how social vulnerability measures influence heat-related emergency room visits in Los Angeles County. The study found that, at the census tract level, excessive heat-related emergency room visits had a significant, but weak relationship with vulnerability scores, such as the CDC's Social Vulnerability Index, the social vulnerability component of the National Risk Index, or the California Heat Assessment Tool (CHAT). The higher the vulnerability scores of a census tract, the more heat-related emergency room visits in that census tract. (Derakhshan, et al. 2023)

As temperatures increase, harmful algal blooms are a significant public health risk at City urban lakes for people and animals, harm aquatic ecosystems, and limit the use of drinking and recreational waterbodies due to the toxins, odors and scum the can produce. (California Water Quality Monitoring Council 2023)

The CHAT was used to assess heat-related public health impacts in the City. The CHAT assesses heat health events, which are events that result in negative public health impacts, regardless of the absolute temperature (California Natural Resources Agency n.d.). To develop heat health events, emergency department visitation data from the California Office of Statewide Health and Planning is paired with daily meteorological data (California Natural Resources Agency n.d.). For the time period of 2021 through 2040, the average number of heat health events for the City in a year is estimated to range between 2.00 and 7.78 (see Figure 12-3); each heat health event is estimated to last 2 to 4.89 days (California Natural Resources Agency n.d.).

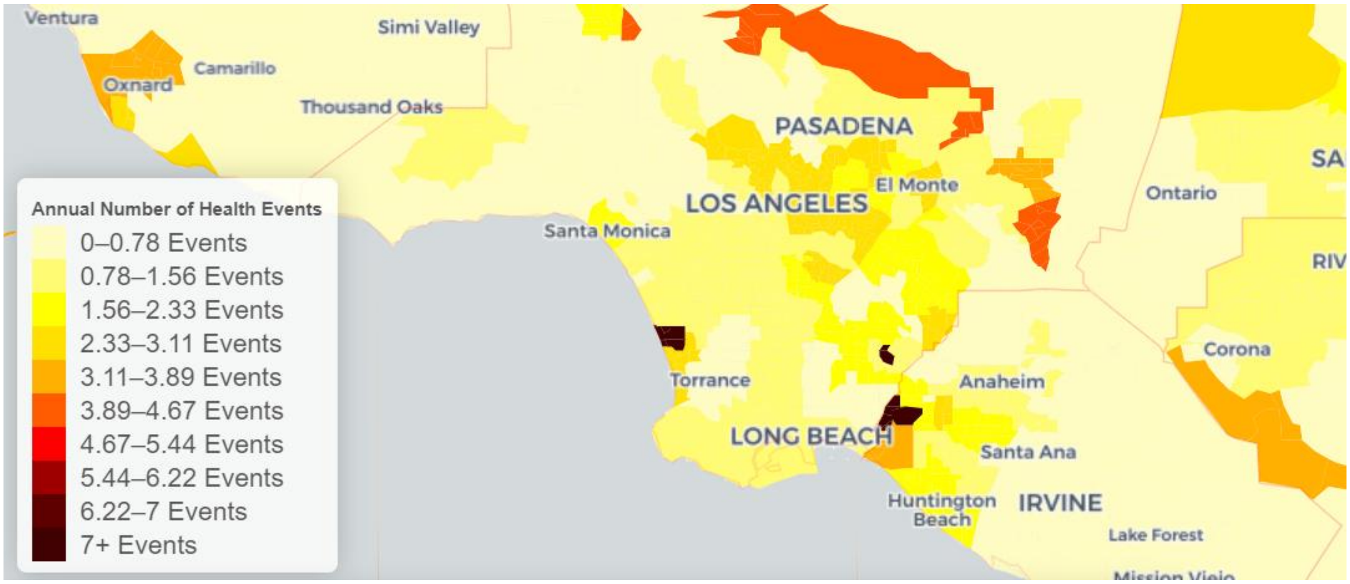


Figure 12-3. Average Number of Heat Health Events 2021 – 2040

The University of California Los Angeles (UCLA) has developed maps to indicate heat-related risk, based on emergency room visit data from the California Department of Health Care Access and Information. These maps show the excess daily emergency room visits that occur on an extreme heat day compared to the usual, non-extreme heat day. Figure 12-4 shows the relative number of excess daily emergency room visits, broken down by zip code. Figure 12-5 shows the relative rate of such visits per 10,000 persons, broken down by zip code. The maps are intended to aid in identifying areas with the greatest risk of harm during extreme heat events (UCLA n.d.).

For this HMP, the CHAT data is used to establish a baseline and the UCLA Heat Maps are used to demonstrate public health outcomes, as a potential tool to assess the success of future mitigation actions. Although the UCLA Heat Maps are the best available data to track effects on public health outcomes, they do not account for individuals who choose or are unable to access the healthcare system.

12.4.2 Property

Extreme or prolonged heat exposure may affect older, poorly built, or uninsulated buildings. Newer built structure generally are not impacted; however, elevated summer temperatures increase the energy demand for cooling. Losses can be associated with the overheating of heating, ventilation, and air conditioning (HVAC) systems.

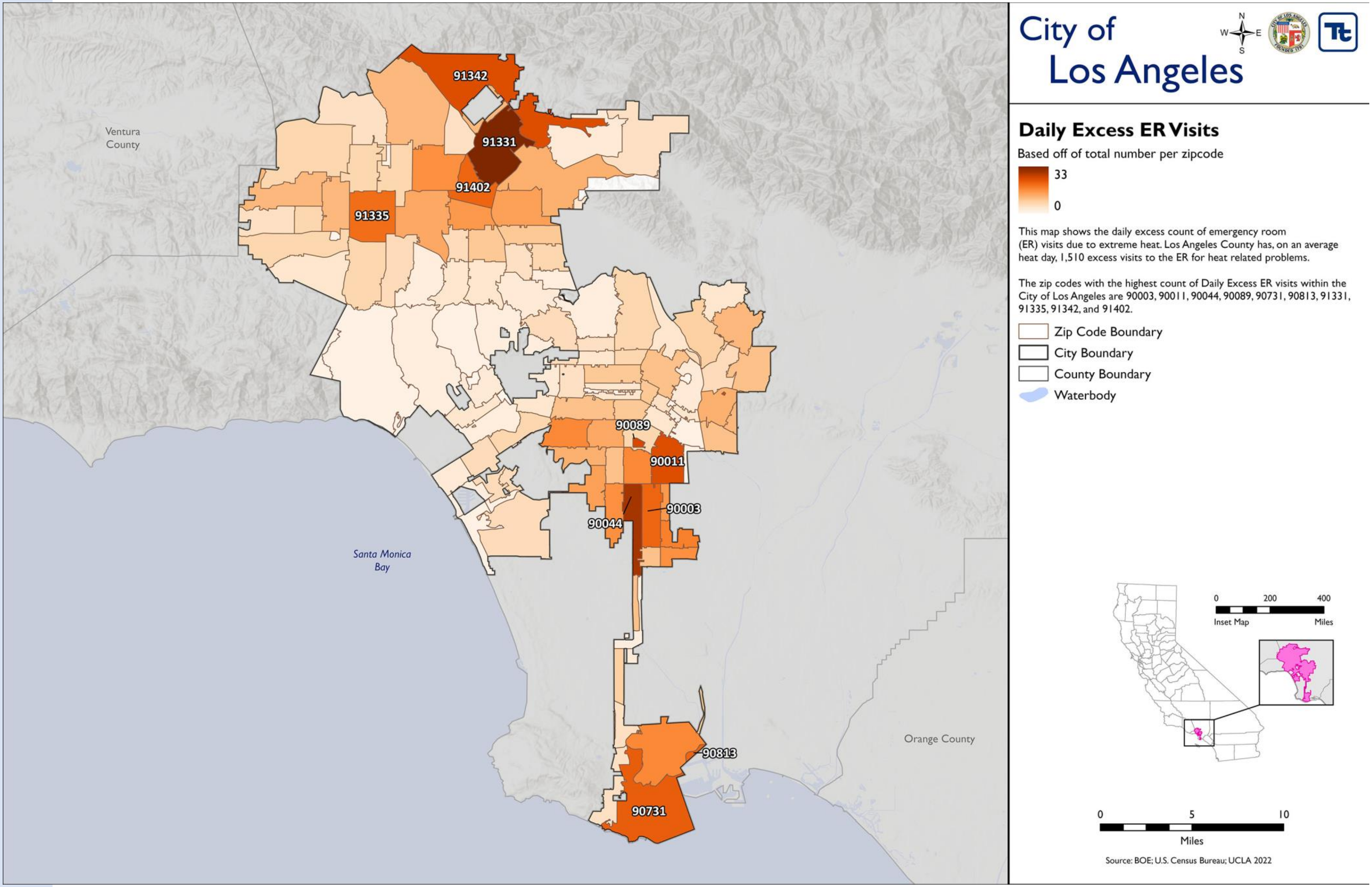


Figure 12-4. Excess Daily Emergency Room Visits Due to Extreme Heat

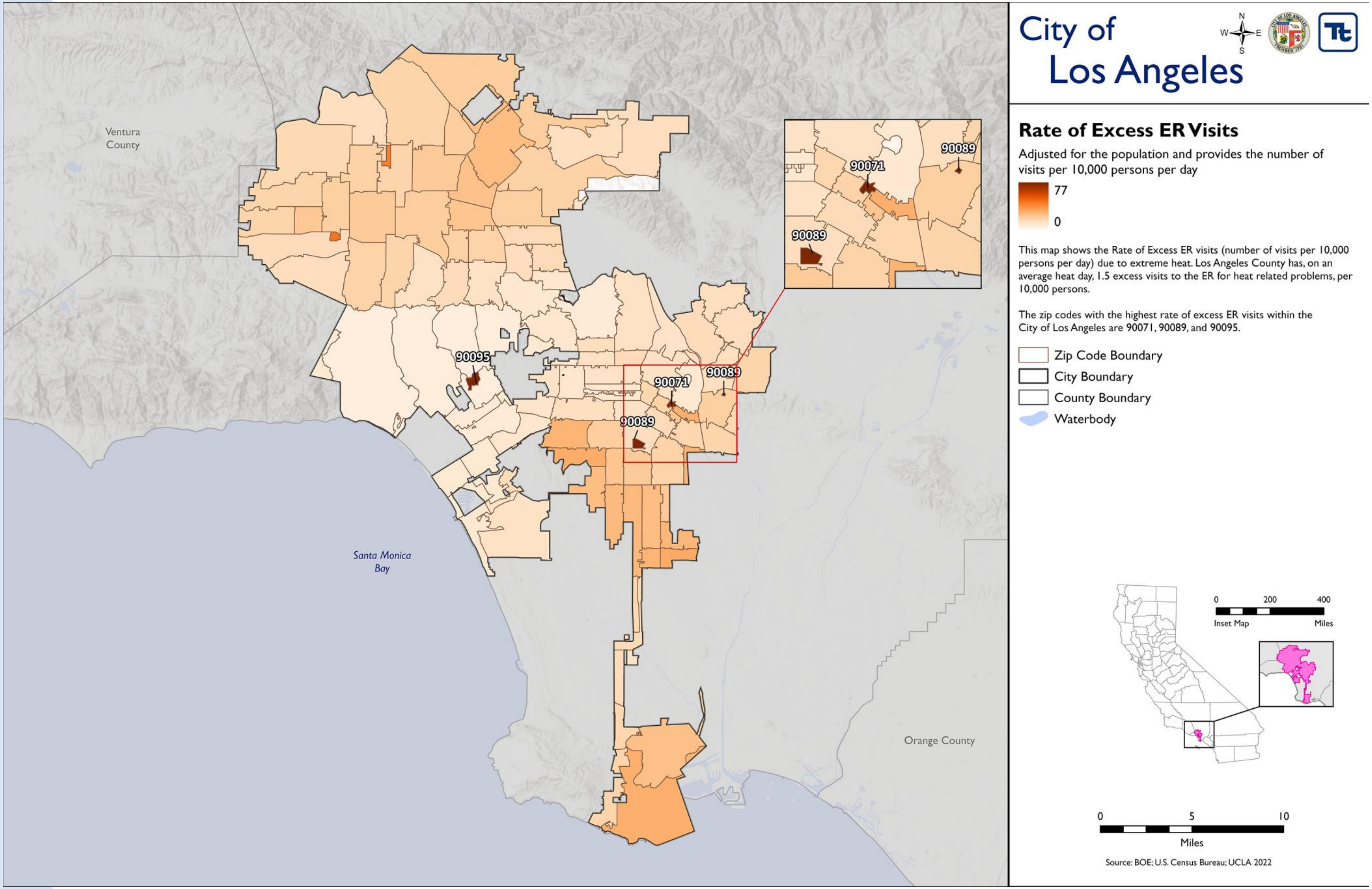


Figure 12-5. Excess Daily Emergency Room Visits per 10,000 Persons Due to Extreme Heat

12.4.3 Community Lifelines

All critical facilities, infrastructure, and community lifelines in the City are exposed to the extreme heat hazard. Critical facilities, infrastructure, and lifelines experience issues similar to those of the general building stock. Additionally, it is essential that critical facilities remain operational during natural hazard events. Extreme heat events can sometimes cause short periods of utility failures, commonly referred to as brownouts, due to increased usage from air conditioners and other energy-intensive appliances, which can prevent facilities from performing their essential operations. During a blackout, all community lifelines that are reliant upon electricity for power are severely impacted unless they are connected to a backup power source. The lack of power to certain energy-dependent systems may also be life threatening, such as medical devices used in senior centers and medical facilities.

Impacts on infrastructure may include cracking, buckling, or sagging of railroad tracks, roads, and bridges due to high temperatures. These impacts may result in service disruptions, potentially hazardous travel conditions, and the need for costly repairs. Extreme heat can also prevent aircraft from taking off as it reduces the density of air mass, making it more difficult for aircraft to lift, in addition to possibly softening tarmac materials (UCLA Luskin Center for Innovation 2021).

12.4.4 Environment

Prolonged extreme heat can degrade landscape quality, lakes, and vegetation. Extreme heat events can have particularly negative impacts on aquatic systems, contributing to fish kills, aquatic plant die offs, and increased likelihood of harmful algal blooms. Extreme temperature events can also affect the surrounding ecosystems, which can destroy food webs and deplete resources in the environment.

12.4.5 Historic and Cultural Resources

Extreme heat can increase the risk of ignition of fires and their propagation. Fire causes material loss and deformation of cultural heritage assets and may also increase the probability of cracking or splitting in built structures. Under extreme heat, stones can face both macro (e.g., cracking of stones, soot accumulation, color change in stone containing iron) and micro degradation (e.g., mineralogical and textural changes), leading to potential structural instability. The long-term impacts include weakened stones and increased susceptibility to deterioration processes such as salt weathering and temperature cycling (Sesana, et al. 2021).

12.4.6 Economy

Extreme heat events have impacts on the economy, including loss of business function and damage and loss of inventory. Business owners may be faced with increased financial burdens due to unexpected repairs to the building or a loss or delay of inventory. Another major financial impact may be found in a loss of days or time that certain workers are able to perform work outside, such as construction workers.

The agricultural industry is most at risk in terms of economic impact and damage caused by extreme heat events. Extreme heat events can result in drought and dry conditions and directly affect livestock and crop production. As the effects of climate change exacerbate drought conditions and plague California crops with extreme heat, these extended dry conditions prevent rainfall from penetrating the soil and refreshing parched crops. According to a recent study published by UCLA, the 2021 drought season cost the California agriculture industry over $1.1 billion and 8,750 jobs (Anderson 2022).

12.5 Effects of Future Change on Vulnerability and Impacts

12.5.1 Future Development

Future development may increase extreme heat impacts due to the creation of impervious surfaces (i.e., buildings, concrete, etc.), which will exacerbate the felt urban heat island effects. Future development built on current open space or vegetated land will increase the impervious surfaces in the City. New development is generally paired with an increase in population; a raise in density also contributes to impacts felt by extreme heat.

Impacts may be able to be reduced through enhanced through land use practices and consistent enforcement of codes and regulations for new construction, modification of City policies and programs, and the planting of more trees and green spaces; however, some portion of the impacts will always remain. Further reduction could be performed through area redevelopments. Using land which was already developed will prevent open space or undeveloped land from be utilized.

12.5.2 Climate Change

As the climate warms, extreme heat events may increase in frequency; the shift in temperatures could result in hotter extreme heat events. With increased temperatures, populations could face increased vulnerability to extreme heat and its associated health issues, such as heatstroke and cardiovascular and kidney disease. Additionally, as temperatures rise, more buildings, facilities, and infrastructure systems may exceed their ability to cope with the heat, taking a toll on vulnerable populations.

13. FLOOD

13.1 GENERAL BACKGROUND

Flooding is any 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 (NOAA n.d.-a). 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.

A floodplain is the area adjacent to a river, creek or lake that becomes inundated when flooding occurs. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control.

13.1.1 FEMA Regulatory Flood Zones

FEMA defines flood hazard areas through statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on Flood Insurance Rate Maps (FIRMs), which are official maps of a community on which the Federal Insurance and Mitigation Administration has delineated special flood hazard areas (SFHAs). Digital versions of FIRMs are called DFIRMs.

The SFHA is the land area on a DFIRM covered by floodwaters of the "base flood," which is the flood with a 1 percent chance of occurrence in any given year (also called the 1 percent-annual-chance flood). A structure within the SFHA (also called the 1 percent-annual-chance floodplain) has a 26 percent chance of undergoing flood damage during the term of a 30-year mortgage. The base flood is the regulatory standard adopted by federal agencies and most states to administer floodplain management programs. In SFHAs, National Flood Insurance Program (NFIP) floodplain management regulations must be enforced, and flood insurance is mandatory.

Common Flood Map Zones

DFIRMS show the boundaries of floodways and floodplains, as well as expected floodwater elevations at specific sites during the base flood. They define the following specific flood-related areas:

- **Zone A (also known as Unnumbered A-zones**)—SFHAs where no base flood elevations or depths are shown because detailed hydraulic analyses have not been performed.
- **Zones A1-30 and AE**—SFHAs that are subject to inundation by the base flood, determined using detailed hydraulic analysis. Base flood elevations are shown within these zones.
- **Zone AH and AO—**SFHAs that are subject to inundation by types of shallow flooding where average depths are between 1 and 3 feet. These are normally areas prone to ponding (Zone AH) or shallow sheet flow flooding on sloping terrain (Zone AO).
- **Zone B and X (shaded)—**Zones where the land elevation as been determined to be above the base flood elevation, but below the 500-year flood elevation. These zones are not SFHAs.
- **Zones C and X (unshaded)—**Zones where the land elevation has been determined to be above both the base flood elevation and the 500-year flood elevation. These zones are not SFHAs.

Mapping of Levee-Protected Areas

FEMA can accredit levee systems that meet federal certification requirements. Areas protected by these levees are considered to have reduced flood risk due the presence of the levee. FEMA's mapping shows these areas as Zone X. These are considered to be "awareness" zones that depict the "residual risk" associated with the levee systems. Residual risk is the risk that remains after controls are accounted for. The protection level for any flood control facility is based on its design level of protection. A facility with 100-year design effectiveness loses that effectiveness for events with greater than a 100-year probability. This is residual risk.

Federal flood insurance for properties in these areas is available through the NFIP's lower-cost Preferred Risk Policy. While not federally required, it is strongly recommended, as there is still a risk.

13.1.2 Floodplains

Ecosystems and Beneficial Functions

Floodplains can support ecosystems that are rich in plant and animal species. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture (City of Los Angeles 2020). Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick growing compared to non-riparian trees.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain accumulations of sand, gravel, loam, silt, and/or clay, often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce, and residential development.

Effects of Human Activities

Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to develop. But human activity in floodplains frequently interferes with the natural function of floodplains. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced. Structures can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions (City of Los Angeles 2020).

13.1.3 Cascading and Compounding Impacts

The most problematic secondary effect for flooding is bank erosion, which in some cases can be more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much property damage, but scour the banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary effect of flooding if storage tanks rupture and spill into streams, rivers or storm drains.

Other secondary effects of a flood include the following:

- Disruption of services:
    - Gas and electrical service may be disrupted.
    - Transportation systems may be disrupted, resulting in shortages of food and clean-up supplies.

- Long-term effects:
  - Location of river channels may change as the result of flooding. New channels develop, leaving the old channels dry.
  - Sediment deposited by flooding may destroy farmland (although silt deposited by floodwaters could also help to increase agricultural productivity).
  - Jobs may be lost due to the disruption of services, destruction of business, etc. (although jobs may be gained in the construction industry to help rebuild or repair flood damage).
  - Insurance rates may increase.
- Destruction of wildlife habitat.

13.2 HAZARD PROFILE

13.2.1 Flood Types and Areas in City of Los Angeles

Flooding results from a diversity of factors; there is no single type of flood or single area most susceptible to flooding. The following sections describe the primary flood types and flood hazard areas in Los Angeles.

FEMA Special Flood Hazard Areas

SFHAs are defined in the October 1, 2019, DFIRM for Los Angeles County. These areas include the following:

- **Areas of Shallow Flooding—**Shallow flooding occurs in flat areas when there are depressions in the ground that collect ponds of water, areas of sloping land and areas of sheet flow where flood depths range from 1 to 3 feet.
- **Regulated Floodways—**The regulated floodway consists of a stream channel plus the portion of the overbanks that must be kept free from encroachment in order to convey the 1 percent-annual-chance flood without increasing flood levels.
- **Alluvial Fan Flooding—**An alluvial fan is a sedimentary deposit at a point where ground surface slope changes suddenly, such as the base of a mountain front, escarpment, or valley side. Sediments at these locations are deposited in the shape of a fan. Alluvial fan flooding occurs on the surface of these deposits and is characterized by uncertain flow paths.
- **Coastal Areas—**SFHAs along coasts are subject to inundation by the 1 percent-annual-chance flood with the additional hazards associated with storm waves.

Non-SFHA Hillside Areas

The City of Los Angeles has hillside areas (slopes of 6 percent or greater) that have not been mapped as SFHAs but are subject to flood hazards. These include water courses that may appropriately belong among the City's regulated water courses, as well as mud and debris flow areas that have yet to be mapped.

Non-SFHA Shallow Flooding Areas

Flooding records indicate non-hillside areas across the City that have experienced multiple occasions of shallow flooding. Such flooding may be caused by clogged or undersized drains, catch basins or water courses, or poor surface drainage patterns on streets or property.

Non-SFHA Urban Drainage Flood Areas

Pipes, roadside ditches, channels and roadways serve as drainage facilities in urbanized areas. Urban drainage flooding occurs when these conveyance systems lack the capacity to convey runoff to nearby creeks, streams and rivers. The key factors that contribute to urban drainage flooding are rainfall intensity and duration and the design and maintenance of drainage facilities. Topography, soil conditions, urbanization and groundcover also play important roles. Many portions of the City are subject to this type of flooding. This type of flooding is the predominant contributor to repetitive flood loss in the City.

Flash Flooding

Flash flooding is characterized by a quick rise and fall of water level. Flash floods generally result from intense storms dropping large amounts of rain within a short period of time onto watersheds that cannot absorb or slow the flow. Natural terrain and vegetation help to reduce the potential for flash floods, but flash flooding can occur when vegetation is lost due to wildfires and the ground becomes impervious due to extreme heat. Such events usually include deposition of large amounts of sediment transported from the denuded hillsides.

Non-SFHA Coast Areas

Coastal areas are susceptible to several flood hazards, regardless of whether they are within the SFHA:

- **Storm Surge Areas—**A storm surge occurs when the ocean level increases above the normal astronomical high tide due to wind, low barometric pressure, storms coinciding with astronomical high tide, or the configuration of the shoreline.
- **Coastal Erosion Areas—**Coastal erosion is generally associated with storm surges, hurricanes, windstorms, and flooding. It may be exacerbated by construction of seawalls, groins, jetties or navigation inlets, boat wakes, dredging and other interruption of physical processes.
- **Tsunami Hazard Areas—**Earthquakes, landslides on the ocean floor, and volcanic activity all have the potential to create large sea waves that can inundate coastal areas. The California coast has experienced only 6 tsunamis over the past 75 years, and none of these have caused fatalities (NOAA 2023c).

Geologic Hazard Areas

Flooding is associated with geologic hazards in two ways:

- **Subsidence Areas—**Human activities such as underground mining, groundwater or oil withdrawal, or soil drainage can cause the ground to subside. This may occur gradually, resulting in greater flood potential due to lower land elevation, or suddenly, resulting in sinkholes and collapses that may damage buildings, roads, and utilities.
- **Landslide Areas—**Floods and earthquakes can trigger landslides. The landslide risk can be exacerbated by human activities such as mining or the cut-and-fill construction of highways, buildings and railroads.

System-Failure-Related Flood Hazard Areas

Dam and Storage Tank Inundation Areas

The failure of water-holding dams and storage tanks can cause inundation of downstream properties. Dam owners submit inundation maps to California's Office of Emergency Services that represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir.

Power-Failure-Induced Flooding Areas

Power-failure-induced flooding would result from a loss of power at the City's stormwater pump stations that drain low-lying areas. The City operates and maintains 18 stormwater pumping plants. The Bureau of Sanitation maintains an updated inventory of the pumping plants with emergency generators. Most of the pumping plants have permanent backup power generators installed. For pumping plants that do not have permanent backup generators, portable generators located at the nearest District yards can be brought into service rapidly. Portable generators are strategically located at the six District yards (South, Harbor, North, Venice, West Los Angeles, and North Hollywood Districts).

Levee Failures

Levees are a basic means of providing flood protection along waterways in regions where development exists or is planned and in agricultural areas. Levees confine floodwaters to the main river channel or protect inland areas from high tides. Failure of a levee can lead to inundation of surrounding areas.

The causes of levee failures are structural failures, foundation failures of underlying soils, and overtopping by flood flows, tides, and waves. Contributing factors include poor construction materials, erosion by current and wave action, seepage through or under the levee, burrowing rodents, and improper repairs. Seismic activity can affect levees as well, especially those constructed on the softer soils that are typical of floodplains. Lack of adequate and regular maintenance to correct these problems also contributes to levee failure. Most failures are composites of several of these factors.

There are 7.82 miles of levees in the City of Los Angeles that provide protection against floods of 25-year or greater magnitude. Fewer than half of these levee systems have been certified as meeting FEMA levee accreditation criteria. The Army Corps of Engineers has jurisdiction over 83 percent of the levee systems; the remainder are under the jurisdiction of the Los Angeles County Flood Control District.

13.2.2 Principal Flooding Sources

In southern California, most flooding is the result of heavy precipitation over one or two days. Short streams and steep watersheds emptying onto lowlands that may be heavily populated produce large volumes of water in short periods, and damage is often severe. The problem is sometimes compounded by the denuding of large areas of watershed by fire during the previous season (Western Regional Climate Center 2023).

Four primary watersheds cover the City of Los Angeles: the Los Angeles River, the Santa Monica Bay, Ballona Creek and the Dominguez Channel. The Los Angeles River is the major watercourse that drains the San Gabriel Mountains. Its watershed covers a land area of over 834 square miles, including the eastern portions of the Santa Monica Mountains and portions of the San Gabriel Mountains in the west. The Los Angeles River is 51 miles long from its headwaters to its mouth, and 32 miles of the river is within the City of Los Angeles.

The Los Angeles River originates at the west end of the San Fernando Valley in the northwest corner of Los Angeles County. The river channel extends east to Glendale, where it turns and flows south to the Pacific Ocean. The Los Angeles River is part of a network of dams, reservoirs, debris collection basins, and spreading grounds built by the Los Angeles County Flood Control District and the U.S. Army Corps of Engineers to minimize flooding. The floodplain starts in the northeast part of the City of Los Angeles at the Arroyo Seco confluence and then passes through the cities of Los Angeles, Bell, Bell Gardens, South Gate, Lynwood, Lakewood, Paramount, Compton, Bellflower, Carson, Gardena and Long Beach on the way to its terminus at the Pacific Ocean.

13.2.3 Flood Control System

As the City of Los Angeles began to grow rapidly in the 1920s and 1930s, rainwater that was once absorbed by miles of undeveloped land began to run off newly paved and developed areas, leading to an increased amount of water flowing into local rivers and creeks. These waterways could not contain the increased amount of water and the region experienced extensive flooding. In response, the U.S. Army Corps of Engineers lined the Los Angeles River and Ballona Creek with concrete and initiated the development of an underground urban drainage system. As the City continued to grow, a complex drainage system developed.

The City of Los Angeles today has an extensive drainage system to protect its residents and property from flood damage. The primary agencies responsible for flood control in the City are the U.S. Army Corps of Engineers, the Los Angeles County Flood Control District, the City of Los Angeles, and Caltrans. Each agency exercises jurisdiction over its own flood control facilities, which include open flood control channels, flood control basins, storm drains, debris basins, detention basins, and spreading grounds.

Typically, City and County storm drains are designed according to criteria identified in a design criteria manual to carry flow from design storms. The combination of storm drainpipe and street conveyance of stormwater typically strives to provide capacity for up to a 25-year storm. Army Corps facilities are typically designed for a 1 percent-annual-chance storm (City of Los Angeles 2010).

Los Angeles County Drainage Area Project

In 1915, the State Legislature created the Los Angeles County Flood Control District to control floods and conserve water. Early bond issues financed construction of 14 dams in the San Gabriel Mountain, flood channel modifications, and construction of debris basins to trap sediment. In 1936, federal legislation made the Army Corps a participant in Los Angeles County's flood protection program. The Army Corps' Los Angeles River, San Gabriel River and Ballona Creek projects included the construction of five flood storage reservoirs or basins, 24 debris basins, 95 miles of main channels, 191 miles of tributary channels and two jetties.

These two agencies are responsible for all the major flood control facilities that protect the City of Los Angeles. This regional flood control system is described in the Los Angeles County Drainage Area (LACDA) study. It includes the Los Angeles River, San Gabriel River, Rio Hondo Channel and Ballona Creek. Flood control facilities in the LACDA system fall into four general categories:

- Debris basins, found at the mouth of canyons, trap debris carried by floodwaters, leaving relatively clean water to flow unimpeded in downstream channels.
- Flood control reservoirs control and reduce stream flow so that downstream main channel capacities are not exceeded. The Army Corps operates five major reservoirs:
    - Hansen Dam—25,446 acre-feet (1,461.3 acres)
    - Lopez Dam—441 acre-feet (119 acres)
    - Santa Fe Dam—30,887 acre-feet (2,553.7 acres)
    - Sepulveda Dam—17,425 acre-feet (2,131.9 acres)
    - Whittier Narrows Dam—34,947 acre-feet (2,640.1 acres)

  Locally operated facilities include 15 flood control and water supply reservoirs in the upper watershed areas of the LACDA basin. Combined, these local reservoirs have a maximum combined capacity of 109,146 acre-feet. The City of Los Angeles has built recreational facilities at the Hansen Dam, the Santa Fe Dam, and the Sepulveda Dam (including golf courses, riding and hiking trails, picnic etc.).
- Improved channels speed the passage of flood flows through local communities and into the main stem river system. Improved tributary channels include Arroyo Seco and Compton Creek.

- Main channel improvements pass the controlled or partially controlled flows to the ocean. The Los Angeles River is improved along most of the reach below Sepulveda Dam; its sides and bottom are generally lined with concrete or grouted rock. Sepulveda and Hansen Dams regulate flows to the main channel of the Los Angeles River.

In total, the LACDA system has over 100 miles of main stem channel, over 370 miles of tributary channels, 129 debris basins, 15 flood control and water conservation dams, and five flood control dams (City of Los Angeles 2010).

City Drainage System

The City of Los Angeles has complemented the LACDA drainage system with a comprehensive network of underground pipes and open channels to prevent local flooding. These local drains collect runoff and carry it rapidly to the main stem river channels. Most of the storm drain system receives no treatment or filtering and is completely separate from Los Angeles' sewer system.

Runoff drains from streets to gutters and enters the system through catch basins. From there, it flows into underground tunnels that empty into flood control channels that are not under the City's jurisdiction such as Ballona Creek or the Los Angeles River.

13.2.4 Federal Flood Programs

National Flood Insurance Program

City Participation

Participation in FEMA's National Flood Insurance Program (NFIP) opens up opportunity for grant funding associated specifically with flooding issues. The City of Los Angeles participates in the NFIP and has adopted regulations that meet the program's requirements to regulate and permit development in SFHAs.

The City entered the NFIP in 1980; its first Flood Insurance Rate Map (FIRM) was issued February 12, 1980. Structures permitted or built in the City of Los Angeles before then are called "pre-FIRM" structures, and structures built afterwards are called "post-FIRM." The insurance rate is different for the two types of structures. The effective date for the current FIRM is June 2, 2021. A detailed flood insurance study for the areas subject to flooding was originally completed on September 2, 1980, with updates in 1984, 1987, 1991, 1998, 1999, 2008, 2018, and 2021 (FEMA 2023b). The City is currently in good standing with program requirements. Information on the City's NFIP program is presented in Table 13-1.

Table 13-1. National Flood Insurance Program Compliance	
Date of adoption of the City's flood damage prevention ordinance	Effective April 19, 2021 (Ordinance No. 186952)
Local department responsible for floodplain management	Department of Public Works (DPW)
Floodplain administrator (department/position)	Ted Allen, City Engineer, Bureau of Engineering, DPW
Number of certified floodplain managers on City staff	None
Most recent Community Assistance Visit or Community Assistance Contact	2019
Outstanding NFIP compliance violations that need to be addressed	None
Adequacy of current flood hazard maps in addressing the flood risk the City	The City constantly works with federal, state and regional agencies to prepare accurate flood hazard maps based on best available data. The City understands that floodplains are dynamic so current mapping may not always reflect true flood risk.
Floodplain management staff assistance or training needed to support the floodplain management program	City floodplain management personnel always seek opportunities to enhance their floodplain management capabilities.
Procedures for meeting substantial improvement/substantial damage provisions of the NFIP	For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, the building official will determine where the proposed work constitutes substantial improvement or repair of substantial damage. Where the building official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by City Code, the building official shall require the building to meet the requirements of the California Building Code, or the California Residential Code.

Policies and Claims

As of January 1, 2024, there were 7,616 flood policies in Los Angeles, providing $2.4 billion in coverage at a combined annual premium of $6.7 million. The amount of insurance in force represents 30.5 percent of the total value of vulnerable assets in the SFHA. The average cost of a flood insurance policy in the City is $880 per year.

As of January 1, 2024, 3,842 claims had been paid, for a total amount of $23.0 million, an average of $6,000 per claim. Since the previous Los Angeles HMP, 10 new losses have been reported.

The Community Rating System

The City of Los Angeles has participated in the CRS program since October 1, 1991, and reverified in 2005. The City has a Class 7 rating last confirmed in 2021, so residents who live in a 1 percent annual chance floodplain can receive a 15 percent discount on their flood insurance; outside the 1 percent annual chance floodplain they receive a 5 percent discount. This equates to a savings ranging from $59 to $223 per policy, for a total citywide premium savings of almost $511,286. To maintain or improve its rating, the City goes through an annual recertification and a re-verification every five years.

Repetitive Loss

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property

The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. Studies have found that many of these properties are outside any mapped special flood hazard area. FEMA's list of repetitive loss properties identifies 131 such properties in the Los Angeles planning area as of March 2024:

- 115 single-family residences
- 6 multi-family residences
- 10 commercial properties

Five of the listed properties qualify as severe repetitive loss properties, which is defined by the following criteria:

- An NFIP-insured residential property that has met at least one of the following paid flood loss criteria since 1978, regardless of ownership:
  - Four or more separate claim payments of more than $5,000 each (including building and contents payments)
  - Two or more separate claim payments (building payments only) where the total of the payments exceeds the current value of the property.
- Two of the claim payments must have occurred within 10 years of each other. Multiple losses at the same location within 10 days of each other are counted as one loss, with the payment amounts added together.

Causes of flood damage to repetitive loss properties in Los Angeles were analyzed in 2020 based on field investigation, data review, interviews with homeowners, and hydrologic/hydraulic calculations. Causes were classified as generally associated with stormwater runoff on steep slopes and urbanized stormwater drainage issues (City of Los Angeles 2020).

The CRS requires participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss (City of Los Angeles 2020). This information for Los Angeles is provided in Appendix F of the *2020 Floodplain Management Plan*.

13.2.5 Past Events

Federal Disaster Declarations

The federal government has issued 27 disaster declarations that include flooding in Los Angeles County (see Section 3.1.1). The state has issued one flood-related emergency proclamation that included Los Angeles County—for flash flooding that occurred in November 2003.

Many flood events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in establishing recurrence intervals for flooding. The sections below describe significant recent flood events in Los Angeles.

January 21 – 23, 2024, Winter Storms

An atmospheric river brought heavy rains and winds to the Los Angeles area causing widespread flooding. Damage assessment is continuing during the writing of this plan.

August 20 – 21, 2023 Flash Flooding

The remnants of Tropical Storm Hilary brought record rainfall to downtown Los Angeles and resulted in flash flooding across Los Angeles County. No injuries, deaths, or property damage from this event are reported in the NCEI storm events database.

December 27, 2022 – January 31, 2023, Winter Storms

A powerful atmospheric river brought heavy rainfall, widespread flooding, and gusty winds to the Los Angeles County area. During these storm events, the Los Angeles Department of Building and Safety surveyed 104 affected buildings, of which 14 structures were yellow-tagged, and six structures were red-tagged (Armond Gregory, Los Angeles Department of Building and Safety, personal communication, February 19, 2024).

January 18 – 23, 2017, Winter Storms

A series of storms pounded Southern California, including one storm that dropped nearly 2.5 inches of rain in 3 hours. It caused roads to be flooded, homes to be threatened by mudslides, and traffic to become clogged on many freeways and surface streets. According to the Los Angeles Department of Water and Power, at least 10,000 customers were without power.

January 18 – 22, 2010, Winter Storms

A series of storms brought heavy rain, gusty winds, and flash flooding to Southern California. Rainfall totals ranged from 4 to 8 inches over coastal areas. Water was chest high in places, which stranded many vehicles and flooded numerous businesses.

2004 – 2005 Flooding Events

National Weather Service records show a total of 37.25 inches of rain at the downtown Los Angeles Civic Center during the rainy season of 2004-2005—the second highest recorded seasonal rainfall (the highest was 38.18 inches in 1883-1884). FEMA records indicate over 70 flood insurance claims filed by owners of structures within the city limits. The storms of January 7 – 11, 2005 and February 17 – 23, 2005 prompted state and federal disaster declarations, with flooding throughout southern California. Widespread mud and debris flows, rockslides, and small stream and urban flooding caused considerable damage to roads and homes. Significant damage was reported by the Bureau of Engineering, included the following:

- 25th Street was filled with debris. Cars were trapped when drivers misjudged the level of the water.
- Approximately 20,000 cubic yards from Tujunga Avenue north of Strathern Street washed out into an adjacent gravel pit, resulting in a hole about 200 feet long, 100 feet wide, and 30 feet deep.
- Homeowners were evacuated when Laurel Canyon and Coldwater Canyon experienced debris slides.

Approximately 80 homes in Los Angeles were red-tagged (no one was allowed back in). According to local newspaper accounts, nine people died, including two deaths caused by mud and rockslides and a City of Los Angeles employee who died responding to the Tujunga Avenue sinkhole.

2003 – 2004 Flooding Events

On November 12, 2003, 5.6 inches of rain fell during a 4-hour period over the Watts area of Los Angeles and portions of the City of Carson. According to the County of Los Angeles, the storm represented a 0.2 percent-annual-chance storm event. Runoff far exceeded the design capacity of the storm drain system. The Watts area is not a FEMA-designated 1 percent-annual-chance floodplain, so most property owners did not have flood insurance. According to the Los Angeles Department of Building and Safety, 496 buildings were affected and 57 were damaged—one building had structural damage and the others had content damage. Eight FEMA flood claims were reported within the City for other events during the 2003-2004 wet season, mostly along hillsides.

1997 – 1998 El Niño

Noteworthy storm incidents that occurred in Los Angeles due to the 1997-1998 El Niño include the following:

- October 1997—Hurricane Nora caused three deaths and caused extensive damage due to mudslides.
- February 6, 1998—Mud crashed into an apartment building in the Westlake area; more than 100 residents were evacuated.
- February 8, 1998—An ocean-eroded cliff in Malibu buckled, causing one home to collapse and threatening two others.
- February 13, 1998—A rain-soaked hillside collapsed in the Canoga Park area, forcing the evacuation of five homes and threatening several others.

13.2.6 Location

The June 2, 2021 Los Angeles County Digital Flood Insurance Rate Maps (DFIRMs) are FEMA's official delineation of SFHAs for the City of Los Angeles (see Figure 13-1 through Figure 13-7). Identified SFHAs include shallow flooding areas, floodways, alluvial fans, and coastal areas. They were determined using statistical analysis of records of river flow, storm tides, and rainfall; information obtained through consultation with the City of Los Angeles and the County of Los Angeles; floodplain topographic surveys; and hydrologic and hydraulic analyses. These maps represent the best data available at the time of this analysis.

13.2.7 Frequency

Assessment Based on Past Events

The City of Los Angeles experienced significant flooding in 1914, 1916, 1927, 1934, 1938, 1941, 1943, 1952, 1956, 1969, 1978, 1980, 1983, 1993, 1995, 1998, 2005, 2010, 2017, and 2022-2023. Large floods occur approximately every 5 to 6 years in the City. U.S. Geological Survey records indicate that 1 percent annual chance flood flow in the Los Angeles River Basin was exceeded at the Tujunga Canyon in March 1938 and Topanga and Malibu Creeks in January 1969. The January-February 1980 flooding was a 10- to 50- year recurrence event.

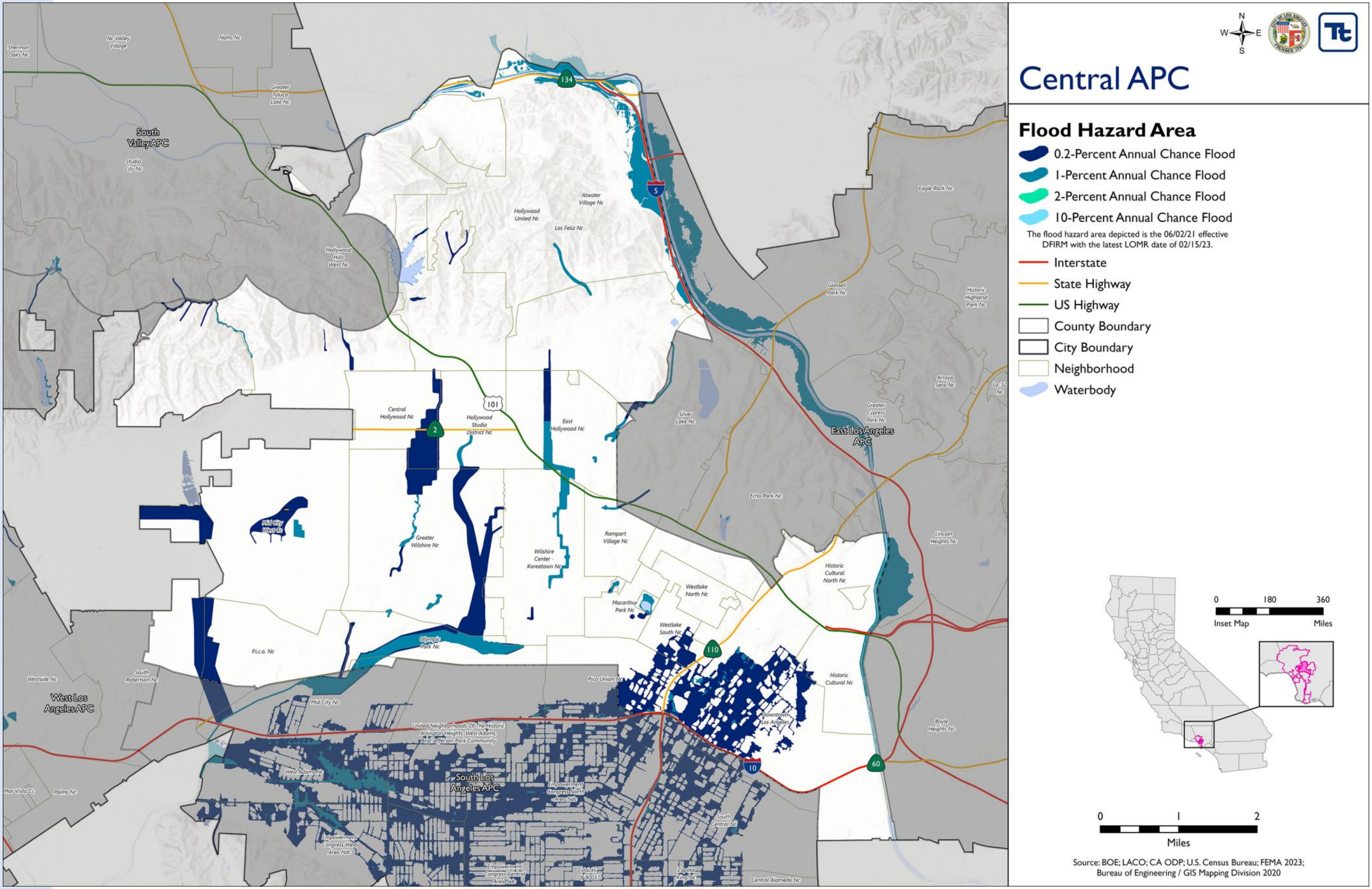


Figure 13-1. Mapped Flood Hazard Areas in the Central APC

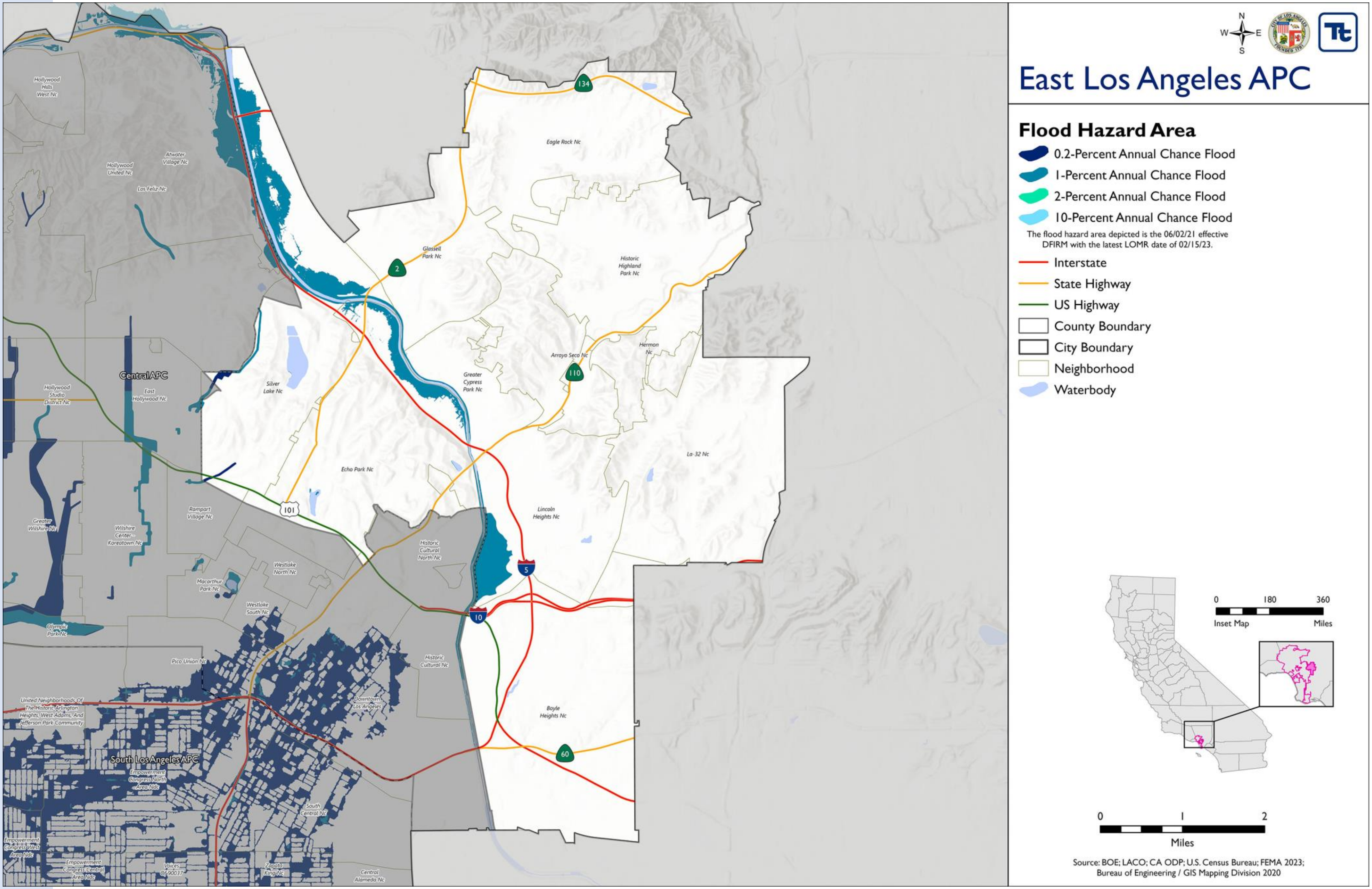


Figure 13-2. Mapped Flood Hazard Areas in the East Los Angeles APC

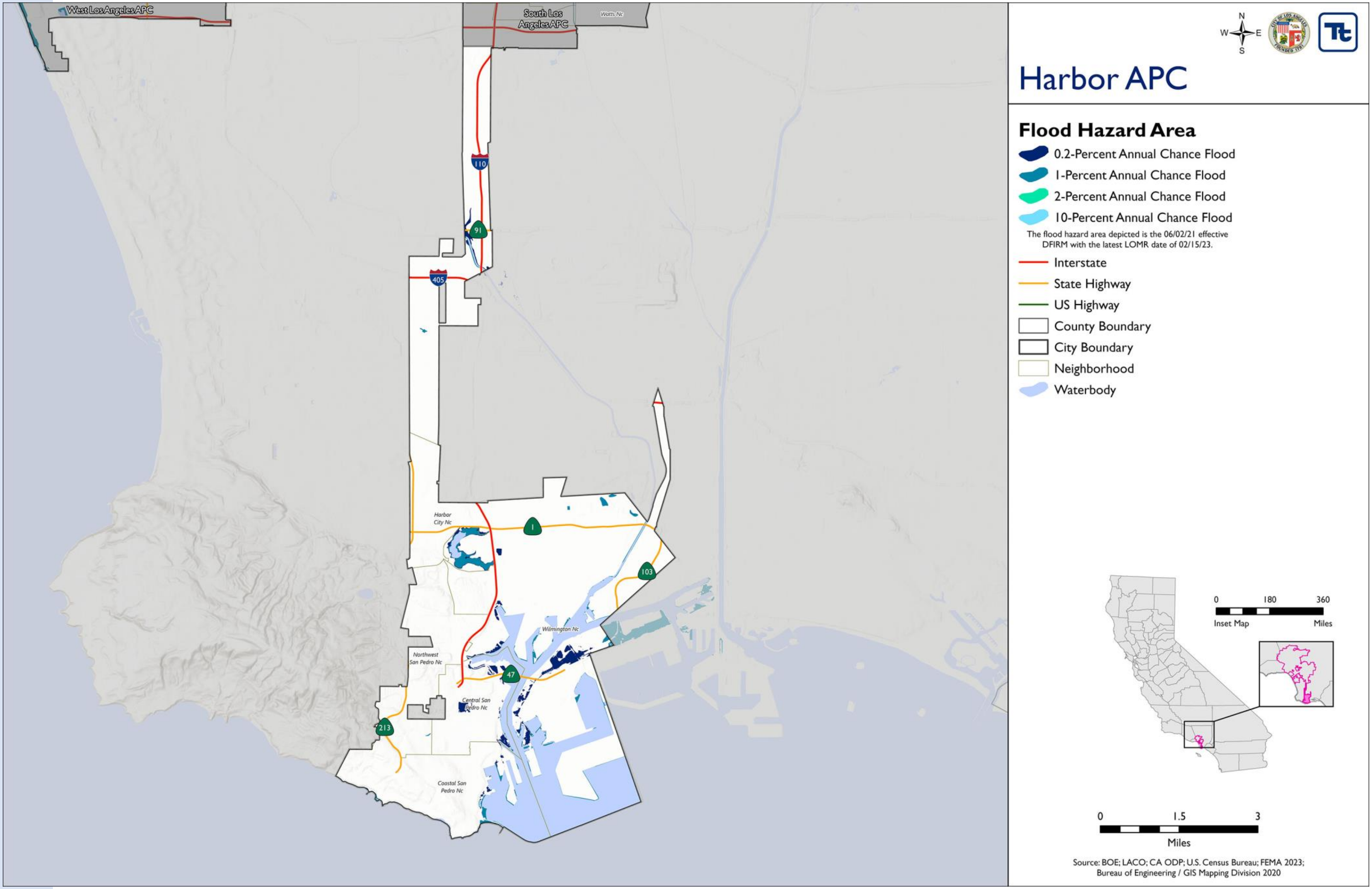


Figure 13-3. Mapped Flood Hazard Areas in the Harbor APC

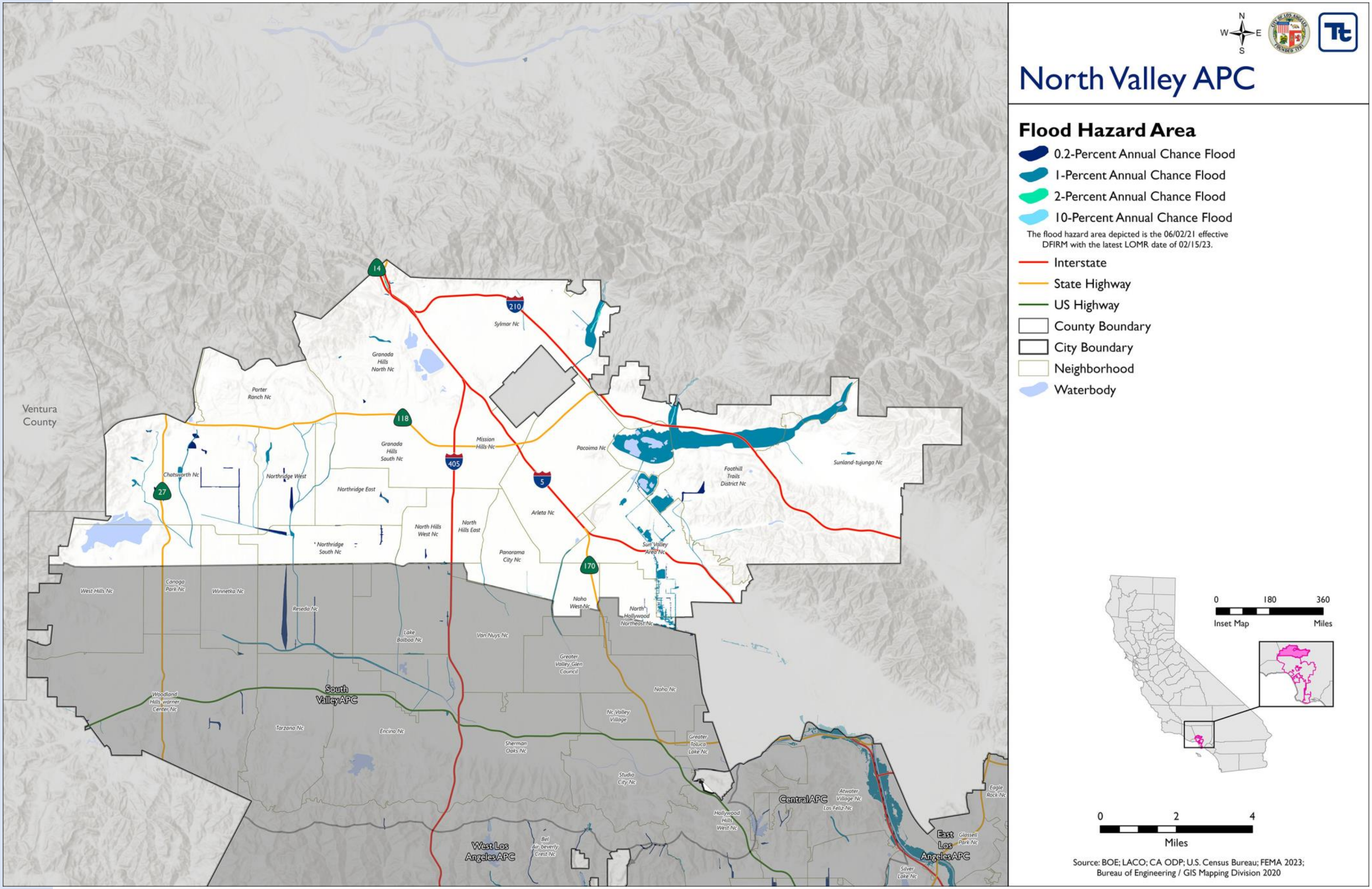


Figure 13-4. Mapped Flood Hazard Areas in the North Valley APC

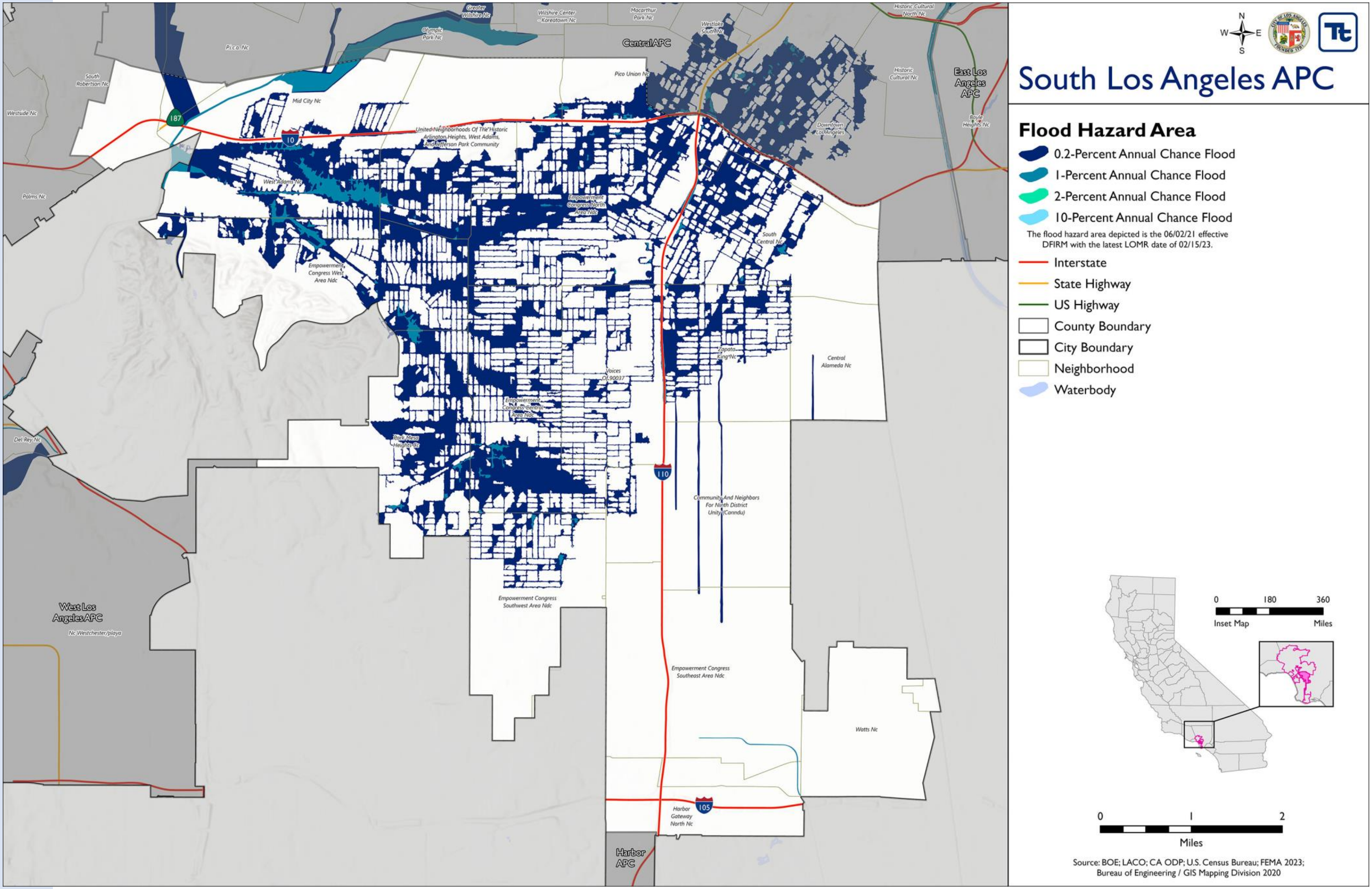


Figure 13-5. Mapped Flood Hazard Areas in the South Los Angeles APC

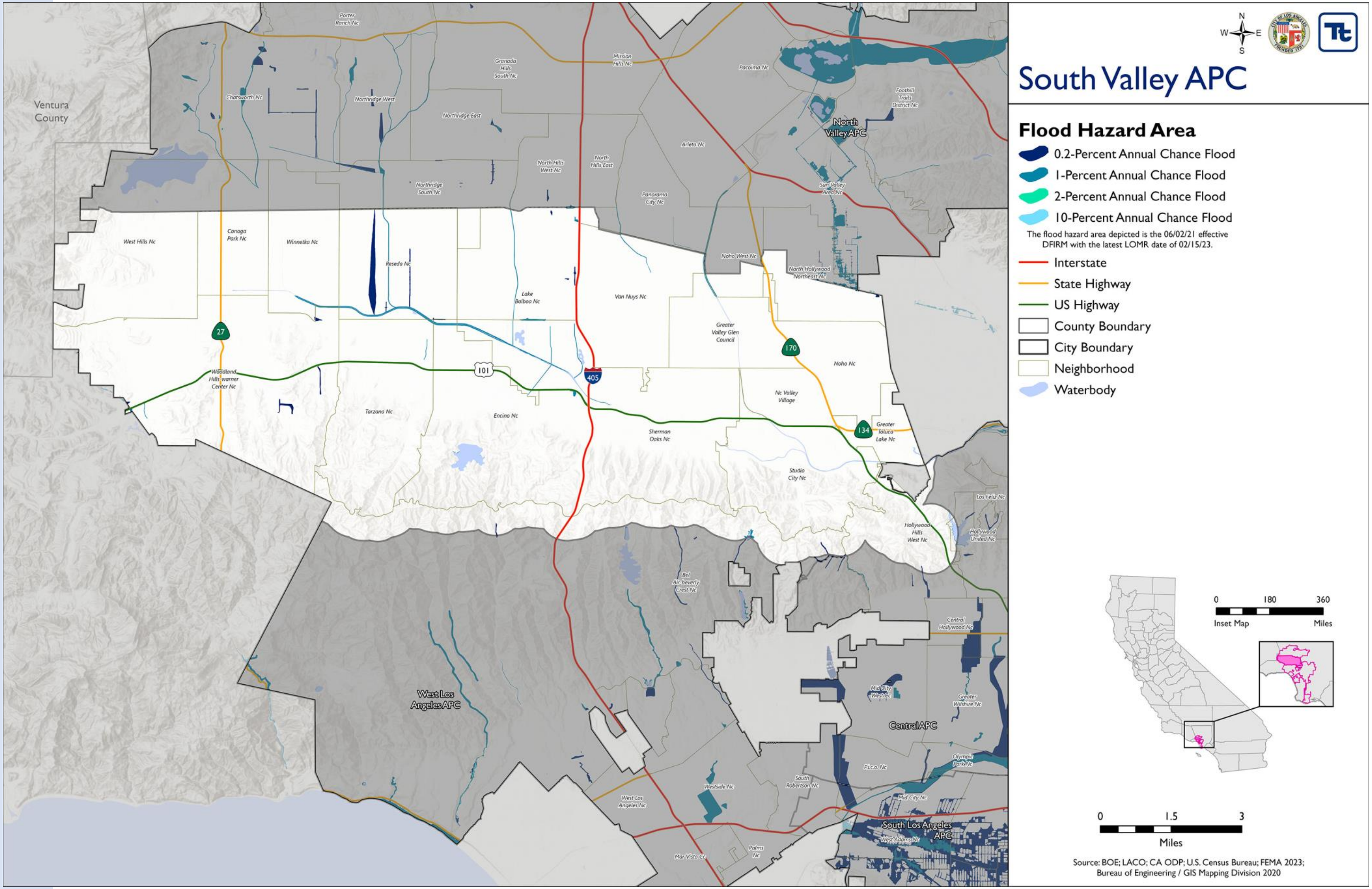


Figure 13-6. Mapped Flood Hazard Areas in the South Valley APC

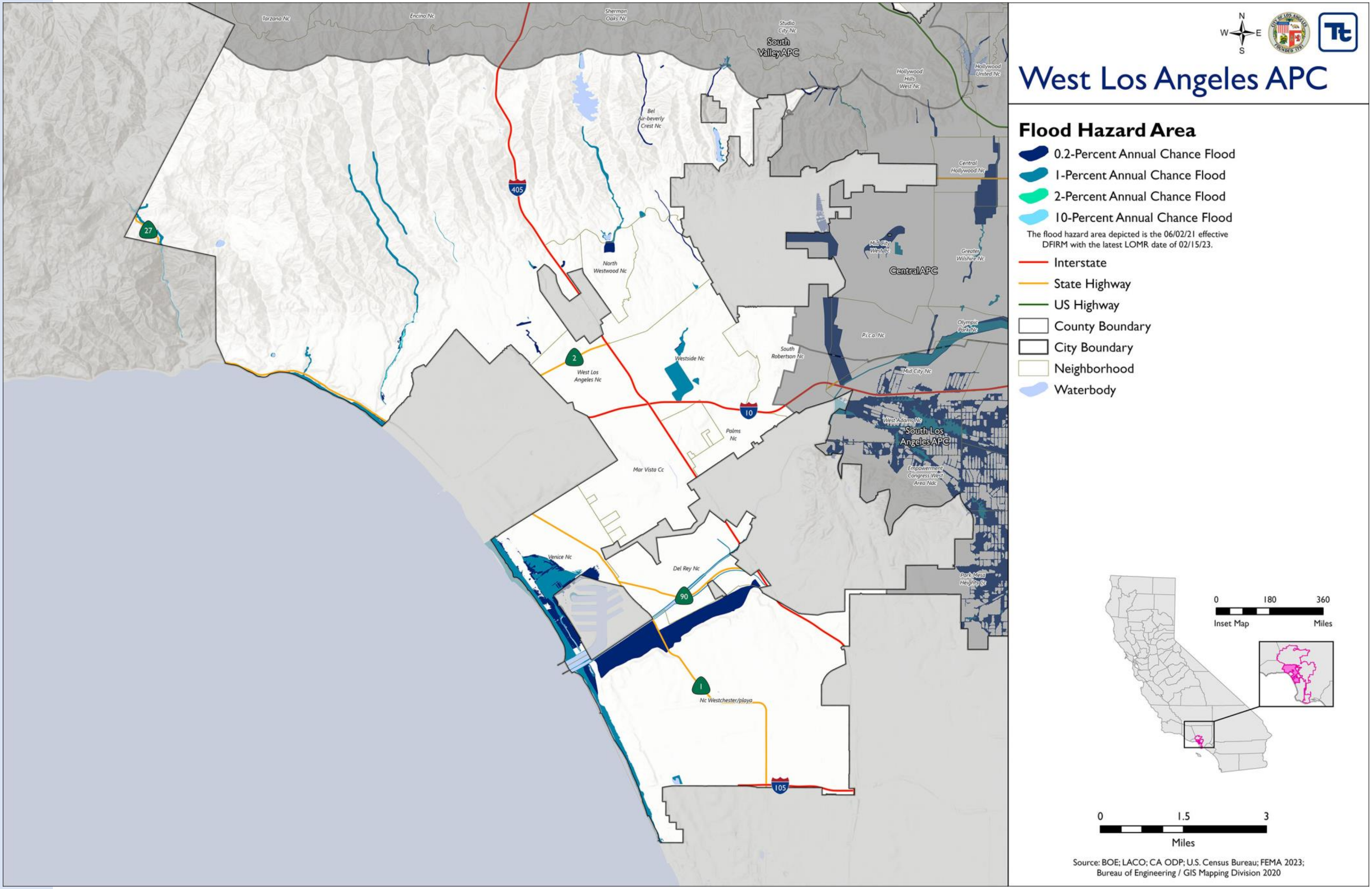


Figure 13-7. Mapped Flood Hazard Areas in the West Los Angeles APC

Potential Effect of Future Conditions on Hazard Probability

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, scientists project greater storm intensity with climate change, resulting in more direct runoff and flooding.

High frequency flood events (e.g., 10-year floods) in particular will likely increase with a changing climate. What is currently considered a 1 percent annual chance flood also may strike more often, leaving many communities at greater risk. Some properties that are currently outside the mapped flood hazard area may be within the hazard area when mapping is updated to account for future climate conditions. Going forward, model calibration must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted.

Climate change is already affecting water resources, and resource managers have observed the following:

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

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more mountain areas, such as the Sierra Nevada watersheds, to contribute to peak storm runoff. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality.

13.2.8 Severity

Flooding in Los Angeles has the potential for significant damage, especially as development in the floodplain has increased dramatically. The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity. This is especially true when a channel migrates over a broad floodplain, redirecting high velocity flows and transporting debris and sediment.

Although jurisdictions can implement mitigation and take preventative actions to significantly reduce severity and threat of flood events, some residual risk will always exist (i.e., risk of a hazard event occurring despite technical and scientific measures applied to reduce/prevent it). Threats associated with residual risk could include failure of a reservoir, a dam breach, or other infrastructure failure, or a severe flood event that exceeds flood design standards or drainage capacity.

Flood severity is often evaluated by examining peak discharges; Table 13-2 lists peak flows used by FEMA's Flood Insurance Study, revised June 2021 to map the floodplains of the planning area.

Table 13-2. Summary of Peak Discharges Within the Planning Area

Source/Location	Drainage Area (sq. mi.)	Discharge (cubic feet/second)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Los Angeles River					
At Compton Creek	808	92,900	133,000	142,000	143,000
At Imperial Highway	752	89,400	126,000	140,000	156,000
Rio Honda					
At Stewart and Gray	132	35,600	41,000	39,300	40,200
At Beverly Blvd.	113	33,800	37,500	38,000	38,400
Outflow from Whittier Narrows Dam	110	33,500	36,500	36,500	36,500
West Los Angeles					
Balsam Ave./Olympic Blvd.	1.2	290	550	660	940
Manning Ave./Tennessee	3.4	530	1,300	1,700	2,600
Westwood Blvd. and Overland at Exposition Blvd.	4.00	190	1,200	1,500	2,700
Roundtree Rd/ Manning Ave.	0.7	500	740	840	1,100
Harbor District					
Harbor Lake, SE of Vermont Ave.	19.0	3,200	7,000	8,900	14,000
Denker Ave./204th St.	0.3	60	130	170	260
Little Tujunga Wash					
3,000 feet upstream of Los Angeles City Limits	17.9	2,273	5,019	6,405	10,022
Hancock Park					
6th St. / Alexandria Ave.	8.1	2,100	4,600	5,900	9,200
Lucerne Blvd./Francis Ave.	0.3	70	160	200	320
Olympic Blvd./Hudson	0.6	130	290	370	570
Western Ave./11th St.	3.5	670	1,300	1,600	2,500
Bronson Ave./Country Club Dr.	18.1	3,700	7,900	9,600	14,000
West Blvd. / Dockweiler St.	18.8	3,600	7,600	9,300	13,600

Source/Location	Drainage Area (sq. mi.)	Discharge (cubic feet/second)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
San Vicente / Pico Blvd.	18.9	3,500	7,400	9,000	13,100
Highland Ave. / St. Elmo Dr.	20.2	3,600	7,700	9,300	13,700
Arlington Ave. / 37th Place	0.7	440	990	1,400	2,500
Victoria Ave. / Jefferson Blvd.	1.2	320	1,100	1,400	2,600
Chesapeake Ave. / Exposition Blvd.	8.0	1,100	2,400	3,000	3,700
Harcourt Ave./ Westhaven St.	0.5	160	350	450	700
Lakeview Terrace					
Little Tujunga Canyon upstream of Foothill Blvd.	20.3	2,700	6,000	7,700	12,200
Kagel Canyon, upstream of Osborne Ave.	2.0	490	1,100	1,400	12,200
Park La Brea					
Wilshire Blvd./Crescent Heights Ave.	6.6	1,500	3,300	4,200	6,600
Orange Dr./Pickford St.	24.7	4,400	9,500	11,800	17,700
Whitworth Dr./La Cienega Blvd.	17.1	3,400	7,600	9,700	15,200
Venice Blvd. / Fairfax Ave.	18.4	3,400	7,500	9,500	14,900
Redondo Blvd./Santa Monica Freeway	1.2	300	670	860	1,300
Redondo Blvd./Roseland St.	14.5	2,000	4,400	5,700	9,100
Houser Blvd./ La Cienega Blvd.	14.8	1,900	4,300	5,500	8,800
Fairfax Ave. /La Cienega Blvd.	16.7	2,100	4,700	6,000	9,600
Century City					
Santa Monic Blvd./ Avenue of the Stars	0.5	400	590	700	900
Bel Air Estates					
Stone Canyon Rd south of Somma Way	0.7	480	710	800	1,100
Stone Canyon Rd south of Bellagio Rd	1.0	630	940	1,100	1,400
Beverly Glen Blvd. north of Sunset Blvd.	1.2	700	1,000	1,200	1,600
Brentwood					
North of San Vicente, west of Westgate Ave.	0.2	60	140	180	280
Sunset Blvd./Barrington Ave.	0.2	230	340	390	520
Pacific Palisades					
Rustic Canyon, downstream of Sunset Blvd.	5.7	700	1,500	2,000	3,100
Westchester					
Sepulveda Blvd., south of the San Diego Freeway	1.4	310	690	880	1,400
Arizona Ave. north of Arizona Circle	1.7	340	740	950	1,500
Hyde Park					
Halldale Ave./65th St.	1.20	300	660	850	1,300
Wilton Pl/Gage Ave.	3.3	770	1,600	1,900	3,000

Source/Location	Drainage Area (sq. mi.)	Discharge (cubic feet/second) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Southwest Dr./Van Ness Ave.	4.2	730	1,600	2,100	3,200
Sunland					
Big Tujunga Canyon, upstream of Foothill Blvd.	34.6	8,100	24,700	36,500	62,600
Big Tujunga Canyon, upstream of Wheatland Ave.	43.3	9,300	26,800	38,900	66,000
Sylmar					
East side of Golden State Freeway, south of Sierra Hwy	0.2	50	120	150	240
Weldon Canyon, downstream of Sierra Hwy	1.5	410	900	1,150	1,800
Van Nuys					
Victory Blvd./Hayvenhurst Ave.	0.7	90	200	250	390
Porter Ranch					
Mayerling St./Shoshone Ave.	0.2	40	100	120	190
Vicinity of Senson Blvd.	0.10	30	60	70	120
Granada Hills					
Superior St./Paso Robles Ave.	0.5	90	200	260	400
Balboa Blvd. / Citronia St.	0.5	90	200	260	400
Sepulveda					
Roscoe Blvd. / Haskell Ave	0.8	160	360	460	720
Haskell Ave., north of Union Pacific Railroad	1.0	230	500	640	1,000
Chatsworth					
Chatsworth St./Corbin Ave.	0.9	220	480	610	960
Variel Ave./ Chatsworth Ave.	13.4	2,100	4,700	6,000	9,300
Canoga Ave./ Devonshire St.	0.8	230	510	650	1,000
Valley Circle/Lassen St.	0.8	220	480	600	950
Topanga Canyon Blvd. / Lassen St	0.3	50	120	150	230
Farrolone Ave. / Lassen St.	0.4	100	220	280	440
Topanga Canyon Blvd./Santa Susana Pl.	0.1	20	50	60	100
Santa Susana Pass Rd/Santa Susana Ave.	1.5	450	990	1,300	2,000
Woodland Hills					
Mulholland Dr./Ventura Freeway	2.3	490	1,100	1,400	2,200
Saltillo St./Canoga Ave.	0.3	100	250	300	500
Sherman Oaks					
Magnolia Blvd./Haskell Ave.	1.2	360	800	1,000	1,600

Source: FEMA, 2016

13.2.9 Warning Time

The time it takes to recognize a flooding threat reduces the potential warning time that a community has to take actions to protect lives and property. Due to the sequential pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can be warned in advanced of potential flash flooding danger.

The Los Angeles County flood threat system consists of a network of precipitation gages stream gages at strategic locations in the county that constantly monitor and report stream levels. This information is provided to the National Weather Service (NWS) and National Oceanic and Atmospheric Administration. In addition to this program, data and flood warning information is provided by the NWS.

Wireless Emergency Alerts from the NWS are notices about potentially hazardous weather that are sent out to all compatible cell phones in affected areas. All of this information is analyzed to evaluate the flood threat and possible evacuation needs. The NWS issues watches, and warnings as follows when forecasts indicate rivers may approach bank-full levels:

- **Minor Flooding**—Minimal or no property damage, but possibly some public threat or inconvenience.
- **Moderate Flooding**—Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- **Major Flooding**—Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

When a watch is issued, the public should prepare for the possibility of a flood. When a warning is issued, the public is advised to stay tuned to a local radio station for further information and be prepared to take quick action if needed. A warning means a flood is imminent, generally within 12 hours, or is occurring. Local media broadcast NWS warnings.

13.2.10 Scenario

The major flooding causes in the City of Los Angeles are short-duration, high-intensity storms. Water courses in the City can flood in response to a succession of intense winter rainstorms, usually between early November and late March. A series of such weather events can cause severe flooding in the City due to the large percentage of impervious area and the age and capacity of the drainage system.

The worst-case scenario is a series of storms that flood numerous drainage basins in a short time such as those projected by USGS in its ARkStorm (1,000-year atmospheric river) scenario (USGS 2013). This could overwhelm response and floodplain management capabilities within the City. Major roads could be blocked, preventing critical access for many residents and critical functions. High in-channel flows could cause water courses to scour, possibly washing out roads and creating more isolation problems. In the case of multi-basin flooding, floodplain management resources would not be able to make repairs quickly enough to restore community lifelines. Additionally, as the grounds become saturated, groundwater flooding issues typical for the City would be significantly enhanced.

13.3 VULNERABILITY

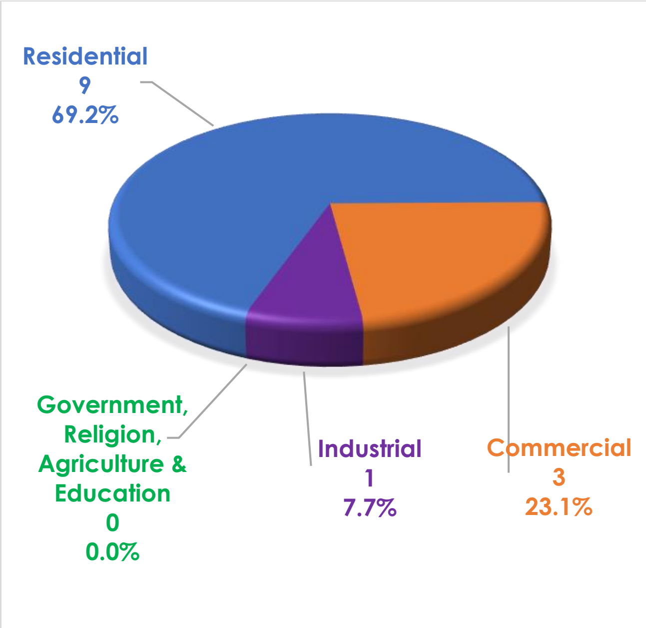
FEMA mapping of the 0.2 percent-annual-chance, 1 percent-annual-chance, 2 percent-annual-chance, and 10 percent-annual-chance floods were used to perform the vulnerability analysis. Summary findings of the risk assessment, showing vulnerability results for the entire planning area, are provided in the sections below. A breakdown by APC is provided in Appendix E.

13.3.1 Population and Property

Table 13-3 summarizes the estimated population, land area, and buildings in the evaluated flood hazard areas. The distribution of buildings in the hazard area by use category is shown in Figure 13-8 through Figure 13-11.

Table 13-3. Population and Property in Mapped Flood Hazard Zones

	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Total Population				
Population in the Hazard Area	50	112	46,032	232,589
% of Total Planning Area Population	<0.1%	<0.1%	1.2%	6.0%
Socially Vulnerable Population				
Community Health & Equity Index = 43.56 – 48.57				
Population in the Hazard Area	0	0	12,417	88,998
% of Total Planning Area Population	0.0%	0.0%	0.3%	2.3%
Community Health & Equity Index > 48.57				
Population in the Hazard Area	0	0	5,876	58,254
% of Total Planning Area Population	0.0%	0.0%	0.2%	1.5%
Property				
Total Land Area in the Hazard Area (acres)	31.4	47.7	15,677.8	36,742.9
Number of Buildings in the Hazard Area	13	24	9,325	48,730
Total Property Value in the Hazard Area	$21,884,937	$29,596,837	$15,275,417,383	$87,291,196,262
Total Value in the Hazard Area as % of Planning Area Total Value	<0.1%	<0.1%	2.0%	11.2%



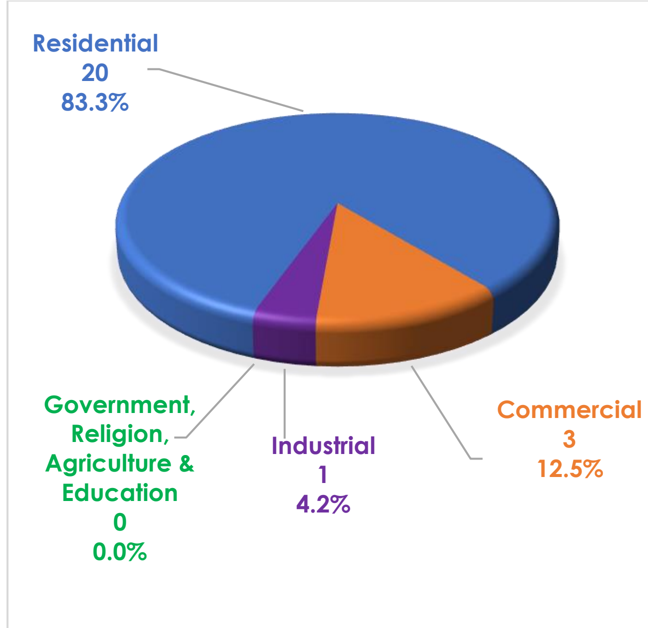
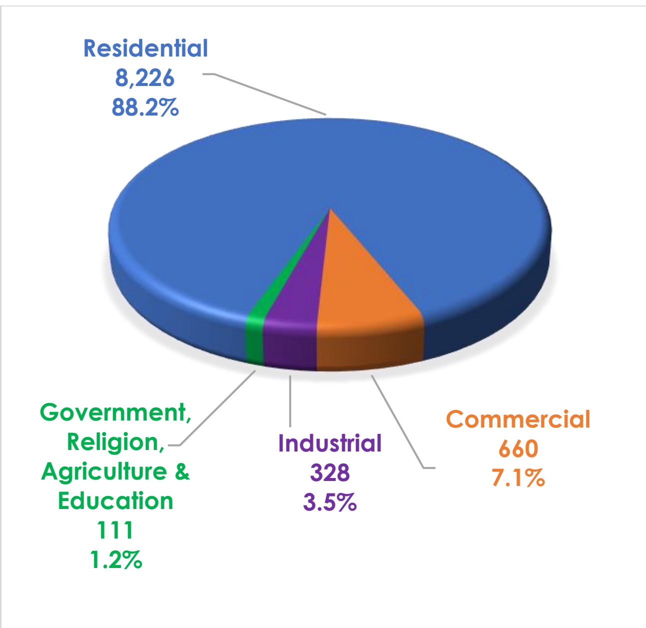


Figure 13-8. Buildings in 10% Annual Chance Flood Zone by Occupancy Class

Figure 13-9. Buildings in 2% Annual Chance Flood Zone by Occupancy Class



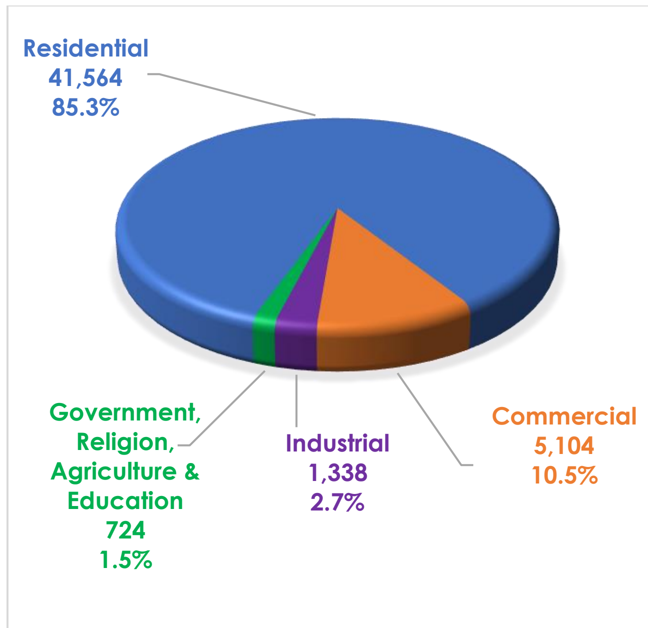


Figure 13-10. Buildings in 1% Annual Chance Flood Zone by Occupancy Class

Figure 13-11. Buildings in 0.2% Annual Chance Flood Zone by Occupancy Class

13.3.2 Community Lifelines

The risk assessment found the following numbers of community lifelines or other critical facilities within the hazard area for the evaluated flood events:

- **10 percent-annual-chance flood**—no facilities in the mapped hazard area

- **2 percent-annual-chance flood**—no facilities in the mapped hazard area
- **1 percent-annual-chance flood**—133 facilities in the mapped hazard area (2.0 percent of the planning area total)
- **0.2 percent-annual-chance flood**—565 facilities in the mapped hazard area (8.6 percent of the planning area total)

Figure 13-12 summarizes the distribution of these facilities by community lifeline category for the 1 percent and 0.2 percent-annual-chance floods. Flooding can significantly affect roads and bridges, which provide the only ingress and egress to some areas. There are 33 bridges that are in or cross over the 1 percent annual chance floodplain and 42 bridges that intersect the 0.2 percent annual chance floodplain within the City of Los Angeles.

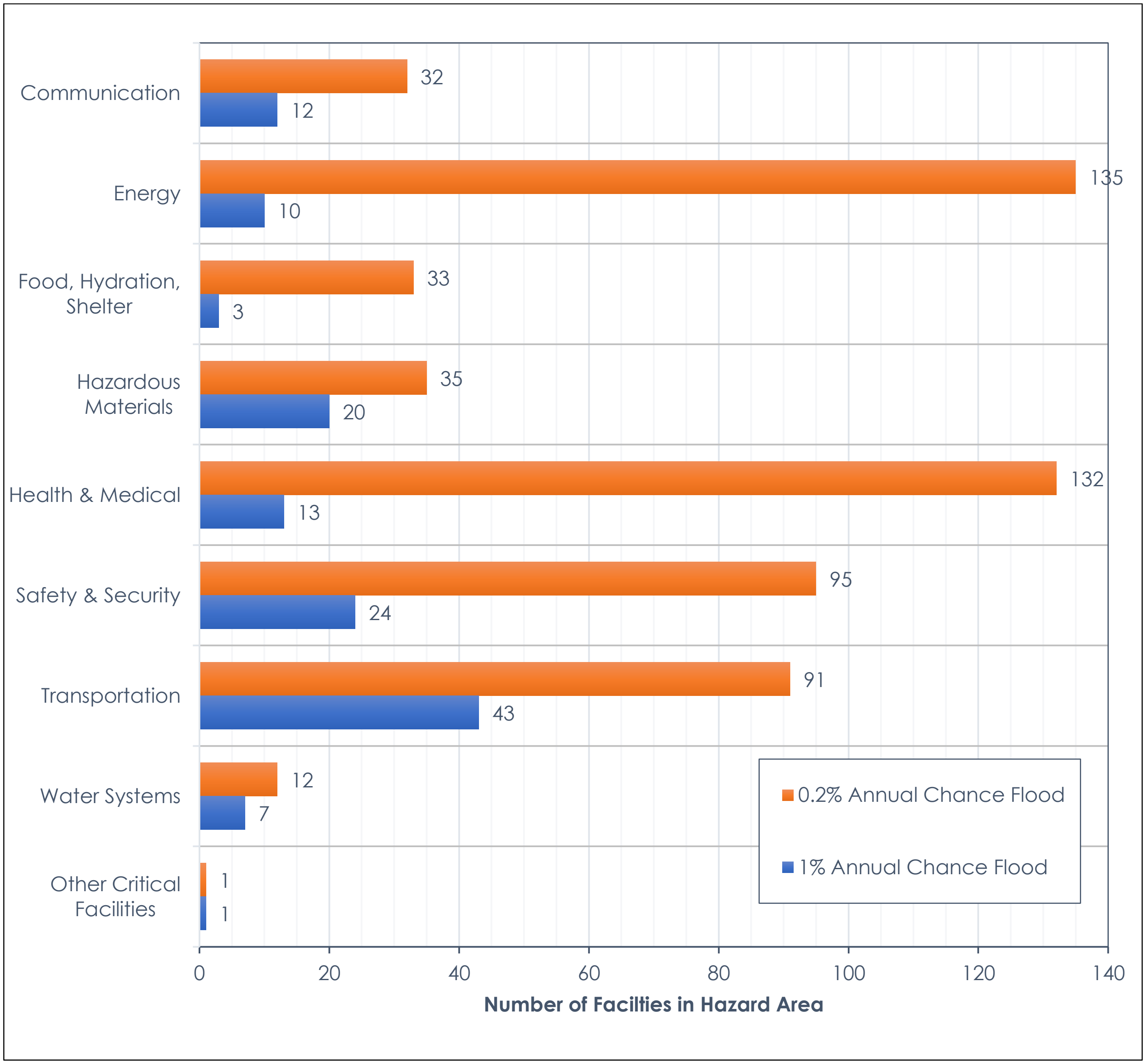


Figure 13-12. Number of Community Lifelines in Mapped Flood Hazard Areas

13.3.3 Environment

Flooding can impact the environment in negative ways. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development within flow channels can increase stream bank erosion if not carefully designed and mitigated, causing rivers and streams to migrate into non-natural courses.

13.3.4 Historic and Cultural Resources

Historic and cultural resources, such as historic places, cultural institutions, parks and open spaces, community facilities, and religious institutions, are all vulnerable to impacts from flooding. Venues such as museums and historic buildings face structural damage during flood events, with additional risk of damage to important cultural artifacts housed within that are not easily replaceable. Parks, recreation, and community space closures due to flood events can disrupt residents' lives and hinder access to critical community services.

13.4 IMPACTS

Summary findings of the risk assessment for flood, showing estimated impacts for the entire planning area, are provided below. A breakdown by APC is provided in Appendix E.

13.4.1 Population

Flood impacts on persons and households were estimated for each event through the Hazus analysis. Table 13-4 summarizes the results.

Table 13-4. Estimated Flood Impacts on Households and Residents

	10% Annual Chance Flood Zone	2% Annual Chance Flood Zone	1% Annual Chance Flood Zone	0.2% Annual Chance Flood Zone
Displaced Population	28	46	33,759	253,003
Number of Residents Requiring Short-Term Shelter	13	16	9,050	51,023

Flooding can cause multiple disruptions to the population, impacting transportation, communication, access to essential services, and emergency service response. It can displace residents because of rising waters, landslides, structure collapse, or unstable ground.

Flooding can be particularly difficult for those with disability, access, and function needs because of potential mobility problems or limitation. For those socially vulnerable – the elderly or young, mobility may be a challenge to evacuate quickly; for those with limited income or homeless – a flood may cause them to lose needed belongings or places to return to; for those with medical problems – response resources may be challenged in accessing individual during a flood. Additionally, facilities accustomed to providing services to these groups may also be impacted by the flood waters and unable to assist.

13.4.2 Property

Hazus generated loss estimates for the evaluated flood hazard areas, as reflected in Table 13-5. Table 13-6 describes the estimated amount of debris created during the evaluated flood events.

Table 13-5. Estimated Flood Impacts on Buildings

	10% Annual Chance Flood Zone	2% Annual Chance Flood Zone	1% Annual Chance Flood Zone	0.2% Annual Chance Flood Zone
Estimated Loss				
Residential	$24,718	$404,442	$73,588,300	$596,437,292
Commercial	$732,918	$1,665,972	$328,657,264	$1,211,192,301
Other	$0	$0	$126,794,868	$425,803,356
Total	**$757,636**	**$2,070,415**	**$529,040,432**	**$2,233,432,949**
% of Total Planning Area RCV	**0.0%**	**0.0%**	**0.1%**	**0.3%**

Table 13-6. Estimated Debris Generated by Flood

	10% Annual Chance Flood Zone	2% Annual Chance Flood Zone	1% Annual Chance Flood Zone	0.2% Annual Chance Flood Zone
Finish Debris (tons)	94.1	165.6	20,382.1	74,691.7
Structure Debris (tons)	30.9	73.7	5,105.5	20,575.4
Foundation Debris (tons)	19.5	49.3	4,806.3	16,582.1
Total Debris (tons)	**144.4**	**288.6**	**30,294.0**	**111,849.2**

Finish debris = carpeting, drywall, etc. Foundation debris = basement, crawlspace, pier, pile, etc.
Structure debris = framing, roof, etc.

13.4.3 Community Lifelines

Facilities Expected to Experience Damage from Flooding

Hazus was used to estimate the number of community lifelines affected by flooding (experiencing any damage). Figure 13-13 compares the predicted number of damaged facilities to the number of facilities in the hazard area, for the 1 percent and 0.2 percent annual chance flood events. Key results for the 1 percent annual chance event are as follows:

- For most community lifeline categories, fewer than half the facilities within the mapped flood hazard area are expected to experience any damage. The exceptions are communications facilities, energy facilities, and food, hydration, and shelter facilities.
- The energy category has the highest percentage of facilities in the hazard area that are expected to be damaged by the flood event, at 70 percent.

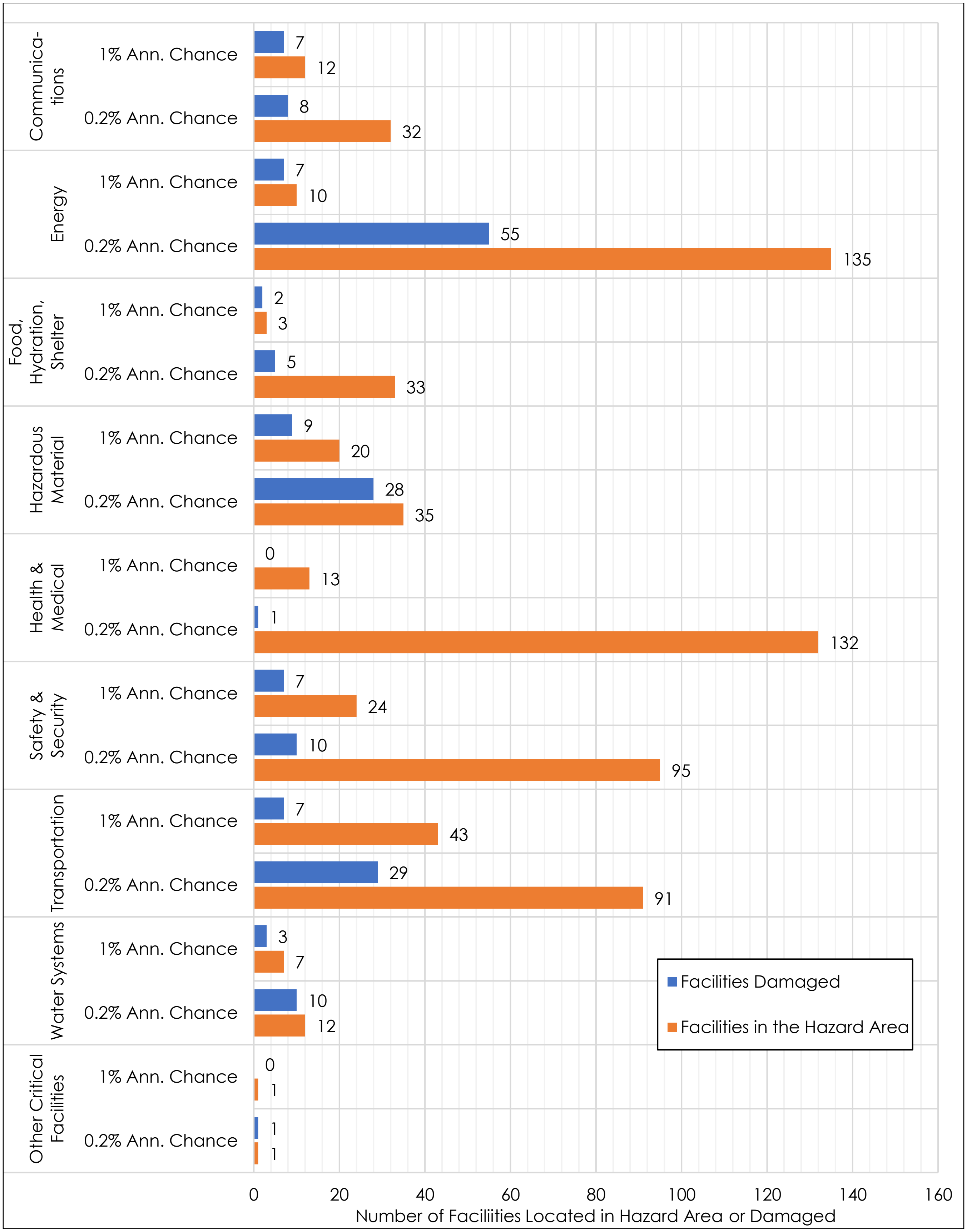


Figure 13-13. Community Lifelines Affected by the 1% and 0.2% Annual Chance Floods

Significant community lifelines predicted by Hazus to be damaged by the 1 percent annual chance flood include the following:

- 9 hazardous materials facilities
- 4 dams
- 3 shelters
- 3 sewage pumping plants
- 1 power plant
- 1 light rail station

Estimated Amounts of Damage

Hazus also estimated the amount of damage caused by flooding, in terms of dollar loss value as a percent of total facility replacement cost value. Figure 13-14 shows the estimated percent damage to community lifelines for the 1 percent and 0.2 percent annual chance flood events. For the 1 percent annual chance event, the average amount of damage to facilities ranges from 0.7 percent to 40.3 percent of total value.

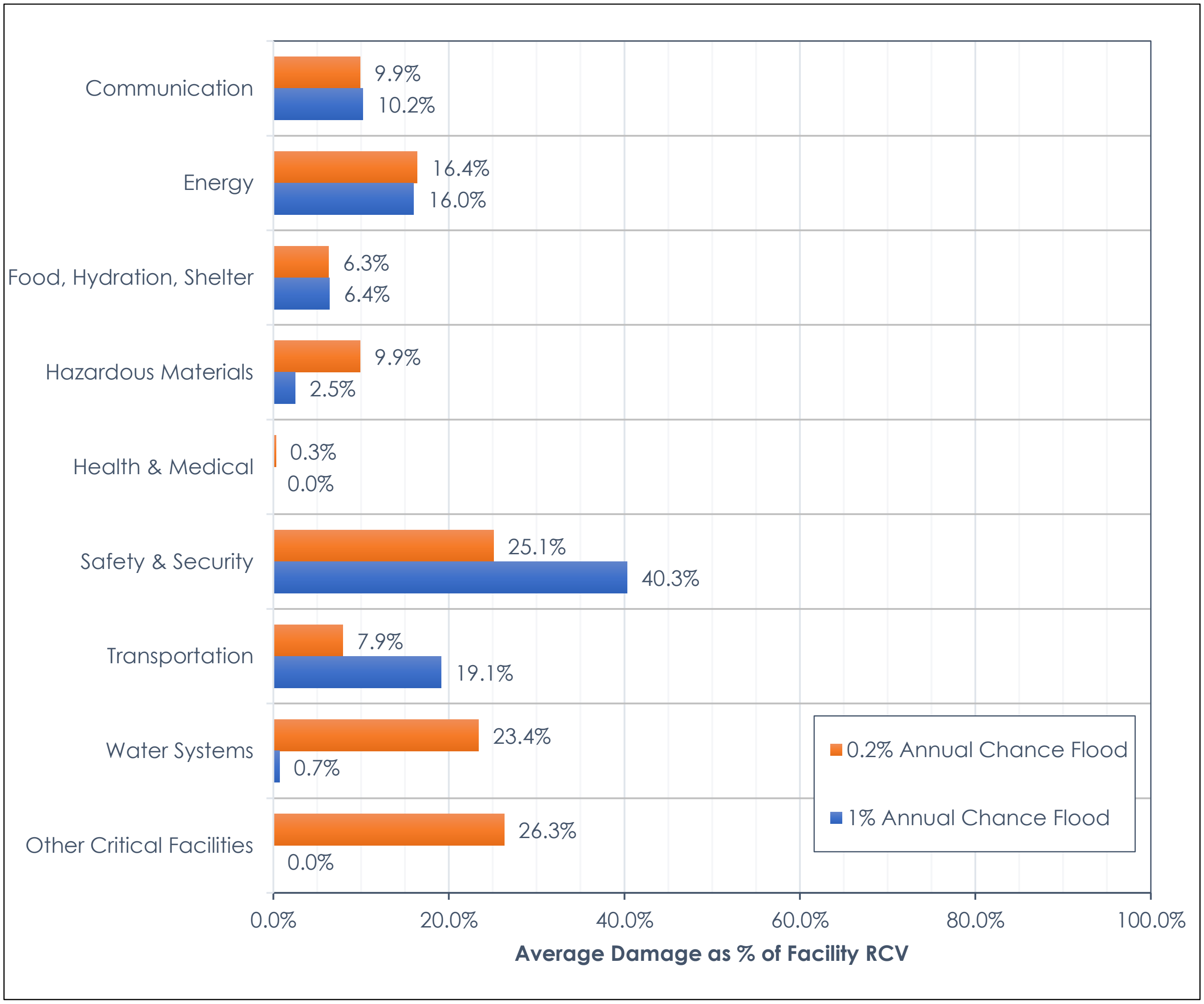


Figure 13-14. Average Damage to Community Lifelines from 1% and 0.2% Annual Chance Floods

13.4.4 Environment

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, flooding can impact the environment in negative ways.

- Fish can wash into roads or over dikes into flooded fields, with no possibility of escape.
- Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses.
- Human development such as bridge abutments and levees can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.
- Flooding may disrupt normal drainage systems in cities and can overwhelm sewer systems, causing raw sewage to spill into the flooded area.
- Severe flooding can destroy buildings that may contain toxic materials (paints, pesticides, gasoline, etc.) releasing these materials into the local environment.

Loss estimation platforms such as Hazus are not currently equipped to measure environmental impacts of flood hazards. The best gauge of potential impacts on the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in assessing potential impacts on the environment for future updates.

13.4.5 Historic and Cultural Resources

Depending on severity, flood events affecting the City of Los Angeles could bring devastating loss of life and property to the area in and around historical and cultural landmarks. Within the SFHA, there are 22 food assistance service critical facilities and 6 agriculture and food critical facilities.

13.4.6 Economy

Flood events have the potential to severely impact the economy. Both direct and indirect interruptions and losses could be significant. Building repair and replacement costs (including both structural and non-structural damage), building contents losses, and building inventory losses could be significant.

13.5 Effects of Future Change on Vulnerability and Impacts

13.5.1 Future Development

According to the California Department of Finance population projections for 2020 – 2060, the population of Los Angeles County is projected to decrease over the next 40 years (California Department of Finance 2023). The City has limited potential for expansion through annexation, as it is surrounded by other incorporated cities. It is anticipated that any future growth in the City will be managed through redevelopment, which creates an opportunity to correct past land use decisions, especially with regards to development within floodplains.

The City will be well-equipped to manage growth in floodplains with its flood damage prevention ordinance, its building code, available studies and study outcomes, such as the University of California Irvine Los Angeles Flood Risk study, and the Safety Element of its General Plan. Proper application of these tools requires accurate hazard mapping. It is the conclusion of this planning effort that currently effective flood hazard mapping does not accurately reflect the true flood risk for the City of Los Angeles. This should be taken into account as future land use decisions are made for areas impacted by flooding.

13.5.2 Climate Change

Population and Property

Population and property vulnerability and impacts may increase as a result of climate change. Runoff patterns may change, resulting in flooding in areas where it has not previously occurred.

Community Lifelines

Community lifeline vulnerability and impacts may increase as a result of climate change. Runoff patterns may change, resulting in risk to facilities that have not historically been at risk from flooding. Additionally, changes in the management and design of flood protection community lifelines may be needed as additional stress is placed on these systems. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, bypass channels and levees, as well as the design of local sewers and storm drains.

Environment

Environmental vulnerability and impacts may increase as a result of climate change. Changes in the timing and frequency of flood events may have broader ecosystem impacts that alter the ability of already stressed species to survive.

14. HIGH WIND

14.1 GENERAL BACKGROUND

Meteorological phenomena have the potential to cause damage, serious social disruption, or loss of human life. Los Angeles, as in other large metropolitan and geographically diverse areas, is subject to various types of weather occurrences. The planning team identified high wind as a highly probably hazard to be assessed in this HMP.

14.1.1 Defining High Winds

In this HMP, "high winds" refers to strong straight-line winds (i.e., winds that do not have the rotating characteristic of a tornado). High winds are generally short-duration events involving winds or gusts of over 60 mph, strong enough to cause property damage. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. The Beaufort Wind Chart (Table 14-1) provides terminology and a description of potential wind impacts at different levels.

Table 14-1. Beaufort Wind Chart

Beaufort Number	Range (mph)	Terminology	Description
0	0	Calm	Calm. Smoke rises vertically.
1	1-3	Light air	Wind motion visible in smoke.
2	4-7	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	Moderate breeze	Dust and loose paper are raised. Small branches begin to move.
5	19-24	Fresh breeze	Smaller trees sway
6	25-31	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use is difficult.
7	32-38	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	Severe gale	Light structure damage.
10	55-63	Storm	Trees uprooted. Considerable structural damage.
11	64-73	Violent storm	Widespread structural damage.
12	74-95	Hurricane	Considerable and widespread damage to structures.

Source: (NWS n.d.)

High winds are especially dangerous in areas with significant tree stands and areas with poorly constructed buildings, manufactured housing units, major infrastructure, and above-ground utility lines. A windstorm can topple trees and power lines, cause damage to public and private structures, and leave tons of debris in its wake. Damage from high winds accounts for half of all severe weather reports in the lower 48 states and is more common than damage from tornadoes.

High winds have been known to damage utilities. As an example of the impacts from high windstorms, Southern California experienced severe storms in February 2023 that left over 12,000 customers without power.

Santa Ana Winds

Santa Ana winds are a principal feature of Southern California weather. These are offshore winds, usually warm, blowing from the mountains to the coast, and occurring principally in fall and winter. Their frequency peaks in December. Santa Ana winds are marked by clear air and low humidity. They may last from a day to over a week. The Santa Ana condition is usually one of warm temperatures when the rest of the United States is in the grip of winter. High pressure builds over the Great Basin in fall and winter as cold air travels into that region from Canada. When the surface pressure gradient reaches or exceeds 10 millibars, as measured from Tonopah, Nevada, to Los Angeles, wind gusts can reach 70 mph in the mountains and below passes and canyons near Los Angeles. These Santa Ana winds from the north occur most commonly in Los Angeles from October through March.

Other Types of Damaging Winds

Other damaging straight line winds include the following:

- **Downdrafts**—A small-scale column of air that rapidly sinks toward the ground.
- **Downbursts**—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 begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- **Microbursts**—A small, concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the intermountain west, occur with little or no precipitation reaching the ground.

These damaging winds are often associated with thunderstorms, which are local storms produced by cumulonimbus clouds and accompanied by lightning and thunder (NWS 2021). The National Weather Service (NWS) considers a thunderstorm severe if it produces damaging wind gusts of 58 miles per hour (mph) or higher (NWS 2021).

Thunderstorms can become dangerous due to their ability to generate tornadoes, hail, high winds, flash flooding, and lightning. Only the high wind component of thunderstorms is addressed in this chapter. Flash flooding is addressed in the hazard chapter on floods in this HMP. The City of Los Angeles does not have a history of frequent severe events with hail, lightning, or tornadoes, although all have occurred in Los Angeles County. According to NOAA, there has been far more damage reported from thunderstorm straight line winds than tornadoes. For the strength and frequency of tornadoes that have occurred in the planning area, mitigation planning for the high-wind hazard will address the tornado risk as well.

14.1.2 Cascading and Compounding Impacts

High winds may cause loss of power if utility service is disrupted. Debris carried by high winds can also result in injury or property damage. Fires can result from damage to natural gas infrastructure. Hazardous materials may be released if a structure is damaged that stores such materials or if such a material is in transport.

14.2 HAZARD PROFILE

14.2.1 Past Events

There is a long history of high wind events in California. The NCEI storm events database lists 189 high wind events and 21 thunderstorm wind events from 2016 to 2024 in Los Angeles County. Among those events, only one injury was reported.

Since 2016 there have been two FEMA disaster declarations associated with wind events (tornadoes and straight-line winds) as shown in Table 14-2. There have been two state emergency proclamations with wind-related elements in Los Angeles County (see Section 3.1.2).

Table 14-2. Wind-Related FEMA Disaster Declarations for Los Angeles County

FEMA Declaration	Declaration Date	Incident Type	Declaration Title	Incident Begin Date	Incident End Date
DR-4769-CA	2024-04-13	Severe Storm	Severe Winter Storms, Tornadoes, Flooding, Landslides, and Mudslides	2024-01-31	2024-02-09
DR-4699-CA	2023-04-03	Severe Storm	Severe Winter Storms, Straight-Line Winds, Flooding, Landslides, and Mudslides	2023-02-21	2023-07-10

In August 2023, the remnants of Tropical Storm Hilary brought strong gusty winds to Los Angeles (Thiem 2023). The National Hurricane Center issued its first ever tropical storm watch for parts of Southern California. This was later changed to a warning as the system approached the California coast.

14.2.2 Location

High wind events have the potential to happen anywhere in the planning area. Santa Ana winds tend to channel below specific passes and canyons, coming in gust clusters. These winds may blow in one neighborhood, while a few blocks away there are only gentle warm breezes.

14.2.3 Frequency

Assessment Based on Past Events

Table 14-3 summarizes search results from the National Center for Environmental Information Storm Events Database for Los Angeles County events from 2002 through 2023. Based on these results, high wind events in the County are likely to happen every year.

Table 14-3. Los Angeles County High Wind Events, January 2002 – May 2023

Event Types Included[a]	Total Number of Events	Number of Days with:			Average Years Between Days with Event
		Event	Event and Death or Injury	Event and Property Damage	
High Wind, Marine High Wind, Marine Strong Wind, Marine Thunderstorm Wind, Strong Wind, Thunderstorm Wind	417	246	3	0	<1

Source: National Center for Environmental Information Storm Events Database

a. Event types are the categories available for search in the National Center for Environmental Information Storm Events Database

Potential Effect of Future Conditions on Hazard Probability

Until recently, scientists had predicted rapid inland warming would weaken one of the primary drivers for Santa Ana winds and reduce their frequency. However, a 2021 study found that bouts of hot Santa Ana winds are not declining and could even be increasing (Science 2021). Overall, the effects of future conditions, including climate change, on the type, location and range of intensities of severe wind are not clear with the most current science.

14.2.4 Severity

The ASCE civil engineering professional organization lists the highest risk category (Category IV) wind speed for Los Angeles as 105 mph (ASCE 2024). In the last five years, a gust of up to 70 mph has been recorded in Los Angeles (NWS 2023). The wind speed given in wind warnings issued by the NWS is for a one-minute average; gusts may be 25 to 30 percent higher.

Offshore winds from the northeast or east must reach 30 mph or more below passes and canyons to reach minimum criteria for Santa Ana wind advisories. Typical wind speeds are in the 40 to 55 mph range. In extreme cases, winds can gust locally to over 100 mph.

14.2.5 Warning Time

NOAA issues watch, warning, and advisory information for high winds. Weather Radio and other weather stations to warn residents of upcoming wind events so they may prepare and plan accordingly (NOAA-NSSL 2023).

14.2.6 Scenario

Although high winds occur on an annual basis, secondary effects can be significant for the densely populated City of Los Angeles. A worst-case event would involve prolonged high winds during a severe storm. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by the winds. Extremely high winds could cause structural damage, injury, fatalities and displacement of people from their homes.

14.3 VULNERABILITY

All people and property and the entire environment of the planning area are vulnerable to some degree to high winds, as summarized in Table 14-4.

Table 14-4. Population and Property Vulnerable to High Wind

Total Population	
Population in the Hazard Area	3,766,109
% of Total Planning Area Population	100%
Socially Vulnerable Population (see Section 4.4.2 for explanation of index values)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	831,919
% of Total Planning Area Population	21.5%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	844,409
% of Total Planning Area Population	21.8%
Property	
Number of Buildings in the Hazard Area	739,644
Total Property Value in the Hazard Area	$781,603,700,869
Total Value in the Hazard Area as % of Planning Area Total Value	100%

14.4 IMPACTS

14.4.1 Population

People located outdoors are considered most vulnerable to high winds because there is little to no warning, and shelter might not be available. Downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life.

Outdoor workers are vulnerable to high wind. Employers should prepare for the hazards associated with high winds that may require special facilities and safety equipment being provided to employees, or in some instances, work stoppage to ensure the safety and health of workers. High wind conditions during wet weather can pose a greater threat to employees working in the construction and shipbuilding industries. For instance, workers in the construction industry are bound to work in open spaces, at heights, with electrical equipment and metals, and in excavation areas and trenches, and may handle hazardous materials as a work task, thereby causing exposure to a myriad of safety hazards (Hazwoper OSHA 2020).

As a result of a significant event, residents may be displaced or require temporary or long-term sheltering. The number of people requiring shelter is generally less than the number displaced as some displaced persons use hotels or stay with family or friends following a disaster event.

Table 33-3 and Table 33-4 identify action items associated with the high wind hazard.

Socially Vulnerable Populations

Those at greater risk from the adverse effects of high winds are persons who have ambulatory or physical disabilities, cognitive impairments, economic constraints, and social isolation. Such populations include the elderly, young children, low-income people, people with life-threatening illnesses and those who are overweight. Power outages can be life threatening to those dependent on electricity for life support.

14.4.2 Property

All property can experience impacts from high wind, but structures in poor condition or in vulnerable locations may risk the most damage. Northern portions of the City are more vulnerable to high Santa Ana winds, and buildings in higher elevations and on ridges may be more prone to wind damage in general. Homes near mature trees or overhead power lines may be more susceptible to wind damage and blackouts.

Loss estimations for the high wind hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the replacement value of vulnerable structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 14-5 lists the loss estimates for the City of Los Angeles.

Table 14-5. Loss Potential for the High Wind Hazard

Total Building Value Vulnerable	$76,675,732,846
10% of Total Building Value	$7,667,573,285
30% of Total Building Value	$23,002,719,854
50% of Total Building Value	$38,337,866,423

14.4.3 Community Lifelines

Incapacity and loss of roads are the primary transportation failures resulting from high winds, mostly associated with secondary effects. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, and disrupting ingress and egress. During a blackout, all community lifelines that are reliant upon electricity for power will be severely impacted unless they are connected to a backup power source. Additional facilities on higher ground may also be vulnerable to wind damage or damage from falling trees.

14.4.4 Environment

The environment is highly vulnerable to high wind events. Natural habitats and park areas are vulnerable to the elements and risk damage and destruction. High winds can cause entire trees to topple.

14.4.5 Historic and Cultural Resources

High wind has large impacts on historical and cultural resources by causing extensive damage, and in some cases, complete destruction. The impact of high wind events relies heavily on the materials used for construction. Many of the 19th century structures identified in the HistoricPlacesLA database are made of wood clapboards, which are feeble and weaken with age. The monitoring and management of restoration activities have been an ongoing effort led by the City to mitigate impacts from hazard events such as high winds (Los Angeles City Planning 2023a).

14.4.6 Economy

High wind events can have a large impact on the City's local economy and small businesses. Power outages and structural damage can cause businesses to close for several days during and after a high wind event to clean up debris and ensure publicly safe conditions.

14.5 Effects of Future Change on Vulnerability and Impacts

14.5.1 Future Development

All future development will be affected by high winds. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Los Angeles has adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of high wind events. Land use policies identified in the City's General Plan also address many of the secondary effects of the high wind hazard. With these tools, the City of Los Angeles is well equipped to deal with future growth and the associated impacts of high winds.

14.5.2 Climate Change

Population and Property

Population and property vulnerability and impacts associated with high wind would be unlikely to increase as a direct result of climate change. High wind events may occur more frequently, but vulnerability and impacts will remain the same.

Community Lifelines

Community lifeline vulnerability and impacts associated with high wind would be unlikely to increase as a result of climate change; however, community lifeline owners and operators may experience more frequent disruption to service. For example, more frequent and intense winds may cause more frequent disruptions in power service.

Environment

Vulnerability of the environment and impacts from the hazard would be unlikely to increase; however, more frequent and intense winds may place additional stressors on already stressed systems.

15. Landslide and Other Mass Movements

15.1 General Background

15.1.1 Landslide Types

According to the USGS, the term landslide includes a wide range of ground movements. Landslides are commonly categorized by the type of initial ground failure, the material carried, or the nature of the movement. They include the following (see Figure 15-1):

- **Block slides**—Blocks of rock that slide along a slip plane as a unit down a slope.
- **Creep**—A slow-moving landslide often only noticed through crooked trees and disturbed structures.
- **Debris avalanche**—A debris flow that travels faster than about 10 miles per hour (mph). Speeds in excess of 20 mph are not uncommon, and speeds in excess of 100 mph, although rare, can occur. The slurry can travel miles from its source, growing as it descends, picking up trees, boulders, cars, and anything else in its path.
- **Earth flows**—Fine-grained sediments that flow downhill and typically form a fan structure.
- **Mudslides or Debris Flows**—Rivers of rock, earth, organic matter, and other soil materials saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt.
- **Post-Wildfire Debris Flows**—A result of post-fire conditions, where burned soil surfaces enhance rainfall runoff that concentrates and picks up debris as it moves. This debris flow is similar to a debris flow derived from hillslopes, in that it may result in a fast-moving flow, inundation, and a detrimental impact on lives and property within its zone of runout and deposition.
- **Rock falls**—Blocks of rock that fall away from a bedrock unit without a rotational component.
- **Rock topples**—Blocks of rock that fall away from a bedrock unit with a rotational component.
- **Rotational slumps**—Blocks of fine-grained sediment that rotate and move down slope.
- **Transitional slides**—Sediments that move along a flat surface without a rotational component.

15.1.2 Landslide Risk Areas

Landslides are typically a function of soil type and steepness of slope. Soil type is a key indicator for landslide potential and is used by geologist and geotechnical engineers to determine soil stability for construction standards.

Source: (U.S. Geological Survey 2006)

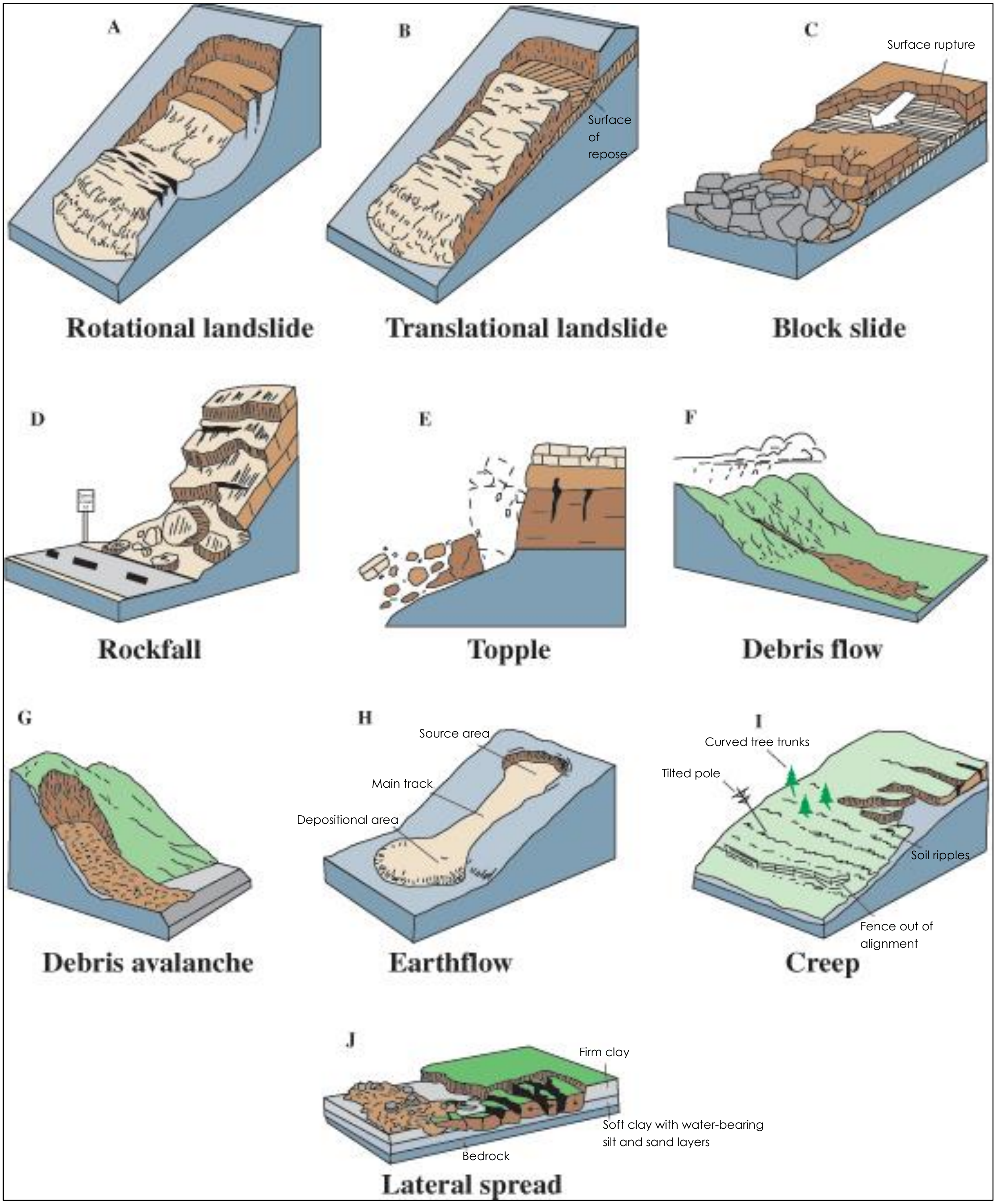


Figure 15-1. Common Landslide Types

In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- A slope greater than 33 percent
- Post-wildfire areas
- A history of landslide activity or movement during the last 10,000 years
- Stream or wave activity, which has caused erosion, undercut a bank or cut into a bank to cause the surrounding land to be unstable
- The presence or potential for snow avalanches
- The presence of an alluvial fan, indicating historical flows of debris or sediments
- The presence of impermeable soils, such as silt or clay, mixed with granular soils, such as sand or gravel.

One predictor of where slides might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges. The recognition of ancient dormant landslide sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are at risk of construction-triggered sliding.

15.1.3 Landslide Causes

Landslides are caused by a combination of geological and climate conditions and the influence of urbanization. They can be initiated by storms, earthquakes, fires, volcanic eruptions, or human modification of the land. Natural conditions are affected by human development and the infrastructure that supports it. In some cases, irrigation increases the landslide potential. The following factors can contribute to slide formation:

- Change in slope of the terrain
- Increased load on the land
- Shocks and vibrations
- Change in water content
- Groundwater movement
- Frost action
- Weathering of rocks
- Removing or changing the type of vegetation covering slopes
- Wildfire

While small landslides are frequently a result of human activity, the largest landslides are often naturally occurring phenomena with little or no human contribution.

15.1.4 Cascading and Compounding Impacts

Landslides can cause secondary effects such as blocking roads, which can isolate residents and businesses and delay commercial, public, and private transportation. Other potential problems can result from landslides if vegetation or poles on slopes are knocked over, causing losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

15.2 Hazard Profile

15.2.1 Past Events

Federal disaster declarations include 19 events that cover Los Angeles County and included a landslide or similar mass movement component (see Section 3.1.1). In addition, declared events for earthquake are known to have caused extensive landslides. The state has not issued any emergency proclamations covering Los Angeles County that include landslides.
Table 15-1 lists known landslide events that impacted the planning area between 1978 and April 2023.

Table 15-1. Landslide Events in and near the City of Los Angeles Planning Area

Event Date	Event Type	Federal Declaration Number	Location	Description
2/5/2024	Severe storms	—	Studio City, Beverly Crest, Baldwin Hills, and other canyon communities	February 5, 2024, was the 10th wettest day in the history of Los Angeles. This event caused slope erosion and several road closures, including Sepulveda Basin and Mulholland Drive. Several homes in canyon neighborhoods were impacted by debris flow and mudslides. This situation is ongoing as this plan is being finalized.
3/9/2023	Severe Winter Storms, Flooding, Landslides, and Mudslides	3592	Los Angeles County	An atmospheric river brought up to 3 inches of rain in coastal and valley areas, with foothill and mountain areas saw up to 6 inches. Extensive street flooding and flooding of creeks and rivers occurred.
2/21/2023	Severe Winter Storms, Straight-Line Winds, Flooding, Landslides, and Mudslides	4699	Los Angeles County	A powerful winter storm brought heavy rain, heavy snow, and strong winds to Los Angeles County. Rainfall totals ranged from 2 to 5 inches across coastal and valleys areas with 4 to 10 inches across the foothills and mountains. Peak wind gusts of 60 to 80 MPH were reported.

Event Date	Event Type	Federal Declaration Number	Location	Description
1/8/2023	Severe Winter Storms, Flooding, and Mudslides	3591	Los Angeles County	A powerful atmospheric river brought heavy rainfall, widespread flooding, and gusty winds to the area. Rainfall totals generally ranged from 2-6 inches across the coastal and valley areas with 6-16 inches across the mountains and foothills. Strong southerly winds, gusting up to 94 MPH, were reported across the area.
1/6/2023	Atmospheric River	—	Mulholland Drive, Coldwater Canyon, Hollywood Hills	Slope erosion undermined Mulholland Boulevard between Bowmont Avenue and Summit Circle, resulting in a road closure. The erosion carried over 100 tons of debris down the slope, impacting roads below the erosion. The Los Angeles Department of Building and Safety surveyed 104 affected buildings, of which 14 were yellow tagged, and 6 were red tagged.
12/27/2022	Severe Winter Storms, Flooding, Landslides, and Mudslides	4683	Los Angeles County	Temperatures rapidly dropped overnight from the 26th into the 27th by 15 to 20 degrees. Areas in Los Angeles county received an inch of rainfall in four hours.
12/6/2018	Heavy rain, mudslides, debris flow	—	Seminole Hot Springs	Heavy rain over the Woolsey Fire burn scar resulted in a significant mud and debris flow across the Pacific Coast Highway. The highway was closed around Leo Carrillo Beach due to a mud and debris flow.
1/9/2018	Heavy rain, mudslides, debris flow	—	Topanga Beach	Due to heavy rain, a significant mud and debris flow closed the Pacific Coast Highway around the intersection of Topanga Canyon Boulevard. Over 3 feet of mud was reported across the roadway.
1/18 – 1/23/2017	Severe winter storms, flooding, and mudslides	4305	Hollywood Hills	A hillside collapsed, affecting five homes. Hundreds of residents were without power immediately after the collapse.
10/17/2015	Mudslide	—	State Route 58 east of Bakersfield	In northern Los Angeles County's Antelope Valley, a river of mud covered a section of the highway and cars after high rains.
3/21/2013	Landslide	—	Pacific Coast Highway near Santa Monica	A landslide closed northbound Pacific Coast Highway for a day.
11/04/2011	Landslide	—	San Pedro	A major landslide along a seaside cliff in San Pedro was triggered by a heavy rainstorm The landslide took out 600 feet of the scenic road and carved a chasm into the 12-foot-high coastal bluff.
1/17-2/6/2010	Severe Winter Storms, Flooding, and Debris And Mud Flows	1884	Regional storm	A slow-moving rainstorm triggered a mudslide along Ocean View Boulevard in the La Canada Flintridge burn area, flooded freeways, and caused traffic problems and mudslides throughout the region.

Event Date	Event Type	Federal Declaration Number	Location	Description
10/21/2007 – 3/31/2008	Wildfires, Flooding, Mud Flows, and Debris Flows	1731	Regional storm	A series of wildfires burned across southern California, destroying over 1,500 homes and burning over 500,000 acres of land. Wind gusts and a major storm brought flooding, mud flows, and debris flows.
2/16 – 2/23/2005	Severe Storms, Flooding, Landslides, Mud & Debris Flows	1585	Regional storm	A powerful storm produced heavy rain and flash flooding. Rainfall totals ranged from 4 to 8 inches over coastal areas to between 10 and 20 inches in the mountains. In Los Angeles county, numerous roadways were closed due to mudslide and flash flooding including Interstates 5 and 10, Highway 101 in Hollywood, North Topanga Canyon Road in the San Fernando Valley, Malibu Canyon Road near Malibu and East Colima Road in Walnut. In the mountains of Los Angeles county, resort areas received up to 4 feet of new snowfall.
12/27/2004 – 1/11/2005	Severe Storms, Flooding, Debris Flows, and Mudslides	1577	La Conchita	Major landslide killed 10 people and destroyed or damaged dozens of homes. The city of Los Angeles received between 10-20 inches of rain.
10/21/2003 – 3/31/2004	Wildfires, Flooding, Mud Flow and Debris Flow	1498	Regional storm	Wildfires in the region destroyed more than 3,600 homes and killed 22 people. Heavy rains followed the wildfire event, leading to heavy rainfall, hailstorms, flooding conditions, debris flows, and power loss to more than 100,000 homes and businesses.
2/13 – 4/19/1995	Severe Winter Storms, Flooding Landslides, Mud Flow	1046	Regional storm	Flooding impacted 57 of California's 58 counties. The flooding was caused by a very rainy few months during an El Niño phase, which generally creates higher than average rainfall and storm frequency. The roads in many areas turned to rivers, bridges collapsed, and city centers flooded.
1/3 – 2/10/1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	1044	Los Angeles and Ventura Counties	A year of above-average rainfall caused landslides in Los Angeles and Ventura counties, including the La Conchita landslide, in which 12 homes were severely damaged or destroyed.
1/17/1994	Northridge Earthquake	1008	Regional event	The earthquake caused more than 11,000 landslides throughout the region. The landslides released a spore, known as "valley fever," leading to several deaths.
10/26/1993 – 4/22/1994	Fires, Mud/Landslides, Flooding, Soil Erosion	1005	Orange County	Landslides in Orange County's San Clemente and Big Rock Mesa cost over $700 million in damage and litigation costs.

Event Date	Event Type	Federal Declaration Number	Location	Description
1/5 – 3/20/1993	Severe Winter Storm, Mud and Land Slides, and Flooding	979	Regional storm	A series of storms left behind heavy rain that caused countywide flooding. Floods during this period caused $14 million in damages to Los Angeles County. In the Pacific Palisades 3 homes were destroyed and 4 more damaged due to landslides. In the Mt. Washington area, 2 structures were threatened by landslides.
2/10 – 2/18/1992	Rain/Snow/Wind storms, Flooding, Mudslides	935	Regional storm	Rains pelted the area at the rate of an inch and a half an hour. Flooding closed parts of the Golden State and Ventura Freeways, and accidents snarled major highways. Rock slides from soggy ground blocked the Pacific Coast Highway near Malibu. The rains also caused large sewage spills that forced the closing of 96 miles of beaches in Los Angeles and San Diego counties. Amtrak suspended service between Los Angeles and Santa Barbara because of mudslides.
10/1 – 11/20/1987	Earthquake and Aftershocks	799	Regional event	The Whittier Narrows earthquake (magnitude 5.9) caused approximately $358-million damage, 200 injuries, three directly related deaths, and five additional fatalities that were associated with the event. Many homes and businesses were affected, along with roadway disruptions, mainly in Los Angeles and Orange counties.
1/21 – 3/30/1983	Coastal Storms, Floods, Slides and Tornadoes	677	Regional storm	Storms caused rain and snow for several days. Coastal areas were hit hard by wind and rain, but the storms also caused flooding in valley areas and mountain landslides. A tornado cut a three-mile scar of destruction, damaging about 100 homes and a hospital, tossing cars around and taking off part of the roof of the Los Angeles Convention Center.
1/8/1980	Severe Storms, Mudslides and Flooding	615	Los Angeles County	Damage in Monterey Park, in Los Angeles County.
2/15/1978	Coastal Storms, Mudslides and Flooding	547	Regional storm	Intense rainfall caused water and debris down canyons in the City, leading to 21 deaths and $50 million in damage.

Sources: FEMA 2017; California Department of Conservation, Division of Mines and Geology 1979, USGS 1988, and 1998; NOAA NCEI 2023

15.2.2 Location

Landslide hazard areas are scattered throughout Los Angeles. As development has spread into the hillsides, unstable soil and erosion often contributes to landslides and mudslides. Factors that characterize landslide hazard areas include significant slope, weak rocks, and heavy rains.

The Santa Susana Mountains and the mountains north of the Santa Clara River valley are susceptible to landslides during seismic shaking. In the Santa Susana Mountains, more than 75 percent of the slope area has been denuded by landslides triggered by strong shaking (USGS 2011). In the San Gabriel Mountains, rock falls have been fewer and more widely scattered.

The California Geological Survey developed statewide mapping of landslide susceptibility using a combination of regional rock strength and slope data to define classes of susceptibility. The methodology assumed that landslide susceptibility is low on very low slopes in all rock materials and increases with slope and in weak rocks. The analysis also factored in locations of past landslides. Landslide hazard mapping for the planning area is shown in Figure 15-2 through Figure 15-8.

15.2.3 Frequency

Assessment Based on Past Events

In the planning area, landslides typically occur during and after earthquakes, wildland fires, and severe storms, so the frequency of landslides largely coincides with the frequency of these other hazard events. According to NCEI storm events database, the planning area has experienced earthquakes, wildland fires, and severe storms at least once every other year since 1960, representing an annual probability of 50 percent. Given the preponderance of steep slopes and the frequency of contributory sources to landslides in Los Angeles, the probability of future occurrence can be considered equal to this 50 percent annual probability. Until better data is generated specifically for landslide hazards, this severe storm frequency is appropriate for the purpose of ranking risk associated with the landslide hazard.

Potential Effect of Future Conditions on Hazard Probability

Climate change may affect storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature is likely to affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors would increase the probability of landslide occurrences. Various parts of the City could be more impacted as climate change has an effect on such hazards as wildfire. An increase in fires followed by a rainy winter season could cause landsides in previously stable regions as a result a fire’s effect on vegetation (trees, scrubs, grasses, and the like).

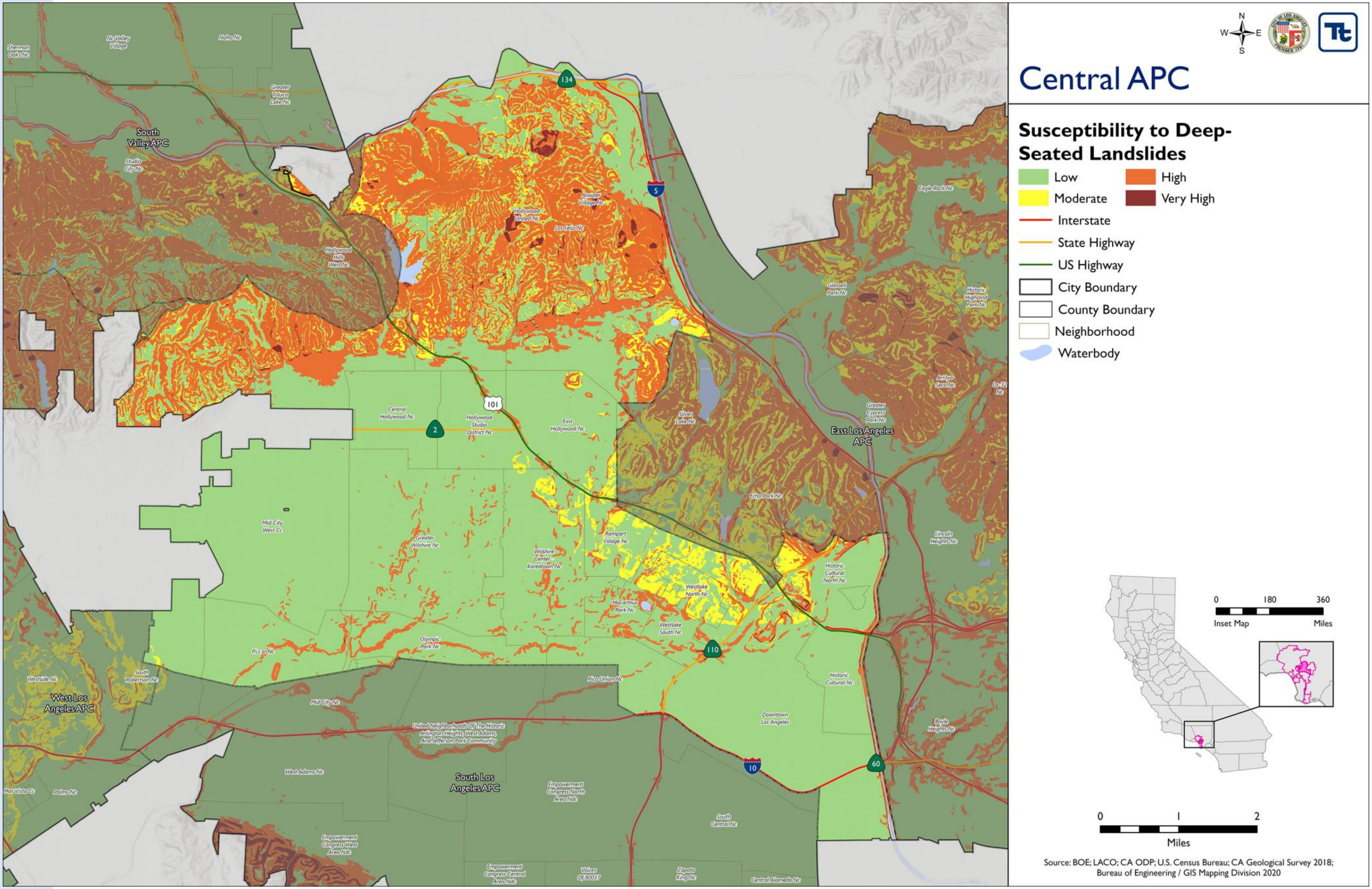


Figure 15-2. Landslide Hazard Areas in the Central APC

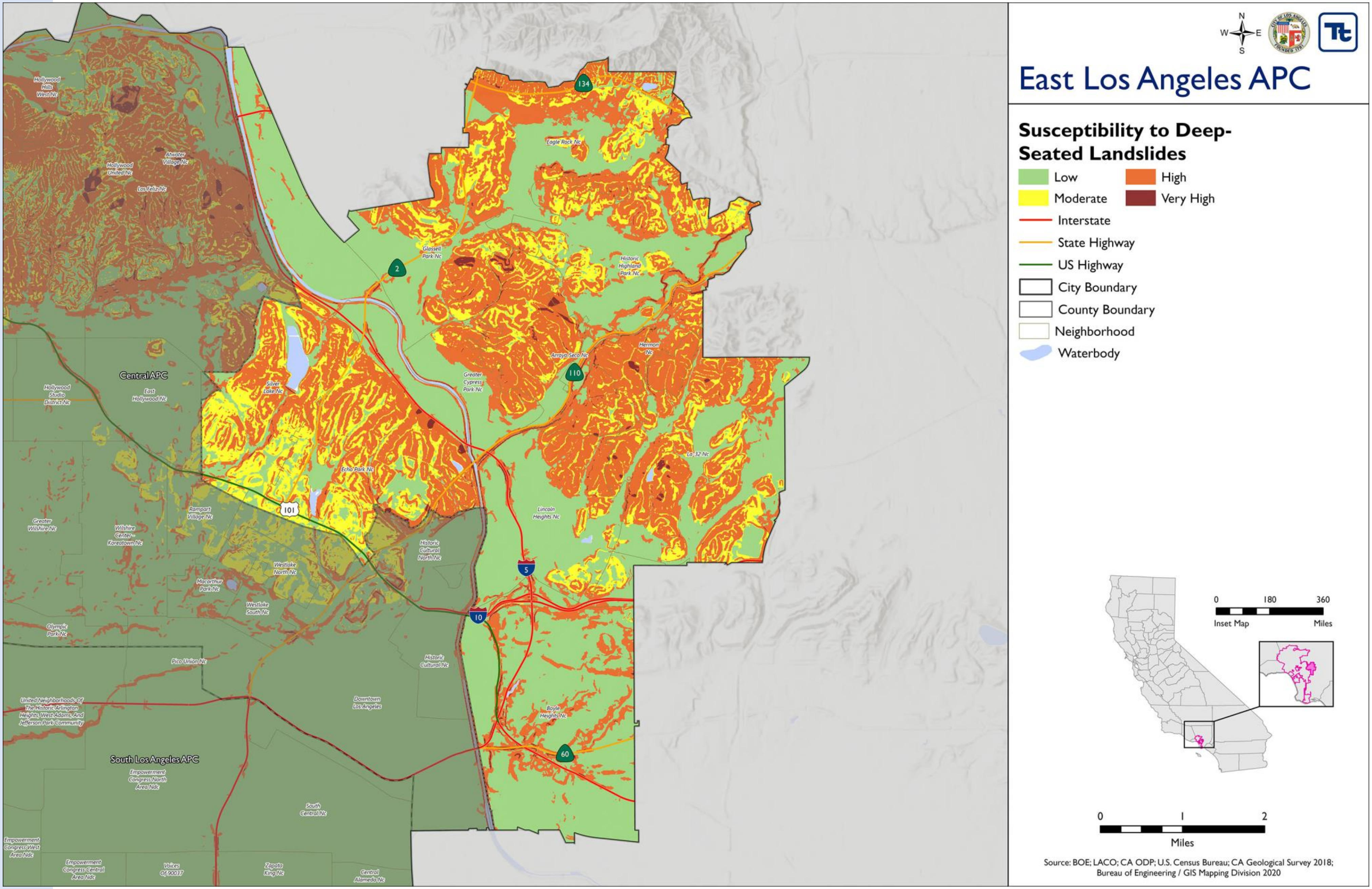


Figure 15-3. Landslide Hazard Areas in the East Los Angeles APC

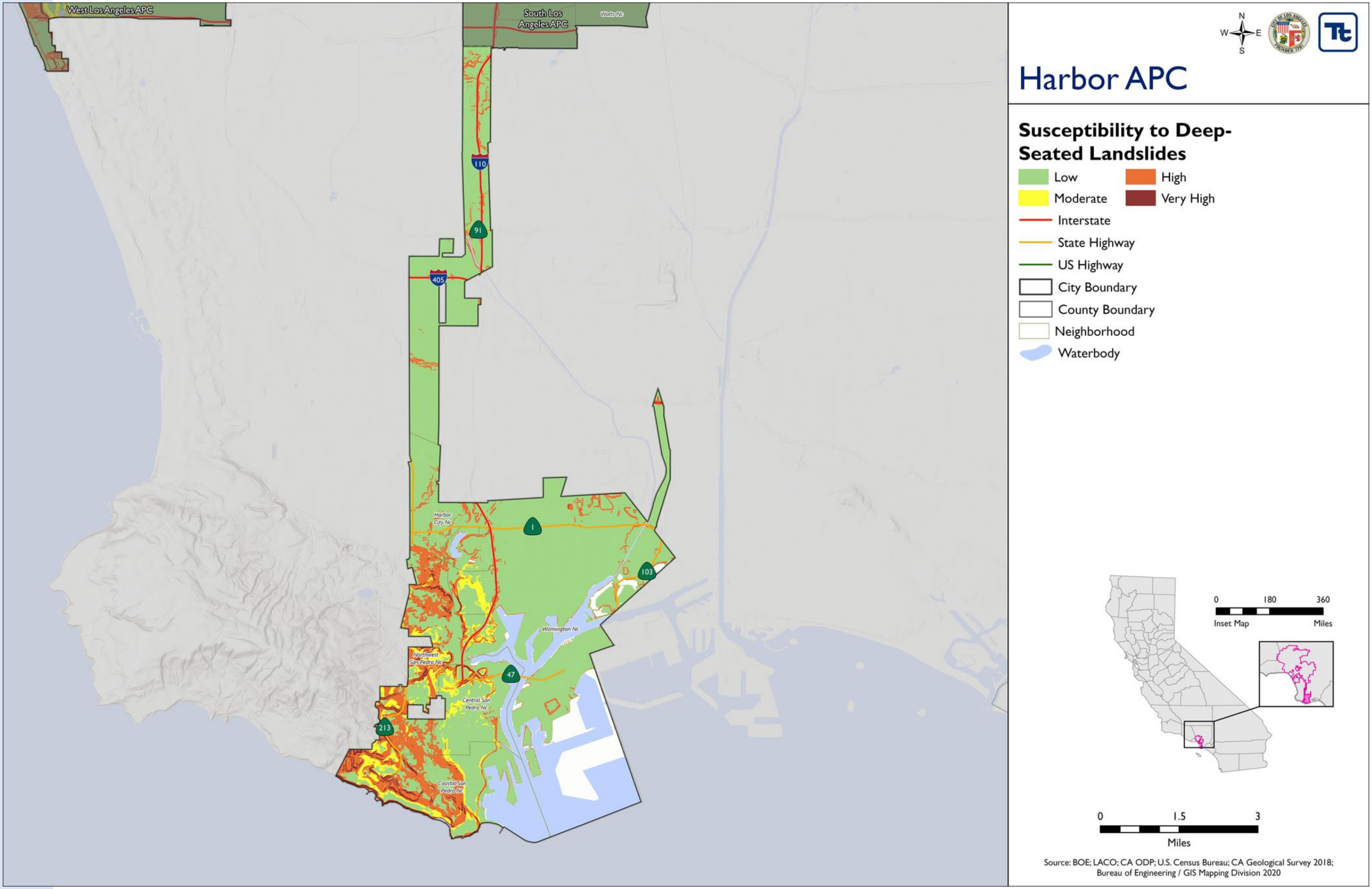


Figure 15-4. Landslide Hazard Areas in the Harbor APC

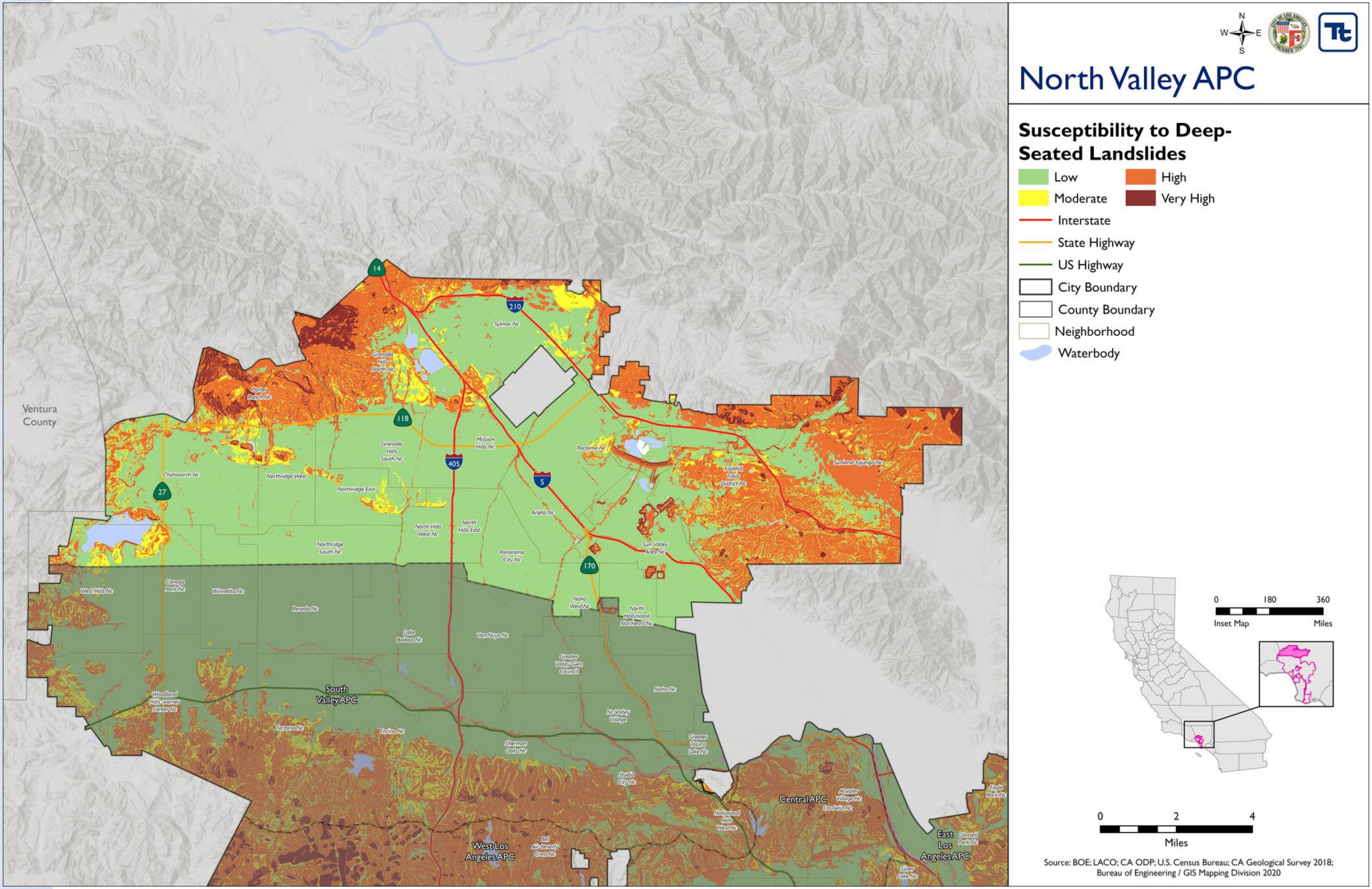


Figure 15-5. Landslide Hazard Areas in the North Valley APC

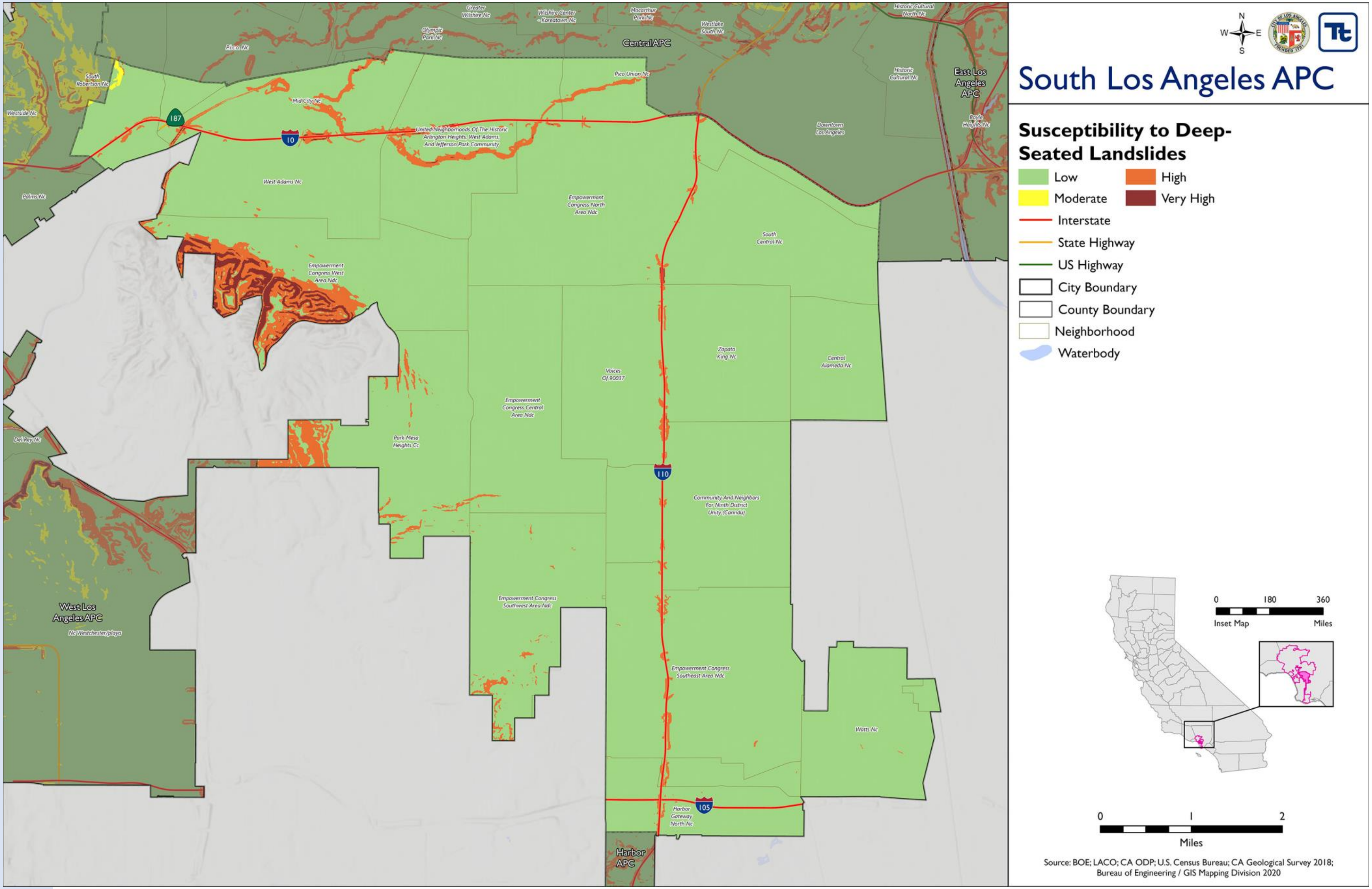


Figure 15-6. Landslide Hazard Areas in the South Los Angeles APC

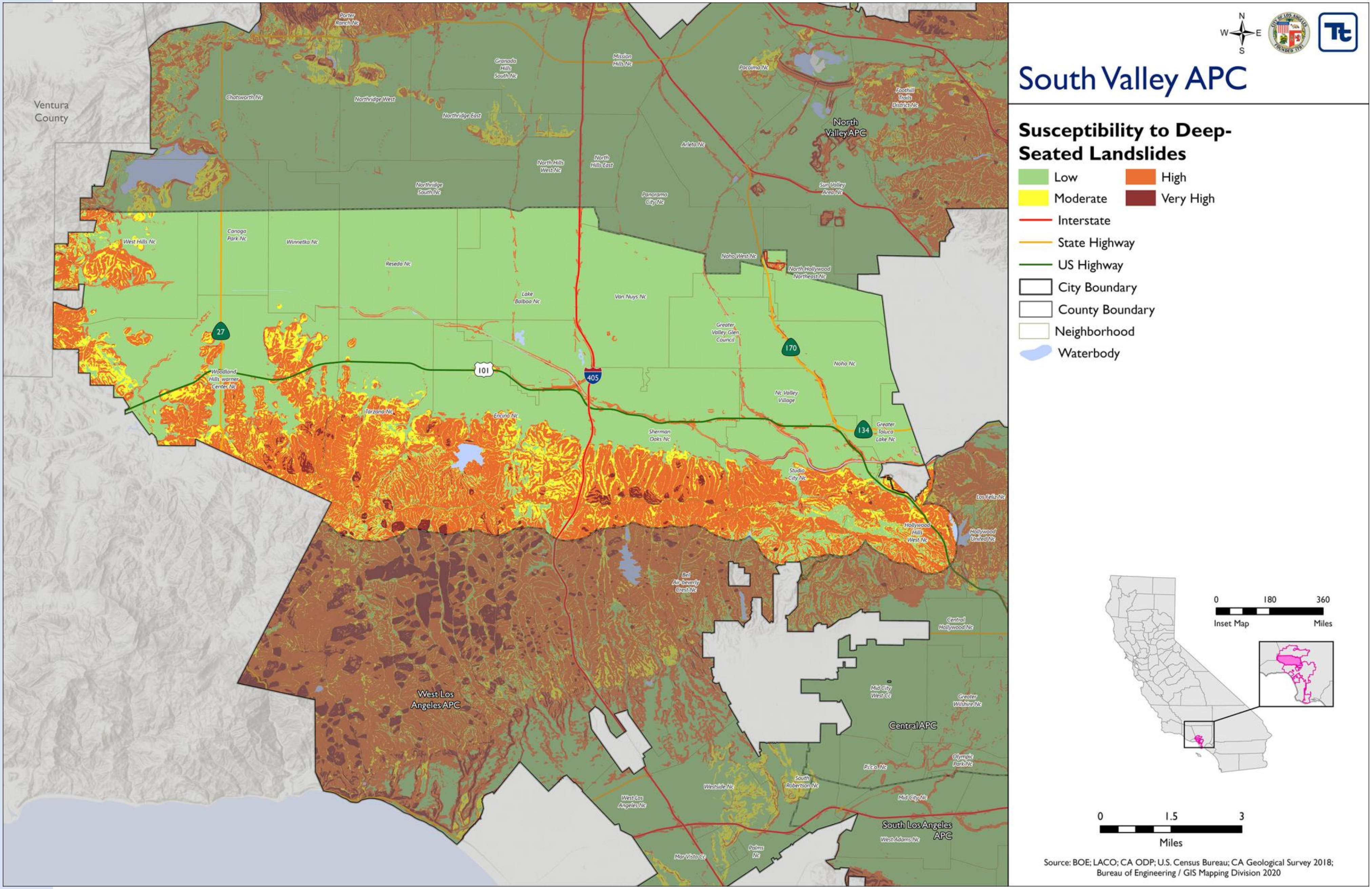


Figure 15-7. Landslide Hazard Areas in the South Valley APC

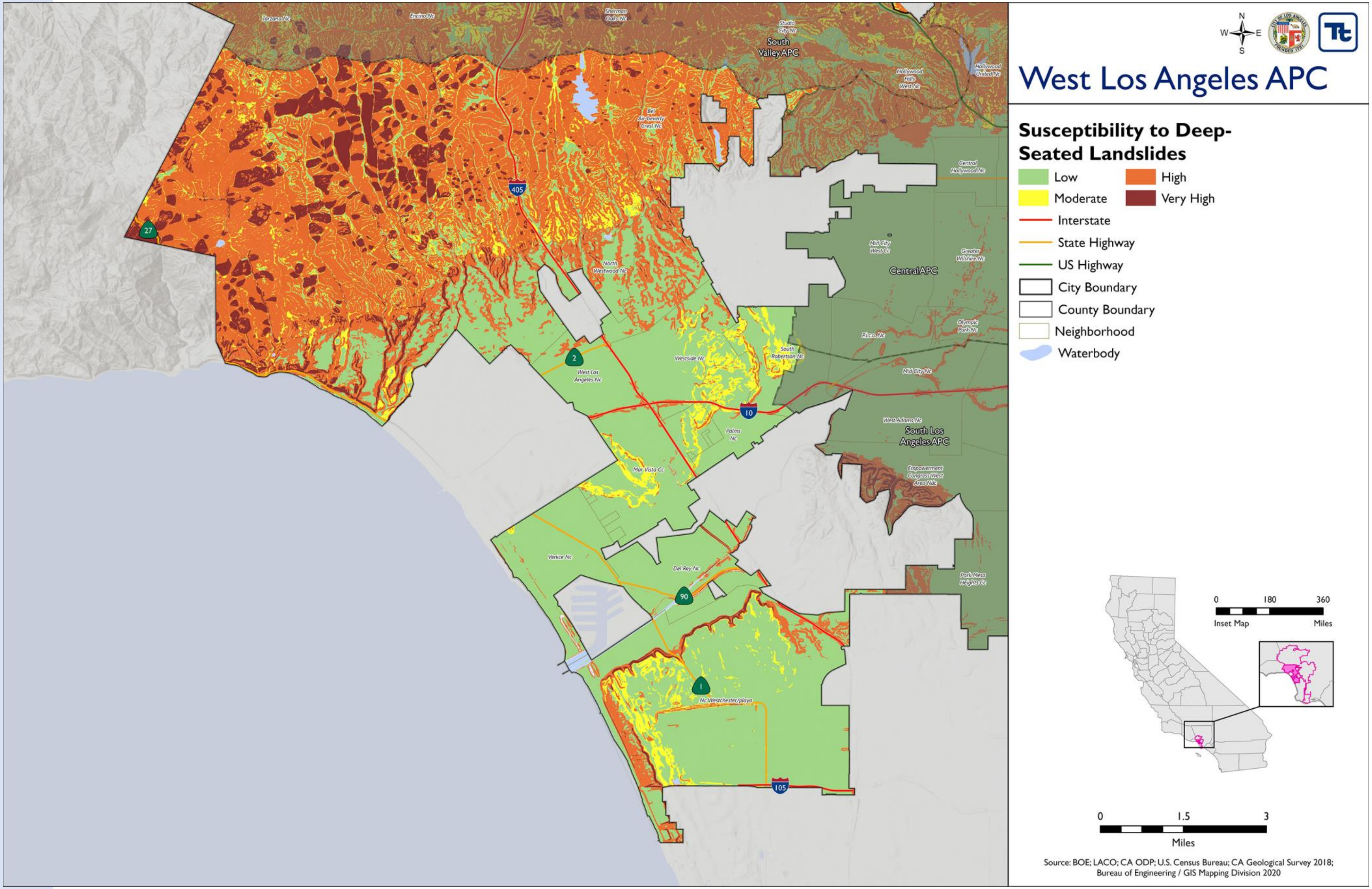


Figure 15-8. Landslide Hazard Areas in the West Los Angeles APC

15.2.4 Severity

Landslides destroy property and infrastructure and can take human lives. Slope failures in the United States result in about 25 to 50 deaths per year and damages costing over $1 billion (U.S. Geological Survey n.d.). Landslides can pose a serious hazard to properties on or below hillsides. When landslides occur — in response to such changes as increased water content, earthquake shaking, addition of load, or removal of downslope support — they deform and tilt the ground surface. The result can be destruction of foundations, offset of roads, breaking of underground pipes, or overriding of downslope property and structures. Landslides cause millions of dollars in cumulative damage to Southern California's homes, businesses, and infrastructure every year.

15.2.5 Warning Time

Landslide velocity can range from inches per year to many feet per second, depending on slope angle, material and water content. Generally accepted warning signs for landslide activity include the following:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements or sidewalks
- Soil moving away from foundations
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house
- Tilting or cracking of concrete floors and foundations
- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls or fences
- Offset fence lines
- Sunken or down-dropped roadbeds
- Rapid increase in creek water levels, possibly accompanied by increased soil content
- Sudden decrease in creek water levels though rain is still falling or recently stopped
- Sticking doors and windows or visible open spaces indicating frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together.

It is possible to determine areas at risk during general time periods based on geology, vegetation, and amount of predicted precipitation for an area. However, there is no practical warning system for individual landslides. The current procedure is to monitor situations on a case-by-case basis and respond after the event has occurred.

15.2.6 Scenario

Major landslides in the planning area occur as a result of soil conditions that have been affected by severe storms, groundwater or human development. The worst-case scenario for landslide hazards in the planning area would generally correspond to a severe storm that had heavy rain and caused flooding. Landslides are most likely during late winter when the water table is high. After heavy rains as a result of particular seasons such as Winter and Spring, soils become saturated with water. As water seeps downward through upper soils that may consist of permeable sands and gravels and accumulates on impermeable silt, it will cause weakness and destabilization in the slope. A short intense storm could cause saturated soil to move, resulting in landslides. As rains continue, the groundwater table rises, adding to the weakening of the slope. Gravity, poor drainage, a rising groundwater table and poor soil exacerbate hazardous conditions.

Mass movements are becoming more of a concern as development moves outside of urban centers and into areas less developed in terms of infrastructure. Most mass movements would be isolated events affecting specific areas. It is probable that private and public property, including infrastructure, will be affected. Mass movements could affect bridges that pass over landslide prone ravines and knock out rail service through the planning area. Road obstructions caused by mass movements would create isolation problems for residents and businesses in sparsely developed areas. Property owners vulnerable to steep slopes may suffer damage to property or structures. Landslides carrying vegetation such as shrubs and trees may cause a break in utility lines, cutting off power and communication access to residents.

Continued heavy rains and flooding will complicate the problem further. As emergency response resources are applied to problems with flooding, it is possible they will be unavailable to assist with landslides and other mass movements occurring all over the planning area.

15.3 VULNERABILITY

Mapping of the moderate, high, and very high risk landslide hazard areas was used to perform the vulnerability analysis. Summary findings of the risk assessment, showing vulnerability results for the entire planning area, are provided in the sections below. A breakdown by APC is provided in Appendix E.

15.3.1 Population and Property

Table 15-2 summarizes the estimated population living in the landslide hazard areas and the estimated property vulnerability. The distribution of vulnerable structures by use category is shown in Figure 15-9 through Figure 15-11.

Table 15-2. Population and Property in Mapped Landslide Risk Zones

	Very High Risk Landslide Area	High Risk Landslide Area	Moderate Risk Landslide Area
Total Population			
Population in the Hazard Area	31,382	611,003	262,539
% of Total Planning Area Population	0.8%	15.8%	6.8%
Socially Vulnerable Population (see Section 4.4.2)			
Community Health & Equity Index = 43.56 – 48.57			
Population in the Hazard Area	1,561	2.0%	0.8%
% of Total Planning Area Population	<0.1%	61,354	27,823
Community Health & Equity Index > 48.57			
Population in the Hazard Area	548		
% of Total Planning Area Population	<0.1%	1.6%	0.7%
Property			
Number of Buildings in the Hazard Area	5,683	111,961	47,856
Total Property Value in the Hazard Area	$4,522,021,198	$88,244,386,945	$37,180,447,298
Total Value in the Hazard Area as % of Planning Area Total Value	0.6%	11.3%	4.8%

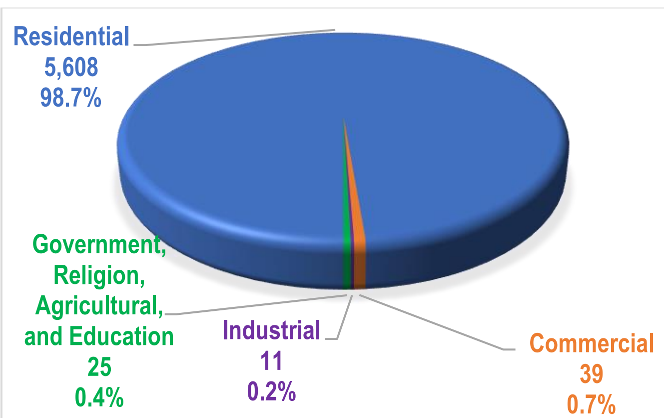


Figure 15-9. Vulnerable Structures in Very High Landslide Risk Area by Occupancy Class

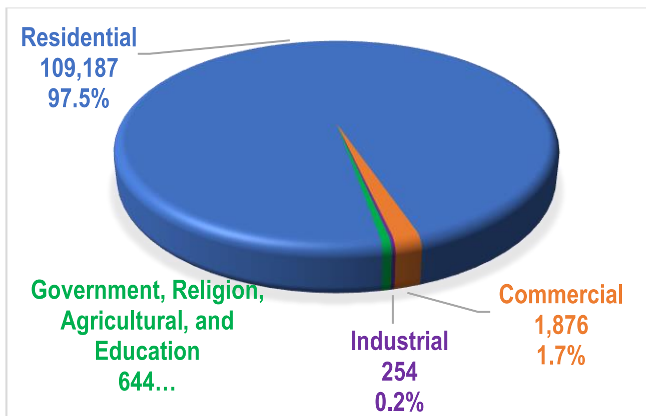


Figure 15-10. Vulnerable Structures in High Landslide Risk Area by Occupancy Class

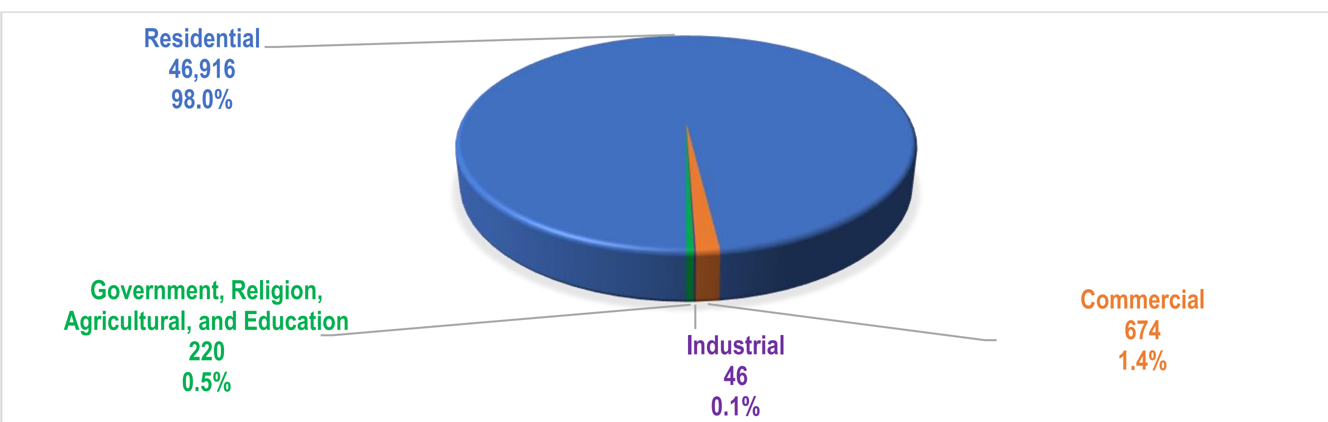


Figure 15-11. Vulnerable Structures in Moderate Landslide Risk Area by Occupancy Class

15.3.2 Community Lifelines

Figure 15-12 summarizes the number of community lifelines in each landslide risk area, by category. The total count of community lifelines in the landslide hazard area (1,134) represents 17.25 percent of the planning area total of 6,574.

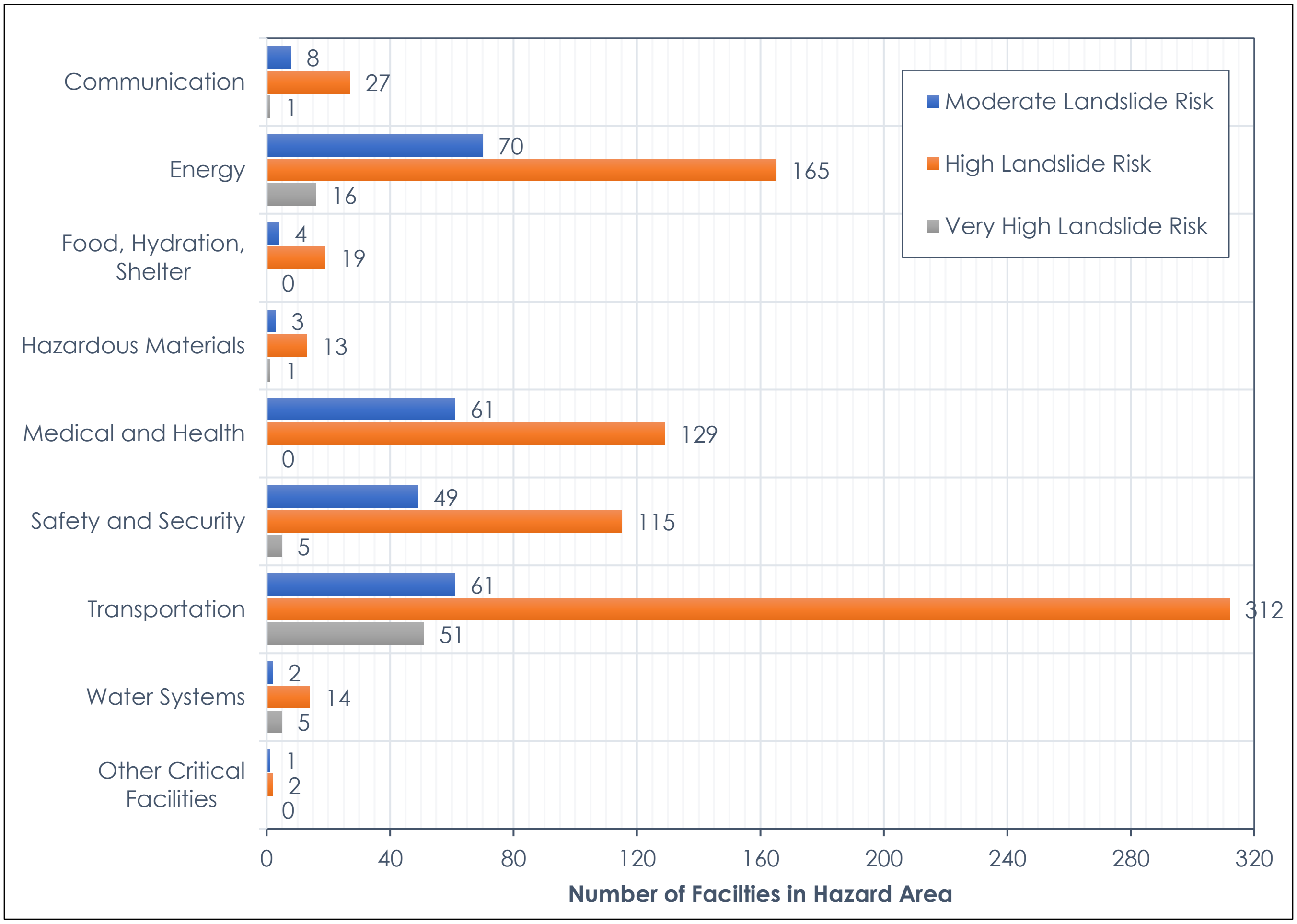


Figure 15-12. Number of Community Lifelines in Mapped Landslide Risk Areas

15.3.3 Environment

All natural areas within the mapped landslide hazard zones are considered to be vulnerable to the hazard.

15.3.4 Historic and Cultural Resources

Landslide impacts on historic and cultural resources within the City are highest in areas near hillsides that are characterized by unstable soil and erosion, such as the Santa Susana Mountains and the mountains north of the Santa Clara River valley. Historical and cultural landmarks in these areas are highly susceptible to landslide occurrences especially following seismic activity.

15.4 Impacts

15.4.1 Population

Generally, a landslide event is an isolated incidence and impacts the populations within the immediate area of the incident. The population downslope of the landslide hazard areas is particularly vulnerable. In addition to causing damage to residential buildings and displacing residents, landslide events can block off or damage major roadways and inhibit travel for emergency responders or populations trying to evacuate the area.

Socially Vulnerable Populations

Populations with access and functional needs, as well as elderly populations and the very young, may be unable to evacuate quickly enough to avoid the impacts of a landslide. Other vulnerable groups may include those experiencing homelessness or those with limited knowledge of English.

15.4.2 Property

Loss estimations for landslide are not based on modeling utilizing damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the replacement value of vulnerable structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 15-3 shows the aggregate general building stock loss estimates from the combined very high, high, and moderate landslide risk areas.

Table 15-3. Loss Potential for Landslide (Aggregate from Very High and High Risk Area Vulnerability)

Total Building Value Vulnerable	**$129,946,855,441**
10% of Total Building Value	$12,994,685,544
30% of Total Building Value	$38,984,056,632
50% of Total Building Value	$64,973,427,721

15.4.3 Community Lifelines

There are 1,134 community lifelines vulnerable to the landslide hazard in the moderate to very high risk areas. A more in-depth analysis of the mitigation measures taken by these facilities to prevent damage from mass movements should be done to determine if they could withstand impacts of a mass movement.

Several types of infrastructure are vulnerable to mass movements, including transportation, water and sewer and power infrastructure. Highly susceptible areas of the planning area include mountain and coastal roads and transportation infrastructure. At this time, all infrastructure and transportation corridors identified as vulnerable to the landslide hazard are considered at risk of impacts until more information becomes available.

15.4.4 Environment

Environmental problems as a result of mass movements can be numerous. Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolong periods of time due to landslides.

15.4.5 Historic and Cultural Resources

Landslides are a threat to historical and cultural resources by causing extensive damage, and in some cases, complete destruction. Many of the HCMs located in the City pre-date the 1900s and are negatively impacted by landslide or other mass movements. The monitoring and management of restoration activities have been an ongoing effort led by the City to mitigate impacts from hazard events such as landslides. The vulnerability of HCMs to landslide hazards relies heavily on the materials used for construction and the foundations they were built upon. Many of the 19th century structures identified in the HistoricPlacesLA database are made of materials such as wood clapboards, which are feeble and weaken with age (Los Angeles City Planning 2023a).

15.4.6 Economy

Landslide events can have an impact on the City's economy and residential housing market. These events can lead to displaced people and families in large quantities and cause businesses to close for several days to repair structural damage and utilities. Communities in hillside areas, which have an increased vulnerability to landslide due to their unstable geological characteristics, attract tourism for recreational activities available in their natural areas. The economy is dependent on resilience from landslide events and these communities' ability to bounce back after an event occurs.

15.5 EFFECTS OF FUTURE CHANGE ON VULNERABILITY AND IMPACTS

15.5.1 Future Development

The planning area has experienced moderate growth over the past few decades, increasing in population by 9.2 percent from 2000 to 2020. According to the California Department of Finance population projections for 2020 – 2060, the population of the City of Los Angeles and the surrounding county is projected to decrease (California Department of Finance 2023).

The City of Los Angeles is equipped to handle any future growth within landslide hazard areas in the event that the City population increases in the coming years. In July 2016, the City updated the Baseline Mansionization Ordinance and the Baseline Hillside Ordinance that includes limiting the grading quantities of lots in designated "Hillside Areas." In addition, the City's General Plan addresses landslide risk areas in its Safety Element. The City of Los Angeles has committed to linking its General Plan to this hazard mitigation plan update. This will create an opportunity for wise land use decisions as future growth impacts landslide hazard areas.

The State of California has adopted the International Building Code (IBC) by reference in its California Building Standards Code. The IBC includes provisions for geotechnical analyses in steep slope areas that have soil types considered susceptible to landslide hazards. These provisions ensure that new construction will be built to standards that reduce the potential for impacts from landslides.

15.5.2 Climate Change

Population and Property

Population and property vulnerability and impacts associated with landslide would be unlikely to increase as a result of climate change. Landslide events may occur more frequently, but the extent and location should be contained within mapped hazard areas or recently burned areas.

Community Lifelines

Community lifeline vulnerability and impacts associated with landslide would be unlikely to increase as a result of climate change impacts on the landslide hazard; however, community lifeline owners and operators may experience more frequent disruption to service provision as a result of landslide hazards. For example, transportation systems may experience more frequent delays if slides blocking these systems occur more frequently. In addition, increased sedimentation resulting from landslides may negatively impact flood control facilities, such as dams.

Environment

Environmental vulnerability and impacts associated with landslide would be unlikely to increase as a result of climate change, but more frequent slides in river systems may impact water quality and have negative impacts on stressed species.

16. SEA-LEVEL RISE, COASTAL FLOOD AND EROSION

16.1 GENERAL BACKGROUND

16.1.1 Sea-Level Rise

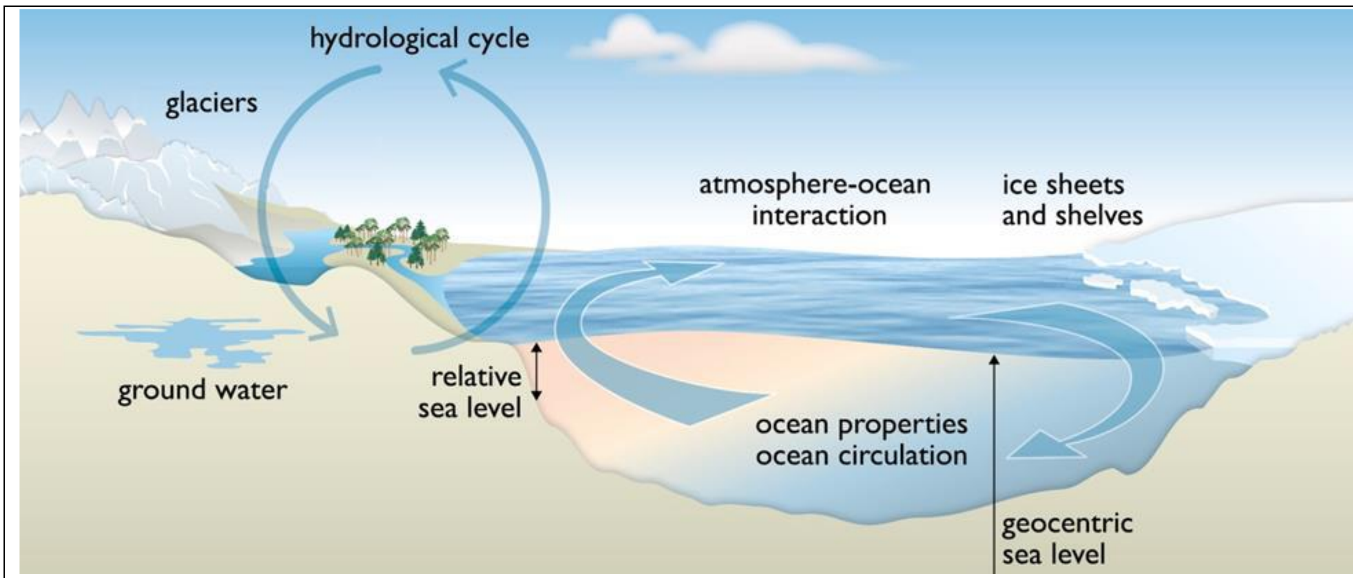
Global mean sea-level rise has been observed over the last century in tide station data from around the world and, more recently, in satellite-based ocean height measurements. Global mean sea level has risen by 8 to 9 inches since 1880, with the rate of rise accelerating over the past century. In 2021, global sea level was measured at 3.8 inches above 1993 levels (Lindsey 2022).

Global and Local Sea-Level Rise

There are two types of sea-level rise: global and relative (local). Global sea-level rise is primarily attributed to changes in ocean volume due to ice melt and thermal expansion. The melting of glaciers and continental ice masses can contribute significant amounts of freshwater input to the earth's oceans. In addition, an increase in global ocean temperature causes seawater to expand, increasing ocean volume (NASA 2020).

Relative, or local, sea level is affected by global sea level fluctuations, winds, ocean circulation, and changes in land elevation due to factors such as subsidence, glacial rebound, or large-scale tectonic motion (see Figure 16-1). It refers to the height of the water as measured along the coast relative to a specific point on land.

Source: (IPCC 2013)



A number of processes factor into global sea levels. Any alteration to the processes shown will result in a sea level change. The term "ocean properties" refers to aspects such as temperature, salinity, and density, which influence and are dependent from ocean circulation.

Figure 16-1. Causes of Sea-Level Rise

Tide stations measure local sea-level rise. Water measurements at tide stations are referenced to stable vertical points on the land, and a known relationship is established. Since the heights of both the land and water change, the land-water interface can vary spatially and temporally and must be defined over time. Depending on the rates of vertical land motion relative to changes in sea level, observed local sea level trends may differ greatly from the average rate of global sea-level rise and vary widely from one location to the next. Relative sea level trends reflect changes in local sea levels over time and are typically the most critical sea level trend for many coastal applications, including coastal mapping, marine boundary delineation, coastal zone management, coastal engineering, sustainable habitat restoration design, and the general public enjoying their favorite beach (NOAA 2022).

Physical Impacts of Sea-Level Rise

Sea-level rise will cause currently dry areas to be permanently or chronically inundated. Temporary inundation from extreme tide events and storm surge also will change. The mobilization of subsurface contaminants within rising groundwater is also a major concern for the City of Los Angeles (Cushing, et al. 2023).

The California Coastal Commission released the most recent version of its Sea-Level Rise Policy Guidance in 2018. The report details the physical impacts of sea-level rise on coastal communities in California, including the following:

- **Flooding and inundation**—Low-lying coastal areas may experience more frequent flooding (temporary wetting) or inundation (permanent wetting) due to sea-level rise, and the inland extents of 1 percent-annual-chance floods may increase. For example, a 10-centimeter rise could double the flooding potential in coastal locations such as San Francisco and Los Angeles. Higher water levels at the coast may cause water to back up and increase upstream flooding. Drainage systems that discharge close to sea level may become flooded if outfall pipes back up with saltwater.
- **Wave impacts**—Wave impacts can cause some of the more long-lasting consequences of coastal storms, resulting in high amounts of erosion and damage or destruction of structures. Any increase in the extent and elevation of floodwaters due to sea-level rise will also increase wave impacts and move the wave impacts farther inland.
- **Saltwater intrusion and rising groundwater**—An increase in sea level could cause saltwater to enter into groundwater resources. In California, saline intrusion into groundwater resources is a problem in multiple areas, including the heavily urbanized coastal plains of Los Angeles and Orange Counties. Sea-level rise can also result in higher groundwater, which can result in flooding and mobilization of subsurface contaminants when combined with high tides and/or high precipitation events.

16.1.2 Coastal Flood

DFIRMS define the following specific flood-related areas for coastal zones:

- **Zone VE, V1-30—**SFHAs along coasts that are subject to inundation by the base flood with additional hazards due to waves with heights of 3 feet or greater. Base flood elevations derived from detailed hydraulic analysis are shown within these zones.
- **Zone AE**—where flood elevation includes wave heights less than 3 feet.

Studies in coastal areas of the United States have found that wave heights as low as 1.5 feet can cause significant damage to structures built without consideration of coastal hazards. DFIRMs recently published also include a line showing the limit of moderate wave action (LiMWA), the inland limit of the area expected to receive 1.5-foot or greater breaking waves during the 1 percent annual-chance flood event beyond the coastal VE zones and into the AE zone (Figure 16-2).

Source: (FEMA 2021a)

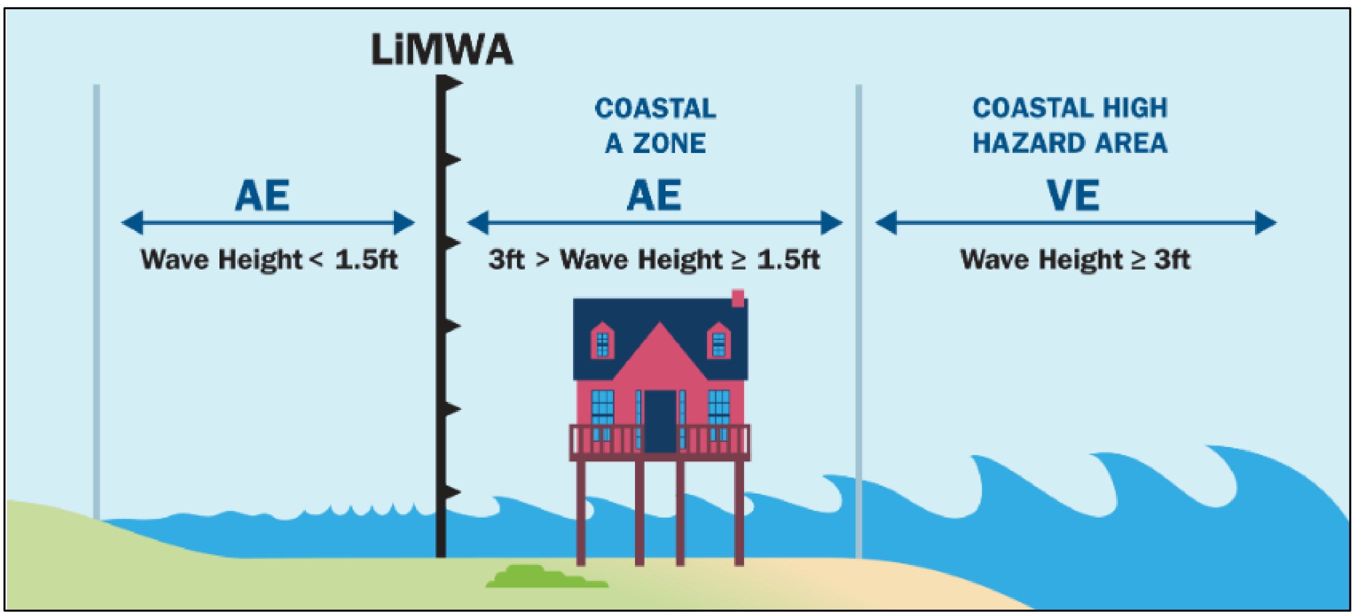


Figure 16-2. Limit of Moderate Wave Action

The addition of LiMWA area to DFIRMs allows communities and individuals to better understand flood risks to their properties. The LiMWA area alerts property owners on the coastal side of the line that being within Zone AE, their properties may be affected by 1.5-foot or higher breaking waves and may therefore be at significant risk during a 1 percent-annual-chance flood event (FEMA 2021c). While not formally defined in NFIP regulations or mapped as a flood zone, the area between Zone VE and the LiMWA is called the Coastal A Zone. This area is subject to flood hazards associated with floating debris and high-velocity flow that can erode and scour building foundations and, in extreme cases, cause foundation failure (FEMA n.d.-b).

16.1.3 Coastal Erosion

Coastal erosion is a natural geomorphic process by which local sea-level rise, strong wave action, and coastal flooding wears down or carries away rocks, soils, and sands along the coast (U.S. Global Change Research Program 2021). Coastal erosion damage is highly localized, and damage can often be dependent on the level of shoreline development—in heavily populated locations, 1 or 2 feet of coastal erosion may be catastrophic.

In California, coastal erosion can be accelerated or exacerbated through a combination of factors, including winter storms, tidal action, wind-generated high surf, wave action, and rising sea levels (Cal OES 2018). High tides may coincide with heavy rain causing coastal flooding, coastal bluff erosion, and landslides, such as were experienced during the 1998 and 2016 El Niño storms.

Coastal erosion and cliff collapse threaten public safety, infrastructure, and property as they become more common with sea-level rise (OEHHA 2022). In Southern California, 31 to 67 percent of beaches may become completely eroded by 2100 without human intervention, and sea cliffs could retreat at a rate nearly double the historical rate, causing an average total land loss of 62 to 135 feet by 2100 (OEHHA 2022).

16.2 HAZARD PROFILE

16.2.1 Past Events

Sea-level rise in California has accelerated over the past century, as seen in Figure 16-3. Mean sea level has risen in southern California by 8 inches since 1900 (OEHHA 2022). The National Oceanic and Atmospheric Administration (NOAA) tide gauge in Los Angeles has recorded a trend of 0.04 inches of sea-level rise per year between 1975 through 2020 (OEHHA 2022).

Three federal disaster declarations the included Los Angeles County have addressed coastal storms, tides, or flooding (see Section 3.1.1). There have been no state emergency proclamations for Los Angeles addressing this hazard. No federal or state disaster declarations have been related to coastal erosion in Los Angeles.

16.2.2 Location

Unlike many other effects of climate change, sea-level rise will have a defined extent and location. This allows for a more-detailed risk assessment to be conducted for this climate change impact. Although the extent and timing of sea-level rise is still uncertain, conducting an assessment of potential areas at risk provides information appropriate for planning purposes.

Source: (OEHHA 2022)

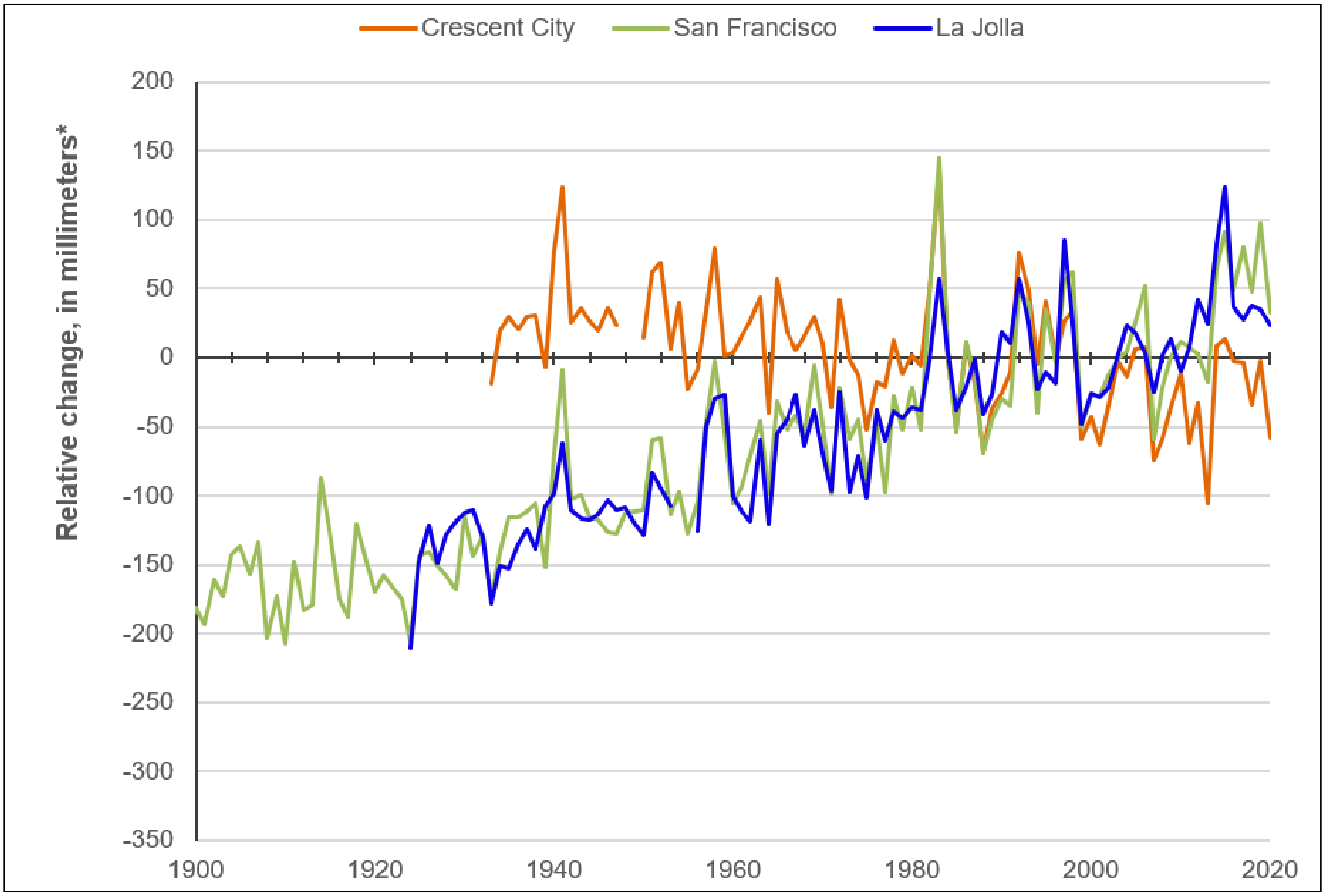


Figure 16-3. Sea-Level Rise in California, 1900-2020

The County of Los Angeles has 75 miles of coastline that extends from the Ventura County line to Long Beach. The City of Los Angeles' coastline includes the Pacific Palisades, Venice, Marina Del Rey, and San Pedro with other City and County beaches interspersed between the City of Los Angeles beaches. A 2013 Sea-Level Rise Vulnerability Study for the City of Los Angeles divided the coastlines into four reaches. Each reach has a unique coastal setting and ocean exposure, and a different history of development that has altered the coastal landscape.

The following is an overview of the four reaches:

- **Pacific Palisades**—The high-relief shoreline hosts a critical coastal transportation and utility corridor, including the Pacific Coast Highway.
- **Venice-Marina Peninsula-Playa Del Rey-LAX**—The beach area from Venice to the foot of LAX is low-relief and an important recreational, cultural, and storm-wave protection resource that has been highly developed over the last century.
- **San Pedro (exposed coast)**—The ocean-front exposed shore of San Pedro is high-relief with unprotected sea cliffs that are potentially unstable. The shoreline contains highly developed urban areas.

- **San Pedro (sheltered)-Wilmington-Terminal Island-Los Angeles Harbor**—The sheltered harbor-side of San Pedro with Wilmington and Terminal Island form the Port of Los Angeles. It is one of the largest and most important ports in the world and serves critical local, regional, and national ocean shipping needs. The port is a key economic driver for the City. The area is protected by the Los Angeles-Long Beach outer breakwater, which has its root at Cabrillo Point.

In order to assess coastal flooding across the four reaches and within the city, FEMA's Hazus coastal flood protocol was used. The assessment prepared for this hazard u Coastal Storm Modeling System data within Hazus. Upon consultation with the Steering Committee, two scenarios were selected for assessment in this plan:

- 25 centimeters (9.84 inches) sea-level rise with 100-year storm
- 200 centimeters sea-level rise (78.74 inches) with 100-year storm

These scenarios incorporate two conditions associated with sea-level rise:

- Areas that would be permanently inundated (subject to tidal flooding on a daily basis)
- Areas that would be temporarily inundated (inundated when the 100-year storm occurs). These areas will not be permanently inundated but will experience flooding at a rate equivalent to or greater than today's regulated special flood hazard areas. This condition represents how the regulatory coastal floodplain and asset vulnerability will change as sea levels rise.

The Hazus assessment of vulnerability and impacts does not differentiate between temporary and permanent inundation. The vulnerability and impacts presented here assume instantaneous changes in sea level associated with the predicted sea-level rise and storm surge effects, with resulting impacts on assets as they are currently situated. This means that it may under-represent losses from permanent inundation if no adaptation measures occur, such as relocation or retreat, or may over-represent losses if adaptation efforts do take place in the coming decades.

Figure 16-4 through Figure 16-7 show the inundation areas for the 25- and 200-centimeter sea-level rise with storm scenarios for the Harbor and West Los Angeles APCs (the other City APCs are not exposed to the sea-level rise hazard).

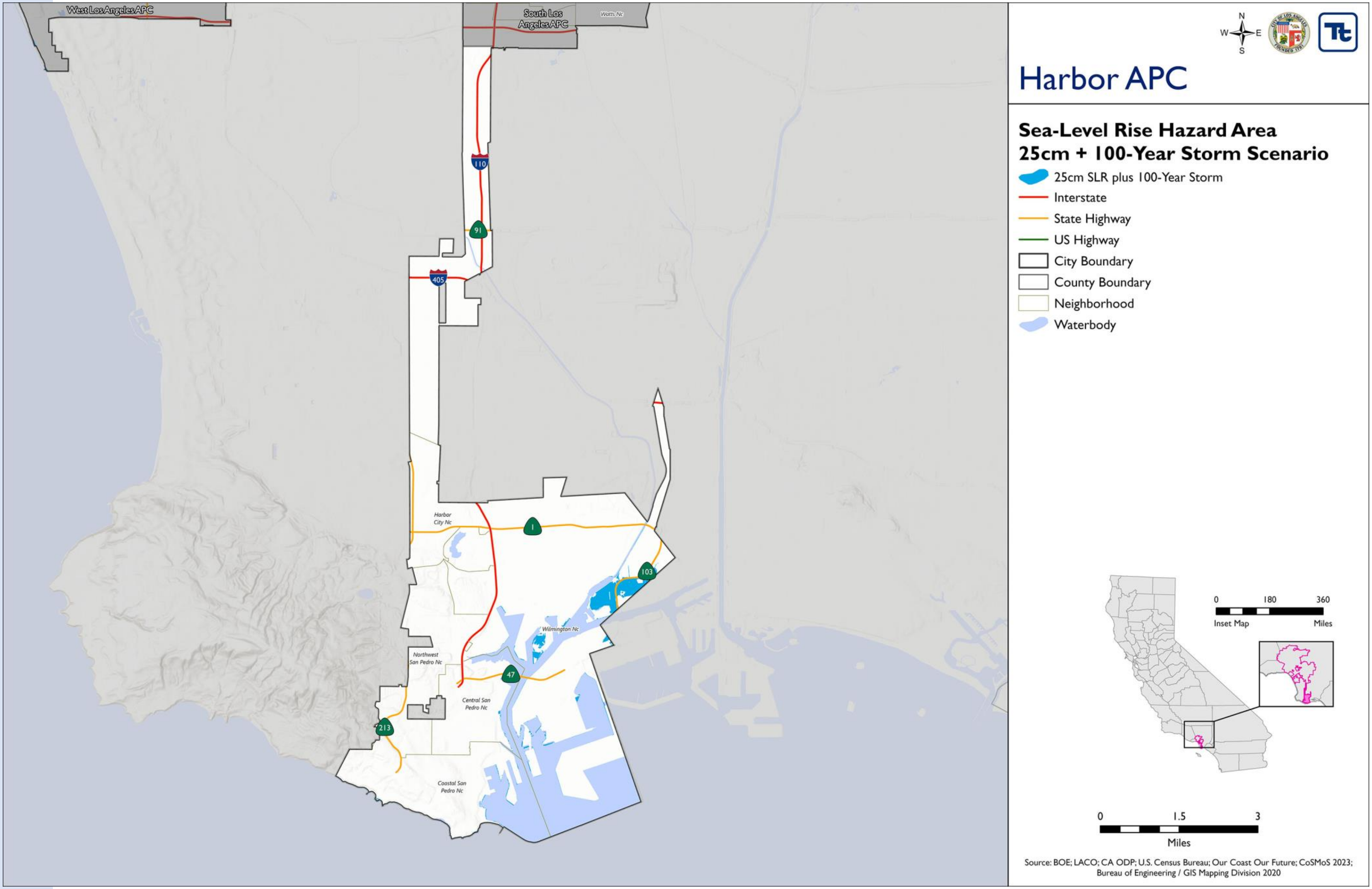


Figure 16-4. Sea-Level Rise in the Harbor APC; 25-cm with 100-Year Storm Scenario

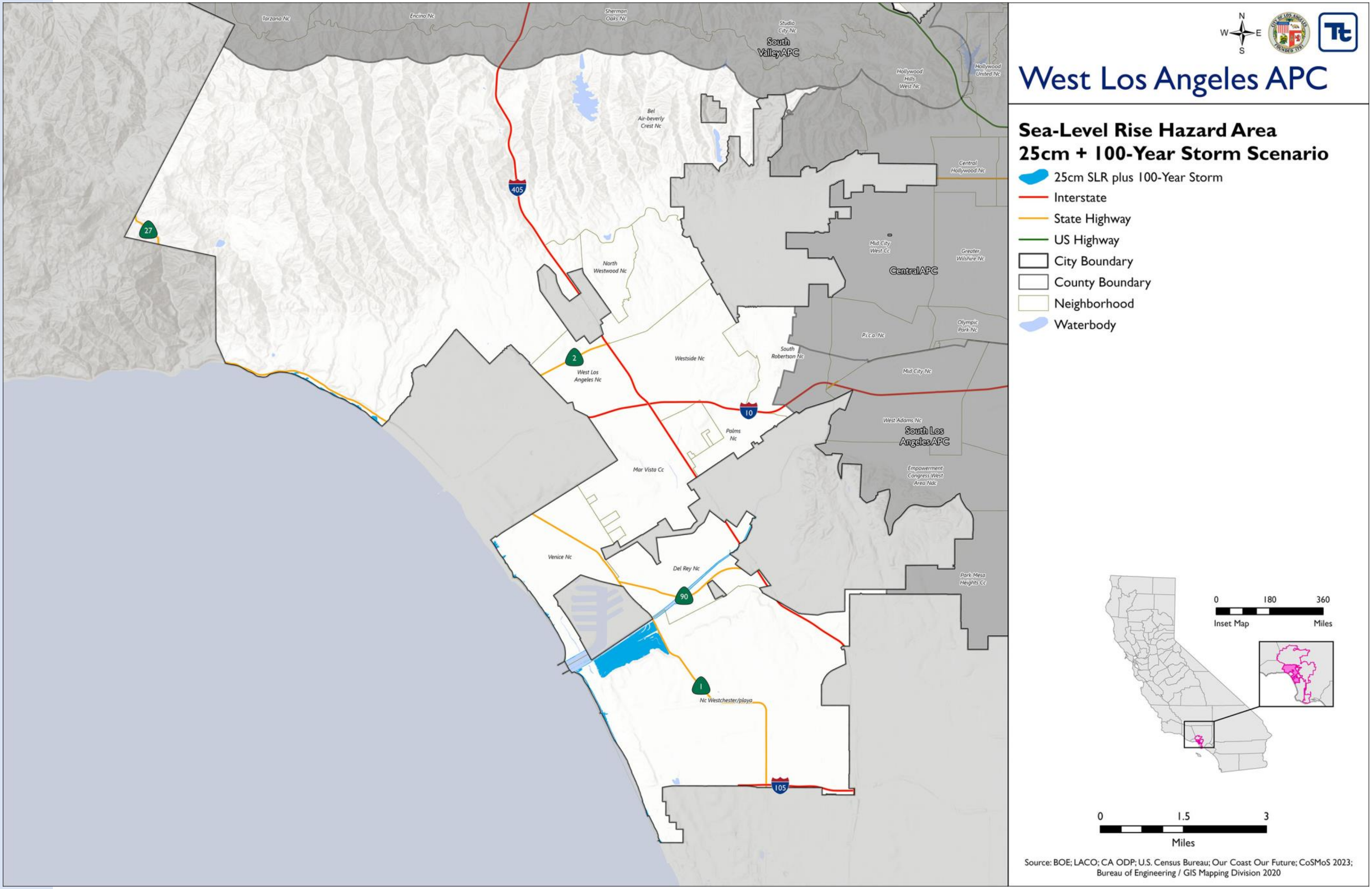


Figure 16-5. Sea-Level Rise in the West Los Angeles APC; 25-cm with 100-Year Storm Scenario

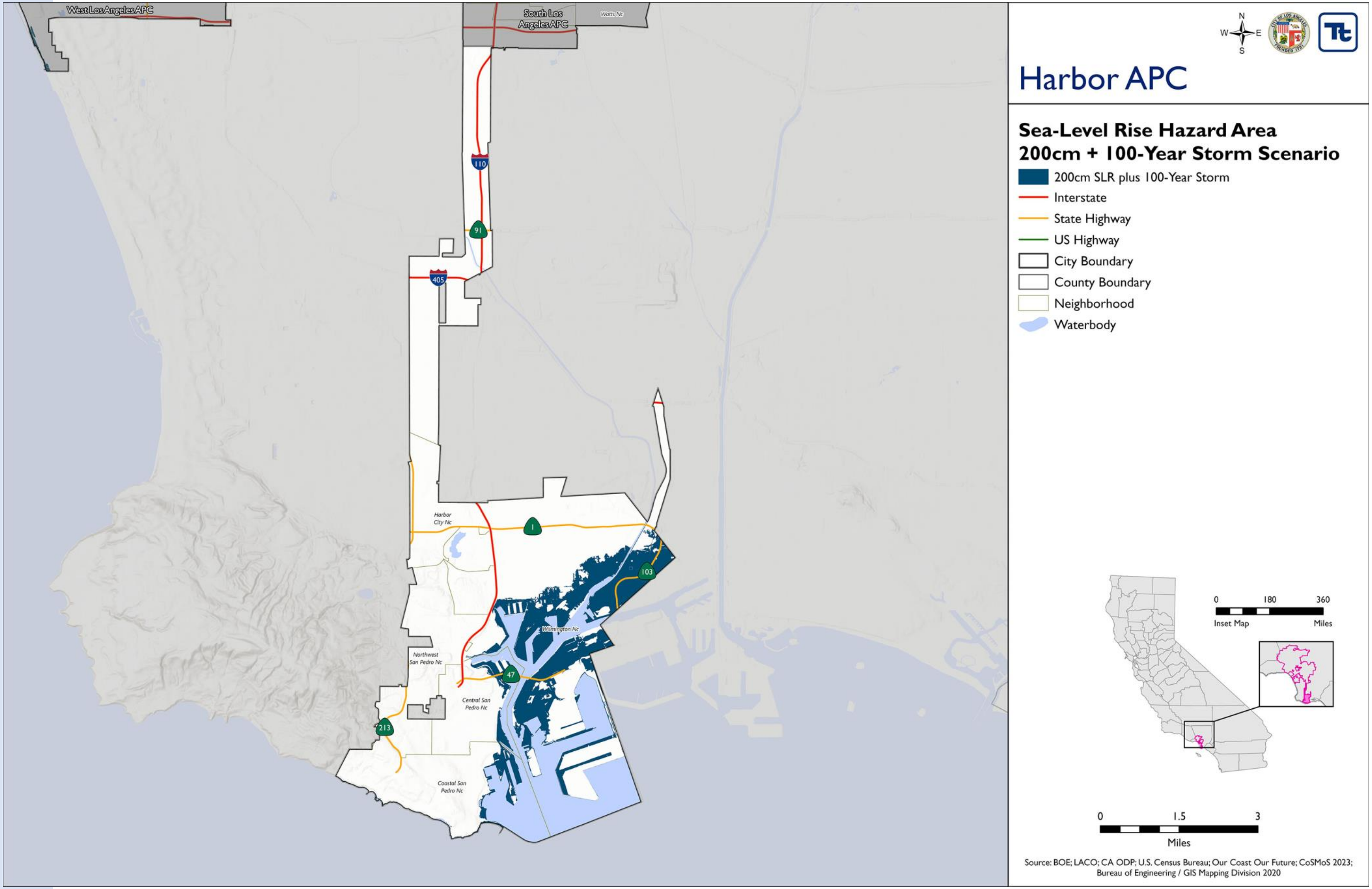


Figure 16-6. Sea-Level Rise in the Harbor APC; 200-cm with 100-Year Storm Scenario

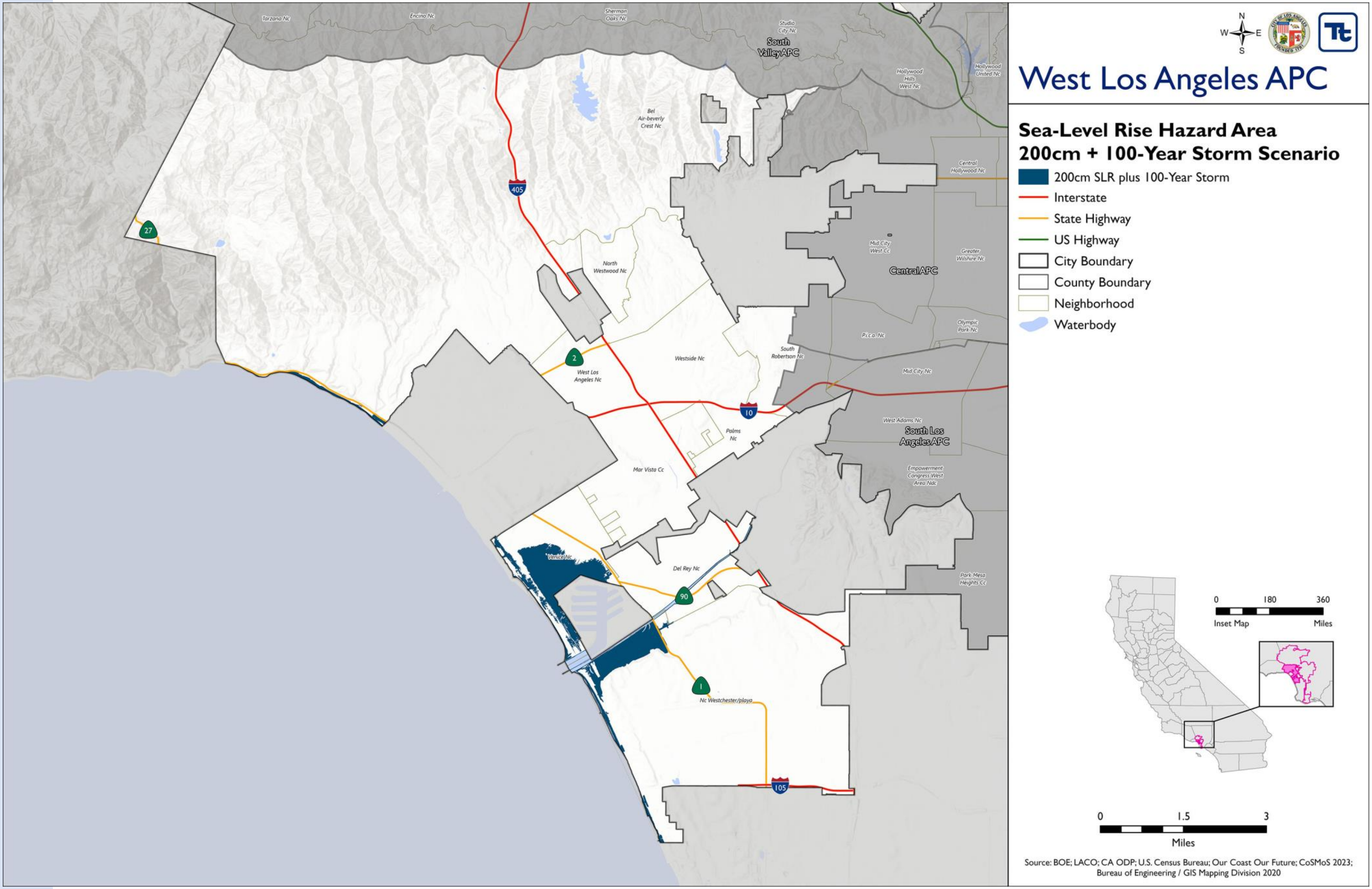


Figure 16-7. Sea-Level Rise in the West Los Angeles APC; 200-cm with 100-Year Storm Scenario

16.2.3 Frequency

Sea-Level Rise

As global temperatures continue to increase, sea levels will rise at increasing rates. The rate of future carbon dioxide emissions and future climate change determines how quickly and how much sea levels will rise. There is uncertainty regarding the level of global carbon dioxide emissions (Sweet, et al. 2022). Different GHG emissions pathways, which range from quick emissions reduction to unmitigated future emissions, will have broad impacts on the rate and severity of climate change effects, including sea-level rise. Additionally, there is scientific uncertainty regarding the rapidity and extent of ice-mass loss, ocean thermal expansion, and local ocean dynamic changes, which impacts the projection of global and relative sea-level rise (Sweet, et al. 2022).

The California Coastal Commission has been tracking and predicting relative sea-level rise in the Los Angeles area at the NOAA Los Angeles tide gauge. The Commission has projected sea-level rise from 2030 through 2150 for the Los Angeles area, using three sea-level rise scenarios (California Coastal Commission 2018):

- Low risk aversion scenario (the upper value for the "likely" range, with a 17 percent chance of being exceeded)
- Medium-high risk aversion scenario (with a 0.5 percent probability of exceedance)
- Extreme risk aversion scenario (which includes the extreme ice loss scenario, with no associated probability).

Under these scenarios, Los Angeles could experience between 1 and 2.6 feet of sea-level rise by 2050, and between 2.2 and 6.4 feet of sea-level rise by 2080 (OEHHA 2022). The Commission's projections for the Los Angeles tide gauge through 2150 are included in Figure 16-8.

Coastal Flood

As sea levels continue to rise, coastal water levels are growing deeper and reaching farther inland, leading to increased occurrences of coastal flooding events. The wet–dry land delineation is encroaching landward causing more permanent inundation and land loss, affecting groundwater levels, stormwater systems' effectiveness, and water quality; and altering the intertidal zone and its ecosystems. Especially problematic for the City's coastal footprint is that the entire spectrum of flood exposure is also growing where sea levels are rising, from minor high tide flooding to more severe major flooding during storms.

Projected Sea Level Rise (in feet): *Los Angeles*			
	Probabilistic Projections (in feet) (based on Kopp et al. 2014)		H++ Scenario (Sweet et al. 2017)
	Low Risk Aversion	**Medium-High Risk Aversion**	**Extreme Risk Aversion**
	Upper limit of "likely range" (~17% probability SLR exceeds...)	*1-in-200 chance (0.5% probability SLR exceeds...)*	*Single scenario (no associated probability)*
2030	0.5	0.7	1.0
2040	0.7	1.2	1.7
2050	1.0	1.8	2.6
2060	1.3	2.5	3.7
2070	1.7	3.3	5.0
2080	2.2	4.3	6.4
2090	2.7	5.3	8.0
2100	3.2	6.7	9.9
2110*	3.3	7.1	11.5
2120	3.8	8.3	13.8
2130	4.3	9.7	16.1
2140	4.9	11.1	18.7
2150	5.4	12.7	21.5

Figure 16-8. Projected Sea-Level Rise (in feet): Los Angeles

Coastal Erosion

Coastal erosion and cliff collapse threaten public safety, infrastructure, and property as they become more common with sea-level rise (OEHHA 2022). In Southern California, 31 to 67 percent of beaches may become completely eroded by 2100 without human intervention, and sea cliffs could retreat at a rate nearly double the historical rate, causing an average total land loss of 62 to 135 feet by 2100 (OEHHA 2022).

16.2.4 Severity

NOAA has established three coastal flood severity thresholds: minor, moderate, and major.

- **Minor Impacts**—Low threat of property damage and no direct threat to life.

- **Moderate Impacts**—Elevated threat of property damage and some risk to life if one places themself in unnecessary danger.
- **Major Impacts**—Significant threat to life and property.

These thresholds vary regionally and are established locally by emergency managers and NOAA Weather Forecast Offices. These offices are included in NOAA's Advanced Hydrologic Prediction System, which warns of possible, predicted, or ongoing hydrologic threats across the United States. The system is primarily focused on inland flooding and tracks a vast array of national river gauges. However, it also tracks conditions along the coast and currently includes about 75 flood-hazard definitions for minor coastal flooding (i.e., high tide) and 50 definitions for moderate and major coastal flooding that reference levels on NOAA tide gauges. Based on a statistical analysis across the contiguous United States, NOAA has found that minor, moderate, and major flooding thresholds can be approximated as being 1.6 feet, 2.6 feet, and 3.8 feet above the local diurnal tide range (Sweet, et al. 2018).

Coastal flooding can be categorized by the warnings, watches, and advisories issued by the National Weather Service (NWS). A coastal flood watch is issued when moderate-major coastal flooding is possible. A coastal flood warning is issued when moderate-major coastal flooding is actively occurring or imminent. A coastal flood advisory is issued when a minor or nuisance coastal flood is occurring or imminent for the area. All coastal flooding warnings, watches, and advisories have the potential to cause serious risk to both life and property in the City's coastal areas (NWS 2017).

Sea level is measured by two main methods: tide gauges and satellite laser altimeters. Tide gauge stations from around the world have measured the daily high and low tides for over a century. Using data from these stations, scientists can calculate a global average of change. Since the early 1990s, sea level has been measured from space using laser altimeters. This method determines the height of the sea surface by measuring the return speed and intensity of a laser pulse directed at the ocean. The higher the sea level, the faster and stronger the return signal (NASA Earth Observatory 2020).

16.2.5 Warning Time

The 2013 Sea-Level Rise Vulnerability Study details the need for a storm watch and notification program using standard available weather and wave forecast products to provide warnings several days in advance of dangerous wave and tide combination conditions. This would facilitate traffic management, increase safety, and provide engineering data that will be useful once adaptation measures become necessary.

While coastal storms and coastal flooding can be monitored and forecasted as part of typical weather forecasting efforts, both sea-level rise and coastal erosion occur over multi-year event horizons. These longer-term event horizons necessitate annual or multi-year monitoring efforts that can demonstrate trends in severity, rate, and impact of both hazards.

16.2.6 Scenario

As sea-level rise continues to occur in Los Angeles, coastal flooding, beach erosion, bluff retreat, loss of ecosystems, salinization of soils, ground and surface water, and impeded drainage will further increase, threatening lives, property, and critical infrastructure.

One of the biggest challenges predicting sea-level rise over the next 10 to 50 years is the uncertainty in emission scenarios. In higher emission scenarios, sea-level rise of multiple feet could cause significant damage to shoreline communities, properties, and ecosystems, permanently inundating community lifelines and damaging the city economy (particularly recreation and tourism) and vital infrastructure. Lower emission scenarios with a lower level of sea-level rise, while still causing harm, could mean less risk to residents, businesses, and community lifelines.

As the impacts of extreme heat continue to affect the City of Los Angeles, sea-level rise and its associated effects may impact the ability for inland communities to access the beach for refuge from extreme heat events. Reduced beach width due to sea-level rise and coastal erosion would be one possible scenario related to this issue.

16.3 VULNERABILITY

FEMA mapping of the 25-cm and 200-cm sea-level rise scenarios was used to assess vulnerability. Summary findings showing vulnerability results for the entire planning area are provided below. A breakdown by APC is provided in Appendix E.

16.3.1 Population and Property

Table 16-1 summarizes the estimated population living in the evaluated sea-level rise inundation areas and the estimated property vulnerability. The distribution of vulnerable structures by use category is shown in Figure 16-9 and Figure 16-10.

The populations most likely to experience impacts from sea-level rise are those who reside near beaches, low-lying coastal areas, tidal flats, and river deltas that empty into ocean-going waters and are elderly or very young or are individuals with disabilities or others with access and functional needs.

Table 16-1. Population and Property in Evaluated Sea-Level Rise Inundation Areas

	25 cm + 100-Year Storm	200 cm + 100-Year Storm
Total Population		
Population in the Hazard Area	95	26,474
% of Total Planning Area Population	<0.1%	0.7%
Socially Vulnerable Population (see Section 4.4.2)		
Community Health & Equity Index = 43.56 – 48.57		
Population in the Hazard Area	0	0
% of Total Planning Area Population	0.0%	0.0%
Community Health & Equity Index > 48.57		
Population in the Hazard Area	0	627
% of Total Planning Area Population	0.0%	<0.1%
Property		
Number of Buildings in the Hazard Area	53	5,546
Total Property Value in the Hazard Area	$540,906,862	$8,718,635,116
Total Value in the Hazard Area as % of Planning Area Total Value	0.1%	1.1%

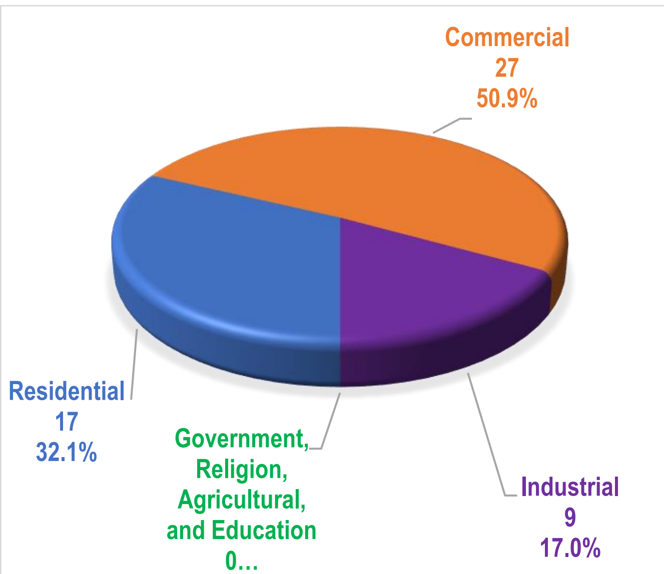


Figure 16-9. Vulnerable Structures in 25 cm with 100-Year Storm Scenario by Occupancy Class

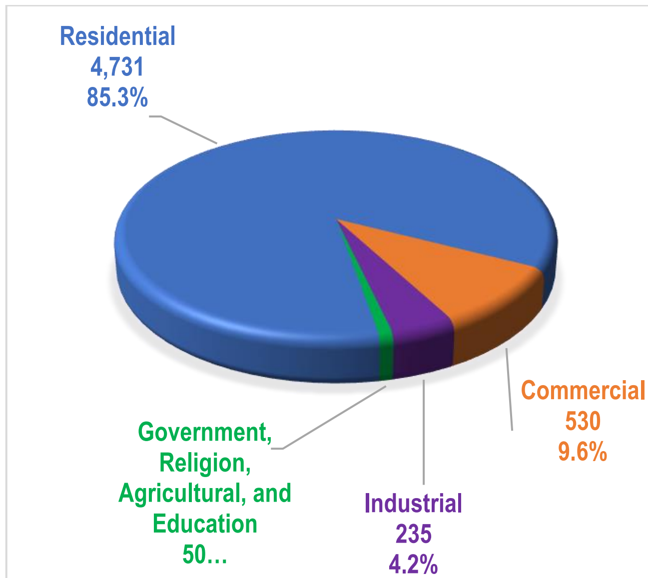


Figure 16-10. Vulnerable Structures in 150 cm with 100-Year Storm Scenario by Occupancy Class

16.3.2 Community Lifelines

The risk assessment found the following numbers of community lifelines or other critical facilities within the hazard area for the evaluated sea-level rise scenarios:

- **25-cm rise with 100-year storm**—184 facilities in the mapped hazard area (2.8 percent of the planning area total)
- **200-cm rise with 100-year storm** —291 facilities in the mapped hazard area (4.4 percent of the planning area total)

Figure 16-11 summarizes the number of community lifelines in each sea-level rise inundation areas, by category.

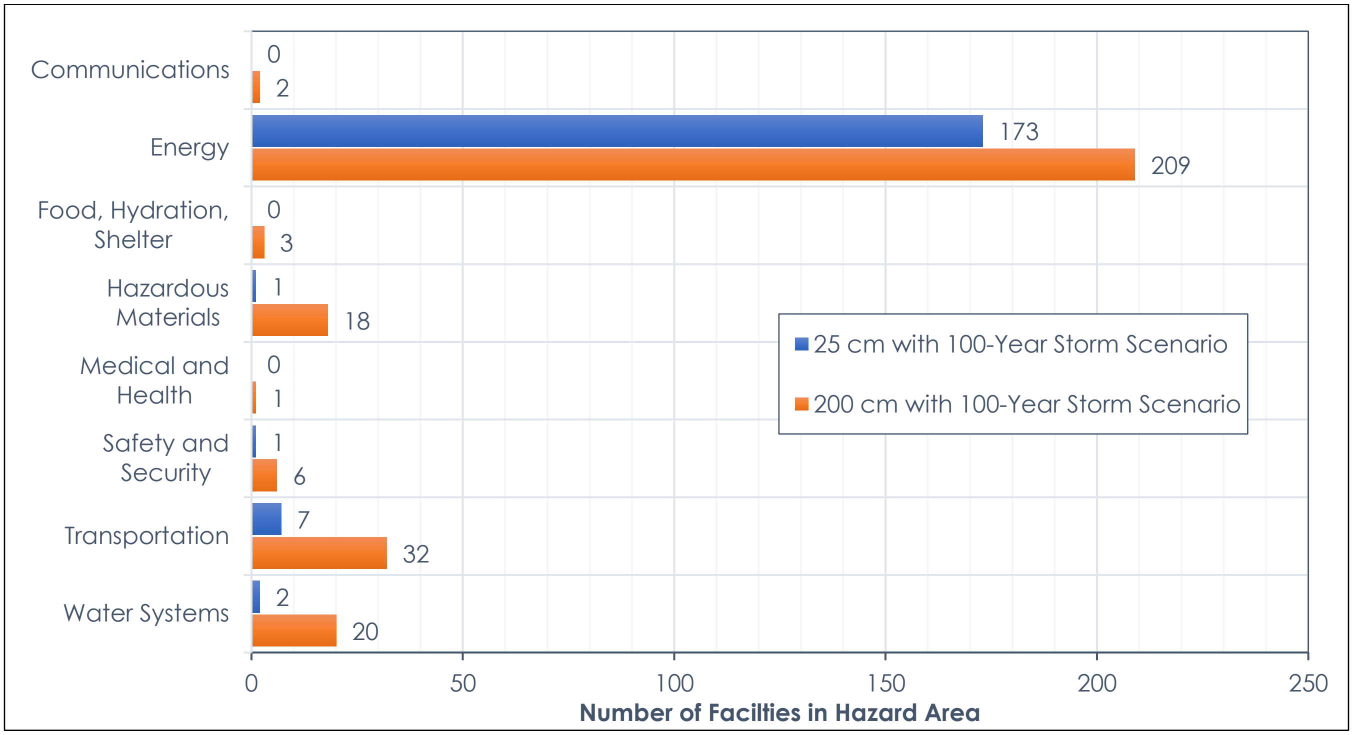


Figure 16-11. Number of Community Lifelines in Mapped Sea-Level Rise Inundations Areas

16.3.3 Environment

As sea levels rise and impacts from coastal storms lead to more flooding and subsequent inundation of the Los Angeles coast, the vulnerability of coastal resources, such as beaches, wetlands, rocky intertidal zones, and groundwater water aquifers, will increase (Los Angeles Regional Collaborative for Climate Action and Sustainability 2016). The California Coastal Commission Sea-Level Rise Guidance identified commercial fisheries, coastal agriculture, public beaches, recreational resources, and wetlands as at risk due to the impacts of sea-level rise. The natural systems that protect and maintain water quality are threatened by the increased severity of extreme high tides and coastal storms under the predicted sea-level rise scenarios.

Most of the coastal zone in the City of Los Angeles is highly urbanized, although there are critical ecological areas, such as Ballona Wetlands Ecological Reserve, located between Marina del Rey and Playa Del Rey at the estuary of Ballona Creek (Grifman, et al. 2013). Ballona Wetlands Ecological Reserve is a 600-acre ecological reserve mostly owned by the State of California, with a portion of the site in unincorporated Los Angeles County and the rest in the City of Los Angeles. Remnant areas of the wetland complex also include Del Rey Lagoon, Ballona Lagoon, Marina del Rey, Oxford Basin, and the Venice Canals.

16.3.4 Historic and Cultural Resources

The City's cultural assets are vulnerable to sea-level rise. Museums and cultural centers are considered to be highly vulnerable because of the damage that can result to the physical buildings and resources. Parks and open space, while in vulnerable locations, are less vulnerable to flooding impacts since they can be restored relatively quickly (Grifman, et al. 2013). Facilities such as the Los Angeles Maritime Museum, which is listed on the National Register of Historic Places, could be impacted. Neighborhood parks located in the sea-level rise exposure zone include Del Rey Lagoon Park, Canal Park, and Titmouse Park. Some facilities, like the Venice Beach Boardwalk, are iconic destinations and their impairment could have significant economic consequences. Recreation centers located in the exposure zone include the Venice Beach Recreation Center and San Juan Garage.

16.4 IMPACTS

Summary findings of the risk assessment for sea-level rise, showing estimated impacts for the entire planning area, are provided below. A breakdown by APC is provided in Appendix E.

16.4.1 Population

Impacts on persons and households were estimated for each sea-level rise scenario through the Hazus analysis. Table 16-2 summarizes the results.

Table 16-2. Estimated Sea-Level Rise Impacts on Households and Residents

	25 cm + 100-Year Storm	200 cm + 100-Year Storm
Displaced Population	325	16,421
Number of Residents Requiring Short-Term Shelter	64	1,085

The State of California's Sea-Level Rise Guidance (2018) outlines how sea-level rise and coastal erosion have outsize impacts on socially vulnerable and historically disadvantaged communities. Communities of color, low-income communities, and Native Nations have been, and will continue to be, disproportionately overburdened by pollution and climate change (California Natural Resources Agency; California Ocean Protection Council 2018). Sea-level rise will add to those burdens. Impacts such as increased flooding, damage to homes and roads, disruption to public transportation, elevated exposure to toxic materials, and destruction of coastal sacred places and cultural sites will unduly affect vulnerable communities. These impacts can manifest as complete community displacement, loss of places of ancient and contemporary cultural and historic significance, loss of personal property, worsened health, reduced or lost wages, and loss of free or affordable public access to the coast. Vulnerable communities may lack financial or other resources to plan for sea-level rise as well as the ability to adequately respond to impacts once they occur.

Socially Vulnerable Populations

Sea-level rise threatens to disrupt the lives of individuals vulnerable to coastal inundation by making these areas potentially uninhabitable. Socially vulnerable populations living along the coastal areas of the City are most at risk.

Residents of low-lying affordable housing in coastal areas tend to be low-income individuals living in old and poor-quality structures, which are especially vulnerable to coastal floods. Low-income individuals are also more likely to be adversely affected as they have fewer financial resources to protect against and support recovery from these hazards (EPA 2021).

Racial and ethnic wealth gaps, which are larger than income gaps and have stronger correlations with property value than income, leave many of these groups more likely to be excluded from protection decisions that consider economic factors (EPA 2021).

Coastal communities are often a preferred retirement destination for older adults, despite the growing risks of sea-level rise and storm surge – for example, from 1970 to 2010, the percent increase for populations 65 and over in coastal watershed counties increased much faster than the overall increase in the nation. The unique physical and psychosocial challenges of the population age 65 and over may affect their ability to prepare, cope with, and recover from hazard events (EPA 2021).

16.4.2 Property

Hazus calculates losses to structures from sea-level rise inundation by looking at depth of inundation and type of structure. Table 16-3 and Table 16-4 summarize Hazus estimates of sea-level rise damage in the planning area.

Table 16-3. Estimated Sea-Level Rise Impacts on Buildings

	25 cm with a 100-Year Storm	200 cm with a 100-Year Storm
Estimated Loss		
Residential	$4,415,236	$715,743,870
Commercial	$18,302,491	$684,318,136
Other	$20,784,509	$574,395,012
Total	**$43,502,236**	**$1,974,457,018**
% of Total Planning Area RCV	**<0.1%**	**0.3%**

Table 16-4. Estimated Debris Generated by Sea-Level Rise

	25 cm with a 100-Year Storm	200 cm with a 100-Year Storm
Finish Debris (tons)	1,082.4	37,603.0
Structure Debris (tons)	417.8	14,149.1
Foundation Debris (tons)	206.0	8,961.1
Total Debris (tons)	**1,706.2**	**60,713.1**

Finish debris = carpeting, drywall, etc. Foundation debris = basement, crawlspace, pier, pile, etc. Structure debris = framing, roof, etc.

16.4.3 Community Lifelines

The greatest number of community lifelines within the mapped sea-level rise hazard areas are oil and gas wells (173), maritime facilities (2), heliports (2), and wastewater facilities (2). These facilities all have the potential, if damaged by surging waters associated with sea-level rise, to pollute the environment and significantly affect the response time of first responders during an emergency.

The 2013 Sea-Level Rise Vulnerability Study for the City outlines impacts for community lifelines, including wastewater, stormwater, and potable water infrastructure; the Port of Los Angeles; energy facilities; and land use and transportation infrastructure. See Table 16-5 for further detail on infrastructure vulnerability.

Table 16-5. Infrastructure Vulnerabilities to Sea-Level Rise

Infrastructure Type	Primary Vulnerabilities
Wastewater	• Collection systems (sewers) in low-lying areas are vulnerable to flooding and groundwater inflow, which could exceed their designed capacity, causing temporary wastewater discharges into the ocean. • Treatment and pumping plants would be vulnerable to flooding, which could damage electrical equipment, generators and/or process operations, resulting in partially treated wastewater discharged into the ocean.
Stormwater	• The stormwater management system is vulnerable to coastal flooding and inundation, which could impair stormwater management facilities and exacerbate flooding from stormwater runoff in low-lying areas.
Potable Water	• The potable water system is vulnerable to flooding, inundation, and groundwater, which make accessing underground assets, such as pipes, extremely challenging and raise public health concerns.
Port of Los Angeles	• Although the Port's assets are sensitive to flooding and inundation, the Port has low vulnerability because of its limited exposure in the near term, and high capacity to adapt by building future infrastructure at a higher elevation.
Energy Facilities	• Energy facilities have low vulnerability to the impacts of sea-level rise because all coastal energy assets were designed to withstand exposure to water. In addition, replacement schedules and system redundancies reduce vulnerability.
Land Use and Transportation	• Roads near the shoreline are highly vulnerable to flooding, inundation, and undermining from erosion and rising groundwater, which could result in reduced access for residents and impaired regional transport. • The building stock is most vulnerable to flooding and inundation in Venice, where it is located very near sea level and there are many older structures.

Source: University of Southern California Sea Grant Program 2012

16.4.4 Environment

All sea-level rise inundation areas are vulnerable and susceptible to impacts. Important coastal habitat may be lost as sea-level rise permanently inundates areas, or it may be damaged due to extreme tide and storm surge events. Saltwater intrusion into freshwater resources may occur, further altering habitat and ecosystems. Protective ecosystem services may be lost as land area and wetlands are permanently inundated.

The Ballona Wetlands, which support a range of habitats and functions, including estuarine-dependent plants and animals, are at particular risk (Grifman, et al. 2013). Altered hydrology and freshwater influence in the wetlands would have significant effects on the habitat types, salinity, and current ecosystem of the area. The wetlands provide a plethora of ecosystem services including biological productivity energy flow, nutrient cycling, foraging, nursery, and sheltering and resting places for wildlife, sediment accretion, and wave attenuation. Sea-level rise could disrupt these critical processes.

An increase in frequency, duration, and intensity of storm events would cause flooding over the current flood control levee structures that divide Ballona Creek from the wetlands. The levees are not currently sufficient to support a 100-year storm event. This flooding could cause significant impacts on the habitats currently within the wetlands. Additionally, the current western wetland habitats receive muted tidal flooding via self-regulated tide gates. Sea-level rise would reduce the functionality of these gates, resulting in altered hydrology and tidal influence. Significant sea-level rise would prevent the tide gates from functioning and would allow no tidal influence to remain on the wetland habitats (Grifman, et al. 2013).

16.4.5 Historic and Cultural Resources

Facilities such as the Los Angeles Maritime Museum, which is listed on the National Register of Historic Places, are within the boundaries of projected sea-level rise impacts. Neighborhood parks located in the sea-level rise exposure zone include Del Rey Lagoon Park, Canal Park, Titmouse Park, and Venice Beach Boardwalk. Recreation Centers located in the exposure zone include the Venice Beach Recreation Center and San Juan Garage.

Sea-level rise impacts could include destruction of coastal sacred places and cultural sites, resulting in the loss of places of ancient and contemporary cultural and historic significance.

16.4.6 Economy

Sea-level rise and coastal erosion have the potential to cause severe economic impacts. Both direct and indirect interruptions and losses could be significant. Building repair and replacement costs (including both structural and non-structural damage), building contents losses, and building inventory losses could be significant. Impacts on beach tourism and cascading impacts from recreation losses could also be significant.

Additional impacts might affect operations at the Port of Los Angeles, an entry point for domestic and international goods. Changes in sea level or erosion could alter configurations and functionality at the Port, with potential ramification for the City, state, and nation.

16.5 Effects of Future Change on Vulnerability and Impacts

16.5.1 Future Development

The land area of the City of Los Angeles will be reduced as sea-level rise permanently inundates areas. This will have significant effects on land use and planning in local communities. The City of Los Angeles General Plan will guide this future development.

16.5.2 Climate Change

Sea levels have been rising over the past several decades and are expected to continue to rise. As average ocean temperatures continue to increase, thermal expansion will continue and can be projected with some degree of certainty. Less certain is how quickly ice sheets will melt, accounting for most of the uncertainty in projections. According to the California Coastal Commission analysis, Los Angeles could experience up to 2.6 feet of sea-level rise by 2050 and up to 6.4 feet of sea-level rise by 2080 (California Coastal Commission 2018).

17. TSUNAMI AND SEICHE

17.1 GENERAL BACKGROUND

A tsunami is a series of high-energy waves in an ocean or other large open water body that radiate outward from the site of a generating event, arriving at shorelines over an extended period. Tsunamis can be induced by earthquakes, landslides, and submarine volcanic explosions (see Figure 17-1).

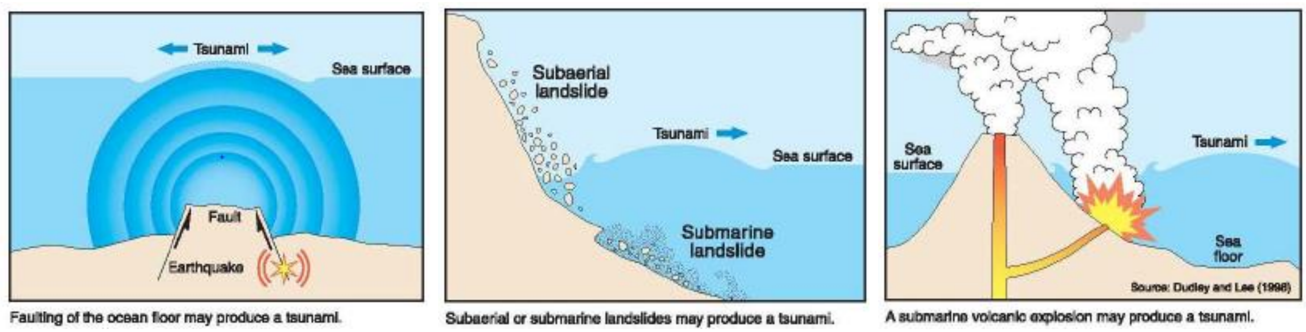


Figure 17-1. Common Sources of Tsunamis

Tsunamis are typically classified as local or distant, depending on the location of their source in comparison to where waves occur:

- The waves nearest to the generating source represent a local tsunami. Such events have minimal warning time, leaving few options except to run to high ground after a strong, prolonged local earthquake. Damage from the tsunami adds to damage from the triggering earthquake due to ground shaking, surface faulting, liquefaction, and landslides.
- The waves far from the generating source represent a distant tsunami. Distant tsunamis may travel for hours before striking a coastline, giving a community a chance to implement evacuation plans if a warning is received.

A seiche is a large wave in a large, enclosed body of water, such as a lake or bay, which has been disturbed by wind, atmospheric pressure variations, or seismic activity. The wave travels the length of the water body and reflects off the other end or sides. These reflected waves can then interfere with each other and create amplified standing waves (National Ocean Service n.d.).

17.1.1 Tsunami Characteristics

In the open ocean, a tsunami may be only a few inches or feet high, but it can travel with speeds approaching 600 miles per hour. As a tsunami enters the shoaling waters near a coastline, its speed diminishes, its wavelength decreases, and its height increases greatly. At the shoreline, tsunamis may take the form of a fast-rising tide, a cresting wave, or a bore (a large, turbulent wall-like wave). The bore phenomenon resembles a step-like change in the water level that advances rapidly (from 10 to 60 miles per hour). The first wave is usually followed by several larger and more destructive waves.

The configuration of the coastline, the shape of the ocean floor, and the characteristics of advancing waves play important roles in the destructiveness of the waves. Bays, sounds, inlets, rivers, streams, offshore canyons, islands, and flood control channels may have effects that alter the level of damage. Offshore canyons can focus tsunami wave energy, and islands can filter the energy. It has been estimated that a tsunami wave entering a flood control channel could reach a mile or more inland, especially if it enters at high tide. The orientation of the coastline determines whether the waves strike head-on or are refracted from other parts of the coastline. A wave may be small at one point on a coast and much larger at other points. The area inundated by a tsunami is often described as runup, as illustrated in Figure 17-2.

Source: (UNESCO 2007)

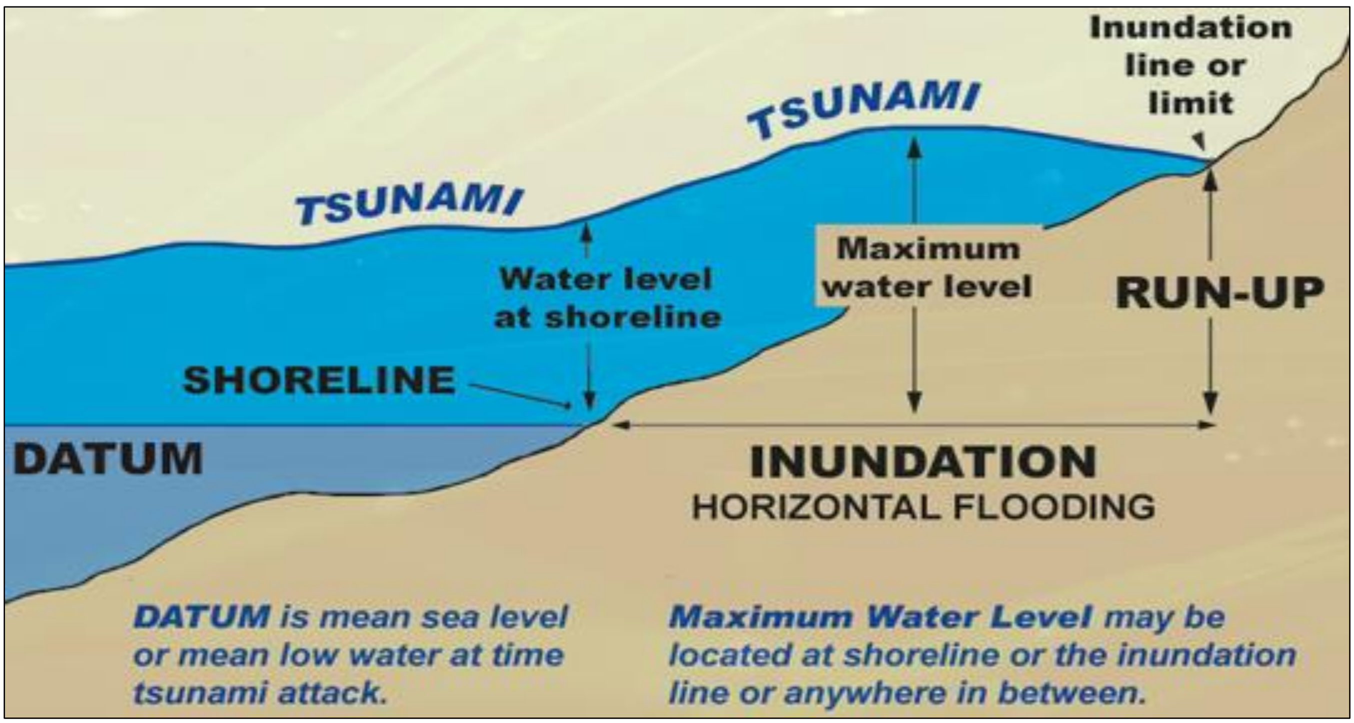


Figure 17-2. Runup Distance and Height in Relation to the Datum and Shoreline

17.1.2 Cascading and Compounding Impacts

In addition to the tremendous hydraulic force of the tsunami waves themselves, floating debris and pollutants carried by a tsunami can endanger human lives and batter inland structures. Railroad yards and oil tanks situated near the waterfront are particularly susceptible to impacts. Oil fires frequently result and are spread by the waves.

17.2 HAZARD PROFILE

17.2.1 Past Events

There has been only one state or federal disaster declaration encompassing Los Angeles County that addressed the tsunami or seiche hazard: a “seismic sea wave” for which federal disaster declaration FM-169 was issued in April 1964.

Sixty-nine possible or confirmed tsunamis have been observed or recorded in California in the past 150 years. Statewide, most recorded tsunami events were small and detected only by tide gages. Thirty-one events were large enough to cause damage, and four caused deaths. The following is a summary of major tsunami events that have affected Los Angeles County (NOAA 2023c, California Geological Survey 2022).

- January 15, 2022— An eruption from Hunga Tonga-Hunga Ha’apai (an uninhabited volcanic island in the southwest Pacific Ocean) resulted in a tsunami that flooded many California coastal communities. According to the California Geological Survey, the maximum wave height recorded in Los Angeles was 2.5 feet, with a maximum elevation of 6.7 feet. This event, named the Tonga tsunami, was the first to flood on land in California since the 1964 Good Friday earthquake tsunami.
- September 16, 2015—A magnitude 8.3 earthquake in Chile caused the National Tsunami Warning Center to issue a tsunami advisory for Southern California including Los Angeles County. No damage was reported in Los Angeles County.
- March 11, 2011—A magnitude 9.0 earthquake in Japan generated tsunami waves that caused extensive damage in Japan. The tsunami reached Los Angeles County, where waves capsized vessels berthed near the Santa Catalina Island and caused minor damage in Marina del Rey, Redondo Beach and Santa Monica. This was the most damaging tsunami to hit California since 1964. The California coastal counties of Del Norte, Monterey, and Santa Cruz were included in FEMA-1968-DR-CA declaration.
- February 27, 2010—A tsunami originating off Chile created rapid water level fluctuations and strong currents in harbors and along beaches in California.
- September 29, 2009—Following a magnitude 8.0 to 8.3 earthquake 120 miles from America Samoa, a tsunami brought strong currents and dangerous waves to the San Pedro area and the Santa Monica Bay area.
- June 15, 2005—A major earthquake with a magnitude of 7.2 occurred off the northern coast of California. The earthquake produced a minor tsunami that was observed at Crescent City.
- November 29, 1975—A magnitude 7.2 earthquake in Hawaii caused a tsunami that reached Santa Catalina Island.
- March 27, 1964—A magnitude 9.2 earthquake in Prince William Sound, Alaska triggered a tsunami that caused damage in Alaska, British Columbia, Washington, California and Hawaii. The hardest hit was Crescent City, California, where waves destroyed half of the waterfront business district. There was also extensive damage in San Francisco Bay, marinas in Marin County and the Los Angeles and Long Beach harbors.

- May 22-24, 1960—A magnitude 8.5 earthquake in Chile caused a tsunami that resulted in $1 million in damage to boats, docks, and other facilities in Los Angeles, Long Beach, and San Diego. Crescent City saw waves of more than 5 feet.
- April 1, 1946—A magnitude 7.8 earthquake in Alaska's Aleutian Island chain caused a tsunami whose effects were felt along the United States coastline, especially in Los Angeles and Long Beach harbor areas.
- August 31, 1930 – A magnitude 5.2 earthquake in Santa Monica Bay generated a wave that affected 16 miles of California coastline, from Santa Monica to Redondo Beach. Sixteen people were rescued, and one fatality occurred at Redondo Beach.
- November 22, 1878 – A tsunami hit Southern California, causing a 6-foot wave to hit Wilmington (a southern suburb of Los Angeles). Damage was also observed in other locations along the California coastline, and one fatality occurred. No earthquake or wind was reported; the tsunami's origin was likely from a submarine landslide.

No seiche wave events that have occurred in the State of California have affected the City of Los Angeles or the surrounding region. However, the presence of large reservoirs throughout the city and the high probability of earthquakes make the threat of seiche a meaningful hazard for Los Angeles.

17.2.2 Location

Tsunamis are a threat to life and property anywhere near the ocean, but low-lying coastal beaches, bay, ports/harbors, lagoons, and waterways are the most vulnerable. Depending upon the magnitude of the tsunami, coastal areas of the City could be inundated, most notably in the San Pedro and Los Angeles Harbor areas, and in neighboring Santa Monica. Figure 17-3 and Figure 17-4 show tsunami hazard areas in the Harbor and West Los Angeles APCs, based on data provided by the California Department of Conservation (other APCs in the planning area are not exposed to the tsunami, hazard). The tsunami hazard area map assists Los Angeles with identifying the tsunami hazard for corresponding tsunami response planning.

Seiches can occur in any large semi- or fully enclosed body of water, such as the Port of Los Angeles.

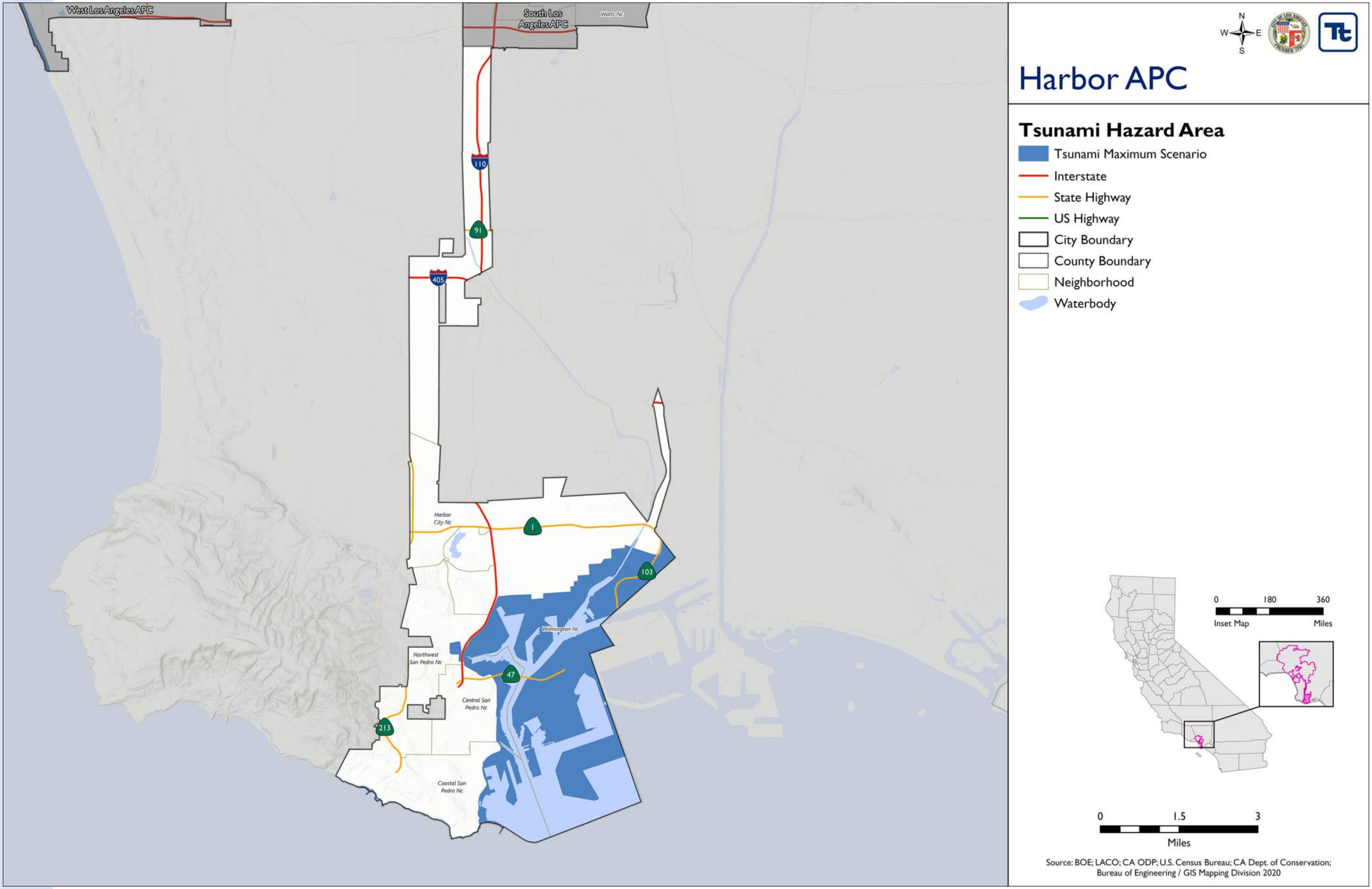


Figure 17-3. Mapped Tsunami Hazard Area in the Harbor APC

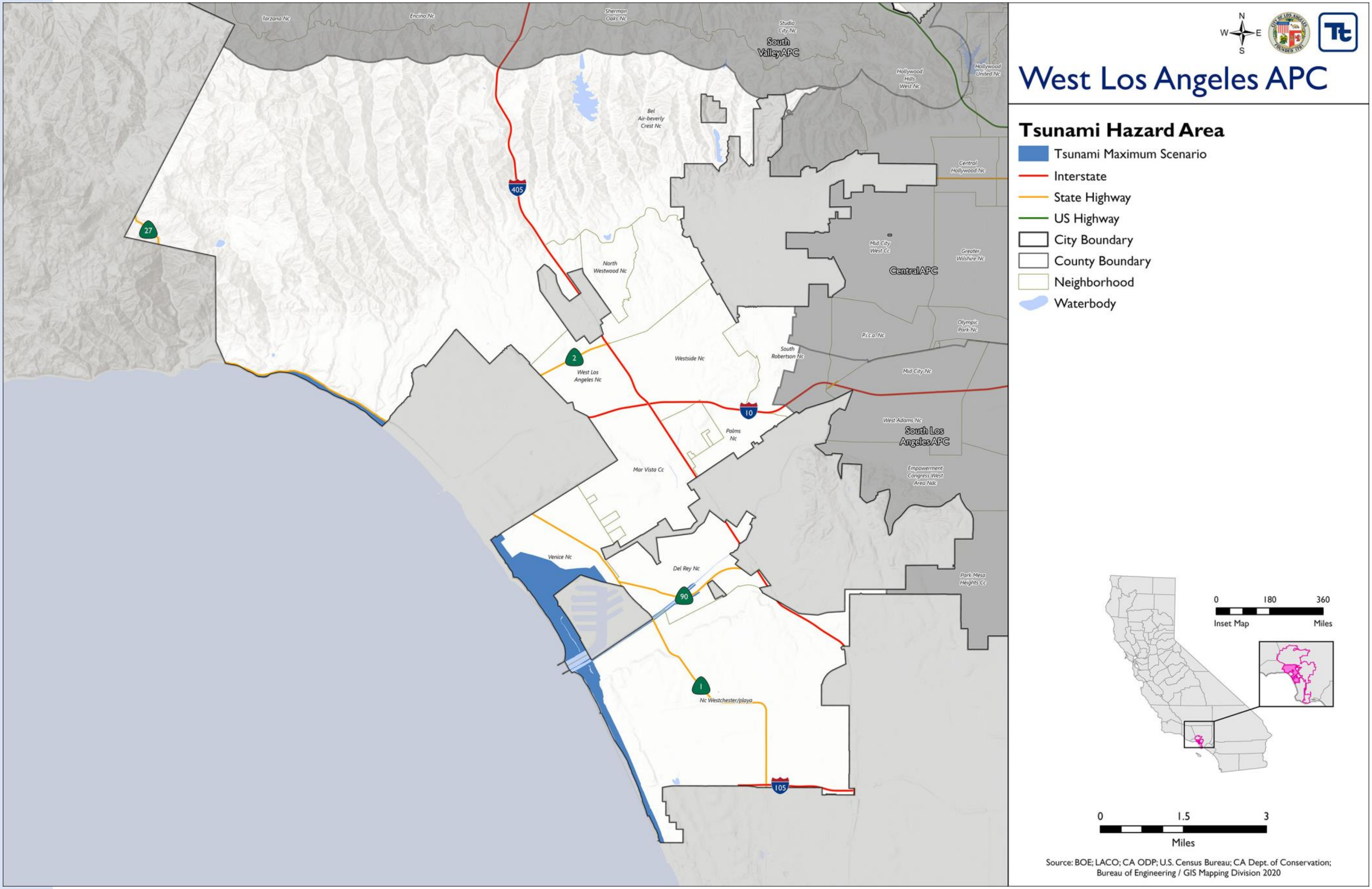


Figure 17-4. Mapped Tsunami Hazard Area in the West Los Angeles APC

17.2.3 Frequency

Assessment Based on Past Events

The frequency of tsunamis or seiches is related to the frequency of the events that cause them, making them similar to the frequency of seismic or volcanic activities or landslides. Generally, two destructive tsunamis occur every year in the Pacific Basin. Pacific-wide tsunamis are rare and generally occur on average every ten to twelve years (NPS 2024). The National Tsunami Hazard Mitigation Program rates the risk to the U.S. west coast from the tsunami hazard as high to very high (Dunbar and Weaver 2015).

Potential Effect of Future Conditions on Hazard Probability

The effects of global climate change on tsunami or seiche probability are unknown. Some scientists suggest that underwater landslides caused by melting glaciers may result in tsunamis. Even if climate change does not increase the frequency with which tsunamis or seiches occur, it may result in more destructive waves. As sea levels continue to rise, tsunami hazard areas would likely reach further into communities than current mapping indicates. The depth and area of tsunami inundation could increase.

17.2.4 Severity

Tsunamis are a threat to life and property anywhere near the ocean. The worst recorded tsunami event in California was the 1964 tsunami generated by a magnitude-9.2 earthquake in Alaska, which killed 12 in northern California and caused over $15 million in damage. The 1960 Chilean earthquake produced a great tsunami that affected the entire Pacific basin. Damage was reported in California ports and harbors from San Diego to Crescent City and losses exceeded $1 million. The tsunami caused by the 2011 Tōhoku-oki earthquake in Japan impacted several ports, bays, and docks in coastal California 9 to 11 hours after the earthquake. Damage exceeded $100 million statewide (CGS 2011).

Local tsunamis have the potential to cause locally greater wave heights. The local tsunami caused by the 1927 Point Arguello, California, earthquake (Magnitude 7.1) produced 7-foot waves in the nearby coastal area. The last prehistorical local-source tsunami, the 1700 Cascadia earthquake and tsunami, was triggered after a ~9.2 magnitude earthquake occurred along a ~600-mile-long fault from Vancouver Island, British Columbia to northern California (NOAA 2016). The tsunami that followed had an estimated wave height of more than 50ft (USGS 2024).

Geological records suggest that tsunami wave heights of 15 to 60 feet on the west coast could be generated by a powerful earthquake near the coast. Significant damage would result from the ground shaking, tsunami wave forces, and impacts associated with debris.

17.2.5 Warning Time

Natural Warning Signs

Tsunamis are difficult to detect in the open ocean; with waves generally less than 3 feet high. The first visible indication of an approaching tsunami may be either a rise or drop in water surface levels (NTHMP 2001):

- A drop in water level (draw down) can be caused by the trough preceding the advancing, large inbound wave crest. Rapid drawdown can create strong currents in harbor inlets and channels that can severely damage coastal structures due to erosive scour around piers and pilings. As the water's surface drops, piers can be damaged by boats or ships straining at or breaking their mooring lines. The vessels can overturn or sink due to strong currents, collisions with other objects, or impact with the harbor bottom.
- The advancing tsunami may initially arrive as a strong surge increasing the sea level. This can be similar to the rising tide, but the tsunami surge rises faster and does not stop at the shoreline. The strength of the accompanying surge can be deadly. Waist-high surges can cause strong currents that float cars, small structures, other debris, and hazardous materials. Boats and debris are often carried inland by the surge and left stranded when the water recedes.

Estimated Travel Times

According to the California Geological Survey, Figure 17-5 provides a list of potential tsunami sources and estimated travel times impacting the City of Los Angeles:

Additionally, the NOAA National Center for Environmental Information website provides maps that show estimated travel times to coastal locations for various tsunami-generating events. Figure 17-6 shows one example of the travel time for a tsunami generated in Aburatsu, Japan to reach the planning area—approximately 13 hours.

Tsunami Warning System for the Pacific Ocean

The tsunami warning system for the Pacific Ocean is a cooperative effort among 26 nations. The National Weather Service operates two regional information distribution centers for this system: the National Tsunami Warning Center in Palmer, Alaska, which is the official tsunami warning center for California; and the Pacific Tsunami Warning Center in Ewa Beach, Hawaii. The warning centers issue tsunami information statements, watches, advisories, and warnings.

When a Pacific basin earthquake of magnitude 6.5 occurs or an earthquake is widely felt along the North American coast, data is interpolated to determine epicenter and magnitude of the event. Tsunami travel times are calculated, and an appropriate notification is transmitted to disseminating agencies who can relay it to the public.

	TSUNAMI SOURCES	Approximate Travel Time	Leo Corrillo State Beach	Malibu Beach/ Lagoon	Santa Monica Pier	Marina Del Rey	Manhattan Beach	Redondo Beach	Palos Verdes Hills	San Pedro-POLA	Long Beach Middle Harbor-POLB	Long Beach	Naples-Alamitos Bay	Catalina - Avalon	Catalina - Two Harbors
Local Sources	M7 Newport-Inglewood Fault	10-15min								2	3	3	3		
	M7.5 Channel Isl. Thrust Fault	10-15min	4		3	2	3	3	3						
	M7.2 Anacapa Dume Thrust Fault	10-15min		8	6	3	6	6	5						
	Palos Verdes Landslide 1	10-15min			7	4	6	10	20	4	4	4	5		
	Palos Verdes Landslide 2	10-15min								6	5	5	5	12	16
	M7.1 Santa Monica Thrust Fault	10-15min		4	5	3	3	4	3						
	M7.7 Catalina Fault	15-20min	4	6	6	5	6	6	6	5	7	7	7	27	10
Distant Sources	M9 Cascadia-full rupture	2hr			4	4	4	4	3	3	4	4	4	3	3
	M9.2 Alaska 1964 EQ	6hr	5	5	7	6	5	4	4	8	7	9	8	4	4
	M9.3 Alaska-East Aleutians	6hr	7	8	14	14	9	8	7	9	8	12	13	-	-
	M8.9 Central Aleutians I	6hr	3		5	5	4	4	4	4	5	5	4		
	M8.9 Central Aleutians II	6hr			3	4	3	4	3	3	3	4	4		
	M9.2 Central Aleutians III	6hr	6	7	10	10	7	6	5	13	10	11	13	5	5
	M9 Kamchatka 1952 EQ	9hr	3												
	M8.8 Kuril Islands II	10hr			3	2	3	2	2	2	3	3	3		
	M8.8 Kuril Islands III	10hr			3	3	3	3	2	2	3	3	3		
	M8.8 Kuril Islands IV	10hr			3	3	3	3	2	2	3	3	3		
	M8.8 Japan II	11hr			3	3	3	3	2	2	3	3	3		
	M9.5 Chile 1960 EQ	13hr			5	5	4	4	4	4	7	9	10	3	3
	M9.4 Chile North	13hr	5	5	5	6	5	5	5	4	10	9	11	4	5
	Maximum Runup - Local Source		**4**	**9**	**8**	**5**	**7**	**11**	**24**	**7**	**8**	**8**	**8**	**30**	**18**
	Maximum Runup - Distant Source		**7**	**9**	**11**	**11**	**8**	**7**	**5**	**15**	**12**	**13**	**15**	**7**	**7**
	UPDATED Maximum Runup - Distant Source		**8**	**9**	**15**	**15**	**10**	**9**	**9**	**10**	**10**	**14**	**15**	**-**	**-**

2019 UPDATE - Near shore tsunami heights (flow depths) for both local and distant source scenarios, in FEET above Mean Sea Level.
NOTE: The projections do not include any adjustments for ambient conditions, such as storm surge and tidal fluctuations, and model error (it is very important to note this difference, as those numbers can increase the projected water height during an event).

2019 Updated Source Information

Figure 17-5. Tsunami Scenario Model Results for Los Angeles County

Source: (NOAA n.d.-b)

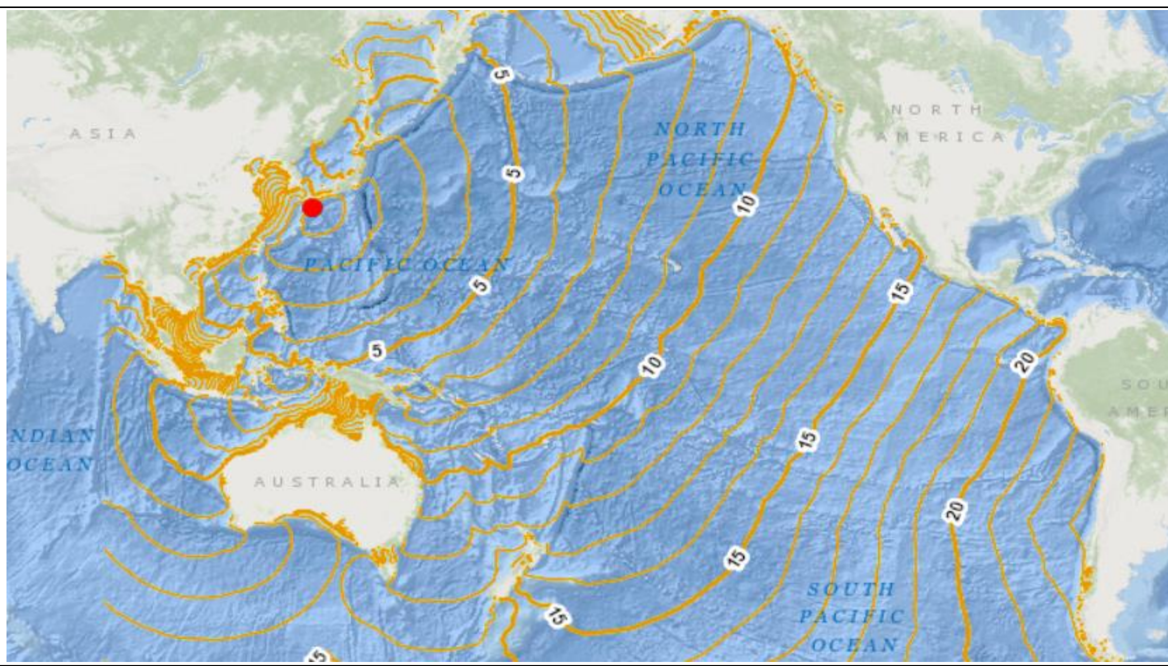


Figure 17-6. Potential Tsunami Travel Times in the Pacific Ocean, in Hours

Potential notifications are as follows (NWS 2024):

- A TSUNAMI INFORMATION STATEMENT is issued to specific recipients when an earthquake or tsunami has occurred. In most cases, information statements are issued to indicate there is no threat of a destructive basin-wide tsunami, in order to prevent unnecessary evacuations.
- A TSUNAMI WATCH is typically issued for the California coastline when a tsunami may later impact the watch area.
- A TSUNAMI WATCH is upgraded to a TSUNAMI ADVISORY if tsunami wave heights are forecast to be 0.3 meters to less than 1 meter.
- A TSUNAMI WATCH is upgraded to a TSUNAMI WARNING if tsunami wave heights are forecast to be 1 meter or larger.

The National Tsunami Warning Center will cancel/expire watches, warnings, or advisories if tide gauges and buoys indicate no significant tsunami was generated or if tsunami waves no longer meet the criteria for at least 3 hours. Local agencies may then issue all-clear messages based on observed local conditions.

This system is not considered to be effective for communities close to the tsunami source, because the first wave would arrive before the data could be processed and analyzed, and communications systems may be affected by the precipitating event. In this case, strong ground shaking would provide the first warning of a potential tsunami and evacuations should begin immediately.

17.2.6 Scenario

A worst-case-scenario for the Los Angeles coastline would be a nearshore tsunami caused by a significant off-shore seismic event. These types of events are not likely, but should one occur, damage could exceed what is estimated in the risk assessment for this hazard mitigation plan. Historical records suggest that tsunami wave heights on the order of 9 to 13 feet could be generated by such an event (Los Angeles County OEM 2006). A local source tsunami presents a high risk to people, as there would not be time to initiate evacuation; the first surge could arrive in minutes. Strong ground shaking preceding the tsunami could damage buildings, communications and electric utility infrastructure, roads, and bridges, further impairing the community’s ability to evacuate safely.

17.3 VULNERABILITY

Summary findings of the risk assessment for tsunami, showing vulnerability results for the entire planning area, are provided in the sections below. A breakdown by APC is provided in Appendix E.

17.3.1 Population and Property

Table 17-1 summarizes the estimated population and property vulnerability in the mapped tsunami hazard area used for this assessment. The distribution of vulnerable structures by occupancy class is shown in Figure 17-7.

Table 17-1. Population and Property in Tsunami Hazard Area

Total Population	
Population in the Hazard Area	22,703
% of Total Planning Area Population	0.6%
Socially Vulnerable Population (see Section 4.4.2 for description)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	0
% of Total Planning Area Population	0.0%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	285
% of Total Planning Area Population	<0.1%
Property	
Number of Buildings in the Hazard Area	4,669
Total Property Value in the Hazard Area	$7,871,726,007
Total Value in the Hazard Area as % of Planning Area Total Value	1.0%

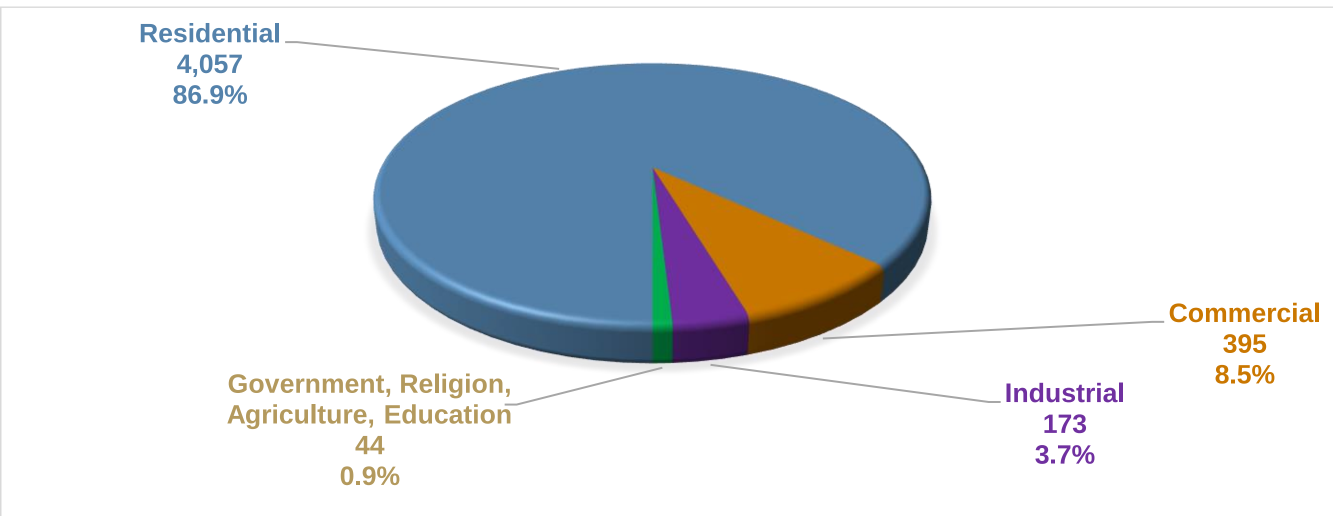


Figure 17-7. Structures in Tsunami Hazard Area by Occupancy Class

17.3.2 Community Lifelines

The total count of community lifelines in the tsunami hazard area (246) represents 3.7 percent of the planning area total of 6,574. Figure 17-8 summarizes community lifelines located in the tsunami hazard area by category.

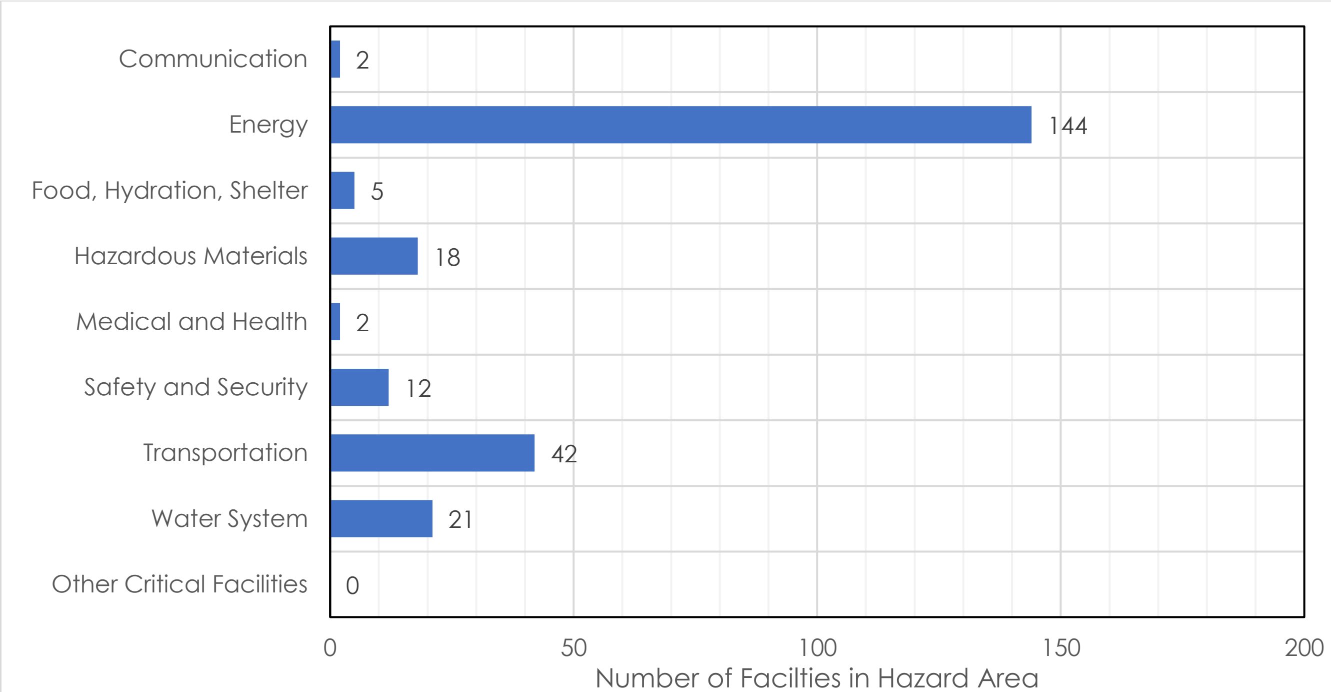


Figure 17-8. Community Lifelines in Tsunami Hazard Area and Percent of Citywide Total

Roads are an important component in the management of tsunami emergencies as they are the primary resource for evacuation to higher ground before and during a tsunami event. Roads often act as flood control facilities in low depth, low velocity flood events by acting as levees or berms and diverting or containing flood flows. The risk assessment identified the following major road facilities that may be impacted by tsunami events:

- Interstate 110
- State Highway 1
- State Highway 47
- State Highway 103
- Venice Boulevard
- Pacific Avenue

Bridges vulnerable to tsunami events can be extremely susceptible to impacts due to the forces transmitted by the wave run-up and by the impact of debris carried by the wave action. The risk assessment identified 11 bridges within the tsunami hazard area, all of which are included in the critical facilities listings.

17.3.3 Environment

All waterways would be vulnerable to the effects of a tsunami; inundation of water and introduction of foreign debris could be hazardous to the environment. All wildlife inhabiting the area also is vulnerable.

17.3.4 Historic and Cultural Resources

Historic-cultural monuments in the mapped hazard area are vulnerable to the effects of tsunamis or seiches and the lasting impacts resulting from such hazard events. Tsunami impacts on the historic and cultural resources within the City are highest near the coastline and low-lying areas due to rapid flooding as a result from tsunami events.

17.4 IMPACTS

Summary findings of the tsunami risk assessment for the entire planning area are provided below. A breakdown by APC is provided in Appendix E.

17.4.1 Population

Impacts on all vulnerable persons and households were estimated through Hazus as follows:

- Number of Displaced Residents: 17,199
- Number of Residents Requiring Short-Term Shelter: 1,009

The populations most likely to experience impacts from tsunami or seiches are those who reside near beaches, low-lying coastal areas, tidal flats, and river deltas that empty into ocean-going waters and are elderly or very young or are individuals with disabilities or others with access and functional needs. In the event of a local tsunami generated in or near the planning area, there would be little warning time, so more of the population would be likely to experience impacts. The degree of impact is based on a number of factors:

- Is there a warning system?
- What is the lead time of the warning?
- What is the method of warning dissemination?
- Where are the evacuation areas and routes?
- Will the people evacuate when warned?

Socially Vulnerable Populations

Residents of low-lying affordable housing in coastal areas tend to be low-income individuals living in old and poor-quality structures, which are especially vulnerable to tsunamis. Low-income individuals are also more likely to be adversely affected as they have fewer financial resources to protect against and support recovery from these hazards (EPA 2021).

Racial and ethnic wealth gaps, which are larger than income gaps and have stronger correlations with property value than income, leave many of these groups more likely to be excluded from protection decisions that consider economic factors (EPA 2021).

Coastal communities are often a preferred retirement destination for older adults, despite the growing risks – for example, from 1970 to 2010, the percent increase for populations 65 and over in coastal watershed counties increased much faster than the overall increase in the nation. The unique physical and psychosocial challenges of the population age 65 and over may affect their ability to prepare, cope with, and recover from hazard events (EPA 2021).

17.4.2 Property

Hazus generated loss estimates for the estimated tsunami hazard areas, as reflected in Table 17-2. All structures along beaches, low-lying coastal areas, tidal flats and river deltas would be susceptible to impacts from a tsunami, especially in an event with little or no warning time. The impact of the waves and the scouring associated with debris that may be carried in the water could be damaging to structures in the tsunami's path. Those that would be most susceptible are those located in the front line of tsunami impact and those that are structurally unsound. Table 17-3 describes the estimated amount of debris created during a maximum impact tsunami event.

Table 17-2. Estimated Maximum Tsunami Impacts on Buildings

Estimated Loss	
Residential	$592,628,155
Commercial	$299,404,357
Other	$625,456,919
Total	**$1,517,489,431**
% of Total Planning Area RCV	**0.2%**

Table 17-3. Estimated Debris Generated by Tsunami

Finish Debris (tons)	139.8
Structure Debris (tons)	48.3
Foundation Debris (tons)	46.5
Total Debris (tons)	**234.5**

Finish debris = carpeting, drywall, etc. Foundation debris = basement, crawlspace, pier, pile, etc. Structure debris = framing, roof, etc.

17.4.3 Community Lifelines

The greatest number of community lifelines within the mapped tsunami hazard areas are oil and gas wells (108), maritime facilities (26), wastewater management facilities (19), and hazardous material sites (18). These facilities all have the potential, if damaged by surging waters associated with a tsunami, of releasing materials to the surrounding area that present health risks to people and the environment.

17.4.4 Environment

Impacts on aquatic habitat and associated ecosystems would be highest in low-lying areas close to the coastline. Areas near gas stations, industrial areas and hazardous materials facilities would face impacts associated with potential contamination.

Tsunami waves can carry destructive debris and pollutants that can have devastating effects on all facets of the environment. Millions of dollars spent on habitat restoration and conservation in the planning area could be wiped out by one significant tsunami. There are currently no tools available to measure these effects. However, it is conceivable that the potential financial impact of a tsunami event on the environment could equal or exceed the impact on property. Community planners and emergency managers should take this into account when preparing for the tsunami or seiche hazard.

17.4.5 Historic and Cultural Resources

Tsunami hazards pose a major threat of extensive damage to the City's HCMs and, in the case of very old structures, complete destruction. Many of these sites and structures pre-date the 1900s and are negatively impacted by floods and debris. The monitoring and management of restoration activities have been an ongoing effort led by the City to mitigate impacts from hazard events such as tsunamis (Los Angeles City Planning 2023a).

17.4.6 Economy

Tsunami events can have a large impact on the City's local economy and small businesses. During a tsunami event, rapid flooding from waves occurs, which can carry debris and pollutants. This can cause businesses to close for several days during and after a tsunami event to clean up debris and ensure publicly safe conditions. Coastal communities are also high tourist destinations within the City, which drives the local economy in the area. As a result, the economy is more dependent upon resilience from tsunamis and these coastal communities' ability to bounce back after an event occurs. Tsunamis can also impact transportation routes that provide access to these businesses and community hubs for residents and tourists.

17.5 Effects of Future Change on Vulnerability and Impacts

17.5.1 Future Development

According to the California Department of Finance, the population of Los Angeles County is expected to decrease 14.8 percent by 2060. The City of Los Angeles has limited potential for expansion through annexation if the population increases, as it is surrounded by other incorporated cities. It is anticipated that any future growth in the City will be managed through redevelopment, which creates an opportunity to correct past land use decisions, especially with regards to development within tsunami hazard areas. Los Angeles is subject to state general planning laws and the California Coastal Act. The City has adopted critical areas and resources lands regulations pursuant to these laws.

17.5.2 Climate Change

Population, Property, and Community Lifelines

Population, property, and community lifeline vulnerability and impacts associated with the tsunami hazard may increase as a result of climate change related sea-level rise. As sea levels rise, tsunami impact areas may reach into parts of the community that were previously believed to be outside of the tsunami risk area. This reach will depend on the size of the tsunami, the local topography, and the extent of sea-level rise. Increases in severe storms may result in an increased probability of seiches.

Environment

Environmental vulnerability and impacts associated with tsunamis may be affected by climate change. Sea-level rise could alter the shape of existing shoreline, putting different structures and ecosystems closer to the shoreline and potential tsunami impacts. These assets would not have the same protection against tsunamis due to a shorter period to adapt. Additionally, ice crust melt could lead to a rise of the earth's crust, especially at higher latitudes, causing more submarine landslides and greater impacts from tsunamis.

18. WILDFIRE

18.1 GENERAL BACKGROUND

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by natural forces such as lightning or by human activity such as smoking, campfires, equipment use, and arson. The potential for significant damage to life and property exists in areas designated as "wildland/urban interface areas," where development is adjacent to densely vegetated areas.

18.1.1 California Wildfire Mapping

The California Department of Forestry and Fire Protection (CAL FIRE) has modeled and mapped wildfire hazard zones using a computer model that designates moderate, high or very high fire hazard severity zones (FHSZ). The FHSZ model is built from CAL FIRE data and hazard information based on factors such as the following:

- **Fuel**—Fuel may include living and dead vegetation on the ground, along the surface as brush and small trees, and above the ground in tree canopies. Lighter fuels such as grasses, leaves and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs and trunks take longer to warm and ignite. Trees killed or defoliated by forest insects and diseases are more susceptible to wildfire.
- **Weather**—Relevant weather conditions include temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount and duration, and the stability of the atmosphere. Of particular importance for wildfire activity are wind and thunderstorms:
    - Strong, dry winds, such as Santa Ana winds, produce extreme fire conditions. Such winds generally reach peak velocities during the night and early morning hours.
    - The thunderstorm season typically begins in June with wet storms and turns dry with little or no precipitation reaching the ground as the season progresses into July and August.
- **Terrain**—Topography includes slope and elevation. The topography of a region influences the amount and moisture of fuel; the effects of weather conditions such as temperature and wind; potential barriers to fire spread, such as highways and lakes; and elevation and slope of landforms (fire spreads more easily uphill than downhill).
- **Probability of Future Occurrence**—The likelihood of an area burning over a 30- to 50-year time period, based on history and other factors.

The model also is based on frequency of fire weather, ignition patterns, and expected rate-of spread. It accounts for flying ember production, which is the principal driver of the wildfire hazard in densely developed areas. A related concern in built-out areas is the relative density of vegetative fuels that can serve as sites for new spot fires within the urban core and spread to adjacent structures. Significant land-use changes need to be accounted for through periodic model updates.

18.1.2 Wildfire Protection Responsibility in California

Hundreds of local, state, and federal agencies have fire protection responsibility for wildfires in California. In many instances, multiple organizations can have responsibility on the same parcel of land—one for wildfire protection, and the other for structural or "improvement" fire protection. To address wildfire jurisdictional responsibilities, the California state legislature adopted legislation establishing the following responsibility areas:

- **Federal Responsibility Areas (FRAs)**—FRAs are fire-prone wildland areas that are owned or managed by a federal agency such as the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, or U.S. Department of Defense. Primary financial and rule-making jurisdictional authority rests with the federal land agency. In many instances, FRAs are interspersed with private land ownership or leases. Fire protection for developed private property is usually not the responsibility of the federal land management agency; structural protection responsibility is that of a local government agency.
- **State Responsibility Areas (SRAs)**—SRAs are lands in California where CAL FIRE has legal and financial responsibility for wildfire protection and where CAL FIRE administers fire hazard classifications and building standard regulations. SRAs are defined as lands that meet the following criteria:
  - Are county unincorporated areas
  - Are not federally owned
  - Have wildland vegetation cover rather than agricultural or ornamental plants
  - Have watershed or range/forage value
  - Have housing densities not exceeding three units per acre.

  Where SRAs contain built environment or development, the responsibility for fire protection of those improvements (non-wildland) is that of a local government agency.
- **Local Responsibility Areas (LRAs)**—LRAs include land in cities, cultivated agriculture lands, non-flammable areas in unincorporated areas, and lands that do not meet the criteria for SRA or FRA. LRA fire protection is typically provided by city fire departments, fire protection districts, and counties, or by CAL FIRE under contract to local governments. LRAs may include flammable vegetation and areas where the financial and jurisdictional responsibility for improvement and wildfire protection is that of a local government agency.

State law requires local governments to update the safety elements in their general plans to recognize wildfire risks in SRAs and "Very High" FHSZs (based on statewide criteria). The Safety Element must include information and policies on unreasonable risk from potential hazards, including fire. The state encourages integration among jurisdictions to enhance mitigation and prevention efforts.

18.1.3 Cascading and Compounding Impacts

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. A major fire can lead to ancillary effects such as landslides in steep ravine areas and flooding due to the effects of silt in local watersheds. Wildfires cause the contamination of reservoirs, destroy transmission lines, and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes, sometimes several years after a wildfire (refer to the high wind hazard profile for discussions on post-wildfire debris flows).

Wildfires can have a significant effect on air quality, especially with prolonged periods of burning combined with climatic conditions. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather.

The hot, dry Santa Ana winds that frequently occur in Southern California during autumn can exacerbate fire conditions, causing additional fires and creating extreme conditions for firefighters. Additional information on Santa Ana winds is included in Section 14.1.1.

18.2 Hazard Profile

18.2.1 Past Events

Federal disaster declarations for Los Angeles County include 60 that addressed wildfire hazards (see Section 3.1.1). There have been 19 state emergency proclamations for wildfire in Los Angeles County (see Section 3.1.2).

Incident information from CAL FIRE identifies over 62 wildfires in Los Angeles County since 2016, but most of them have been outside the City of Los Angeles (CAL FIRE 2023). Los Angeles County has been included in five wildfire emergency declarations (EM), 11 wildfire major disaster declarations (DR), and 38 fire management assistance declarations (FM), for a total of 54 federal declaration since 1970 (FEMA 2023a). The following are recent major wildfires that have affected Los Angeles (as reported by CAL FIRE unless otherwise noted):

- **September 28 – October 6, 2005, Topanga Fire**—Burned 24,175 acres in the Chatsworth area. Numerous residential and commercial properties were damaged and destroyed. Costs were reported around $15.8 million.
- **October 13, 2008, Sesnon Fire**—Burned 14,700 acres in the Porter Ranch Community, Twin Lakes and Indian Hills areas of Los Angeles County. The fire destroyed 15 residences and 63 outbuildings; 11 residences were damaged. Costs were reported around $12.6 million.
- **August 26 – October 16, 2009, Station Fire**—Burned 160,000 acres and resulted in the death of two firefighters, the injury of 22 persons, and the burning of 89 homes and more than 110 other structures. The Los Angeles Times reported costs exceeding $100 million. The Station Fire was the largest fire in the recorded history of Angeles National Forest, the 12th largest in California and the largest in Los Angeles County. It threatened Mount Wilson Observatory and communication towers with transmitters for every major

television station in Los Angeles. Cooperating agencies included: Forest Service, Los Angeles County Fire Department, Los Angeles County Sheriff's Department, California State Highway Patrol, Cal Trans, and Los Angeles City Fire Department. The fire threatened the Sunland and Tujunga neighborhoods of the City of Los Angeles.

- **January 16 – 27, 2014, Colby Fire—**Burned 1,915 acres, damaged seven homes, destroyed 5 homes near Morris Reservoir, north of Glendora.
- **June 24, 2015, Calgrove Fire**—Burned 415 acres along southbound Interstate 5, north of Calgrove.
- **June 20 – November 8, 2016, San Gabriel Complex**—Burned 5,399 acres in San Gabriel Complex.
- **July 9 – 16, 2016, Sage Fire**—Burned 1,109 acres off Calgrove Boulevard, southwest of Santa Clarita.
- **November 14, 2016, Marek Fire**—Burned 4,824 acres in Angeles National Forest.
- **September 1, 2017, La Tuna Fire**—Burned 7,194 acres in the Verdugo Mountains.
- **December 5, 2017, Creek Fire**—Burned 15,619 acres in the Sierra National Forest.
- **December 6, 2017, Skirball Fire**—Burned 422 acres, destroyed six single-family homes and 12 other buildings.
- **November 8, 2018, Woolsey Fire**—Burned 96,949 acres in Los Angeles and Ventura Counties, killing three people.
- **October 28, 2019, Getty Fire**— Burned 745 acres of land, destroyed residential homes and injured firefighters.
- **November 5, 2019, Saddle Ridge Fire**—Burned 8,799 acres near the San Fernando Valley.
- **August 12, 2020, Lake Fire**—Burned 31,089 acres in the Angeles National Forest.
- **June 1, 2021, Palisades Fire**—Burned 1,202 acres in Topanga State Park and Palisades neighborhood.

18.2.2 Location

FHSZ mapping for the planning area is shown in Figure 18-1 through Figure 18-7. Many of the wildfires occur and spread on federal and state lands, as brush and other vegetation that are fuels for the fires can be found in abundance in these areas. Neighboring communities and City assets, such as public buildings and emergency response facilities, are at risk of damage from wildfires.

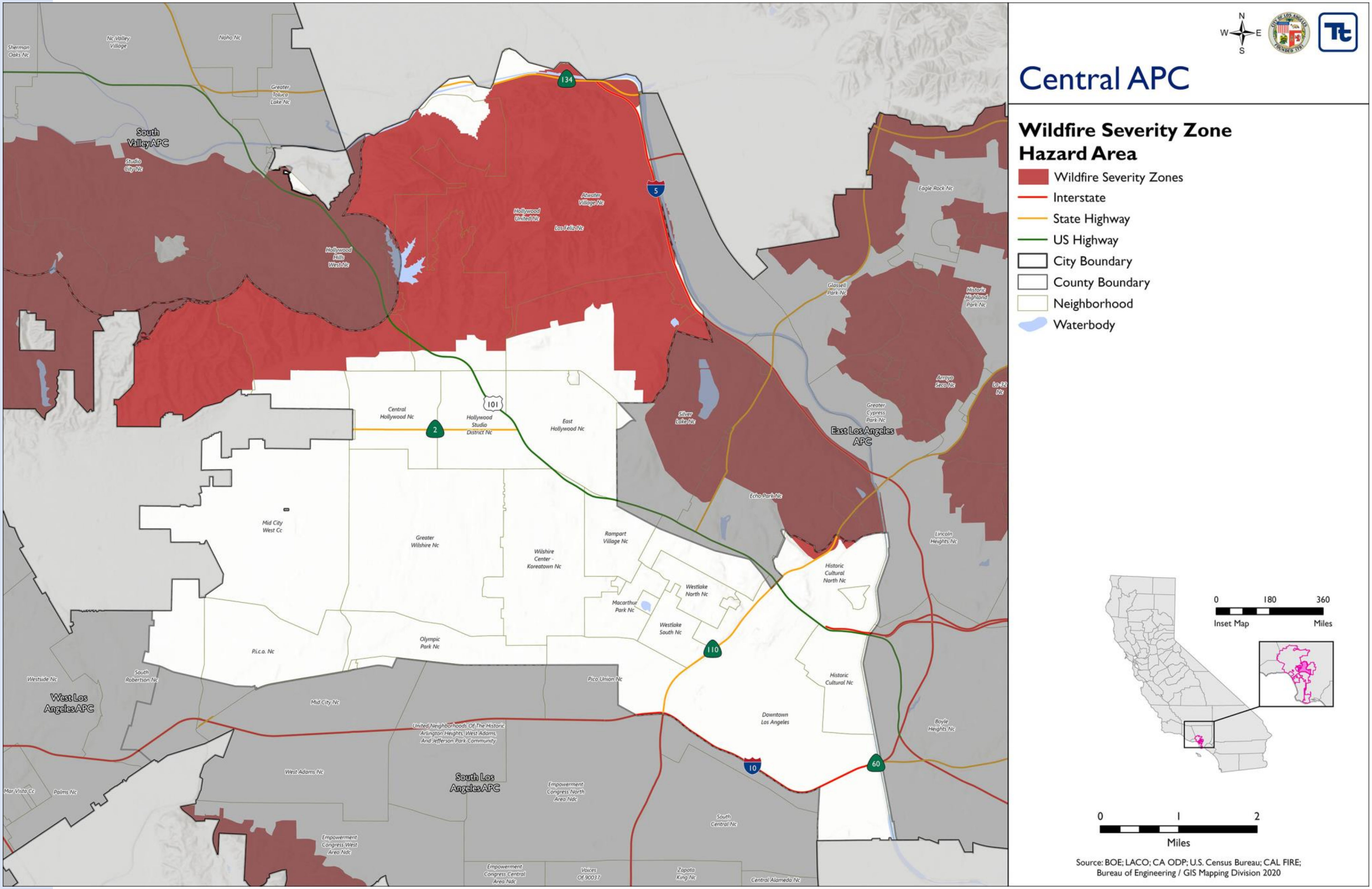


Figure 18-1. Wildfire Severity Zones in Central APC

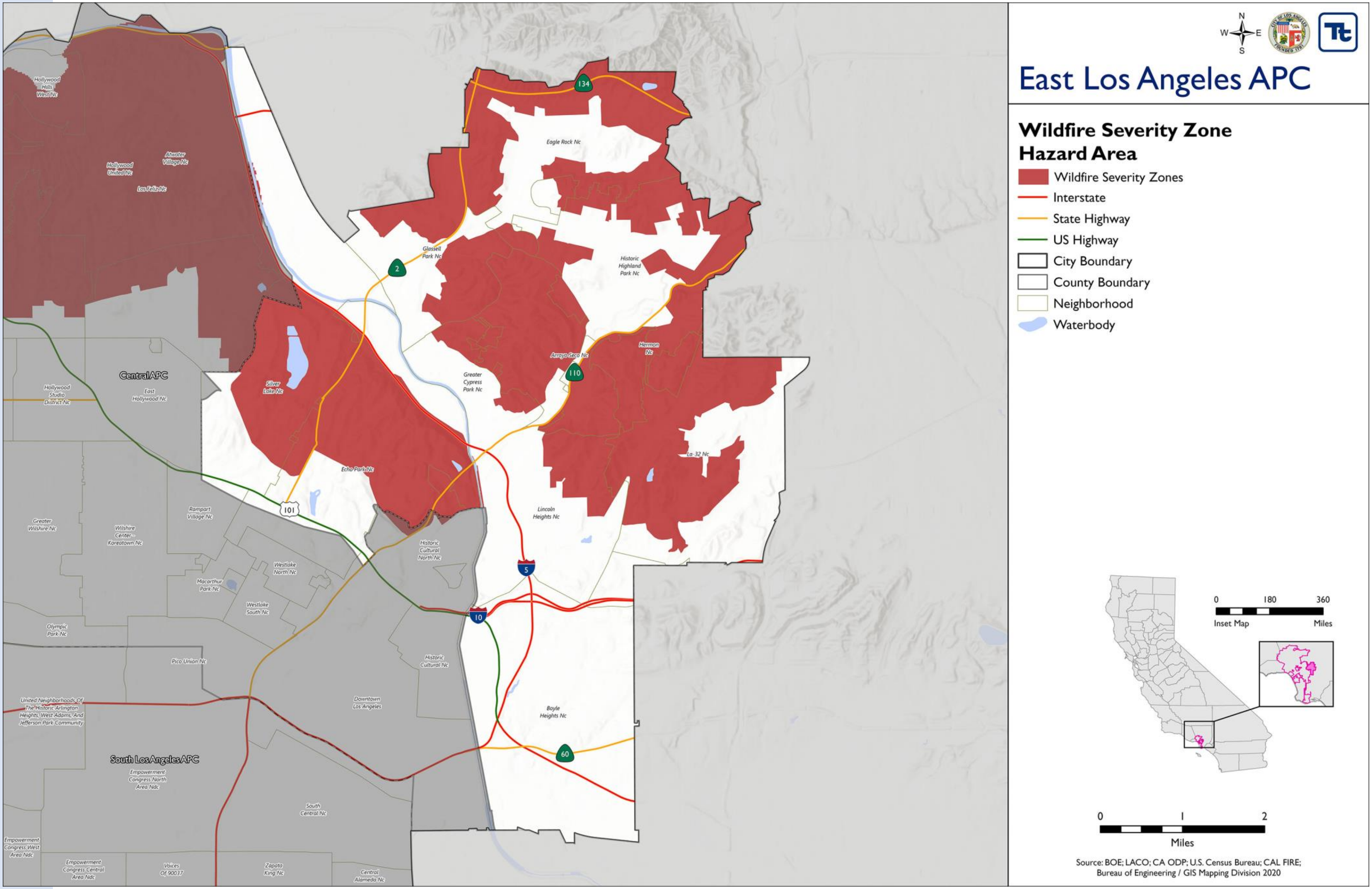


Figure 18-2. Wildfire Severity Zones in East Los Angeles APC

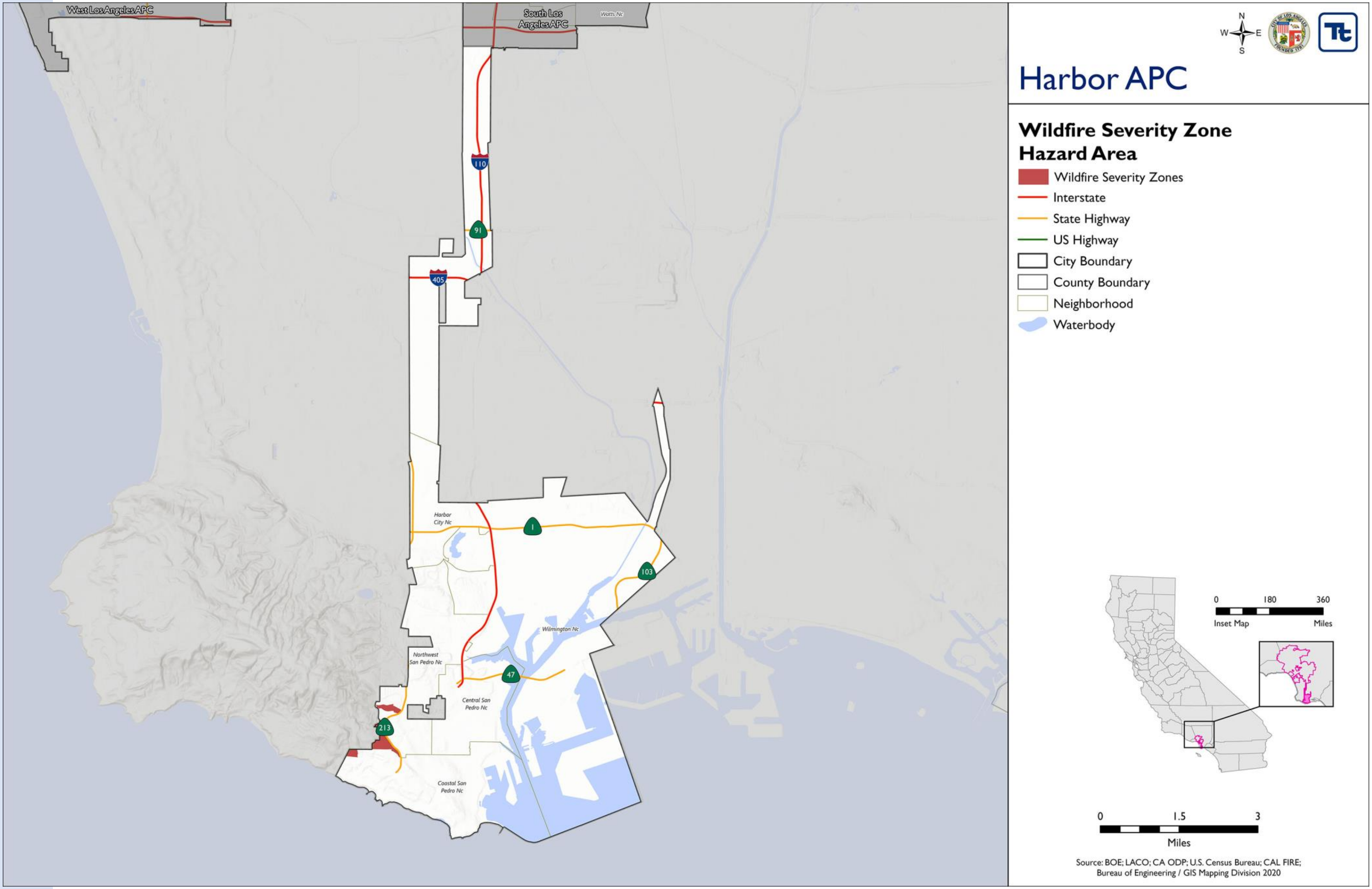


Figure 18-3. Wildfire Severity Zones in Harbor APC

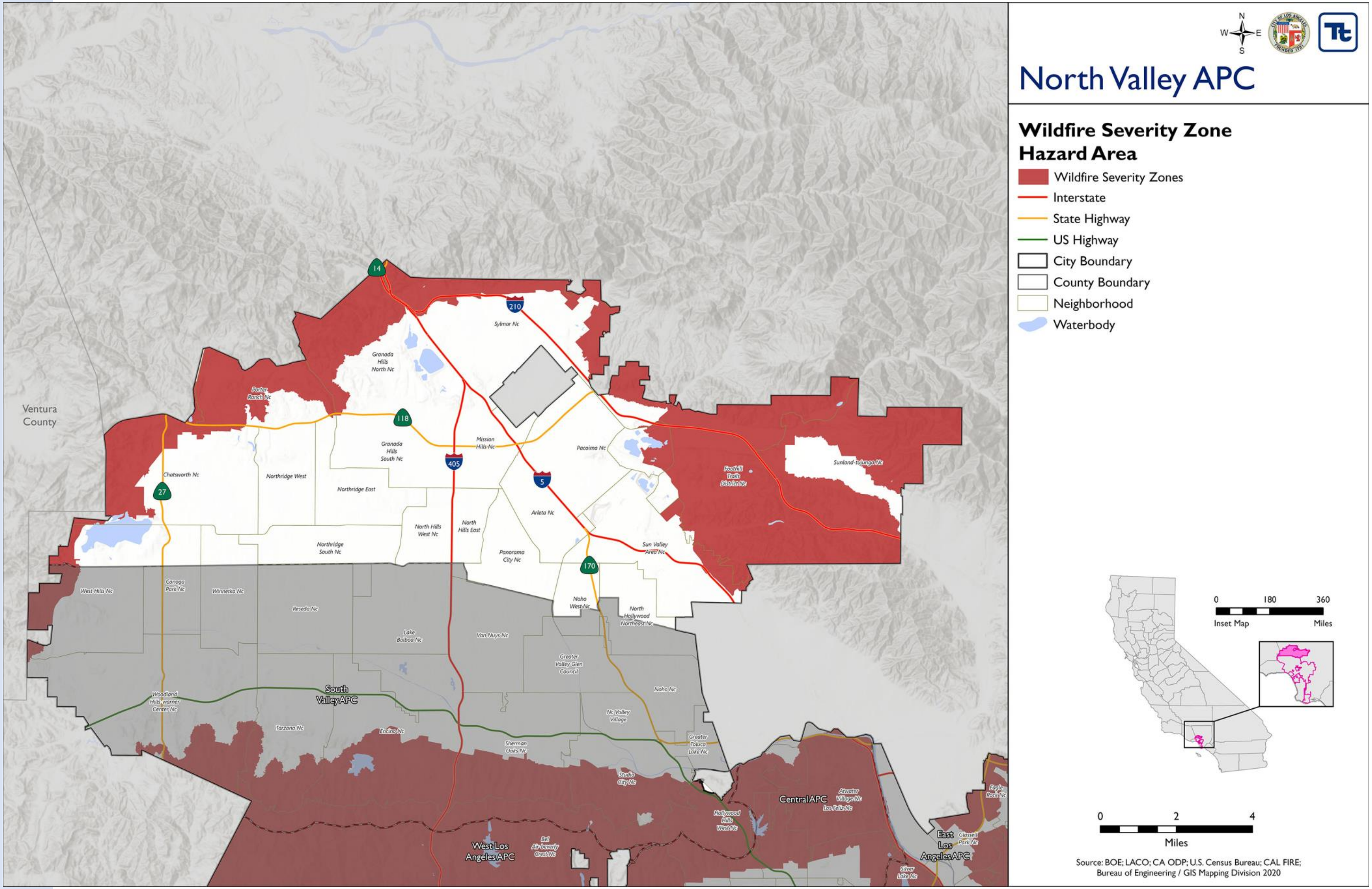


Figure 18-4. Wildfire Severity Zones in North Valley APC

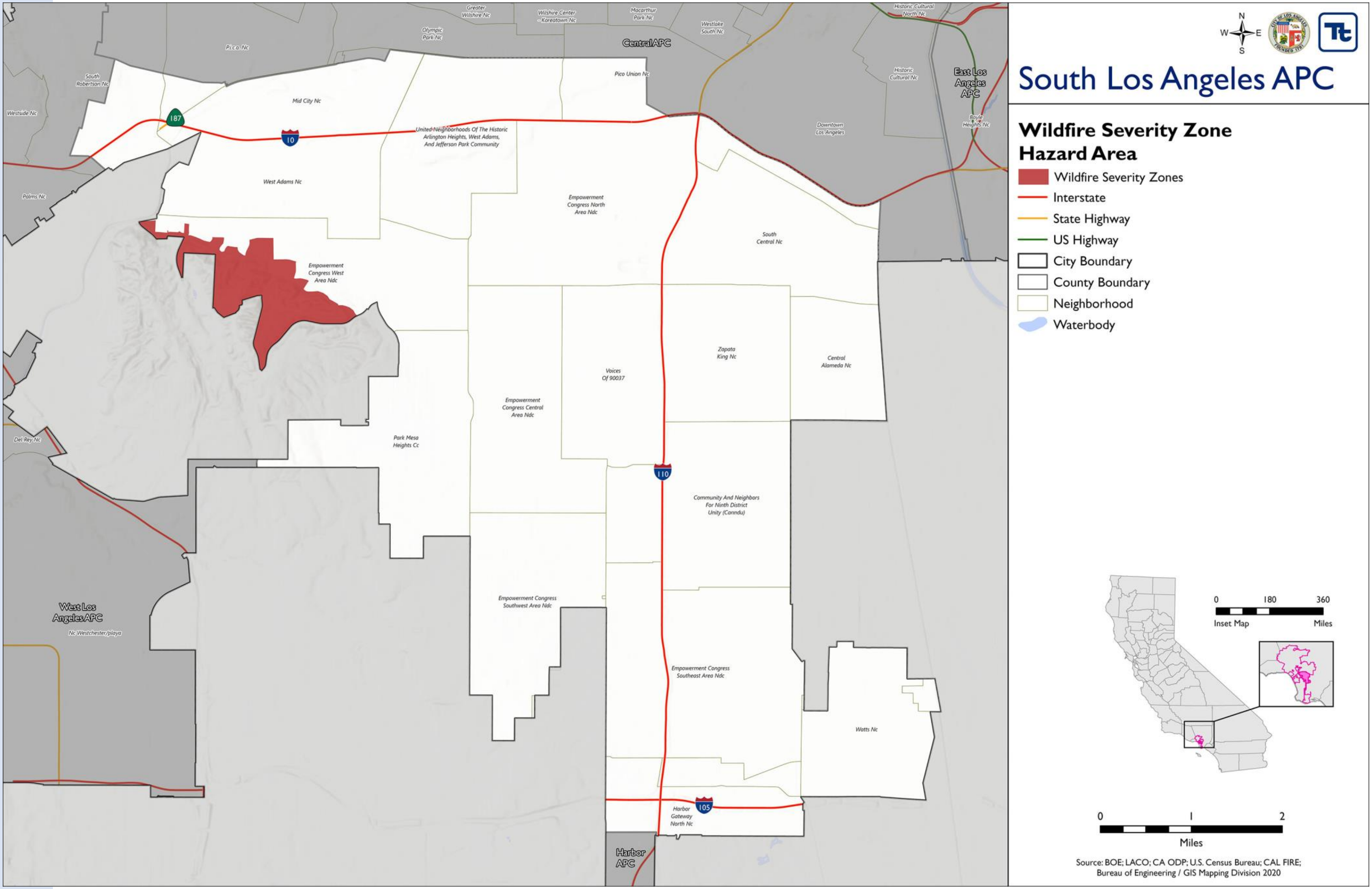


Figure 18-5. Wildfire Severity Zones in South Los Angeles APC

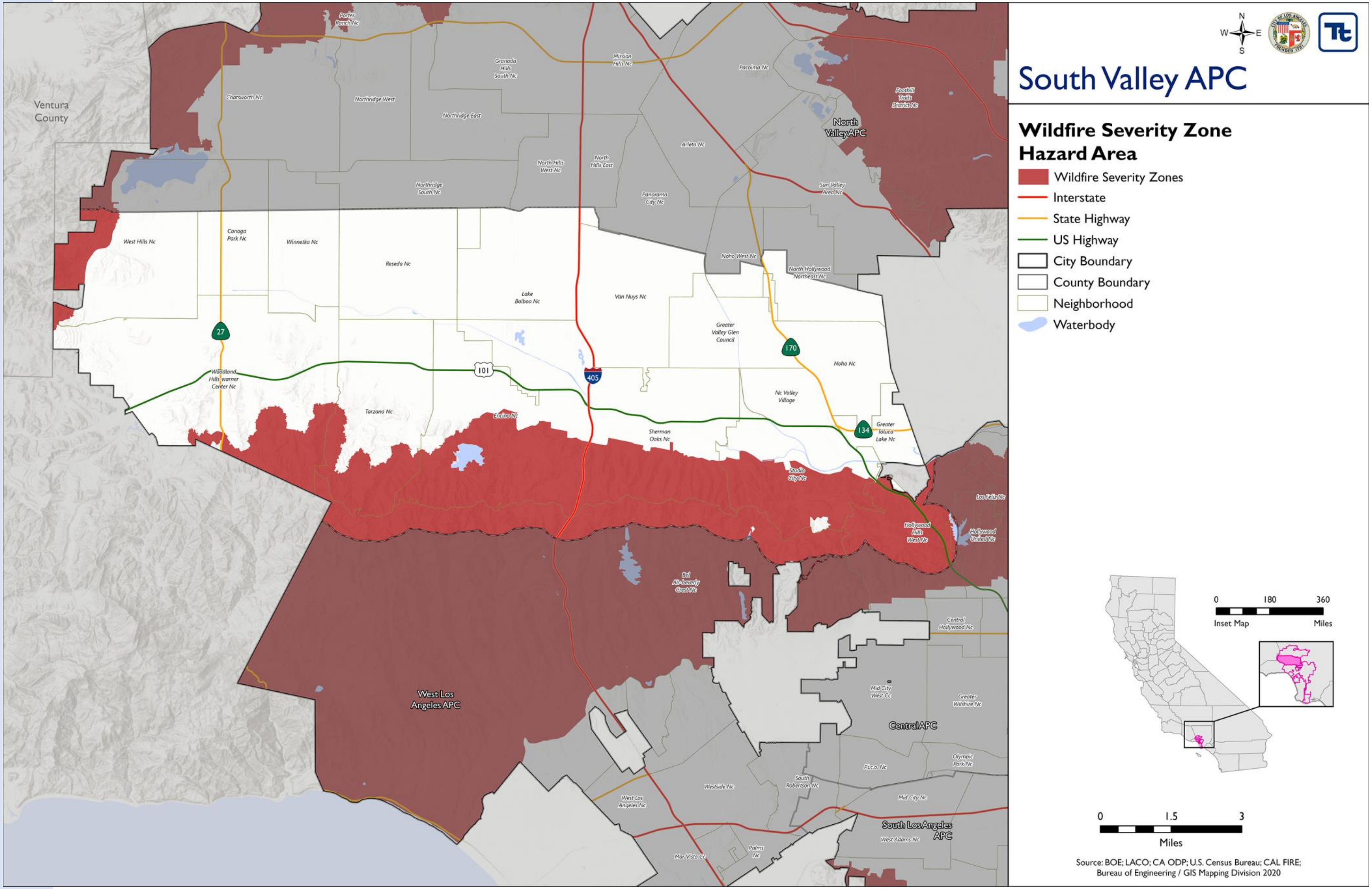


Figure 18-6. Wildfire Severity Zones in South Valley APC

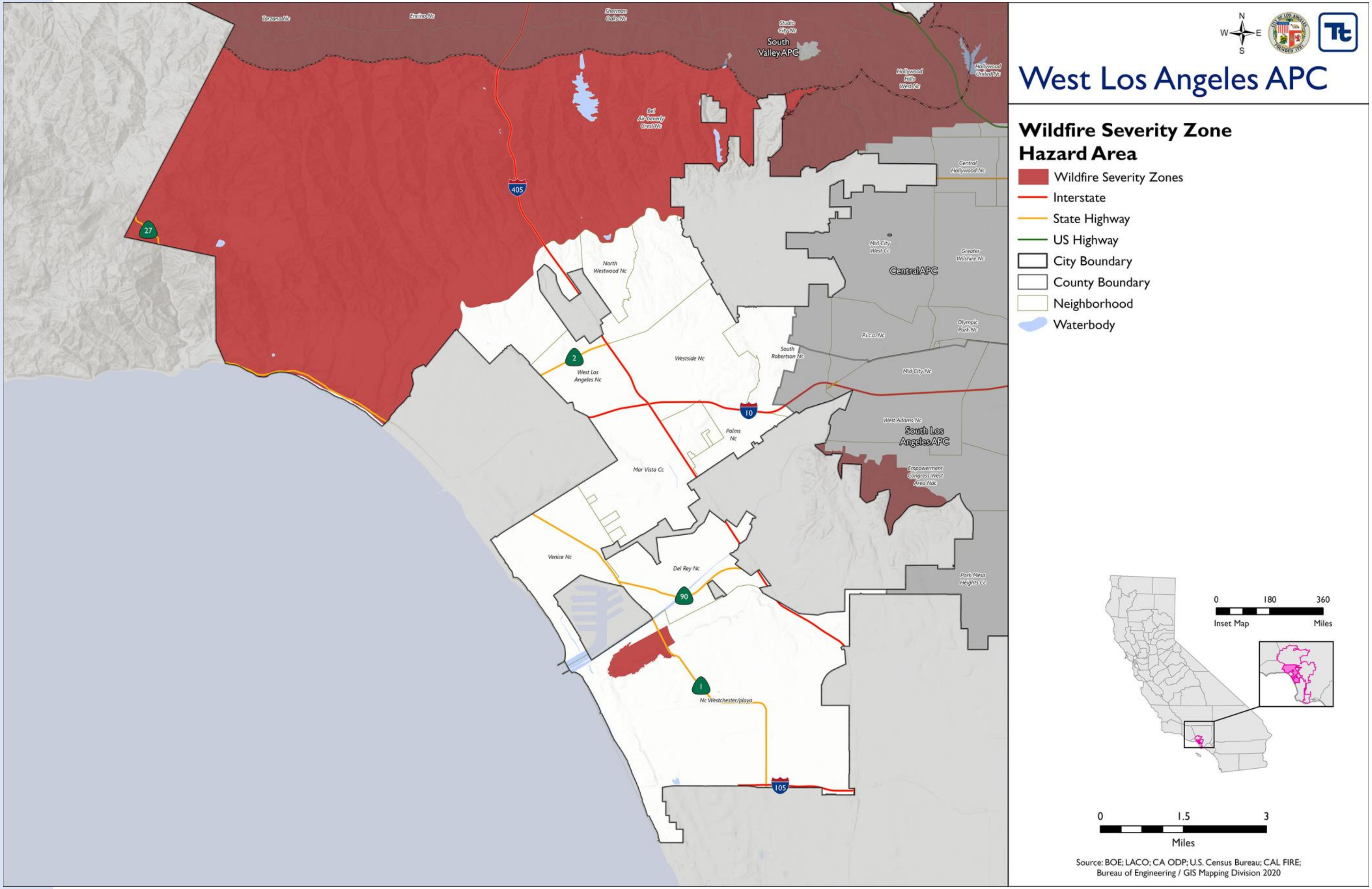


Figure 18-7. Wildfire Severity Zones in West Los Angeles APC

18.2.3 Frequency

Assessment Based on Past Events

Wildfire frequency can be assessed through review of the number of previous wildfire events and the area burned over a defined time period. Figure 18-8 shows the number and area of SRA-reported fires in Los Angeles County from 2008 through 2022. Over this period, the county's average number of report SRA wildfires was 111 per year. Although these statistics cover a much larger area than the City planning area, it is still reasonable to assume that Los Angeles will experience multiple wildfires in a typical year.

(CAL FIRE 2024b).

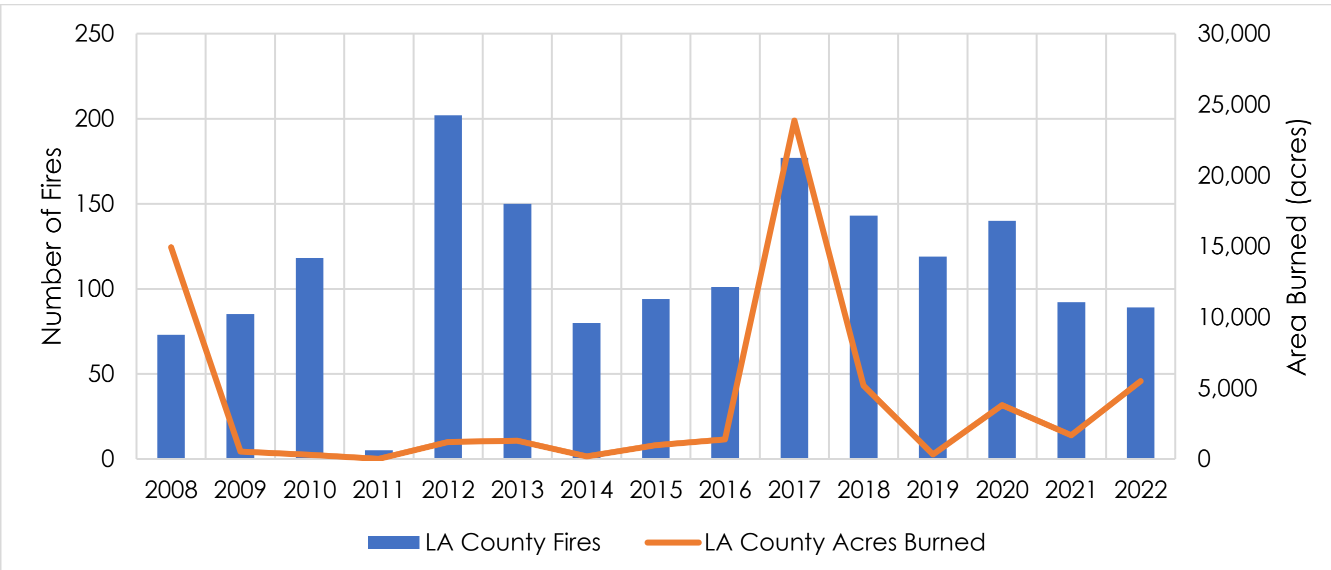


Figure 18-8. SRA Fires in Los Angeles County, 2008 – 2022

Potential Effect of Future Conditions on Hazard Probability

The frequency and severity of wildfires are determined by climate variability, local topography, and human intervention. Climate change has the potential to affect multiple elements of wildfires: fire behavior, ignitions, fire management, and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify fire danger by warming and drying out vegetation.

Changes in climate patterns may impact the distribution and perseverance of insect outbreaks that create dead trees (increase fuel). When climate alters fuel loads and fuel moisture, forest susceptibility to fire changes. Climate change also may increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods. If the intensity of Santa Ana winds increases, there are additional risks of fires occurring as a result of burning embers being wind-blown to areas miles away.

Current climate projections for California predict that the area burned by wildfire in Los Angeles may decrease slightly over the remainder of this century. However, a number of factors can affect wildfire—weather, environment, season, climate, terrain, and more. Overall, the effects of future conditions, including climate change, on the type, location and range of intensities of wildfire in Los Angeles are not clear with the most current science.

18.2.4 Severity

Potential losses from wildfire include human life, structures and other improvements, and natural resources. There are no recorded incidents of loss of life from wildfires in the planning area. However, many of the wildfires with the highest damage costs in the West have been in California. The Station Fire (2009), which started in the Angeles National Forest, caused an estimated $92.5 million in damage.

18.2.5 Warning Time

Wildfires are often caused by humans, intentionally or accidentally. While weather conditions that may lead to wildfire events can be forecasted, there is no way to predict when or where a fire might break out. Since fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within minutes or hours. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

18.2.6 Scenario

A major wildfire in the planning area might begin with a wet spring, adding to fuels already present within the chaparral or scrubland environment. Flashy fuels would build throughout the spring. The summer could see the onset of insect infestation. A dry summer could follow the wet spring, exacerbated by dry hot winds. Carelessness with combustible materials or a tossed lit cigarette, or a sudden lighting storm could trigger a multitude of small, isolated fires.

The embers from these smaller fires could be carried miles by hot, dry winds. The deposition zone for these embers would be deep in the forests and interface zones. Fires that start in flat areas move slower, but wind still pushes them. It is not unusual for a wildfire pushed by wind to burn the ground fuel and later climb into the crown and reverse its track. This is one of many ways that fires can escape containment, typically during periods when response capabilities are overwhelmed. These new small fires would most likely merge. Within the City Of Los Angeles, suppression resources will prioritize life, property, and natural resources.

The worst-case scenario would include an active fire season throughout the American west, spreading firefighting resources thin. Many federal assets would be responding to other fires that started earlier in the season. While local fire districts would be extremely useful in the urban interface areas, they have limited wildfire capabilities or experience, and they would have a difficult time responding to the ignition zones. Even though the existence and spread of the fire is known, it may not be possible to respond to it adequately, so an initially manageable fire can become out of control before resources are dispatched.

18.3 VULNERABILITY

Mapping of the very high FHSZ was used to perform the vulnerability analysis. Summary findings of the risk assessment, showing vulnerability results for the entire planning area, are provided in the sections below. A breakdown by APC is provided in Appendix E.

18.3.1 Population and Property

Table 18-1 summarizes the estimated population living in the wildfire hazard areas and the estimated property vulnerability. The distribution of vulnerable structures by use category is shown in Figure 18-9.

18.3.2 Community Lifelines

Figure 18-10 summarizes the number of community lifelines in the very high wildfire risk area, by category. The 580 total facilities in this zone represent 8.8 percent of the planning area total.

Table 18-1. Population and Property in Mapped Fire Hazard Severity Zones

Total Population	
Population in the Hazard Area	616,465
% of Total Planning Area Population	15.9%
Socially Vulnerable Population (see Section 4.4.2)	
Community Health & Equity Index = 43.56 – 48.57	
Population in the Hazard Area	63,469
% of Total Planning Area Population	1.6%
Community Health & Equity Index > 48.57	
Population in the Hazard Area	22,927
% of Total Planning Area Population	0.6%
Property	
Number of Buildings in the Hazard Area	112,255
Total Property Value in the Hazard Area	$76,675,732,846
Total Value in the Hazard Area as % of Planning Area Total Value	9.8%

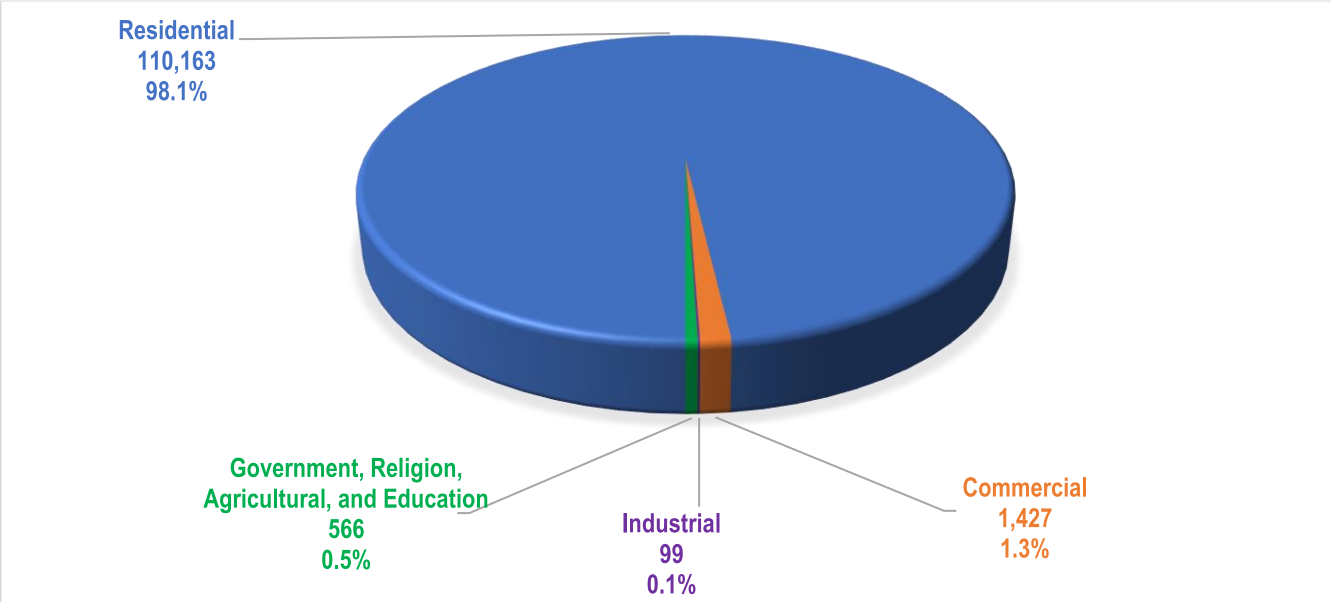


Figure 18-9. Vulnerable Structures in Very High FHSZ by Occupancy Class

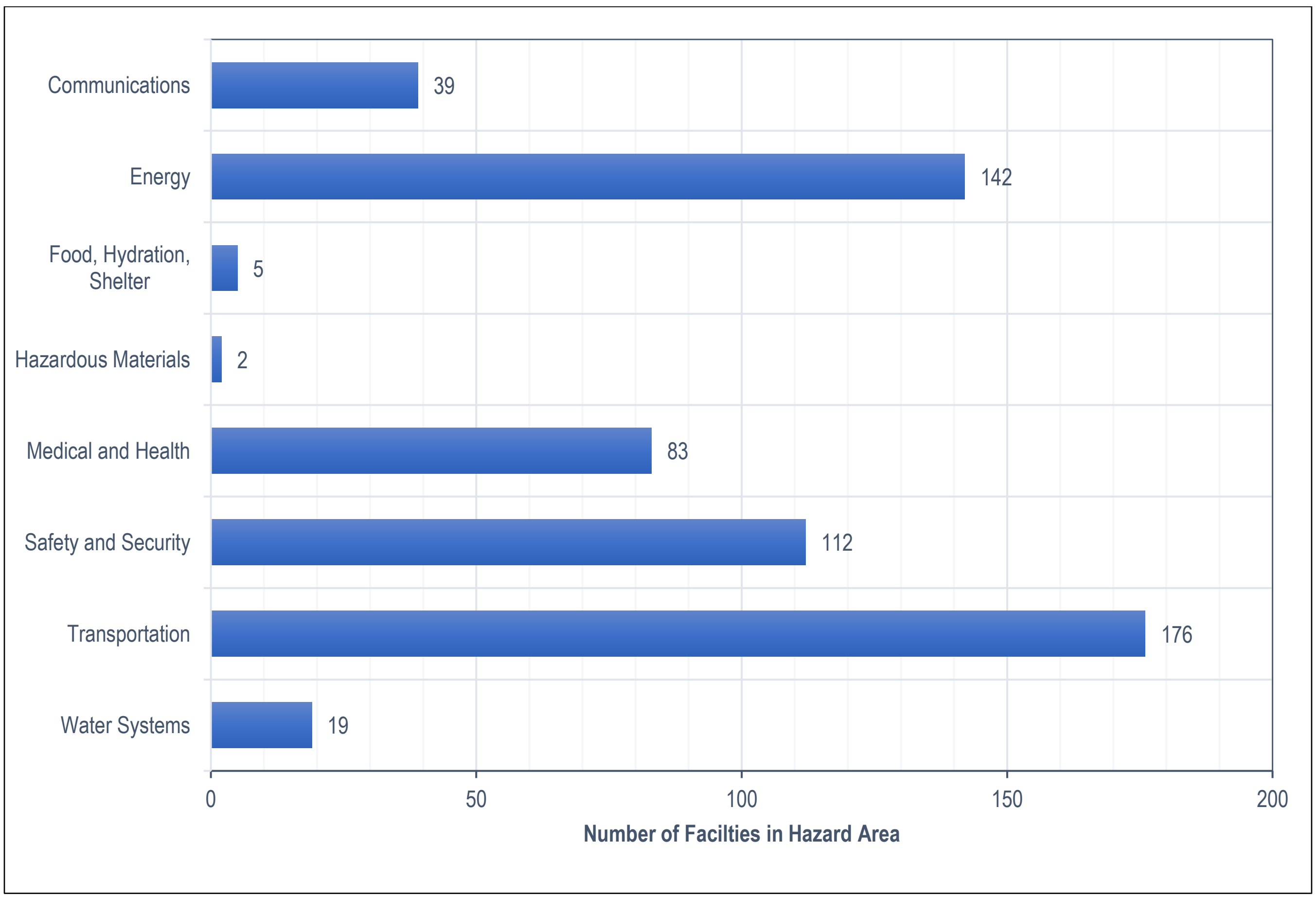


Figure 18-10. Number of Community Lifelines in Mapped Very High Fire Hazard Severity Zone

18.3.3 Environment

Mapped wildfire hazard zones and wildland urban interface (WIU) areas around the City include numerous natural areas. All plants and animals in these natural areas are vulnerable to the wildfire hazard.

18.3.4 Historic and Cultural Resources

Wildfire impacts on the historic and cultural resources within the City are highest near wildland/urban interface areas due to the susceptibility of wildfire hazard occurrences. The HistoricPlacesLA map includes the location of each historical resource or zone and a resource report that contains evaluation information on the site.

18.4 IMPACTS

18.4.1 Population

The nature and movement of wildfires can change without warning in response to such factors as environment, terrain, and weather. The impacts on people living in a wildfire zone can be significant. They include cutting off evacuation routes, causing power outages, and generating harmful smoke.

Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Socially Vulnerable Populations

The most vulnerable populations are emergency responders and those within a short distance of the interface between the built environment and the wildland environment. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. For persons with health situations, especially respiratory conditions, the ramifications can be noteworthy. For individuals with disabilities or access or functional needs, wildfire can cause disorientation and limit the ability to evacuate promptly. Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases.

18.4.2 Property

Loss estimations for the wildfire hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent, and 50 percent of the replacement value of vulnerable structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 18-2 lists the loss estimates for the general building stock vulnerable to a very high fire hazard severity zone.

Table 18-2. Loss Potential for Wildfire (Aggregate from Very High Risk Area Vulnerability

Total Building Value Vulnerable	**$76,675,732,846**
10% of Total Building Value	$7,667,573,285
30% of Total Building Value	$23,002,719,854
50% of Total Building Value	$38,337,866,423

18.4.3 Community Lifelines

Community lifelines of wood frame construction are especially susceptible to impacts from wildfire events. In the event of wildfire, there would likely be little damage to most infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

18.4.4 Environment

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, dictating in part the types, structure, and spatial extent of native vegetation. However, wildfires can cause severe environmental impacts:

- **Damaged Cultural and Historical Resources**—The destruction of cultural and historic resources may occur, scenic vistas can be damaged, and access to recreational areas can be reduced.
- **Damaged Fisheries**—Fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.
- **Destroyed Endangered Species Habitat—**Wildfire can have negative consequences for endangered species by degrading their habitat.

- **Disease and Insect Infestations**—Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- **Reduced Agricultural Resources**—Wildfire can have disastrous consequences on agricultural resources, removing them from production and necessitating lengthy restoration programs.
- **Soil Erosion**—The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitats.
- **Soil Sterilization**—Some wildfires burn so hot that they can sterilize the soil. Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost.
- **Spread of Invasive Plant Species**—Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.

18.4.5 Historic and Cultural Resources

Wildfires are a major threat to historical and cultural resources, with the potential to cause extensive damage, and in some cases, complete destruction. Many of the HCMs located in the City pre-date the 1900s. The potential impacts on HCMs from wildfire depend heavily on the materials used for construction. Many of the 19th century structures identified in the HistoricPlacesLA database are made of wood clapboards which is a highly flammable material. The monitoring and management of restoration activities have been an ongoing effort led by the City to mitigate impacts from hazard events such as wildfires (Los Angeles City Planning 2023a).

18.4.6 Economy

Wildfire events can have a large impact on the City's economy and residential housing market. During a wildfire event, flames can rapidly spread in a suburban area, causing mass destruction to many residential buildings and businesses. These events can lead to large numbers of displaced people and families and cause businesses to close for several days in order to repair structural damage and utilities.

Communities located in the wildland/urban interface areas may have an increased vulnerability to wildfire events due to proximity to greenspaces which can fuel and rapidly spread wildfires. These communities attract tourism through recreational activities available in these natural areas, driving much of the local economy. As a result, the economy is increasingly dependent upon the resilience from wildfire events and these communities' ability to bounce back after an event occurs.

18.5 EFFECTS OF FUTURE CHANGE ON VULNERABILITY AND IMPACTS

18.5.1 Future Development

The highly urbanized planning area has little wildfire risk. Urbanization tends to alter the natural fire regime and can create the potential for expansion of urbanized areas into wildland areas. Expansion of the wildland/urban interface can be managed with strong land use and building codes. The planning area is well equipped with these tools and this planning process has assessed capabilities with regards to the tools. As the planning area experiences future growth, it is anticipated that the vulnerability to this hazard will remain as assessed or even decrease over time due to these capabilities.

18.5.2 Climate Change

Population

According to California's Fourth Climate Change Assessment, future projections indicate that southern California may experience a larger number of wildfires and burned area by the mid-21st century. Similarly, the annual burned area over the Los Angeles region may increase over 2,000 hectares by the mid-21st century (State of California 2018).

Populations near the wildland/urban interface will be at risk from the wildfire hazard. Projected conditions call for more instances of extreme heat and prolonged drought, both which contribute to the wildfire hazard. A secondary impact from wildfires includes smoke and air pollution, which leads to poor air quality and impacts the health of the population.

Property and Community Lifelines

Property and community lifeline vulnerability and impacts are anticipated to increase. Wildfires will continue to impact water supplies throughout the City due to residual pollutants like char or debris landing in water resources which can clog wastewater pipes, culverts, etc. Wildfires may cause harsher impacts on transportation routes, blocking residents and commuters from getting in and out of the City; char, smoke, and debris thicken and pollute the air making it difficult for drivers to see, flames with close proximity to the roadways make routes unsafe passageways. In general, roads and bridges surrounding the areas of wildfire risk are critical, as the structures provide ingress and egress to large areas and, in some cases, to isolated neighborhoods. Wildfires can create conditions that block or prevent access and can isolate residents and emergency service providers.

Environment

CAL FIRE data outlines the increase and decrease in the number of fires and acreage burned over the last several years. According to CAL FIRE data, the number of wildfires in 1987 was 13,476; the number of wildfires in 2023 was 7,127 (CAL FIRE 2024a). With changing environment and weather conditions in the state and around the world, the nature of wildfire will change. California experiences both drought and atmospheric rivers. Drought conditions can contribute to an increase in the number of fires; excessive rains can also impact the number of fires.

19. Risk Ranking

19.1 HAZARD RANKING METHODOLOGY

Hazard rankings have been used as one of the bases for identifying the hazard mitigation strategies included in Chapter 33. This chapter describes the process used to rank hazards of concern and the results for the full planning area. Ranking results for each APC are presented in Appendix E.

The City of Los Angeles has differing levels of vulnerability to and potential impacts from each of the hazards assessed in this plan. The City needs to recognize the hazards that pose the greatest risk to its community and direct its attention and resources accordingly to manage risk and reduce losses. To achieve this, the hazards of concern were ranked using methodologies promoted by FEMA's hazard mitigation planning guidance and hazard information developed for this update. Relative ranking scores were generated by FEMA's Hazus risk assessment tool.

19.1.1 Categories Used in Ranking

The ranking methodology is based on four risk assessment categories, with the following scoring parameters defined for each category:

- **Level**—The level is a qualitative description of how each hazard rates in each category (such as low to high, or unlikely to frequent)
- **Benchmark value**—The benchmark values are clearly determinable quantities or descriptions that define which level should apply to each hazard
- **Numeric value**—The numeric value is the hazard's score in each category, based on the assigned level
- **Weighting**—The weighting is a multiplier applied to each hazard's numeric value in each category, to represent the relative importance of the category (the higher the weighting, the more important the category)

The following sections describe the categories and their associated scoring parameters.

Probability of Occurrence

The probability of occurrence of the hazard scenario evaluated was estimated by examining the historical record or calculating the likelihood of annual occurrence. When no scenario was assessed, an examination of the historical record and judgment was used to estimate the probability of occurrence.

The hazard ranking methodology for some hazards of concern is based on a scenario event that only impacts specific areas (such as a floodplain), while others are based on their potential risk to the City as a whole. To account for these differences, the quantitative hazard ranking methodology was adjusted using professional judgement. The limitations of this analysis are recognized; nonetheless, there is value in summarizing and comparing the hazards using a standardized approach to evaluate relative risk.

Table 19-1 summarizes the scoring parameters for probability of occurrence.

Table 19-1. Values and Weights for Probability of Occurrence

Level	Benchmark Value	Numeric Value	Weighting
Unlikely	A hazard event is not likely to occur or is unlikely to occur with less than a 1 percent-annual-chance probability.	0	30%
Rare	Between 1 and 10 percent annual probability of a hazard event.	1	
Occasional	Between 10 and 100 percent annual probability of a hazard event.	2	
Frequent	100 percent annual probability; a hazard event may occur multiple times per year.	3	

Consequence

Consequence represents the expected vulnerability and impact associated with the hazard. This is rated for three subcategories: vulnerability of people; vulnerability of property; and economic impacts on the community. A numeric value based on defined benchmarks is assigned for each subcategory, and a factor is applied to those values representing the relative importance of each subcategory. The total numeric value for consequence is the sum of the factored numeric values for each subcategory. Table 19-2 summarizes the scoring parameters for consequence.

Adaptive Capacity

Adaptive capacity describes a jurisdiction's administrative, technical, planning/regulatory and financial ability to protect from or withstand a hazard event. Mitigation measures that can increase a jurisdiction's capacity to withstand and rebound from events include codes or ordinances with higher standards to withstand hazards due to design or location; deployable resources; or plans and procedures for responding to an event.

A rating of "weak" for adaptive capacity means a jurisdiction does not have the capability to effectively respond, which increases vulnerability. A "strong" adaptive capacity means the jurisdiction does have the capability to effectively respond, which decreases vulnerability. These ratings were assigned using the results of the core capability assessment. Table 19-3 summarizes the scoring parameters for adaptive capacity.

Climate Change

Current climate change projections were evaluated as part of the hazard ranking to account for potential increases in severity or frequency of the hazard. This is important because the hazard ranking helps guide and prioritize the mitigation strategy as a long-term future vision for mitigating the hazards of concern. The potential impacts that climate change may have on each hazard of concern are discussed in the risk assessment chapters for each hazard. Table 19-4 summarizes the scoring parameters for climate change.

Level	Benchmark Value	Numeric Value	Factor	Weighting
Population (Numeric Value x 3)				**30%**
None	No population vulnerable to the hazard	0	3	
Low	14 percent or less of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	1		
Medium	15 to 29 percent of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	2		
High	30 percent or more of population is exposed to a hazard with potential for measurable life-safety impact, due to its extent and location.	3		
Property (Numeric Value x 2)				
None	No property vulnerable to the hazard	0	2	
Low	Property vulnerability is 14 percent or less of the total number of structures for your community.	1		
Medium	Property vulnerability is 15 to 29 percent of the total number of structures for the community.	2		
High	Property vulnerability is 30 percent or more of the total number of structures for the community.	3		
Economy (Numeric Value x 1)				
None	No estimated loss due to the hazard	0	1	
Low	Loss estimate is 9 percent or less of the total replacement cost for the community.	1		
Medium	Loss estimate is 10 to 19 percent of the total replacement cost for the community.	2		
High	Loss estimate is 20 percent or more of the total replacement cost for the community.	3		

Table 19-2. Values and Weights for Consequence

Level	Benchmark Value	Numeric Value	Weighting
Weak	Weak, outdated, or inconsistent plans, policies, codes, or ordinances in place; no redundancies; limited to no deployable resources; limited capabilities to respond; long recovery.	1	30%
Moderate	Plans, policies, codes/ordinances in place and meet minimum requirements; mitigation strategies identified but not implemented on a widespread scale; jurisdiction can recover but needs outside resources; moderate jurisdiction capabilities.	0	
Strong	Plans, policies, codes/ordinances in place and exceed minimum requirements; mitigation/protective measures in place; jurisdiction has ability to recover quickly because resources are readily available, and capabilities are high.	-1	

Table 19-3. Values and Weights for Adaptive Capacity

Level	Benchmark Value	Numeric Value	Weighting
Low	No local data are available; modeling projects are uncertain on whether there is increased future risk; confidence level is low (inconclusive evidence).	1	10%
Medium	Studies and modeling projections indicate a potential for exacerbated conditions due to climate change; confidence level is medium to high (moderate evidence).	2	
High	Studies and modeling projections indicate exacerbated conditions and increased future risk due to climate change; very high confidence level (strong evidence, well documented, and acceptable methods).	3	

Table 19-4. Values and Weights for Climate Change

19.1.2 Total Ranking Score

The total ranking score based on the categories described above is calculated using the following equation:

Risk Ranking Score Equation

Ranking Score= [(Consequence on Population x 3) + (Consequence on Property x 2) + (Consequence on Economy x 1) x 0.3] + [Adaptive Capacity x 0.3] + [Climate Change x 0.1] + [Probability of Occurrence x 0.3]

Using this equation, the highest possible ranking score is 6.9. The higher the number, the greater the relative risk. Based on the score for each hazard, a hazard ranking is assigned to each hazard of concern as follows:

- Low = Values less than 3.9
- Medium = Values between 3.9 and 4.9
- High = Values greater than 4.9.

19.2 Hazard Ranking Results

The methodology described above was used to develop initial hazard rankings. The planning team then reviewed the rankings and altered the results as warranted based on local knowledge and experience in managing hazard events.

The only change made to the calculated ranking results was to increase the rank of the flood hazard from low to medium. The ranking calculation for flood was based on vulnerability and impacts calculated for the mapped 1 percent-annual-chance floodplain. However, the City's experience of extreme atmospheric river precipitation events during the winters of 2022/2023 and 2023/2024 shows that these events cause widespread flooding across the City's urban areas, well outside the mapped floodplains. They therefore increase the level of impact on people and property citywide. With increased frequency of such events being seen with a changing climate, the probability of occurrence increases as well. Therefore, the flood hazard rank of “low,” based only on the mapped floodplain, was changed to “medium” for this HMP.

The hazard ranking for Los Angeles is detailed in the following tables that present the stepwise process for the ranking:

- Table 19-5 shows the unweighted numeric values assigned for the probability of occurrence for each hazard.
- Table 19-6 shows the numeric values assigned for each subcategory of consequence for each hazard. Results are shown for applying the subcategory factors, but not the category-wide weighting.
- Table 19-7 shows the unweighted numeric values assigned for adaptive capacity and climate change for each hazard.
- Table 19-8 shows the total weighted hazard ranking scores for each hazard of concern.

The hazard ranking shown in Figure 19-1 includes the entire planning area and may not reflect the highest risk for every APC. Ranking results for each APC are presented in Appendix E.

Table 19-5. Probability of Occurrence for Hazards of Concern

Hazard of Concern	Probability	Numeric Value
Dam Failure	Occasional	2
Drought	Frequent	3
Earthquake	Occasional	2
Extreme Cold	Rare	1
Extreme Heat	Occasional	2
Flood	Occasional	2
Landslide	Occasional	2
Sea-Level Rise, Coastal Flood, Erosion	Occasional	2
High Winds	Frequent	3
Tsunami and Seiche	Rare	1
Wildfire	Frequent	3

Table 19-6. Consequence Rating for Hazards of Concern

	Population			Property			Economy			Total Impact Rating (Population + Property + Economy)
Hazard of Concern	Consequence	Numeric Value	Multiplied by Factor (3)	Consequence	Numeric Value	Multiplied by Factor (2)	Consequence	Numeric Value	Multiplied by Factor (1)	
Dam Failure	Medium	2	6	Medium	2	4	High	3	3	13
Drought	Medium	2	6	Medium	2	4	Medium	2	2	12
Earthquake	Medium	2	6	High	3	6	High	3	3	15
Extreme Cold	Medium	2	6	Medium	2	4	Medium	2	2	12
Extreme Heat	Medium	2	6	Low	1	2	Medium	2	2	10
Flood	Low	1	3	Low	1	2	Low	1	1	6
Landslide	Medium	2	6	Medium	2	4	Medium	2	2	12

Hazard of Concern	Population			Property			Economy			Total Impact Rating (Population + Property + Economy)
	Consequence	Numeric Value	Multiplied by Factor (3)	Consequence	Numeric Value	Multiplied by Factor (2)	Consequence	Numeric Value	Multiplied by Factor (1)	
Sea-Level Rise, Coastal Flood, Erosion	Low	1	3	Low	1	2	Low	1	1	6
High Winds	Medium	2	6	Medium	2	4	Medium	2	2	12
Tsunami and Seiche	Low	1	3	Low	1	2	Low	1	1	6
Wildfire	Medium	2	6	Medium	2	4	Low	1	1	11

Table 19-7. Adaptive Capacity and Climate Change Ratings for Hazards of Concern

Hazard of Concern	Adaptive Capacity		Climate Change	
	Level	Numeric Value	Level	Numeric Value
Dam Failure	Moderate	0	Medium	2
Drought	Moderate	0	High	3
Earthquake	Moderate	0	Low	1
Extreme Cold	Moderate	0	Medium	2
Extreme Heat	Moderate	0	High	3
Flood	Moderate	0	High	3
Landslide	Moderate	0	High	3
Sea-Level Rise, Coastal Flood, Erosion	Moderate	0	High	3
High Winds	Moderate	0	Medium	2
Tsunami and Seiche	Moderate	0	Low	1
Wildfire	Moderate	0	Medium	2

Table 19-8. Total Hazard Ranking Scores for the Hazards of Concern

Hazard of Concern	Probability x 30%	Total Consequence x 30%	Adaptive Capacity x 30%	Climate Change x 10%	Total Hazard Ranking Score
Dam Failure	0.6	3.9	0	0.2	**4.7**
Drought	0.9	3.6	0	0.3	**4.8**
Earthquake	0.6	4.5	0	0.1	**5.2**
Extreme Cold	0.3	3.6	0	0.2	**4.1**
Extreme Heat	0.6	3	0	0.3	**3.9**
Flood	0.6	1.8	0	0.3	**4.0**[a]
Landslide	0.6	3.6	0	0.3	**4.5**
Sea-Level Rise, Coastal Flood, Erosion	0.6	1.8	0	0.3	**2.7**
High Winds	0.9	3.6	0	0.2	**4.7**
Tsunami and Seiche	0.3	1.8	0	0.1	**2.2**
Wildfire	0.9	3.3	0	0.2	**4.4**

Note: Low (yellow) = Values less than 3.9; Medium (orange) = Values between 3.9 and 4.9; High (red) = Values greater than 4.9

a. As described in Section 19.2, the flood hazard rank was revised from low to medium based on recent experience with citywide urban flooding outside of mapped floodplains. The score of 4.0 used here was assigned to provide a rank of medium.

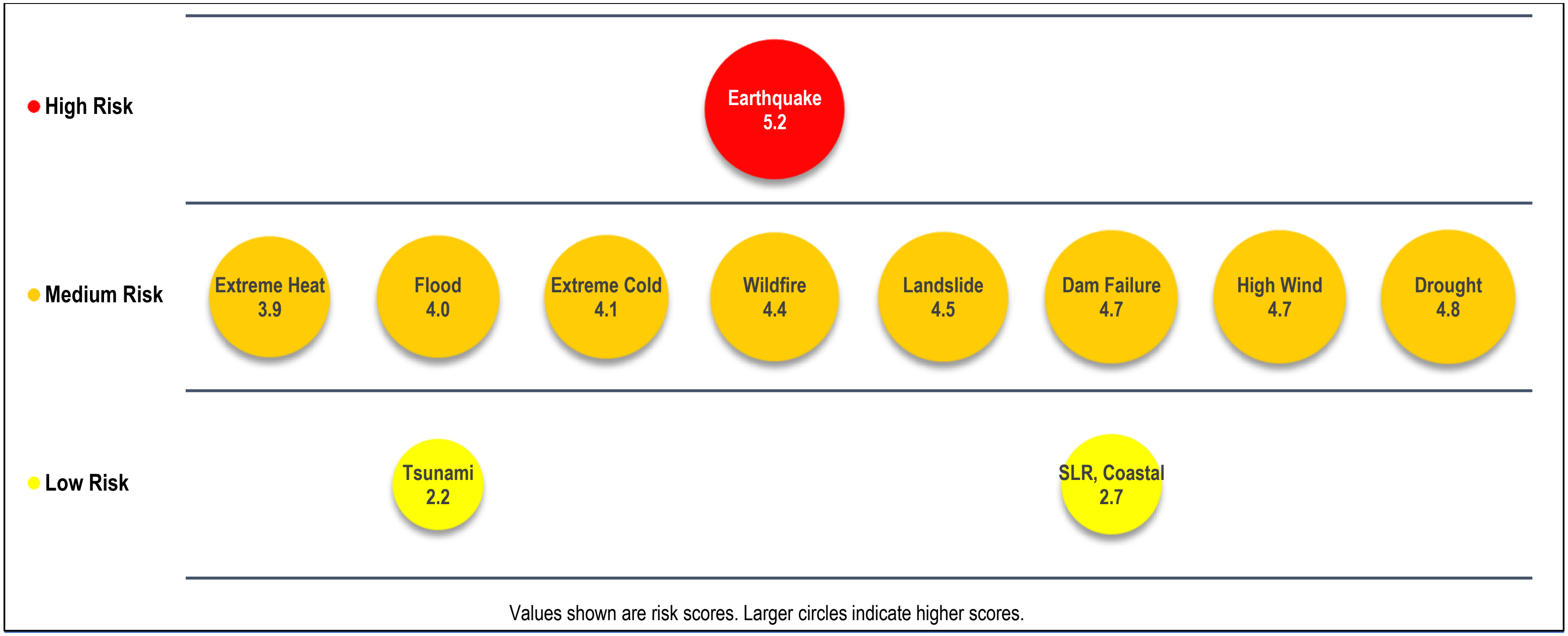


Figure 19-1. Hazard Risk Ranking

PART 4—RISK ASSESSMENT FOR HAZARDS OF INTEREST

20. Civil Disorder

20.1 General Background

Civil disorder, also referred to as civil disturbance or civil unrest, is defined as any public disturbance involving acts of violence by assembly of three or more persons, which causes immediate danger or results in damage or injury to the property or person of any other individual, as defined in 18 U.S. Code 232. In this context, civil disorder is distinct from peaceful public celebrations, lawful protests, and acts of civil disobedience (such as peaceful but unpermitted protests, sit-ins, and comparable protest actions).

Civil disorder can include riots, demonstrations, threatening individuals, or assemblies that have become disruptive and may cause harm to others. Civil disorder is typically a symptom of, and a form of protest against, perceived major sociopolitical problems. Typically, the severity of the action coincides with the level of public outrage. In addition to a form of protest against perceived major sociopolitical problems, civil disorder can also arise out of union protest, institutional population uprising, or large celebrations that become disorderly.

Civil unrest results in urban conflicts that arise from highly emotional, social, and economic issues. Tensions can build quickly in a community over a variety of issues and span a variety of actions, including labor unrest, strikes, civil disobedience, demonstrations, riots, and rebellion. Civil disorder may arise from acts of civil disobedience caused by political grievances and urban economic conflicts or a decrease in the supply of essential goods and services. Tension in these areas creates a potential for violence. When tensions are high, it takes a small or seemingly minor incident, rumor, or act of injustice to ignite groups within a crowd to riot and act violently. This is particularly true if community relations with authorities are part of the problem.

The effects of civil disorder vary with the type, severity, scope, and duration of the event. Essential services (e.g., electricity, water, public transportation, communications) may be disrupted or property damage, injuries, and loss of life may occur. Facilities most at risk are government buildings, schools, utilities, and correctional facilities.

Civil disorder and disturbances are human-caused hazards with tremendous potential for causing damage to the City of Los Angeles. These events are especially harmful when they occur in times of heightened societal tension, as previously mentioned.

20.1.1 Cascading and Compounding Impacts

Incidents of civil disorder generally do not influence or impact the initiation of natural hazards. Despite this, it is plausible that humans could be the cause of a wildfire event or a dam/levee/canal failure. Such an incident would most likely be classified as an arson or terrorist event. Additionally, human actions during a natural disaster can cause civil disorder. During a wildfire or flood event, some homeowners may choose not to evacuate, increasing the risk posed to first responders when responding to the disaster. An example of this would be homeowners not evacuating during a fire and then fleeing to firefighters engaged in firefighting tasks for assistance when the fire gets close, causing the firefighting efforts to be abandoned.

Depending on the size and scope of the incident, civil disorder may lead to widespread urban fire, utility failure, transportation interruption, and environmental hazards. The most significant secondary effect is interruption of government services, which can lead to several of the aforementioned secondary effects. The extent of cascading impacts will vary significantly based on the extent and nature of the act of civil disorder. Civil disorder may also lead to numerous environmental impacts, depending upon the behavior of individuals involved in acts of civil disorder.

20.2 HAZARD PROFILE

20.2.1 Past Events

The history of civil disorder events in Los Angeles includes one federal disaster declaration: DR-942 in April 1992, which was titled "Fire during a period of civil unrest." The same event also triggered a state emergency proclamation.

The following are the major past civil disorder events that have affected the planning area:

- **January 2023, Tyre Nichols Protests**—A few hundred demonstrators gathered on January 28, 2023, outside of the Los Angeles Police Department (LAPD) headquarters as part of a nationwide rally to protest the death of Tyre Nichols at the hands of Memphis police officers. Civil rights groups mobilized for protests in cities across the United States to protest the use of force employed by Memphis police officers that led to Nichols' death.
- **June 2022, Dobbs v. Jackson Supreme Court Decision Protests**—Hundreds of demonstrators marched through the streets of Los Angeles protesting the U.S. Supreme Court's decision in *Dobbs v. Jackson* that overturned the right to abortion outlined in *Roe v. Wade*. Demonstrators gathered outside of multiple buildings in downtown Los Angeles in concert with other demonstrations across the country in opposition to this ruling. LAPD eventually declared an unlawful assembly after skirmishes between demonstrators and law enforcement, but no injuries were reported.
- **May–June 2020, Protest for Racial Justice**—Following the death of George Floyd at the hands of police officers in Minneapolis, nationwide protests were sparked all over the United States. In Los Angeles, these demonstrations resulted in looting, vandalism, numerous injuries of demonstrators and police officers, property damage, and arson.
- **July 2013, Trayvon Martin Protests**—Hundreds of demonstrators gathered on July 20, 2013, at the Los Angeles Federal Courthouse as part of a nationwide rally to honor

Trayvon Martin. Civil rights groups mobilized for protests in cities across the United States amid charged emotions over a not-guilty verdict in the shooting death of the unarmed Florida teenager.

- **June 2000, Los Angeles Lakers' Victory Riot**—Hundreds of fans rioted when the Los Angeles Lakers beat the New Jersey Nets to win the National Basketball Association (NBA) championship. The crowd was mostly peaceful until minutes after the game, when a group of fans began throwing debris at limousines and smashing the windows of a sport utility vehicle and a television news van.
- **1992, Civil Unrest in Los Angeles**—On April 29, 1992, immediately following and in response to the acquittal of four white police officers charged with the use of excessive force in their beating of black motorist Rodney King, thousands of people in Los Angeles took part in mass law breaking, including taking goods from stores and setting fires. These acts lasted about four days. An estimated 63 lives were lost, and material damage was estimated to be $1 billion. Approximately 600 fires were set, and about 12,000 people were arrested (HISTORY 2017). In addition to the LAPD, about 10,000 soldiers from the California National Guard and thousands of soldiers from the United States Army and Marines were deployed to suppress the crowds.

20.2.2 Location

Information is key for acts of civil disorder. There must be knowledge of who the demonstrators are; when, where, and why they are demonstrating; what their capabilities are; and what their possible course of action is. Because of their often spontaneous nature, it is difficult to identify specifics. The entire City of Los Angeles is potentially vulnerable to instances of civil disorder, but certain City facilities and landmarks may face elevated levels of risk to this hazard.

Government facilities, historical and cultural landmarks, prisons, and universities are common sites where crowds and mobs may gather. Civil disorder can erupt anywhere, but the most likely locations are those areas with large population groupings or gatherings. Civil disorder can also occur in proximity to locations where a "trigger event" occurred, as was the case in the 2020 unrest following the death of George Floyd.

20.2.3 Frequency

Large civil disorder events with injuries, fatalities, and public property damage occur infrequently. This type of large event may attract notable national and international media coverage. Smaller gathering events occur more frequently in the planning area but with fewer injuries and less property damage.

Generally, acts of civil disorder become more frequent during periods of rising social tensions. These periods of rising tension often surround a major political election or civil outrage after an act of injustice, such as police brutality. As the frequency of these acts of civil disorder increase, they often remain centered around police stations or other government buildings.

20.2.4 Severity

Civil disorder severity depends on the nature of the disturbance. The high-profile World Trade Organization (WTO) 2000 conference in Seattle resulted in mass arrests, civilian curfews, and over $20 million in property damage. Compare this episode to the Rodney King beating, which led to 4 days of violence, $1 billion in property damage, and left 63 people dead. It is not possible to predict the potential severity of civil disorder events; however, it is necessary to think about the potential of such a disturbance.

There is a low, medium, and high range that can be associated with the severity of the hazard of civil disorder. Such disturbances may be derived from a political rally or professional sports celebration getting out of control. Police dispatched to control traffic corridors or intrusion on private property would be considered a low severity civil disorder. Disruption of businesses and potential property damage are assessed as a moderate act of civil disorder. In these cases, police intervention would be required to restore order without employing chemical agents or physical force. A severe act of civil disorder would involve rioting, arson, looting, and assault, where police action (tear gas, curfews, and mass arrests) may be required. Depending on the level of severity, civil disorder events have tremendous potential for causing damage to City residents and property.

20.2.5 Warning Time

Civil disorder often occurs with little to no warning; however, certain events may trigger riots. As demonstrated in the Past Events section and discussions regarding severity, riots can occur as a result of controversial court rulings, unfair working conditions, or general unrest. Riots can also be triggered as a result of favorable or unfavorable sports outcomes. Thus, there will generally be a certain degree of warning time preceding a potential act of civil disorder; however, achieving certainty that an incident is imminent is not possible. Intelligence-sharing regarding crowd size and behavior and known group presence can assist authorities in determining the possibility of an organized nonviolent demonstration turning violent. When a controversial event has media coverage with a large gathering of people, LAPD is on high alert along with other Emergency Operations Organization divisions.

20.2.6 Scenario

A civil disorder scenario with significant impact could involve an incident leading to multiple fatalities, millions of dollars in property damage, and the City police being unable to control the unrest for several days. Acts of civil disorder spilling into event centers such as the Los Angeles Coliseum, City Hall, other government buildings, or the Los Angeles International Airport (LAX) would prove especially challenging from an incident management perspective.

20.3 Vulnerability and Impacts

20.3.1 Population

The entire population of the Los Angeles is vulnerable to the civil disorder hazard, but those who live in densely populated areas and those living near colleges/universities, correctional facilities, landmarks, courthouses, and other areas of significance may have a higher vulnerability and are thus more susceptible to the effects of civil disorder. Acts of civil disorder occurring in densely populated centers, such as shopping malls or near concert venues, may present an increased risk to bystanders.

20.3.2 Property

All City property and assets are vulnerable during events of civil disorder and may be damaged or destroyed during acts of civil disorder. As previously mentioned, certain facilities may face additional risk due to social and political tensions as these facilities are viewed as representing certain social systems or political philosophies. LAPD facilities, specifically LAPD Headquarters, likely face the highest potential risk because several demonstrations or rallies have originated at this location in the past. Other police and fire facilities have also been targeted during past events.

Previous experience indicates that critical response facilities (police stations, fire stations) are at risk during periods of civil disorder. In addition, critical operating facilities, such as City Hall and Parker Center, are at risk of damage or destruction or may be rendered inoperative for some period of time. Depending on the event, all City-owned assets may be susceptible to damage or destruction as a result of civil disorder. Because of the unpredictability of civil disorder events, no specific estimates can be made concerning potential losses.

20.3.3 Community Lifelines

Community lifelines are especially vulnerable during events of civil disorder because City-owned or leased facilities are often the primary targets of these events. Civil disorder can damage or destroy any facility, block roads and infrastructure from being used, and cause interruptions in service impacting essential facilities. Certain community lifelines, such as those categorized under the Federal Emergency Management Agency's (FEMA) Safety and Security Lifeline category, may be specifically targeted because these facilities represent the presence of government authority in society (FEMA 2024a).

20.3.4 Environment

Civil disorder can result in environmental impacts, but they are likely to be limited. Fires that are started during civil unrest events can spread throughout the City, burning through areas that may include natural resources or hazardous materials and facilities. The majority of damage caused by civil disorder affects people and property.

20.3.5 Historic and Cultural Resources

Acts of civil disorder in and around historical and cultural landmarks have the potential to result in major property damage, including complete destruction of these sites. These landmarks face significant danger if vehicles, explosive devices, or fire-starting materials, such as lighter fluid, matches, or propane tanks, are used to destroy property during civil disorder events.

20.3.6 Economy

Civil disorder events carry the potential impact of disrupting the local economy due to property damage. Smashed windows, looted stores, and burned down buildings are a few examples of potential damages caused by acts of civil disorder that may result in the closure of local businesses until repairs are made. In severe cases, small businesses may not be able to afford repairs or lost revenue due to civil disorder events, resulting in the closure of their businesses. Acts of civil disorder may also discourage tourists from visiting certain areas of the City, further impacting the local economy.

20.4 Effects of Future Change on Vulnerability and Impacts

There is a correlation between civil disorder and higher population density in larger cities. Based on the previous occurrences of instances of civil disorder, larger and more densely populated cities with culturally diverse populations tend to be more vulnerable to this hazard. As a City with considerable cultural diversity, Los Angeles may be subject to civil disorder in the future.

Because civil disorder is a short-term, human-caused hazard, no climate change impacts are associated with the hazard. However, adverse effects on the human populace due to climate change could create a possibility for events of civil disorder. An example would be critical resource shortages (such as water) during a drought, or prolonged power and service issues resulting from floods or severe storms causing the populace to become angry with the government.

21. Cyber Threats

21.1 GENERAL BACKGROUND

This risk assessment includes cyber attacks and cyber terrorism under the inclusive hazard of cyber threats. The terms often are used interchangeably, though they are not the same. While all cyber terrorism is a form of cyber attack, not all cyber attacks are cyber terrorism.

21.1.1 Types of Cyber Threats

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, organization, and nation (FEMA 2013).

Public and private computer systems are likely to experience a variety of cyber attacks, from blanket malware infection to targeted attacks on system capabilities. Cyber attacks specifically seek to breach IT security measures designed to protect an individual or organization. The initial attack is followed by more severe attacks for the purpose of causing harm, stealing data, or financial gain. Organizations are prone to different types of attacks that can be either automated or targeted in nature. Table 21-1 describes the most common cyber attack mechanisms faced by organizations today.

Cyber Terrorism

Cyber terrorism is defined as a premeditated attack or the threat of such an attack by non-state actors intending to use cyberspace to cause physical, psychosocial, political, economic, ecological, or other damage (Maryville University 2022). Such disruptions can be driven by religious, political, or other motives. Like traditional terrorism tactics, cyber terrorism seeks to evoke very strong emotional reactions, but it does so through information technology rather than a physically violent or disruptive action.

Cyber Attacks

A cyber attack is an intentional and malicious crime that compromises a personal or organizational digital infrastructure, often for financial or terror-related reasons. Such attacks vary in nature and are perpetrated using digital mediums (such as email and social media) or social engineering (such as phishing scams) to target human operators. 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 attacks become increasingly frequent and destructive.

Table 21-1. Common Mechanisms for Cyber Attacks

Type	Description
Advanced Persistent Threat (APT)	An attack in which the attacker gains access to a network and remains undetected. APT attacks are designed to steal data instead of cause damage.
Denial of Service Attacks	Attacks that focus on disrupting service to a network in which attackers send high volumes of data until the network becomes overloaded and can no longer function.
Drive-by Downloads	Malware is downloaded unknowingly by the victims when they visit an infected site.
Malvertising	Malware downloaded to a system when the victim clicks on an affected ad.
Man-in-the-Middle Attacks	Man-in-the-middle attacks mirror victims and endpoints for online information exchange. In this type of attack, the attacker communicates with the victims, who believe they are interacting with a legitimate endpoint website. The attacker is also communicating with the actual endpoint website by impersonating the victim. As the process goes through, the attacker obtains entered and received information from both the victim and endpoint.
Password Attacks	Third-party attempts to crack a user's password and subsequently gain access to a system. Password attacks do not typically require malware, but rather stem from software applications on the attacker's system. These applications may use a variety of methods to gain access, including generating large numbers of generated guesses, or dictionary attacks, in which passwords are systematically tested against all of the words in a dictionary.
Phishing	Malicious email messages that ask users to click a link or download a program. Phishing attacks may appear as legitimate emails from trusted third parties.
Ransomware	When an individual downloads ransomware, often through phishing, an execution of code results in encryption of all data and personal files stored on the system. The victim then receives a message that demands a fee in the form of electronic currency or cryptocurrency for the decryption code.
Socially Engineered Trojans	Programs designed to mimic legitimate processes (e.g., updating software, running fake antivirus software) with the end goal of human-interaction caused infection. When the victim runs the fake process, the Trojan is installed on the system.
Unpatched Software	Nearly all software has weak points that may be exploited by malware. Most common software exploitations occur with Java, Adobe Reader, and Adobe Flash. These vulnerabilities are often exploited as small amounts of malicious code are often downloaded via drive-by download.

Source: (CISCO 2024, Baker 2023, Baker 2022, UC Berkely Information Sercurity Office 2024)

Cyber terrorism has three main types of objectives (Wilson 2008):

- **Organizational**—Cyber terrorism with an organizational objective includes specific functions outside of or in addition to a typical cyber attack. Terrorist groups today use the internet on a daily basis. This daily use may include recruitment, training, fundraising, communication, or planning. Organizational cyber terrorism can use platforms such as social media as a tool to spread a message beyond country borders and instigate physical forms of terrorism. Additionally, organizational goals may use systematic attacks as a tool for training new members of a faction in cyber warfare.
- **Undermining**—Cyber terrorism with undermining as an objective seeks to hinder the normal functioning of computer systems, services, or websites. Such methods include

defacing, denying, and exposing information. While undermining tactics are typically used due to high dependence on online structures to support vital operational functions, they typically do not result in grave consequences unless undertaken as part of a larger attack. Undermining attacks on computers include the following:

- Directing conventional kinetic weapons against computer equipment, a computer facility, or transmission lines to create a physical attack that disrupts the reliability of equipment.
- Using electromagnetic energy, most commonly in the form of an electromagnetic pulse, to create an electronic attack against computer equipment or data transmissions. By overheating circuitry or jamming communications, an electronic attack disrupts the reliability of equipment and the integrity of data.
- Using malicious code directed against computer processing code, instruction logic, or data. The code can generate a stream of malicious network packets that disrupt data or logic by exploiting weaknesses in computer software or security practices. This type of cyber attack can disrupt the reliability of equipment, the integrity of data, and the confidentiality of communications.

- **Destructive**—The destructive objective for cyber terrorism is what organizations fear most. Through the use of computer technology and the internet, the terrorists seek to inflict destruction or damage to tangible property or assets and even death or injury to individuals. There are no cases of pure destructive cyber terrorism as of the date of this plan.

21.1.2 Cascading and Compounding Impacts

Critical infrastructure such as power grids, transportation networks, and water supply systems are vital to the City's economy and prosperity. The cascading effect of a cyber attack beyond the system that is under attack can be even more devastating, creating chaos to major economic, food, and health systems and lasting for long periods of time. Interdependencies among critical infrastructure are often necessary to meet design specifications, but also lead to undesirable situations when a fault or attack occurs in one and escalates to other connected locations. Escalations may disrupt the operation of the involved critical infrastructure and create feedback loops that can initiate and propagate disturbances in unforeseen ways due to the complexity of the connected systems (Reddy Palleti, et al. 2021).

In the event of a major cyber attack targeting critical infrastructure such as the power grid, catastrophic, widespread, and lengthy blackouts should be expected. Other loss of electrical services may impact wastewater systems, causing contamination and additional widespread service outages. Consumption of contaminated water and widespread loss of electrical power may result in devastating consequences to public health and safety, including illness, death, and instances of civil disorder (Ben-Meir 2021).

21.2 HAZARD PROFILE

21.2.1 City of Los Angeles Executive Order

In 2013, Mayor Eric Garcetti of the City of Los Angeles signed an executive order creating the Cyber Intrusion Command Center ("the Center"). Its mission is to lead cyber security preparation and response across City departments. The Center is led by the Office of the Mayor and collaborates with multiple federal and intergovernmental agencies, including the Federal Bureau of Investigation (FBI), Secret Service, State of California Military Department, and Joint Regional Intelligence Center. The executive order calls on the Center to do the following (Garcetti 2013):

- Facilitate the identification and investigation of cyber threats and intrusions against City assets.
- Ensure incidents are quickly, properly, and thoroughly investigated by the appropriate law enforcement agency.
- Facilitate dissemination of cyber security alerts and information.
- Provide a uniform governance structure accountable to City leadership.
- Coordinate incident response and remediation across the City.
- Serve as an advisory body to City departments.
- Sponsor independent security assessments to reduce security risks.
- Ensure awareness of best practices.

Following this executive order in 2013, Los Angeles became the home of the first city-based Cyber Lab in the United States in 2017. This Cyber Lab builds off the second executive directive, which created a Cyber Intrusion Command Center with the purpose of leading cyber security preparations and response for Los Angeles. The Cyber Lab will alert small to medium-sized businesses to attacks as they occur and alert larger businesses about automated updates they can incorporate into their own cyber defense systems. It is the hope that this cyber security platform will evolve into a mutual exchange of cyber threat information and data with private sector partners (LACITY 2017).

21.2.2 Past Events

The 24-hour Cyber Intrusion Command Center actively monitors all physical police events around the City. Statistics are not available for occurrences in the City of Los Angeles, but the number of attacks is increasing. Cyber attacks on U.S. companies occur daily, and the quantity and quality of information being hacked, stolen, destroyed, or leaked is becoming more of a problem for consumers, government entities, and businesses. The following are recent local cyber attacks affecting the City of Los Angeles residents:

- **December 2022**—A ransomware attack on the Housing Authority of the City of Los Angeles (HACLA) resulted in over 15 terabytes of files being stolen. According to HACLA's website, the agency has served more than 105,500 people and has an operating budget of more than $1 billion. No information on exact data that was stolen or damaged was reported, but officials stated no cyber ransom was paid.
- **September 2022**—A ransomware attack targeting the Los Angeles Unified School District affecting over 540,000 students and 70,000 district employees. No information on exact data that was stolen or damaged was reported, but officials stated no cyber ransom was paid. It is unknown when the attack first occurred.
- **June 2017**—A global cyber attack affected the Los Angeles County government website, the Harbor Department/Port of Los Angeles, and other major companies. The virus appeared to be related to terrorism. No personal data was said to be compromised, but the County Board of Supervisors website was shut down, along with the Port of Los Angeles, halting import/export for several days.
- **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 a $28,000 cyber ransom in Bitcoin. The district had a cyber security insurance policy to cover such attacks.
- **December 16, 2016**—Hackers compromised the Los Angeles County Departments of Health and Mental Health's patient information. This affected over 700,000 people.
- **May 2016**—Cyber attack targeted 1,000 Los Angeles County employees with a phishing email. A Nigerian national was charged with the crime.
- **September 2014**—A months-long cyber attack on the University of California, Los Angeles hospital system compromised personal information for up to 4.5 million people.

There have been no state or federal disaster declarations for Los Angeles issued for this hazard.

21.2.3 Location

This hazard is not geography-based. Attacks can originate from any computer to affect any other computer in the world. If a system is connected to the internet or operating on a wireless frequency, it is susceptible to exploitation. Targets of cyber attacks can be individual computers, networks, organizations, business sectors, or governments. Financial institutions and retailers are often targeted to extract personal and financial data that can be used to steal money from individuals and banks. The most affected sectors are finance, energy and utilities, defense and aerospace, communication, retail, and health care. Both public and private operations in the City of Los Angeles are threatened on a near-daily basis by the millions of currently engineered cyber attacks developed to automatically seek technological vulnerabilities.

21.2.4 Frequency

Cyber attacks are experienced on a daily basis, often without being noticed. Up-to-date virus protection software used in public and private sectors prevents most cyber attacks from becoming successful. Programs that promote public education on virus protection are an effective way to mitigate cyber threats. It is reported that cyber attacks on the Port of Los Angeles have almost doubled since the pandemic. The Port of Los Angeles, one of the busiest ports in the world, faces frequent cyber threats aimed at slowing down economies. Due to the unpredictable nature of cyber threats, the frequency of these events cannot be accurately projected at this time.

> **Cyber Security at the Port of Los Angeles**
>
> In 2014, the Port of Los Angeles became the first seaport in the United States to establish a Cyber Security Operations Center staffed with a dedicated cybersecurity team (POLA 2024). As the cyber threat and risk landscape continues to rapidly change, the Port continues to research and invest in the most current technology and safeguards to further enhance its cybersecurity management capabilities.
>
> The Port of Los Angeles made history in 2021as the first seaport in the world to establish a Cyber Resilience Center (CRC)—an automated port community cyber defense solution (POLA 2024). The CRC was collaboratively designed by Port of Los Angeles supply chain stakeholders and is operated by IBM. Focused on detecting and protecting against malicious cyber incidents potentially impacting cargo flow, this first-of-its-kind system also greatly improves the quality, quantity, and speed of cyber information sharing, as well as the collective knowledge of threats within the Port's ecosystem.

21.2.5 Severity

There is no official index for measuring the severity of a cyber attack, but the following statistics provide a sense of the scale of such incidents:

- An international study released by Malwarebytes in 2016 found that cyber ransom threats caused 34 percent of business victims to lose revenue and 20 percent had to stop business immediately (Malwarebytes 2016).
- The Malwarebytes study also reported that nearly 60 percent of all cyber ransom attacks demanded over $1,000, over 20 percent asked for more than $10,000, and 1 percent asked for over $150,000 (Malwarebytes 2016).
- According to the White House, ransomware payments reached over $400 million globally in 2020, further illustrating the growing financial impacts of cyber attacks (WH.gov 2021).

21.2.6 Warning Time

Due to the unpredictable nature of cyber threats and their associated attacks, accurate methods of predicting these attacks are unknown at this time.

21.2.7 Scenario

A cyber attack against all City departments would leave City employees locked out of all files and computer systems until the issue is resolved, which could be hours, days, or weeks. These events also have the potential to compromise sensitive data and information from City departments. Significant financial risk would likely be a threat to the City in this event, as attackers aim to gain financial incentives from their criminal activities.

Additionally, a cyber attack could cripple city services, disable communications, and disrupt traffic management (rail, auto, air) and emergency and essential services, all of which could have compounding consequences. The recovery time from such an incident could be days, weeks, months, or even longer.

21.3 VULNERABILITY

21.3.1 Population

The City's entire population is vulnerable to cyber attacks personally or at places of employment. All populations who directly use a computer or receive services from automated systems are vulnerable to cyber terrorism.

Socially Vulnerable Populations

Socially vulnerable populations with existing medical conditions, limited access to cell phone service due to economic hardship, and limited transportation access may be especially vulnerable during acts of cyber terrorism or other cyber threats. As transportation systems are affected and may go offline, those with limited transportation access may be unable to travel to obtain essential items such as food and water. Individuals in need of immediate and consistent medical attention may also be unable to contact emergency services in their time of need, potentially leading to prolonged suffering and/or death.

21.3.2 Property

Buildings and structures in general are usually not impacted by cyber threats, but systems operated by electronics and computers are vulnerable. Examples of City assets using these systems include critical facilities, such as water treatment plants, power grid stations, and other government facilities.

21.3.3 Community Lifelines

All community lifelines that are operated by electricity and/or a computer system are vulnerable to cyber threats.

21.3.4 Environment

The natural environment is not vulnerable to cyber threats and thus would not risk damage. It would only be through a secondary effect that the environment could be affected by a cyber attack, such as the disruption or failure of wastewater treatment facilities.

21.3.5 Historic and Cultural Resources

The City's HistoricPlacesLA online database aids in monitoring and evaluating historical landmarks to promote restoration activities and manage mitigation efforts aimed at protecting against future hazard events (LAHR 2017). Cyber threats and their associated attacks may pose significant risk to the electrical systems located near or within these historic and cultural resources. Attacks that target these systems carry the potential to cause large electrical fires which may severely damage or completely destroy these City resources.

21.4 IMPACTS

21.4.1 Population

Because it is difficult to predict the target of cyber threats, assessing potential impacts is also difficult. All populations who directly use a computer or receive services from automated systems are susceptible to cyber threats. If a cyber attack targeted a facility storing or manufacturing hazardous materials, individuals living adjacent to these facilities would be susceptible to the secondary effects, should the attack successfully cause a critical failure at that facility.

Socially Vulnerable Populations

Certain types of attacks would be most likely to affect specific segments of the population:

- If the cyber attack targeted the City's power or utility grid, individuals with medical needs would be impacted the most. These populations are most at risk because many of the life-saving systems they rely on require power.
- If an attack occurred during months of extreme hot weather, those 65 years of age and older would be susceptible to the effects of the lack of climate control. These individuals might require an air-conditioned shelter operating on a back-up generator.

21.4.2 Property

A catastrophic cyber attack can have far-ranging effects on public and private infrastructure systems. Cyber attacks can cause physical damage if real assets or end consumers are affected by service disruption. This might occur if cyber attacks target industries related to utilities, life support, transportation, human services, or telecommunications. In many cases, attacks on these systems initially will not be detected, and any malfunction will be thought to be system failure.

21.4.3 Community Lifelines

All community lifelines that are operated by electricity and/or a computer system are susceptible to impacts from cyber threats. Cyber attacks may affect structures if any critical electronic systems suffer service disruption. For instance, a cyber attack may cripple the electronic system that controls a cooling system or pressure system within critical infrastructure. This may result in physical damage to the structure from components overheating or an explosion if pressure relief systems are rendered inoperable.

21.4.4 Environment

The natural environment is not expected to be directly impacted by cyber threats. The impacts of cyber threats and their associated attacks are expected to impact the environment only through secondary or cascading impacts such as the release of hazardous material or wastewater into the environment due to a system failure.

21.4.5 Historic and Cultural Resources

Cyber threats may have some impact on natural, historic, and cultural resources, depending on the attacker's justification or reasoning behind the attack. In the event of a cyber attack or act of cyber terrorism, attackers would likely ignite a large electrical fire through the overloading of electrical systems. As many of the 19th century structures identified in the HistoricPlacesLA database are made of highly flammable wood clapboards, an electrical fire as a result of a cyber attack would quickly devastate these City resources (Los Angeles City Planning 2023a).

21.4.6 Economy

A cyber attack can have significant impacts on the economy. Investigations into the stock price impact of cyber attacks show that identified target firms suffer losses of 1 to 5 percent in the days after an attack (Congressional Research Service 2004). The Center for Strategic and International Studies (CSIS) estimated in 2018 that cyber crime cost the world almost $600 billion or 0.8 percent of global gross domestic product (GDP) (CSIS 2018).

21.5 Effects of Future Change on Vulnerability and Impacts

The City of Los Angeles will continue to be impacted and compelled to respond to cyber threats in the future. The nature of these threats is projected to evolve in sophistication over time. The City has taken a proactive position in its cyber security efforts with the establishment of the Cyber Intrusion Command Center and is expected to remain vigilant in its efforts to prevent attacks from occurring or disrupting business operations. The reality remains that many computers and networks in organizations of all sizes and industries around the United States will continue to suffer intrusion attempts on a daily basis from viruses and malware that are passed through websites and emails. As cyber threats continue to evolve and become increasingly sophisticated, these threats become more challenging to identify, prevent, and recover from their consequences.

Generally, cyber threats will not be affected by climate change. However, climate change has many direct and indirect impacts on the human population, including influences on human behavior.

Currently, all relevant City departments are collectively working on a citywide cyber security incident response plan that will address surveying and identifying potential cyber threats and providing a unified response, coordinated communication, and recovery.

22. Geomagnetic Storm (Space Weather)

22.1 GENERAL BACKGROUND

22.1.1 What Is Space Weather?

All weather on Earth, from the surface of the planet into space, is influenced by the small changes the sun undergoes during its solar cycle. These variations are referred to as space weather. The variability of the sun's output is wavelength dependent:

- Most of the energy from the sun is emitted in the visible wavelengths. The output from the sun in these wavelengths is nearly constant and changes by only 0.1 percent over the course of the 11-year solar cycle.
- At ultraviolet or UV wavelengths, solar irradiance is more variable, with changes up to 15 percent over the course of the 11-year solar cycle. This has a significant effect on the absorption of energy by ozone and in the stratosphere.
- At still shorter wavelengths, like extreme ultraviolet, solar irradiance changes by 30 to 300 percent over a period of minutes. These wavelengths are absorbed in the upper atmosphere, so they have minimal effect on the climate of Earth.
- At the other end of the light spectrum, at infrared wavelengths, solar irradiance is very stable and only changes by a percent or less over the solar cycle.

Sudden bursts of plasma and magnetic field structures from the sun's atmosphere—called coronal mass ejections (CMEs)—together with sudden bursts of radiation, or solar flares, all cause weather effects here on Earth. Extreme space weather can cause damage to critical infrastructure, especially the electric grid. It can produce electromagnetic fields that induce extreme currents in wires, disrupting power lines, and even causing widespread blackouts. In severe cases, it produces solar energetic particles, which can damage satellites used for commercial communications, global positioning, intelligence gathering, and weather forecasting.

Other types of space weather can affect the atmosphere. Energetic particles penetrating into the atmosphere can change chemical constituents. These changes in minor species such as nitrous oxide can have long-lasting consequences in the upper and middle atmosphere; however, it has not been determined if these have a major effect on the Earth's climate.

The National Oceanic and Atmospheric Administration (NOAA)'s Space Weather Prediction Center has developed space weather scales to communicate to the general public the current and future space weather conditions and their possible effects on people and systems. NOAA Space Weather Prediction Center studies have determined that different types of space weather may occur separately.

All space weather events (geomagnetic storms, solar radiation storms, solar flare radio blackouts, solar radio bursts, and cosmic radiation) can affect aviation operations at LAX and Van Nuys Airport. Geomagnetic storm events would have a particular impact on a wide range of airport systems. Effects include degradation or loss of HF radio transmission and satellite navigation signals, navigation system disruptions, and avionics errors. Airport dispatchers use space weather forecasts for flight planning at high latitudes, especially for polar routes.

22.1.2 Cascading and Compounding Impacts

Cascading and compounding impacts are those that result when one type of hazard event triggers one or more other hazard events, which may in turn trigger still others. The most likely secondary effect of geomagnetic storms and other space weather events on residents, businesses, and visitors to the City of Los Angeles is disruption of the electric power grid. Geomagnetic storms and other space weather events can have an effect on advanced technologies, which has a direct effect on daily life. The following are notable cascading impacts associated with geomagnetic storm events in particular:

- 911 and all emergency communications could be affected.
- GPS systems could be made inoperable.
- Air traffic control could be impacted.
- People traveling in airplanes could be dosed with radiation.
- Utility losses can cause a reduction in employment and in wholesale and retail sales, require utility repairs, and increase medical risk.
- The City may lose tax revenue.
- Disruption of the electric power grid could hinder government and business operations and impact residents' lives.

22.2 Hazard Profile

22.2.1 Past Events

Table 22-1 is a sample of recent geomagnetic storm and space weather events affecting North America, as recorded by the NOAA Space Weather Prediction Center. NOAA Space Weather Prediction Center issues warnings in advance for these storm events that occur continuously and vary in strength and severity for the Earth (NOAA 2023a). There have been no state or federal disaster declarations for Los Angeles issued for this hazard.

Date of Event	Event Type	Description
September 13–19, 2023	Geomagnetic Storms	A G2 moderate storm warning was issued following the indication of an impending CME. Impacts were projected to be minor, and an increased likelihood of seeing an aurora (natural light display in the sky) at higher latitudes depending on conditions was noted.
March 27–29, 2017	Geomagnetic Storms	Moderate geomagnetic storm condition occurred because of a coronal hole effect affecting the Earth's magnetosphere. This, in turn, affected power grids, radios, and aurora visible as low as New York to Wisconsin to Washington State.
October 13–15, 2016	Geomagnetic Storms	Moderate geomagnetic storm condition occurred because of a coronal hole effect affecting the Earth's magnetosphere. In turn this affects power grids, radios, and aurora visible as low as New York to Wisconsin to Washington State.
September 28–30, 2016	Geomagnetic Storms	Moderate geomagnetic storm condition occurred as effects from a large coronal hole high speed stream. In turn this affects power grids, radios, and aurora more intense in the northern latitudes.
May 9, 2016	Geomagnetic Storms	Strong geomagnetic storm condition with solar winds were observed.
September 12–14, 2014	Geomagnetic storms	Moderate geomagnetic storms occurred as result of the CME associated with solar flares. For several days, it affected HF radio communications. Aurora watchers in the northern U.S. could see activity.
December 2006	Geomagnetic storms and solar flares	This event disabled Global Positioning System (GPS) signal acquisition over the United States.
October 2003	Solar Flares	A series of solar flares affected satellite-based systems and communications. A one-hour long power outage occurred in Sweden as a result of the solar activity. Aurorae were observed as far south as Texas and the Mediterranean countries of Europe.
March 13, 1989	Space weather storm	A space weather storm disrupted the hydroelectric power grid in Quebec, Canada. This system-wide outage lasted for 9 hours and left 6 million people without power.

Table 22-1. Past Space Weather Events

Source: (NOAA 2023a)

22.2.2 Location

Different types of space weather can affect different technologies in the City of Los Angeles. Solar flares can produce strong x-rays that degrade or block high-frequency radio waves used for radio communication during events known as radio blackout storms. Solar energetic particles can penetrate satellite electronics and cause electrical failure. These energetic particles also block radio communications at high latitudes during solar radiation storms. CMEs can cause geomagnetic storms on Earth and induce extra currents in the ground that can degrade power grid operations and modify the signal from radio navigation systems (GPS), causing accuracy to be degraded.

There is no defined area of space weather exposure. The entirety of the City of Los Angeles is potentially exposed to the direct and indirect impacts of geomagnetic storms or other space weather events.

22.2.3 Frequency

Geomagnetic storms are common and may occur multiple times per year or a few times every few years (Means 2021). Space weather events occur daily but do not always affect residents in the City of Los Angeles. They are all monitored and reported by NOAA's Space Weather Prediction Center.

22.2.4 Severity

The severity of space weather, specifically geomagnetic storm events, can be far-reaching, as virtually all infrastructure and services depend on the electric power grid. Ground currents induced during geomagnetic storms can melt copper windings of transformers, which are the primary components of power distribution systems. Power lines traversing the planning area can pick up the currents and spread the problem over the entire area.

22.2.5 Warning Time

Geomagnetic storms can be predicted, providing some time to prepare for a potential disturbance. The time from the prediction of a geomagnetic storm to its onset typically varies between 16 and 90 hours, although an event may begin within tens of minutes of an observed sunspot eruption. After a space weather event begins, it may still take hours or days to reach its maximum (DHS 2019a).

Space weather prediction services in the United States are provided primarily by NOAA's Space Weather Prediction Center and the U.S. Air Force's Weather Agency, which work closely together to address the needs of civilian and military user communities. The Space Weather Prediction Center draws on a variety of data sources, both space and ground-based, to provide forecasts, watches, warnings, alerts, and summaries as well as operational space weather products to civilian and commercial users. Notifications disseminated by the Space Weather Prediction Center are detailed below (NOAA n.d.-d):

- A **Geomagnetic Storm Watch** is based on a forecast of an impending geomagnetic storm in one to three days. The lead time is largely determined by the velocity of the driving CME. Some of the historically fastest CMEs arrived in well under a day; 16- to 18-hour transits have been observed. A watch carries a lower degree of confidence in intensity and in timing than a warning, but it provides longer-range notification.
- A **Geomagnetic Storm Warning** is based on upstream solar wind observations. A warning carries a higher degree of confidence in timing and intensity than a watch but is generally issued only minutes to a couple of hours in advance. Forecasters at the

Space Weather Prediction Center can supply additional comments in a warning and may be able to indicate the specific level of intensity expected.

- A **Geomagnetic Storm Alert** is based on ground-based magnetometer observations and indicates a specific storm threshold being reached. In other words, an alert describes an event already underway.
- A **Geomagnetic Sudden Impulse Expected Warning** is issued when a shock has been observed in the upstream solar wind data. Based on the post-shock velocity, space weather forecasters generate a warning period of when this disturbance is expected at Earth.
- The **Geomagnetic Sudden Impulse Summary** is issued when a shock is observed on Earth, as indicated by the response of ground-based magnetic observatories. This can confirm the arrival of an anticipated CME.

22.2.6 Scenario

A regional blackout power outage for several hours caused by a major geomagnetic storm event would cripple the City and the surrounding region. Emergency communication systems may be temporarily blocked, causing the delayed and uncoordinated response of emergency services. All community lifelines would be on generator back-up power if available, and the local economy would likely face heavy impacts due to widespread disruption in business activity.

22.3 Vulnerability and Impacts

22.3.1 Population

The vulnerability posed to the City's population in the event of a geomagnetic storm or other space weather event is minimal. The main vulnerabilities are satellite operations, HF radio communications, and the local power grid that is heavily relied upon within the City. The sun's activities may cause extreme space weather events that can affect the City's population, mainly by power blackout events.

Socially Vulnerable Populations

Socially vulnerable populations with existing medical conditions, limited access to cell phone service due to economic hardship, and limited access may be especially vulnerable during geomagnetic storm events. Geomagnetic storms primarily disrupt communication systems, which may impact the response time of police, fire, and medical personnel. Individuals in need of immediate and consistent medical attention may be unable to contact emergency services in their time of need, potentially leading to prolonged suffering and/or death.

22.3.2 Property

It is unlikely that space weather would have a negative effect on property and structures, but a magnetic or blackout event caused by geomagnetic storms would affect public and private infrastructure systems.

22.3.3 Community Lifelines

All community lifelines that are operated by electricity and/or a computer system are vulnerable to geomagnetic storm events. It is unlikely that geomagnetic storms would have a negative effect on property and structures, but a magnetic storm or blackout caused by space weather would affect public and private infrastructure systems.

22.3.4 Environment

New research published in October 2023 has found that geomagnetic storm events cause disruptions in migration patterns for nocturnal birds and other migratory animals (Gulson-Castillo, et al. 2023). There are currently no other known environmental impacts from space weather events that include geomagnetic storms.

22.3.5 Historic and Cultural Resources

Geomagnetic storm events are unlikely to cause direct impacts to these historic sites, but voltage surges caused by geomagnetic storms and other space weather may be created, leading to widespread blackouts (USGS n.d.). These surges of electricity may also lead to cascading impacts, such as urban structural fires, which carry the potential to significantly damage or even destroy these historic and cultural landmarks.

22.3.6 Economy

Geomagnetic storm events may pose a significant threat to the local economy in the planning area. According to NOAA, space weather including geomagnetic storms impact four segments of the economy: satellites and satellite communications, electric power distribution, the airline industry, and users of Global Navigation Satellite Systems (including precision agriculture, construction, surveying, transportation, and customer location-based services) (NOAA n.d.-c). Most impacts of geomagnetic storms within these categories involve service interruptions, asset damages, and some human health impacts, such as radiation exposure, that may lead to increased medical costs and lost earnings. Impacts to these segments of the economy carry the potential to significantly reduce economic activity in the City of Los Angeles.

22.4 EFFECTS OF FUTURE CHANGE ON VULNERABILITY AND IMPACTS

22.4.1 Climate Change

According to NASA, variations in Earth's magnetic field, such as those experienced during geomagnetic storm events, are not contributing to today's climate change (NASA 2021). Some research suggests that geomagnetic storm events contribute to climate change, such as the reversal of magnetic poles, shift of magnetic pole locations, and geomagnetic excursions (temporary changes in the intensity of Earth's magnetic fields). However, the latest NASA research has found "no evidence that Earth's climate has been significantly impacted by the last three magnetic field excursions, nor by any excursion event within at least the last 2.8 million years" (NASA 2021).

23. Hazardous Material Release

23.1 GENERAL BACKGROUND

Incidents related to the manufacture, transportation, storage, and use of hazardous materials are assumed to be accidental with unintended consequences. Hazardous materials are present in nearly every city and county in facilities that produce, store, or use them. Hazardous materials are transported along interstate highways and railways daily. For example, water treatment plants use chlorine on-site to eliminate bacterial contaminants. Even the natural gas used in every home and business is a dangerous substance when a leak occurs.

Title 49 of the Code of Federal Regulations (CFR) lists thousands of hazardous materials, including gasoline, insecticides, household cleaning products, and radioactive materials. State-regulated substances that have the greatest probability of adversely affecting the community are listed in the California Code of Regulations (CCR), Title 19.

23.1.1 Incident Types

The following are the most common type of hazardous material incidents:

- **Fixed-Facility Hazardous Materials Incident**—This is the uncontrolled release of materials from a fixed site capable of posing a risk to health, safety, and property. It is possible to identify and prepare for a fixed-site incident because laws require those facilities to notify state and local authorities about what is being used or produced at the site. Hazardous materials at fixed sites are regulated nationally by the United States Environmental Protection Agency (EPA) and in California by the California EPA.
- **Hazardous Materials Transportation Incident**—A hazardous materials transportation incident is any event resulting in uncontrolled release of materials during transport that can pose a risk to health, safety, and property. The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration is responsible for regulating and ensuring the safe and secure movement of hazardous materials to industry and consumers by all modes of transportation, including pipelines. Transportation incidents are difficult to prepare for because there is little, if any, notice about what materials could be involved should an accident happen. Hazardous materials transportation incidents can occur at any place within the country, although most occur on interstate highways, major federal or state highways, or major rail lines. Many incidents occur in sparsely populated areas and affect very few people.
- **Interstate Pipeline Hazardous Materials Incident**—A significant number of interstate natural gas, heating oil, and petroleum pipelines run through the State of California. These are used to provide natural gas to the utilities in California and to transport these materials from production facilities to end-users.

23.1.2 Oversight

Hazardous materials management is regulated by federal and state codes. In the City of Los Angeles, the Fire Department is the designated enforcement agency. The State Fire Marshal and the federal Pipeline and Hazardous Materials Safety Administration (PHMSA) enforce oil and gas pipeline safety regulations. PHMSA also enforces hazardous material transport regulations pursuant to its interstate commerce regulation authority (USDOT 2023).

The Department of Toxic Substances Control (DTSC), a division of the State of California Environmental Protection Agency, acts to protect the State from exposure to hazardous wastes by cleaning up existing contamination and looking for ways to reduce the hazardous waste produced in the state (DTSC 2023). DTSC regulates hazardous waste in California primarily under the authority of the federal Resource Conservation and Recovery Act and the California Health and Safety Code. Other laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, clean-up, and emergency planning.

DTSC reviews and monitors legislation to ensure that proposed regulations reflect DTSC goals. DTSC's major program areas develop regulations and consistent policies and procedures. Under the Resource Conservation and Recovery Act, DTSC has the authority to implement permitting, inspection, compliance and corrective action programs to ensure that people who manage hazardous waste follow state and federal requirements. As such, the management of hazardous sites in Los Angeles is under regulation by DTSC, to ensure that state and federal regulations pertaining to hazardous waste are followed.

Businesses are required to disclose all hazardous materials and waste above certain designated quantities that they use, store, or handle at their facility. They must prepare chemical inventory and business emergency plans, review the plans regularly, and perform annual training. Any release or possible release of hazardous material must be reported to the California Office of Emergency Services (Cal OES) Warning Center pursuant to Section 11004 of Title 42 of the U.S. Code (Cal OES 2023c). Businesses using certain regulated substances (a list of about 260 specific flammable or toxic chemicals) must develop a risk management plan. The risk management plan includes analysis of operations on-site and projection of off-site consequences with accompanying mitigation plans.

Business practices and the laws that regulate them have changed dramatically over the years. Many businesses, through intentional action, lack of awareness, or accidental occurrences, have contamination in and around their property. The City retains a list of properties that were once contaminated and are now clean as well as a few properties that are contaminated with a clean-up process underway.

23.1.3 Cascading and Compounding Impacts

Hazardous material releases have the potential to cause major disruptions to local businesses that house hazardous materials. Additionally, hazardous material releases carry the potential to disrupt major businesses in the planning area. Depending on the severity of the release event, this could result in additional economic impacts to the region, such as prolonged business closures or supply chain disruptions.

23.2 Hazard Profile

23.2.1 Past Events

Table 23-1 lists the number of hazardous material incidents reported to Cal OES Warning Center by year and spill site type for the years 2018 through 2022. Additional historical hazardous material spill report data is available on Cal OES website. The records show that a total of 1,039 hazardous materials spills occurred over five-year timeframe in the City of Los Angeles.

Table 23-1. Hazardous Material Spills in the City of Los Angeles

Spill Site	2018	2019	2020	2021	2022	Total
Airport	6	5	17	17	39	**84**
Industrial Plant	4	3	2	21	3	**33**
Merchant/Business	27	29	23	1	28	**108**
Military Base	0	0	1	0	0	**1**
Oil Field	1	2	1	1	2	**7**
Other	11	11	10	9	7	**48**
Pipeline	0	0	1	1	0	**2**
Railroad	64	55	40	31	34	**224**
Refinery	0	0	0	1	0	**1**
Residence	31	54	49	47	48	**229**
Road	30	30	27	34	24	**145**
School	6	2	2	3	2	**15**
Service Station	11	5	1	6	5	**28**
Ship/Harbor/Port	5	2	6	6	6	**25**
Treatment/Sewage Facility	1	1	0	1	0	**3**
Utilities/Substation	0	0	1	1	1	**3**
Waterways	15	22	13	15	18	**83**
Total	**212**	**221**	**194**	**195**	**217**	**1,039**

Source: (Cal OES 2023b)

Notable recent hazardous materials incidents include the following:

- **October 31, 2022, Los Angeles International Airport (LAX) Carbon Dioxide Leak**—Four people were sickened, including one in critical condition after a carbon dioxide leak from an electrical room at the Los Angeles International Airport (LAX).

- **March 17, 2022, Atwater Village Chemical Spill**—Residents in Atwater Village were ordered to shelter-in-place following a chemical leak that occurred during the transport of a hazardous material. The leak occurred when a small valve broke, causing a plume of smoke to be released into the air. Nearby residents complained of an unusual odor, but no deaths, injuries, or other damage resulted from this incident.
- **October 2015 – February 2016, Aliso Canyon Gas Leak**—This natural gas leak in the Santa Susana Mountains near the Los Angeles neighborhood of Porter Ranch released over 130,000 pounds of methane into the atmosphere every hour, and it took months to be sealed. It began October 23, 2015, at Southern California Gas' large underground natural gas storage facility, 20 miles northeast of Los Angeles. The leak forced the evacuation of over 1,700 homes in the Porter Ranch community. Over 2 million metric tons of greenhouse gases were released into the atmosphere. Although the leak was not within the City's boundaries, it did affect nearby City of Los Angeles residents and schools.
- **January 17, 1994, Northridge Earthquake**—Over 100 releases of hazardous materials were reported because of the earthquake. Of these, 23 involved releases of natural gas, 10 involved liquid chemicals at educational institutions, and 8 involved the release of various hazardous materials at medical facilities. Gas leaks or chemical reactions triggered fires, which destroyed or damaged nine university science laboratories. Rupture of a high-pressure natural gas line under Balboa Boulevard in Granada Hills resulted in a fire that damaged utility lines and adjacent homes. A petroleum pipeline leak released 4,000 barrels of crude oil into the Santa Clara River north of Los Angeles and caused fires in the Mission Hills area.
- **October 1, 1987, Whittier Narrows Earthquake**—This earthquake caused thousands of natural gas lines breaks and leaks.
- **August 8, 1972, GATX Tank Farm Explosion**—Explosions ripped through a tank farm in a chemical storage area at Los Angeles Harbor, touching off an inferno that illuminated much of San Pedro for more than three hours. At least 21 of the silo-like cylinders were destroyed, spilling highly inflammable solvents and chemicals. About 50 of the 250 firefighters battling the blaze suffered chemical burns on their legs, but none were seriously injured.
- **December 17, 1976, SS Sansinena Explosion**—A bulk oil tanker, the SS Sansinena, exploded in the Port of Los Angeles, killing 9 people, injuring 46, and causing an estimated $21.6 million in damage. The tanker was empty. Poor maintenance and operating procedures on board the ship were identified as the cause of the explosion.

A state emergency proclamation was issued for the Aliso Canyon Gas Leak. There have been no federal disaster declarations related to hazardous material release in Los Angeles.

23.2.2 Location

The following locations have the potential of hazardous material releases:

- **Business and Industrial Areas**—Retail, manufacturing, and light industrial firms are areas of concern. These facilities have the highest concentration of hazardous materials at fixed facilities in the City of Los Angeles due to their manufacturing operations. Each business is required to file a detailed, confidential plan with the Fire Department regarding materials on-site and safety measures taken to protect the public. Additionally, the increasing use of lithium batteries has contributed to a rise in fires and hazmat responses. These batteries are prevalent in tools, toys, E-mobility devices, automobiles, and battery storage systems, both residential and commercial. The growing use has led to more lithium battery-related fires, attributed to misuse, non-UL approved devices, thermal and physical trauma, and improper storage and disposal. Once these batteries undergo trauma, such as in a fire, they are considered hazardous waste and must be disposed of properly.

- **Agricultural Areas**—Accidental releases of pesticides, fertilizers, and other agricultural chemicals may be harmful to both humans and the environment. Agricultural pesticides are transported daily in and around the City of Los Angeles enroute to their destination in rural areas.
- **Illegal Drug Operations**—Illegal operations such as laboratories for fentanyl and methamphetamine pose a significant threat. Laboratory residues are often dumped along roadways or left in rented hotel rooms, creating a serious health threat to unsuspecting individuals and to the environment. Additional effects of illegal drug operations within the City of Los Angeles include:
  - Various fentanyl transit hubs present high-risk areas for nationwide distribution, leading to a significant increase in fentanyl-related overdoses and hazmat responses.
  - Honey oil (liquefied marijuana derivative) extraction labs have caused numerous explosions and fires, with a noticeable uptick in incidents over recent years, resulting in fatalities. All but one type of extraction process is illegal in the City of Los Angeles, leading to significant hazardous material complications. Manufacturers utilize a range of flammable products for extraction, posing recognized hazards in small personal labs to large commercial operations.
  - Illegal marijuana cultivation presents another hazardous material challenge in Los Angeles. Despite the legal cultivation and sale of marijuana in Los Angeles, many operations remain illegal, evading detection by citizens and public safety responders. The primary hazards include the use of banned fertilizers and pesticides, disregarding both California and U.S. regulations on toxicological grounds. These facilities often fail to adhere to city regulations for the storage and disposal of such products.
- **Illegal Dumping Sites**—Hazardous wastes such as used motor oil, solvents, or paint are occasionally dumped in remote areas of the City of Los Angeles or along roadways, creating a potential health threat to unsuspecting individuals and to the environment.
- **Pipelines**— Pipelines in the City transport hazardous liquids and flammable substances such as natural gas, oil, and petroleum. Incidents can occur when pipes corrode, are damaged during excavation, are incorrectly operated, or are damaged by other forces.

23.2.3 Frequency

Hazardous material incidents may occur at any time, given the presence of transportation routes dividing the planning area, the location of businesses and industry that use hazardous materials, the presence of scattered illegitimate businesses such as clandestine drug laboratories at any given time, and the improper disposal of hazardous waste. Table 23-1 lists 1,039 incidents that occurred in the City over a 5-year timeframe. The probability of occurrence for the hazardous material hazard cannot be accurately determined at this time.

23.2.4 Severity

Table 23-2 shows the number of injuries and fatalities associated with hazardous material spills reported to Cal OES Warning Center from 2018 through 2022. Additional historical hazardous material spill report data is available on the Cal OES website. The records show that 92 people have been injured and 34 fatalities have occurred within a 5-year timeframe in the City of Los Angeles.

Table 23-2. Injuries and Fatalities from Hazardous Material Spills in the City of Los Angeles

Severity	2018	2019	2020	2021	2022	Total
Number of Injuries	38	10	15	17	12	**92**
Number of Fatalities	8	9	4	5	8	**34**
Total	**46**	**19**	**19**	**22**	**20**	**126**

Source: (Cal OES 2023b)

Hazardous material releases also affect the environment through contamination of soil, waterways (storm drains, creeks, rivers, flood channels, harbors, ports, etc.), drinking water, and roads. Evacuation orders can affect hundreds of people. In 2022, Cal OES reported 53 incidents in the previous year that affected waterways and 20 evacuations (Cal OES 2022).

23.2.5 Warning Time

The warning time for an incident occurring at an on-site or fixed facility will vary. Incidents may be sudden without any warning, such as an explosion, or slowly developing, such as a leaking container. Facilities that store extremely hazardous substances are required to notify local officials when an incident occurs. Local emergency responders and emergency management officials would determine the need to evacuate the public or to advise sheltering in place.

Similarly to on-site hazardous material incidents, the amount of warning time for incidents associated with hazardous materials in transit (or off-site events) varies based on the nature of the incident, the scope of the incident, and the characteristics of the substance itself. If an explosion does not occur immediately following an accident, there may be time for warning of adjacent neighborhoods and enough time to facilitate appropriate protective actions.

23.2.6 Scenario

An incident involving hazardous materials being transported via ground transportation systems that cross the planning area could have a significant impact on the City. A release of hazardous materials could impact large population centers within the planning area. Advance knowledge of shipments and their contents would play a role in preparedness for this scenario, thus reducing its potential impact. The biggest issue in response to hazardous material is material identification and containment.

23.3 VULNERABILITY

23.3.1 Population

The Environmental Protection Agency's (EPA) Toxics Release Inventory (TRI) tracks the management of over 650 toxic chemicals that pose a threat to human health and the environment. U.S. facilities in industry sectors that manufacture, process, or otherwise use these chemicals in amounts above established levels must report how each chemical is managed through recycling, energy recovery, treatment, and releases to the environment. Individuals who are employed at these facilities face the greatest vulnerability of exposure to this hazard. A "release" of a chemical means that it is emitted to the air or water or placed in some type of land disposal. The information submitted by facilities to the EPA and states is compiled annually as the TRI and is stored in a publicly accessible database.

TRI facilities are required to report to EPA each year by July 1. Data are available for facilities that have submitted information since the program began in 1987. TRI on-site and off-site reports of materials disposed of or otherwise released by Los Angeles County industries for 2021 present the following data (EPA 2023e):

- Total On-Site Disposal or Other Releases—4,413,008 pounds
- Total Off-Site Disposal or Other Releases—4,549,496 pounds
- Total On-Site and Off-Site Disposal or Other Releases—8,962,504 pounds

This list includes 61 chemical types released during the 2021 reporting year. It reflects releases and other waste management activities of chemicals, but not whether, or to what degree, the public has been exposed to those chemicals. Release estimates are not sufficient to determine vulnerability or to calculate potential adverse effects on human health and the environment. TRI data, in conjunction with other information, can be used as a starting point in evaluating exposures that may result from releases and other waste management activities which involve toxic chemicals. The determination of potential risk depends on many factors, including the toxicity of the chemical, the disposal of the chemical, and the amount and duration of human or other exposure to the chemical after it is released.

Hazardous materials pose a significant risk to emergency response personnel. All potential first responders and follow-on emergency personnel in the City currently are and will be properly trained to the level of emergency response actions required of their individual position at the response scene.

Socially Vulnerable Populations

Depending on the location of the release, segments of the population may be more vulnerable to this type of event. For example, if a facility is located in a densely populated neighborhood with high rates of overcrowded units or low-income households, then these populations may face elevated vulnerability compared to the rest of the planning area. As previously mentioned, people who are employed at facilities producing elevated levels of hazardous materials also face an increased risk of exposure due to their direct contact with these hazardous substances.

23.3.2 Property

Potential losses to property caused by a hazardous material release, whether in transit or at fixed sites, are difficult to quantify. The degree of damages depends on the scale of the incident. Potential losses may include inaccessibility, loss of service, contamination, and/or potential structural and content losses. Hazardous materials can pose a serious long-term threat to property, particularly to fixed-site facilities where hazardous materials are stored.

The closure of waterways, railroads, airports, and highways as a result of a hazardous materials incident has the potential to impact the ability to deliver goods and services efficiently. Potential impacts may be local, regional, or statewide, depending on the magnitude of the event and level of service disruptions.

23.3.3 Community Lifelines

Most community lifelines house and store hazardous materials and thus are vulnerable to possible incidents caused by blockage, mechanical, or human error. Hospitals, as a community lifeline, often store large quantities of hazardous materials and may face elevated risk in the event of a spill.

Hazardous material releases have the potential to lead to major transportation route closures in the City. The closure of waterways, railroads, airports, and highways as a result of a hazard material release has the potential to impact the ability to deliver goods and services. Regarding transportation corridors, the City has more than 160 miles of freeways and 1,400 miles of major and secondary roadways that are vulnerable to hazardous material releases.

23.3.4 Environment

Hazardous materials that are released into the environment can be harmful to species and their habitat. Wastes that get into waterways will be disruptive and sometimes deadly to aquatic species. Consequentially, wastes that get into waterways can also contaminate drinking water supplies. Hazardous wastes can also leach into soils and travel with wind, which not only impacts the localized habitat but also can create issues for surrounding communities. Strict disposal regulations have been defined by organizations like the EPA to ensure that the environment and community is protected from these types of events (EPA 2023d).

23.3.5 Historic and Cultural Resources

Hazardous materials can pose a serious long-term threat to historic and cultural resources, particularly if the incident is on or near a historic or cultural site.

23.4 IMPACTS

A hazardous material release can occur almost anywhere, so all neighborhoods in City Los Angeles can experience impacts associated with this hazard. The impact will likely be localized to the immediate area surrounding the incident. The initial concern will be for people, then the environment. If contamination occurs, the entity responsible for the spill will carry out clean-up actions and will work closely with responders in the jurisdiction, Cal OES, and EPA to ensure that clean-up is done safely and in accordance with local, state, and federal laws. All significant hazardous material releases are required to be reported to the Cal OES State Warning Center.

23.4.1 Population

People near facilities producing, storing, or transporting hazardous substances are at higher risk. Populations downstream, downwind, and downhill of a released substance are particularly at risk. Depending on the characteristics of the substance released, more people in a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. People in the radius area (outside the immediate affected area) may be evacuated for precautionary reasons or told to shelter-in-place, depending on the release type and wind conditions. Hazardous substance incidents also can cause acute and chronic health issues and have an impact on long-term public health.

23.4.2 Property

The impact of a fixed-facility incident will likely be localized to the property where it occurs. It is difficult to determine potential losses to existing development because of the variable nature of a hazardous material spill. For example, a very small chemical spill in a less populated area would be much less costly and possibly limited to remediation of soil. Local building stock characteristics and the type of substance released during a spill will greatly affect the extent of property damage.

23.4.3 Community Lifelines

Potential impacts to community lifelines may include inaccessibility, loss of service, contamination, and/or potential structural and content losses if an explosion related to a hazardous material release occurs.

If a significant hazardous material release occurred, not only would life, safety, and building stock be at risk, but the economy of the City may be impacted as well. A significant incident in an urban area may force businesses to close for an extended period of time because of contamination or direct damage incurred. The potential losses to existing development vary because of the variable nature of the hazardous material spill, but costs from product loss, property damage and decontamination, and other costs can add up to millions of dollars.

23.4.4 Environment

Hazardous material releases can have obvious, direct environmental impact as well as long-term, insidious environmental damage. If spilled, hazardous substances can contaminate wells, kill wildlife, and impact ecosystems. Water pollution is an immediate concern for direct human consumption, recreation, crop irrigation, and fish and wildlife consumption. Depending on the material, pollutants can bio accumulate to differing degrees, affecting animals high on the food chain long after a spill. Hazardous material releases would not likely affect geology but could significantly impact soils and farmlands, requiring expensive remediation.

23.4.5 Historic and Cultural Resources

Unless a spill is directly adjacent to a site or if the site stores hazard materials, a hazardous materials incident is unlikely to affect historic or cultural sites.

23.4.6 Economy

Hazardous material releases can cause major economic disruptions. Not only do these events impact the companies transporting the materials, but the events may also impact facilities surrounding the location of the event. A hazardous material release can become costly quickly due to the cost of responders, response equipment, and necessary clean-up.

Hazardous material releases can lead to extended business closures that greatly affect the local economy. As businesses close and tourists are prohibited from entering the affected area, tourism may decline and public perception of the area may be permanently affected.

23.5 Effects of Future Change on Vulnerability and Impacts

The number and types of hazardous chemicals stored in and transported through the City of Los Angeles will likely continue to increase as the City continues to develop its available land. As the population grows, the number of people susceptible to the impacts of hazardous material releases is expected to increase in areas located near the storage and transport of hazardous materials.

24. OIL SPILL

24.1 GENERAL BACKGROUND

24.1.1 What Are Oil Spills?

An oil spill is a release of liquid petroleum into the environment due to human activity, resulting in pollution of land, water, or air. Oil spills can result from the release of crude oil from offshore oil platforms, drilling rigs, wells, pipelines, tank trucks, and marine tank vessels (Castranova 2016). Refined petroleum products, such as gasoline or diesel, and heavier fuels, such as bunker fuel used by cargo ships, are also sources of potential oil spills (NASA n.d.). Oil spills can be caused by people making mistakes or being careless, by equipment breaking down, by natural disasters, and by deliberate acts of terrorism, vandalism, or illegal dumping (NOAA 2019). Oil seeps, in which oil releases naturally on land or under water, usually happen slowly and are not considered to be spills (NOAA 2021a).

Spills, Slicks, and Sheens

During an oil spill on water, the oil floats, spreading out across a large area. This is called an oil slick. As the oil slick spreads, it becomes thinner and is known as an oil sheen (NOAA 2019).

24.1.2 Cascading and Compounding Impacts

Cascading impacts are the impacts that result when one type of hazard event triggers one or more other hazard events, which may in turn trigger still others. The following are notable cascading impacts associated with oil spills:

- Oil spills can impact public health.
- Oil spills can contaminate drinking water.
- Oil spills can disrupt the economy.
- Oil spills can devastate the environment.
- Those assisting with cleaning up oil spills can be impacted by being exposed to oil byproducts, dispersants, detergents, and degreasers. Drowning, heat-related illnesses, and falls also are potential hazards to those cleaning up (OSHA 2010).
- Oil spills can cause serious damage to fisheries and mariculture resources.

24.2 HAZARD PROFILE

24.2.1 Past Events

Table 24-1 outlines past oil spill events that have impacted the City of Los Angeles. No FEMA or USDA disaster declarations or proclamations related to oil spills have been issued relevant to the City of Los Angeles.

Table 24-1. Past Oil Spill Events

Date of Event	Event Type	Description
April 25, 2023	Oil Spill/Leak	An estimated 1,000 gallons of oil seeped out of the ground in West Los Angeles. A strong order was reported as a result of the oil spill, and 20 to 40 gallons of oil leaked into a nearby storm drain.
April 7, 2021	Oil Spill	An oil spill at Inglewood Oil Field resulted in an estimated 1,600 gallons of oil being released after a pipe was left open. Concerns arose involving air pollution and health effects due to the spill taking place in close proximity to nearby homes and schools.
May 19, 2015	Oil Spill	Crude oil deposits affected coastlines in the City of Los Angeles due to the nearby Santa Barbara oil spill.

Source: (ABC 7 Los Angeles 2023, Sierra Club 2021, Oceana 2021)

There have been no state or federal disaster declarations for Los Angeles issued for this hazard.

24.2.2 Location

On Land

The complex array of petroleum-related industries and distribution networks throughout California makes the state vulnerable to oil spills. According to the California Geologic Emergency Management Division WellSTAR data dashboard, there are 161,727 oil and gas wells in California, of which 31,117 are active and 37 are located on land in Los Angeles County (WellSTAR 2023).

In 2022, the Los Angeles City Council responded to health and safety concerns associated with oil and gas operations by adopting an ordinance to ban oil drilling within City limits. As of January 18, 2023, Ordinance No. 187,709 has gone into effect and deems all existing drill sites and oil/gas wells to be “a legally nonconforming use” (Los Angeles City Planning 2023d). This ordinance also prevents the drilling, redrilling, deepening, or performance of any well maintenance except in the event of a public health, safety, or environmental emergency as determined by the responsible Zoning Administrator.

Offshore

According to the WellSTAR data dashboard, Los Angeles County is home to 237 offshore oil and gas wells (WellSTAR 2023).

24.2.3 Frequency

The frequency of oil spills has generally decreased over the past few years. According to the International Tanker Owners Pollution Federation, the average number of oil spills per year in the 1970s was approximately 79 events. This number decreased by over 90 percent to approximately six oil spills per year in the 2010s and remains at a similar frequency today (ITOPF 2023a). The City of Los Angeles has experienced only two significant oil spills in the last five years, making the frequency of this hazard relatively low.

24.2.4 Severity

Depending on the origin, size, and duration of the release, an oil spill can have serious impacts on air and water quality, public health, plant and animal habitat, and biological resources (Environmental Pollution Centers 2022). The average oil spill in the United States costs approximately $16 per gallon in clean-up and damage costs, making the potential cost of a large oil spill millions or even billions of dollars (Cohen 2010).

Oil spills can range in size depending on the source and situation. Most spills are relatively small, but large spills still occur (NOAA 2020a). California's largest recorded oil spill released 4.2 million gallons of fuel off the coast of Santa Barbara in 1969 (Cart and Becker 2022).

24.2.5 Warning Time

Oil spills usually occur with little to no warning and often are difficult to stop. However, prevention measures such as inspections play a large role in minimizing spills (NOAA 2021b). The California Department of Fish and Wildfire Office of Spill Prevention and Response (OSPR) is the State's lead for response to oil spills in its inland and marine waters. OSPR aims for best achievable protection of California's natural resources. In 2014, the OSPR program expanded to cover all state surface waters at risk of oil spills from any source, including pipelines, production facilities, and the increasing shipments of oil transported by railroads. This expansion provided critical administrative funding for industry preparedness, spill response, and continued coordination with local, state, and federal government along with industry and non-governmental organizations (NGOs).

In 2021, California lawmakers enacted legislation on renewable fuels and oil spill preparedness and response. Assembly Bill (AB) 148 updated sections of the Lempert-Keene-Seastrand Oil Spill Prevention & Response Act, addressing renewable fuels. Facilities and vessels that handle renewable fuels are now within the jurisdiction of OSPR, including two new categories: renewable fuel production and renewable fuel receiving facilities (CDFW n.d.).

24.2.6 Scenario

The worst-case scenario for an oil spill event within the City of Los Angeles would include a disaster similar in magnitude to the Deepwater Horizon oil spill (in the Gulf of Mexico), where hundreds of thousands of gallons of oil are discharged into the Pacific Ocean. The Deepwater Horizon oil rig exploded and sank into the ocean, resulting in the death of 11 workers, an estimated $14.3 billion in penalties and natural resource damages, and marking the largest oil spill in the history of marine oil drilling operations (EPA 2023c). A similar event impacting the City of Los Angeles would yield devastating consequences to local ecosystems and the local economy.

24.3 VULNERABILITY AND IMPACTS

24.3.1 Population

The population within the City of Los Angeles will be most notably affected by the human health hazards caused by oil spill events. These potential human health hazards are detailed at length alongside aggravating climate change factors in Section 24.4.2.

Socially Vulnerable Communities

Broadly speaking, socially vulnerable communities (estimated to be approximately 22 percent of the City's population) are affected by oil spills in three ways:

- Oil can affect ecological processes that cause direct harm (e.g., health impacts from eating seafood with bioaccumulated oil toxins).
- Oil spill stressors can change intermediary processes (e.g., economic impacts on fishers from oil spill impacts on fish).
- Stressors can directly harm humans (e.g., health impacts from breathing oil vapors).

Socially vulnerable populations, such as residents of Los Angeles struggling to pay for their basic needs, those without ready access to medical care, and those experiencing homelessness, are those most likely to face increased risk in the event of an oil spill. People experiencing homelessness may be unable to find safe shelter to guard them from harmful pollutants being released into the air during an oil spill, increasing the potential for negative health effects that could have serious consequences if financial struggles impede ready access to medical care. Many on-land oil facilities are located in or around neighborhoods of lower socioeconomic status, which increases risk for socially vulnerable populations.

24.3.2 Property

City assets near the shoreline, large inland waterways, oil terminals and pipelines, or transportation corridors that permit the transport of oil have an increased risk of exposure. In terms of facility-related and property damage, damage may include contaminated soil, groundwater, and nearby water bodies.

24.3.3 Community Lifelines

The degree of damage to critical facilities and community lifelines depends on the scale of the incident. Oil spills may lead to road and harbor closures until response and clean-up efforts are completed. This may impact access to certain communities, work commutes, and the ability to deliver goods and services efficiently.

The Port of Los Angeles is a critical point of entry that needs to remain open and operational to maintain the vital shipping logistics required to sustain Los Angeles communities and communities across the State of California. In the event of a large-scale oil spill resulting in a Port closure, cascading impacts will be felt citywide, countywide, and statewide.

24.3.4 Environment

A spill can result in habitat loss from the physical oil slick or the release of chemicals into an area (Environmental Pollution Centers 2022). Similarly, individual organisms can be directly affected as layers of oil can prevent thermoregulation, respiration, feeding, or mobility. They can also be affected by the chemicals released that act as toxins to the organism, which can lead to stunted growth, heart damage, immune system effects, and death (NOAA 2020a). Impacts are based on extent of the spill and type of oil, but one spill has the potential to harm or kill thousands of organisms. Cleaning up a spill is difficult and results in wildlife losses even with extensive efforts (Wong 2022).

24.3.5 Historic and Cultural Resources

Oil spill events near these historic and cultural landmarks may impact these sites by negatively affecting the air quality through toxic chemical release into the atmosphere. Reduced air quality may drive visitors away from these landmarks within the impact area of the oil spill. A number of HCMs are located in close proximity to coastlines in the City of Los Angeles and would be greatly affected by the secondary effects of oil spill, including the destruction of local ecosystems, oil contamination, and expensive oil spill cleaning costs (City of Los Angeles 2023, NOAA 2020b).

24.3.6 Economy

Depending on the magnitude of the event, oil spills can produce devastating economic impacts to the affected area. Depending on an industry's reliance on seawater and marine activities, a wide range of businesses may face economic impacts following an oil spill event. In particular, the tourism and fishing industries typically face the most direct impacts. Aside from expensive clean-up costs, oil spills negatively impact tourism in the area through the disruption of recreational activities, long-term wide-scale pollution, and public perception of pollution in the area (ITOPF 2023b). This public perception piece is a major determining factor of how expediently the tourism industry is able to recover following a major oil spill event.

The fishing industry is often negatively affected by oil spills through the contamination of product, disruption in business activities, and limited access to fishing sites (ITOPF 2023b). Similar to the effects felt by the tourism industry, public perception of the cleanliness of fishing products following an oil spill will determine the extent to which the fishing industry is impacting following an oil spill.

24.4 Effects of Future Change on Vulnerability and Impacts

24.4.1 Future Development

Ordinance No. 187,709, passed in 2022 and in effect as of January 18, 2023, deems all existing drill sites and oil/gas wells to be "a legally nonconforming use" (Los Angeles City Planning 2023d). This adopted ordinance bans oil drilling within City limits.

Growth in population, urbanization, and land development near existing oil facilities may increase the exposure of people and property to oil spills. Oil spills do not typically impact buildings; however, losses may be associated with the disruption of operations and with environmental impacts.

24.4.2 Climate Change

Population

The population of the City of Los Angeles may be impacted by climate change's effects on oil spills through both direct and indirect exposure. These effects of climate change as related to oil spill exposure risks are (Environmental Pollution Centers 2023, USGS 2020):

- **Breathing in contaminated air**—Oil products contain volatile compounds which are emitted as gases during an oil spill. As climate change continues to impact wind patterns, the toxic vapors emitted during oil spills may be carried further by these changing patterns and result in increased population exposure to contaminated air.
- **Direct contact of oil with the skin**—Members of the population may come into direct contact with oil products while walking through a contaminated area (e.g., beach). Over time, sea-level rise may increase the potential for spilled oil to be spread further inland into populated areas. These contaminants may be absorbed through the skin into the body following exposure.

- **Bathing or swimming in contaminated water**—Swimming in a contaminated water stream may also result in exposure to oil contaminants. As previously mentioned, changing wind patterns and sea-level rise may contribute to contaminant spread.
- **Eating contaminated food**—Marine life living in nearby waterways may become exposed to contaminants, and when they are eaten as food, can result in human exposure. Oil spill effects on local ecosystems may be exacerbated as climate change continues to affect these ecosystems through warmer ocean temperatures.

Property and Community Lifelines

Although oil spills are unlikely to directly affect structures, one major effect of oil spills is land contamination. Land contamination results when toxic materials, such as leaked oil, contaminates an area and may lead to the death of wildlife, contaminated waterways on the property, and significant property devaluation due to associated human health hazards (EPA 2023b). As climate change increases the probability and severity of oil spills due varying weather conditions, direct impacts on local property may also increase.

Community lifelines may also be affected in the event of an oil spill through the contamination of water systems. The contamination of water systems by crude oil or other refined petroleum products could yield disastrous health effects across the City of Los Angeles and compromise resident access to clean drinking water. In rare cases, oil products contaminating local water mains may disrupt firefighting activities as firefighters must remain cautious of the potential to spread oil-contaminated water on active fires. This may result in delayed response times for urban structural fires and other fire events, which carries the potential for increased property damage and an increased threat to human safety.

Environment

When an oil spill event takes place, the environment is often most greatly impacted. Climate change impacts the probability and severity of oil spills through warmer sea temperatures and stronger storms to make oil extraction more difficult and prone to spills, while oil spills themselves contribute to human-caused climate change (The Climate Reality Project 2022). The burning of oil releases carbon dioxide into the atmosphere, increasing atmospheric pollution levels and contributing to human-caused climate change.

25. PUBLIC HEALTH HAZARDS

25.1 General Background

Many potential public health hazards exist—some known and some unknown. Epidemics, pandemics, and vector-borne diseases are among the known examples of public health hazards and directly cause the public health emergencies discussed in this chapter. 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 pandemics caused by a disease that spreads among species. This level of disease activity disrupts all aspects of society and severely affects the economy. The ongoing 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.

Although vaccines, antibiotics, and improved living conditions resulted in dramatic declines in communicable diseases in the latter part of the 20th century, infectious diseases remain a threat due to a variety of factors:

- Population growth—Overcrowding, aging, migration
- Methods of food production—Large-scale, wide distribution, importation
- Environmental changes—Drought, encroachment of humans on wild areas, climate change
- 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 Los Angeles County Department of Public Health (LACoDPH) is responsible for the general public health in the City of Los Angeles. City departments coordinate with LACoDPH, depending on the nature of the public health hazard and whether it is located in the City of Los Angeles or throughout the county or state. LACoDPH is the lead agency for public health hazard response in the City of Los Angeles and will work closely with City departments to ensure the following:

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

25.1.1 Known Risks

COVID-19

The impacts from the COVID-19 global pandemic will be long-term and change the way society views, prepares for, and responds to pandemics and other public health hazards. Throughout the pandemic, various mitigation methods have been implemented by local, national, and international agencies. Mask mandates for the public and vaccination mandates for various employment sectors were issued with mixed results. In early 2022, the National COVID-19 Preparedness Plan was released with the following goals (The White House 2022):

- Protect against and treat COVID-19.
- Prepare for new variants.
- Prevent economic and educational shutdowns.
- Continue to lead efforts to vaccinate the world and save lives.

Vector-Borne Diseases

A vector-borne disease results from an infection transmitted to humans and other animals by blood-feeding arthropods, such as mosquitoes, ticks, and fleas. The following are recently prevalent vector-borne diseases in the United States and those identified as important by Los Angeles County's Department of Public Health:

- **Saint Louis encephalitis virus—** Saint Louis encephalitis virus is caused by the bites of infected mosquitoes. The virus re-emerged in Los Angeles County in 2016 and is closely related to West Nile virus (WNV) (County of Los Angeles 2023). Most people infected with SLE virus do not have symptoms. According to the CDC, symptoms may include fever, headache, nausea, vomiting, and tiredness. There are no vaccines to prevent or medicines to treat SLE (CDC 2023b).
- **Flea-borne typhus—**Flea-borne typhus is spread by infected fleas from rodents, opossums, and free-roaming cats. When an infected flea bites a person or animal, the bite breaks the skin, causing a wound, and leaves behind flea dirt. Flea dirt can be rubbed into the bite wound or other wounds and cause an infection. People often do not know they have been bitten by a flea or exposed to flea dirt. Signs and symptoms of flea-borne typhus can include fever and chills, body aches and muscle pain, loss of appetite, nausea, vomiting, stomach pain, cough, and rash (CDC 2023a). Cases in Los Angeles County reached a record count of 171, including 3 deaths, in 2022 (County of Los Angeles 2023).
- **West Nile Virus—**WNV is caused by the bites of infected mosquitoes. The virus survives in nature in several types of birds and is transmitted by the bites of mosquitoes that feed on infected birds. WNV spreads during warm weather months when mosquitoes are most active. While not all mosquitoes carry this virus, the type of mosquito that spreads this virus is found throughout Los Angeles County. According to the CDC, approximately 80 percent of people who are infected with West Nile virus will show no symptoms. Up to 20 percent have symptoms such as fever, headache, body aches, nausea, vomiting,

and sometimes swollen lymph glands or a skin rash on the chest, stomach, and back. About 1 percent of people infected with WNV will develop severe illness, with symptoms that can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness, and paralysis.

- **Zika Virus—**Zika is a mosquito-borne disease. The most common symptoms are fever, rash, joint pain, and conjunctivitis (red eyes). The illness is usually mild, with symptoms lasting for several days to a week. However, Zika virus infection during pregnancy can cause serious birth defects. Zika virus is not spread through casual contact but can be spread by infected men to their sexual partners.
- **Other vector borne diseases—**May include malaria, Lyme disease, and typhus. While these are low risks possibilities. Malaria and Lyme disease may increase due to longer and warmer weather and changes in precipitation, and typhus due to sanitary conditions.

Zoonotic Diseases

A zoonotic disease is a disease that normally exists in animals but can be transmitted from animals to people. The following are past or present prevalent zoonotic diseases:

- **Viral Hemorrhagic Fevers—**Viral hemorrhagic fevers are caused by several families of viruses that affect multiple systems in the body. 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).
- **Anthrax—**Anthrax is a disease caused by a naturally occurring bacterium. Humans can become infected by handling products from infected animals or by breathing in anthrax spores from infected animal products (such as wool). Anthrax can be treated successfully with antibiotics. Anthrax can be used as a weapon, as happened in the United States in 2001, when it was spread through the postal system by sending letters with powder containing anthrax spores.
- **Ebola Virus Disease—**Ebola Virus Disease (EVD) is a virus common in Central African countries. A 2014 outbreak was the largest and deadliest EVD outbreak ever recorded, affecting health care systems across the globe. It was also the first time Ebola made it to the United States and Europe. Prior to 2014, only 2,200 cases of EVD had been recorded. Of these, 68 percent were fatal. Twenty percent of new EVD infections were linked to burial traditions in which family and community members wash and touch dead bodies before burial.
- **Severe Acute Respiratory Syndrome—**Severe Acute Respiratory Syndrome (SARS) is a zoonotic viral respiratory disease caused by the SARS coronavirus. The virus is thought to be transmitted most readily by respiratory droplets produced when an infected person coughs or sneezes. SARS symptoms include a high fever, headache, and an overall feeling of discomfort and body aches. Some people also have mild respiratory symptoms at the outset. About 10 to 20 percent of patients have diarrhea and may develop a dry cough. Most patients develop pneumonia. SARS was first reported in Asia in February 2003. Within several months, the illness spread to more than two dozen countries in Asia, Europe, South America, and North America. In the United States, only eight people had laboratory evidence of SARS coronavirus infection. As of May 2005,

the CDC reported there was no remaining sustained SARS transmission anywhere in the world.

Foodborne Diseases

Foodborne disease infections come from bacterial and parasitic pathogens in food sources. In 2022, the CDC's FoodNet identified 25,479 laboratory-confirmed infections, as well as 5,981 hospitalizations and 170 deaths related to these infections (CDC 2022).

Waterborne Diseases

Waterborne diseases are caused by drinking dirty or contaminated water. According to a study in 2021 by the CDC, over 7.5 million waterborne illnesses occur annually in the U.S., resulting in 118,000 hospitalizations and 6,630 deaths (Collier SA 2021). The following are prevalent waterborne diseases:

- **Cholera—**Cholera is an acute, diarrheal illness caused by infection of the intestine with the toxigenic bacterium *Vibrio cholerae*. An estimated 2.9 million cases and 95,000 deaths occur each year around the world. The infection is often mild or without symptoms but can sometimes be severe. Approximately 10 percent of infected persons will have severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours.
- **Hepatitis A—**Hepatitis A is a vaccine-preventable, communicable disease of the liver caused by the hepatitis A virus. It is usually transmitted person-to-person through the fecal-oral route or consumption of contaminated food or water.
- **Dysentery—**Dysentery is any episode in which the loose or watery stools contain visible red blood. It is most often caused by *Shigella* species or *Entamoeba histolytica*. Other symptoms of dysentery can include painful stomach cramps, nausea or vomiting, and fever. Dysentery is highly infectious and can be passed on if precautions are not taken, such as properly and regularly washing your hands.

Influenza

Influenza (flu) is a contagious respiratory illness caused by influenza viruses. Symptoms can include fever, headache, extreme tiredness, dry cough, sore throat, and muscle aches. Depending on the season, age, and prior health conditions flu can be serious and/or life-threatening. Flu season in Los Angeles County is typically the first week of October through the end of March but flu can circulate throughout the year.

25.1.2 Cascading and Compounding Impacts

Cascading impacts are the impacts that result when one type of hazard event triggers one or more other hazard events, which may in turn trigger others. The following are notable cascading impacts associated with the public health hazard:

- As evidenced by the current COVID-19 pandemic, significant economic impacts may result from public health emergencies that may take decades to correct. Large public health outbreaks could reduce the workforce significantly, causing businesses and agencies to close or be significantly impacted.
- Disease outbreaks reaching pandemic proportions can cause social impacts on a global scale (Shang, Li and Zhang 2021). Civil disorder, protests, depression, and anxiety are a few of the social impacts of the COVID-19 pandemic.
- Stigmatization may also result from public health hazards. The fear of a given public health hazard and fear of the unknown could lead to isolation, violence, and self-inflicted injury. Hospitals and healthcare providers could be overwhelmed with the "worried well" seeking care and comfort. Education and providing key and critical information can reduce and mitigate this secondary risk.

Public health hazards are not like natural hazards that have measurable cascading and compounding impacts, such as earthquakes, floods, or wildfires. This is primarily due to the fact that public health hazards do not generally affect buildings and critical infrastructure as natural hazards do.

25.2 HAZARD PROFILE

The severity of public health hazards is dependent upon the hazard and the population vulnerable to it. As the population increases, so does the risk of exposure to hazards. The key to reducing the effects of public health hazards is isolation so that the vulnerable population does not continue to spread the hazard to the uninfected population. Promoting education and personal preparedness will help to mitigate and reduce the severity of the hazard.

25.2.1 Past Events

The only Los Angeles public health hazard event for which a federal disaster declaration was issued was the COVID-19 pandemic, for which two separate declarations were issued. There have been no state emergency proclamations related to public health in Los Angeles County.

The following recent public health alerts and advisories were issued by the Los Angeles County Health Alert Network:

- September 6, 2023—LACoDPH Health Advisory: Immunize infants and older adults to protect them from severe RSV
- February 24, 2023— LACoDPH Health Advisory: Xylazine in illicit drugs increasing overdose risks
- November 16, 2022—LACoDPH Health Advisory: Increases of flea-borne Typhus
- August 23, 2022—LAC DPH Health Advisory: Recent report of Polio case in Rockland County, New York

- May 27, 2022—LACoDPH Health Alert: Contaminated ecstasy and accidental drug overdoses
- August 18, 2021—LACoDPH Health Advisory: Inappropriate exemptions may subject physicians to discipline
- December 4, 2020—LACoDPH Health Advisory: COVID-19 vaccine update
- October 29, 2020—LACoDPH Health Alert: Wound botulism cases associated with heroin
- July 17, 2020—LACoDPH Health Advisory: Resurgence of *Candida auris* in Los Angeles County
- July 4, 2020—LACoDPH Health Advisory: Increasing COVID-19 cases
- May 12, 2020—LACoDPH Health Alert: Pediatric Multi-System Inflammatory Syndrome potentially associated with COVID-19
- May 8, 2020—LACoDPH Advisory: Maintaining immunizations during COVID-19 pandemic and resuming deferred preventative care
- May 1, 2020—LACoDPH Health Advisory: COVID-19 revised isolation period and clinical symptoms
- March 4, 2020—LACoDPH: COVID-19 guidance-optimizing N95 supplies and managing mild illness

This list summarizes historical disease outbreak events in the United States:

- In Los Angeles County, as of September 8, 2023, there have been 36,651 COVID-19 deaths and 3.79 million cases of COVID-19.
- In the United States during the 2009 H1N1 influenza pandemic, there were 12,271 deaths, 59,979,608 confirmed cases of the disease, and 270,435 people hospitalized due to the illness. In California, there were 4,134 people hospitalized due to the illness and 596 deaths.
- There were two confirmed cases of SARS in California during the worldwide outbreak in 2002–2003, neither of them in Los Angeles.

25.2.2 Location

All of the planning area is susceptible to the public health hazards discussed in this chapter. While some hazards, such as WNV and Lyme disease, can have a geographic presence within the planning area, other diseases can cause exposure to the planning area from outside the local region. Local residents who travel can become exposed to diseases while abroad and bring the diseases back with them, potentially placing the region at risk for exposure. It is difficult to map the extent of public health hazards compared to others, such as floods, wildfires, and dam failures.

25.2.3 Frequency

Due to increased air travel, the growing population and the country’s aging population, the probability of a communicable disease epidemic or pandemic is a growing threat. Certain public health hazards, such as influenza, can be expected seasonally, with variations on specific strains from year to year. Additionally, tick-borne diseases are likely to increase during spring and fall, when people participate in outdoor activities such as hiking. The frequency of other health hazards is difficult to establish and depends largely on the unique circumstances surrounding a localized outbreak and its subsequent expansion into epidemics and eventually pandemics.

25.2.4 Severity

The severity of public health hazards varies from individual to individual. Typically, young children and older adults are more susceptible to acquiring communicable diseases due to developing or diminishing immune systems or experiencing adverse effects to extreme weather conditions. These populations often experience the most severe of symptoms, as their immune systems are not capable of fighting off infection or efficiently regulating temperature. In general, severity varies depending on the pathology of the disease, the health of the infected, and the availability of treatments for alleviating symptoms or curing the disease.

25.2.5 Warning Time

Public health hazards and associated emergencies can occur with very little warning. Warning time for public health hazards vary from a few hours or days to a few months, depending on the illness and outbreak to the population. Air travel can hasten the spread of a new organism and decrease the time available for early implementation of interventions (Grépin, et al. 2021). Warning time will depend on the origin of the virus or disease, rate of spread, and the amount of time needed to identify it.

25.2.6 Scenario

A public health worst-case scenario for the planning area would be a pandemic or large-scale incident of any of the public health hazards discussed in this chapter. Medical treatment facilities in the planning area would be overwhelmed and taxed beyond their capabilities as the number of patients begins to escalate. Impacts on the workforce could have acute and long-term economic impacts on primary employers in the planning area. First responders would be exposed to the public health hazards, which could deplete the medical workforce and could have profound impact on the potential escalation of the scenario.

25.3 Vulnerability and Impacts

25.3.1 Population

All residents and visitors in the planning area could be susceptible to the public health hazards discussed in this chapter. A large outbreak, epidemic, or pandemic could have devastating effects on the population. The young and the elderly, those with compromised immune systems, and those with access and functional needs are considered the most likely to experience impacts. The introduction of disease to communities with high levels of social vulnerability could have even more devastating effects due to a lack of resources, economic barriers, and inequitable access to medical services.

25.3.2 Property

None of the public health hazards discussed in this chapter would have significant measurable impact on structures or property in the planning area.

25.3.3 Community Lifelines

The public health hazards discussed in this chapter would impact health and medical community lifelines in the planning area. Health care facilities (including long-term care and clinics and even veterinary offices) have adopted the recommended "all-hazards" approach to preparedness and have prepared for the health hazards addressed in this chapter.

Emergency management and preparedness planning incorporates all response disciplines: fire, law, first responder ground and air ambulance agencies, public health, and mental and spiritual health. Planning includes identifying shelters, alternate treatment facilities, isolation capacity, and methods to immediately expand physical and human resources.

25.3.4 Environment

Public health hazards can be directly or indirectly tied to environmental impacts. Air pollution dropped suddenly during the COVID-19 lockdown between March 19, 2020, and May 7, 2020. Ground-based observations around California showed a 38 percent drop in concentrations of nitrogen dioxide and a 49 percent drop in concentrations of carbon monoxide during this period (Liu, et al. 2020). Overall improvement of air and water quality, reduction of noise, and restoration of ecology were all noted during the pandemic (Rume and Didar-Ul Islam 2020).

An increased demand for single-use plastic products during the pandemic led to more than 8 million tons of pandemic-associated plastic waste being generated globally, with more than 25,000 tons entering the global ocean. Most of the plastic is from medical waste generated by hospitals (Peng, et al. 2021). Powerful disinfectants end up in water supplies. Microplastics from degrading personal protective equipment (e.g., masks, gloves) can contribute to high concentrations found in fish, water, sediments, soils, and the air (Hartman 2021).

While many of the vectors of public health hazards discussed in this chapter (mosquitoes, rodents, fleas, ticks, and deer flies) rely on local or regional environments for their survival, the public health hazard that they carry or potentially transmit would have no significant measurable impact on the environment.

25.3.5 Historic and Cultural Resources

Public health emergencies resulting in stay-at-home orders, restrictions on travel, and other effects may impact the upkeep and maintenance of historic and cultural sites that could result in negative effects to these landmarks.

25.3.6 Economy

Public health emergencies carry the potential to significantly impact the local, county, state, and even federal economy depending on the event's severity. As seen in the current COVID-19 pandemic, economic impacts to all areas of society can be the result of an outbreak, epidemic, or pandemic. Businesses may be forced to close, families may experience economic hardship due to layoffs and other challenges, and countless other economic impacts may result from emergencies concerning public health.

25.4 Effects of Future Change on Vulnerability and Impacts

It is difficult to predict when the next public health hazard will occur and how severe it will be because viruses are always changing. The United States and other countries are constantly preparing to respond to public health hazards. The U.S. Department of Health and Human Services and others are developing supplies of vaccines and medicines. In addition, the United States has been working with the World Health Organization (WHO) and other countries to strengthen the detection of disease and response to outbreaks and pandemics. Preparedness efforts are ongoing via the California Department of Health, Los Angeles County Department of Health, and the City of Los Angeles Department of Health through community preparedness programs to empower community partners to promote local readiness, foster community resilience, and ensure comprehensive, coordinated, and effective responses.

One factor that influences the spread of public health hazards is population density. Populations that live close to one another are more likely to spread diseases. As population density increases in the City, so too will the probability of a public health hazard event to occur. When there is a significant change in a circulating strain of a virus, more of the population is susceptible and the strain could rapidly spread from person to person.

Changes in temperature and precipitation can influence seasonality, distribution, and prevalence of vector-borne diseases, which are influenced significantly by high and low temperature extremes and precipitation patterns (Rocklöv and Dubrow 2020). A changing climate may also create conditions favorable for invasive mosquitoes in California that would have a direct impact on residents and visitors in the City of Los Angeles (OEHHA 2019b).

High temperatures are among the factors associated with WNV outbreaks. Warmer temperatures associated with climate change can accelerate mosquito development, biting rates, and the incubation of the disease within a mosquito (EPA 2022f). Mild winters are associated with increased WNV transmission due, in part, to less mosquito and resident bird mortality. Warmer winter and spring seasons may allow for transmission to start earlier. Such conditions also allow more time for virus amplification in bird-mosquito cycles, increasing the potential for mosquitoes to transmit WNV to people (Hoover and Barker 2016).

Drought is an important predictor of WNV. Record hot temperatures and extended drought may have contributed to the elevated WNV activity in 2014 and 2015. Mosquito populations increase under drought conditions, especially in urban areas, due to stagnation of water in stormwater systems that would otherwise be flushed by rainfall. Drought conditions may also force infected birds to move to suburban areas where water is more available, bringing residents of these areas into contact with the disease (OEHHA 2019b).

Vector-borne disease transmission can be influenced by many factors other than climate, which makes it difficult to predict how climate change alone will influence future outbreaks of vector-borne diseases (OEHHA 2019b). These factors include how viruses adapt and change, the availability of hosts, changing ecosystems and land use, human behavior such as time spent indoors, and vector control programs.

The potential for these events involving public health hazards is not likely to slow expected growth in the planning area.

26. Radiological Accident

26.1 GENERAL BACKGROUND

Radiological materials have many uses and serve important purposes:

- Use by doctors to detect and treat diseases
- Use by educational institutions and companies for research
- Use by the military to power large ships and submarines
- Use by companies in the manufacture of a variety of medical products
- Use as a critical base material to help produce the commercial electrical power that is generated by a nuclear power plant

The primary radiological threats to Los Angeles are from the transportation of radiological material and from facilities that produce radiation. Radioactive materials are transported through the City of Los Angeles daily for medical and scientific reasons. Prior to its permanent shutdown in January 2012, the San Onofre Nuclear Power Plant, a commercial nuclear power facility, was the largest radiological hazard to the City of Los Angeles. The last remaining nuclear power facility in California, the Diablo Nuclear Power Plant, is roughly 200 miles away.

The production, handling, and transportation of radioactive materials are regulated by the state and federal governments. The Los Angeles Fire Department exercises a significant response role to radiological accidents.

26.1.1 Cascading and Compounding Impacts

Secondary effects of radiological incidents include residual ground contamination, contamination of water sources which could disrupt supply, and long-term health impacts to individuals who may have been exposed to the radiation.

26.2 HAZARD PROFILE

26.2.1 Past Events

On October 1, 2021, the U.S. Department of Energy demolished a building at a highly contaminated Santa Susanna Field Lab (SSFL) with explosives. The SSFL was a former nuclear and rocket test site. The building that was demolished was part of a complex used to develop nuclear reactors. The explosion from the demo caused clouds of radioactive dust into the sky near several residential neighborhoods.

In January 2000, a radioactive spill in the Eagle Rock neighborhood caused the early morning closure of the Glendale Freeway. This transportation incident was caused by a car stalling on the freeway and being struck by at least four other vehicles, one of which was transporting radioactive materials.

There have been no state or federal disaster declarations for Los Angeles issued for this hazard.

26.2.2 Location

The greatest potential for an incident involving radioactive materials is related to transport. Due to the widespread use of radioactive materials in medical and industrial processes, an accident involving the transportation of radioactive materials could occur at almost any location on the 6,000-mile street network of the City of Los Angeles. However, the amount of radioactive material transported is usually very small. Regional transportation facilities—specifically including major highways, railways, airports, and ports—are the most likely locations for accidents involving large quantities of radioactive materials. These regional facilities transport materials passing through the region as well as materials originating in or destined to locations throughout the City.

26.2.3 Frequency

The frequency of radiological incidents in the City of Los Angeles is very low. While there are many sites within the City where small amounts of radioactive materials are used or stored, there are no known major radioactive material production or storage facilities in the City.

Major radiological spills could occur following a major Southern California earthquake. While major medical centers and research universities have taken precautions to avoid such spills, earthquakes have historically resulted in numerous hazardous material leaks.

26.2.4 Severity

Radioactive material, whether naturally occurring or manufactured, is unstable and is constantly seeking a stable atomic configuration through a process called, "radioactive decay." As radioactive material decays to stable, non-radioactive material (or to other types of radioactive material), ionizing radiation is emitted. This ionizing radiation is emitted in either particle or electromagnetic waveform. There are four basic types of radiation of concern:

- **Alpha Radiation (particles)**—Alpha radiation is less penetrating than beta or gamma radiation and may be completely stopped by a sheet of paper. Alpha radiation is not a hazard external to the body but becomes a hazard if the alpha-emitting radioactive material is ingested.
- **Beta Radiation (particles)**—Beta radiation is more penetrating than alpha but less penetrating than gamma radiation. Such radiation may be completely stopped by a thin sheet of metal, such as aluminum. Beta radiation is an external hazard to the skin and eyes. It is an internal hazard if the beta-emitting radioactive material is ingested.
- **Gamma Radiation (electromagnetic waves)**—Gamma radiation is the most dangerous type of radiation as it cannot be easily stopped by physical barriers. Unlike alpha or

beta radiation, gamma radiation is emitted as energy waves, not particles. It is a hazard to the entire body and has the potential to destroy healthy cells and bodily tissue.

- **Neutron Radiation (particles)**—Neutron radiation has the potential to be stopped by an appropriate thickness of a hydrogenous material, such as water or concrete. Neutron radiation has the unique property of being able to convert non-radioactive material to radioactive material. Such radiation could be an internal bodily hazard if a source emitting neutrons is ingested.

26.2.5 Warning Time

Radiological incidents occur without predictability under circumstances that give responders little time to prepare.

26.2.6 Scenario

The greatest potential for an incident involving radioactive materials is related to transport due to the widespread use of radioactive materials in medical and industrial processes. With this in mind, a radiological accident involving a tractor trailer could have a significant impact on the planning area. This type of accident would most likely occur on one of the major highways in the City of Los Angeles' 6,000-mile street network and attempt to bypass heavily populated areas. While bypassing these areas is an admirable safety measure, if the tractor-trailer overturns and the materials come loose from containment, the persons involved in the accident and near the accident will become at risk from exposure. Furthermore, depending on the weather at the time, fumes from the radiological material may get carried by the wind and impact individuals further from the accident.

26.3 Vulnerability and Impacts

26.3.1 Population

For radiological incidents, people need to minimize their exposure to radiation as low as possible. According to the U.S. Environmental Protection Agency (EPA), radiation can damage living tissue by changing cell structure and damaging DNA. The amount of damage depends upon the type of radiation, its energy, and the total amount of radiation absorbed. Because damage is at the cellular level, the effect from small or even moderate exposure may not be noticeable (EPA 2012).

The most important risk from exposure to radiation is cancer. However, radiation can damage health in ways other than cancer. Although rare, damage to genetic material in reproductive cells can cause genetic mutations, which could be passed on to future generations. Exposing a developing embryo or fetus to radiation can increase the risk of birth defects. Although such levels of exposure rarely happen, a person who is exposed to a large amount of radiation all at one time could become sick or even die within hours or days. This level of exposure is rare and can happen only in extreme situations, such as a serious nuclear accident or a nuclear attack (EPA 2012).

26.3.2 Property

Radiological incidents can pose a threat to properties which house radioactive materials. Examples of these locations may include nuclear power plants, hospitals, metal shops, processing plants, and production plants. This threat is generally seen as being low with high risk. For this reason, several agencies regulate the use of radioactive materials in industry, including the U.S. Nuclear Regulatory Commission (NRC), U.S. Department of Health and Human Services (HHS) Food and Drug Administration's (FDA) Center for Devices and Radiological Health, U.S. Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), and others (EPA 2012).

Physical structures are generally not at risk, but land may be. Damage may include contaminated soil, groundwater, and nearby waterbodies. This disrupts nutrient cycles, affects plant growth, and can contaminate groundwater, jeopardizing the safety of drinking water sources (EPA 2012).

26.3.3 Community Lifelines

Most community lifelines, including transportation, medical, safety and security, and hazardous materials, house, store, or utilize radiological materials and technology and thus are vulnerable to possible incidents caused by mechanical or human error.

Radiological incidents may lead to the closure of waterways, railroads, airports, and highways which could impact the ability to deliver goods and services. Regarding transportation corridors, the City has more than 160 miles of freeways and 1,400 miles of major and secondary roadways that are vulnerable to radiological incidents.

26.3.4 Environment

Radiological incidents can kill wildlife, destroy habitat, and contaminate critical resources in the food chain. Radiation causes genetic anomalies, leading to decreased reproduction, deformities, and death. High levels of contamination can also appear in plants and last for decades. A release may result in the death of multiple animal species, or the bioaccumulation of pollutants can affect animals high on the food chain long after a release.

26.3.5 Historic and Cultural Resources

Loss of and harm to species and ecosystems as a result of a radiological event may adversely impact cultural traditions and practices. Additionally, site remediation efforts following a radiological event can result in adverse impacts to archeological and historic resources and sensitive cultural areas in the attempt to remove and/or excavate contaminated sediments from an affected area.

26.3.6 Economy

Contamination of agriculture, livestock, and production can lead to loss of commerce with other regions of the state, country, and even the world. Following the radiological incident at the Fukushima Power Plant, many countries halted imports of products from Japan for fear of contamination. This loss in revenue compounded losses that Japan and region surrounding the power plant were already encountering following the initial disaster. Should a radiological event occur in the City, it is likely that the export of goods would halt, similar to the aftermath following the Fukushima incident.

26.4 Effects of Future Change on Vulnerability and Impacts

As population grows, the number of people susceptible to the impacts of radiological incidents will increase. Similarly, climate change may increase the risk of radiological events. Radiological events typically stem from nuclear power plants, which require huge amounts of water to prevent fission products in the core and spent nuclear fuel from overheating. This is why over 40 percent of the world's nuclear plants are built along the coasts. However, climate change increases the likelihood of hazards such as sea-level rise, storm surge, heavy rainfall, and high temperatures. These hazards pose risks to both operational and decommissioned plants and may result in facility failures or releases of radiological materials (NRDC 2019).

27. SMOKE AND AIR POLLUTION

27.1 GENERAL BACKGROUND

The World Health Organization defines "air pollution" as "the contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere" (World Health Organization 2022). Air pollution has the potential over time to be highly hazardous to the health of all visitors and residents in the City of Los Angeles. Temporarily hazardous air conditions can occur as a result of natural and human-caused hazards, including wildfires, high winds and dust, volcanic activities, stratospheric ozone intrusion, hazardous material accidents, structural fires, and fireworks (National Park Service 2018, LASAN 2024).

27.1.1 Sources of Air Pollution

Sources of air pollution are generally grouped into four categories (National Park Service 2018):

- Stationary sources include fixed facilities such as power plants and landfills.
- Mobile sources are typically associated with operation of vehicles such as cars, trucks, ships, and airplanes, which are often the largest source of emission in a region.
- Area-wide sources are widely dispersed and may include agriculture, construction grading, or unpaved roads.
- Natural sources can include plant pollens, biological decay, fires, and windblown dust.

27.1.2 Air Quality Standards

The U.S. Environmental Protection Agency (EPA) set National Ambient Air Quality Standards for six common air pollutants: ozone, particulate matter (PM), carbon monoxide, lead, sulfur dioxide, and nitrogen dioxide (EPA 2022e). These "criteria air pollutants" cause human and environmental health issues. The California Air Resources Board (CARB) has set California Ambient Air Quality Standards for the EPA's criteria pollutants and for hydrogen sulfide, vinyl chloride, sulfate, and visibility-reducing particles (State of California 2022e). PM and ozone have some of the greatest concern from a human health perspective (State of California 2022k). More information on ambient air quality standards can be found on CARB's California ambient air quality standards web page (State of California 2022b).

Ozone

Ozone (O_3) is a highly reactive gas composed of three oxygen atoms. It is both a natural and a human-made product that occurs in the Earth's upper atmosphere (the stratosphere) and lower atmosphere (the troposphere). It is a secondary pollutant produced from nitrogen oxides and volatile organic compounds in the presence of sunlight (EPA 2022b).

According to the California Office of Environmental Health Hazard Assessment (OEHHA), the main sources of the components of ground-level ozone are trucks, cars, planes, trains, factories, farms, construction, and dry cleaners. Ozone levels are typically highest in the afternoon and on hot days (OEHHA 2022). Studies of historical ozone levels find that increased daytime temperatures increase ozone concentrations (Kleeman, Chen and Harley 2010).

Ozone is among the most widespread and significant air pollution health threats in California (OEHHA 2022). Studies have shown that exposure to ozone can damage respiratory tract tissues, causing decreased lung function and respiratory symptoms (State of California 2022f). At higher daily concentrations, ozone increases asthma attacks and deaths related to respiratory causes. Children are the most susceptible to harmful effects from ozone, and increased medication use, hospitalizations, and school absences have been noted (EPA 2022c). Ozone can also impact plant health by limiting the plants' ability to photosynthesize (National Park Service 2020).

Particulate Matter

PM is a mixture of suspended liquids and solids that can include organic substances, dust, soot, and metals. Two types are typically monitored (EPA 2022d):

- $PM_{2.5}$ consists of fine particles 2.5 micrometers or less in diameter (about 1 ten-thousandth of an inch). These particles are typically formed when gas-phase emissions from human activities (e.g., un-combusted gasoline and diesel, industrial processes, asphalt, household products) react in the atmosphere to form PM. A substantial fraction of $PM_{2.5}$ is also emitted from combustion of motor vehicles, power plants, industrial processes and factories, wildfires, residential wood burning, agricultural burning, and other activities.
- PM_{10} consists of coarse particles that are 10 micrometers or less in diameter. PM_{10} includes mostly dust, pollen, and bacteria fragments (State of California 2022f).

$PM_{2.5}$ is an extremely small pollutant, and human exposure to it is linked to adverse health outcomes. The smaller the particles, the deeper they can move into the lungs when people breathe. $PM_{2.5}$ is capable of reaching deep into the lungs and causing a host of complication including heart disease, respiratory disease, asthma, and premature mortality (OEHHA 2022a). $PM_{2.5}$ is also linked to hospital emergency department admissions for sensitive populations such as children or those who have reduced lung function (State of California 2022f).

PM_{10}, like $PM_{2.5}$, is a small pollutant, and human exposure to it is linked to adverse health outcomes. PM_{10} is linked to the worsening of respiratory diseases. It reduces lung function and contributes to respiratory mortality (State of California 2022f).

27.1.3 Cascading and Compounding Impacts

The following are notable cascading impacts associated with air pollution (National Geographic 2022):

- Short-term effects are temporary and often include irritation to the nose, eyes, throat, or skin. Air pollution can also cause headaches, dizziness, and nausea.
- Long-term effects can last for years or a lifetime. They include heart disease, lung cancer, and respiratory diseases such as emphysema. Air pollution can also cause long-term damage to nerves, brain, kidneys, liver, and other organs.
- Other tangible cascading impacts from air pollution include school closures, reduced visibility, impacts on HVAC systems, and short-term health impacts, including effects on cognitive abilities

27.2 Hazard Profile

27.2.1 Past Events

The first recognized episodes of "smog" occurred in Los Angeles in the summer of 1943. The phenomenon was termed a "gas attack" and blamed on a nearby butadiene plant. In 1947, the Los Angeles County Air Pollution Control District was formed. The district regulated obvious culprits, like smoke-belching power plants and oil refineries, but still the smog persisted. It was not until the early 1950s that it became clear the automobile was the main culprit. In 1967, the California Air Resources Board was established (CARB 2024).

The term "smog" was first used in the 1950s to describe the combination of smoke and fog in London. Today, it refers to a mixture of pollutants made up mostly of ground-level ozone (EPA 2023a).

There have been no state or federal disaster declarations for Los Angeles issued for this hazard. The City of Los Angeles has been included in numerous disaster declarations related to wildfire. Smoke from wildfires can increase PM in the air, and the heat combines with the smoke and other pollutants to create more ground-level ozone. The City of Los Angeles has not been included in any disaster declarations relating to volcanoes. Volcanic ash contains carbon dioxide and fluorine, which can be toxic to humans. The resulting ash fall can lead to crop failure, animal death and deformity, and human illness. Ash's abrasive particles can scratch the surface of the skin and eyes, causing discomfort and inflammation. If inhaled, volcanic ash can cause breathing problems and damage the lungs. Inhaling large amounts of ash and volcanic gases can cause a person to suffocate. Past smoke and air pollution events can be found in Table 27-1.

27.2.2 Location

The entirety of the City of Los Angeles is susceptible to air pollution, but the extent varies by location. Generally, pollutants that affect air quality are created by polluting industries, transportation emissions, wildfires, dust, and heat waves (Earth.org 2022). Therefore, densely populated, industrial areas prone to wildfire risk face the highest risk.

Table 27-1. Past Smoke and Air Pollution Events		
Date of Event	**Event Type**	**Description**
October 2023	Interstate 10 Freeway Fire	Stacks of pallets, tires, wood boxes, cardboard, and more caught fire causing a stretch of Interstate to be closed. The fire released a significant amount of smoke into the air, affecting the surrounding areas.
October 2021	Dominguez Channel Odor Incident	More than 4,7000 odor complaints were received from the greater Los Angeles area. After investigation, results showed elevated levels of hydrogen sulfide, which can cause strong odors and irritate some people.
September 10, 2020	Air Pollution	During a Labor Day weekend heat wave, ozone pollution spiked to 185 parts per billion in downtown Los Angeles according to South Coast Air Quality Management District monitoring data. It was the highest hourly reading in Southern California since 2003 and the highest in downtown Los Angeles in 26 years. The 8-hour average ozone level in downtown Los Angeles was 118 ppb, which is "very unhealthy" on the Air Quality Index and far above the federal standard of 70 ppb.
1974	Stage III Hazardous Ozone Levels	Issued for Upland, California (most recent Stage III alert issued).

Source: (Barboza 2020, South Coast AQMD 2024)

As a city with high population density, a booming industrial sector, and significant wildfire risk, Los Angeles possesses all of the major elements for high air pollution susceptibility. While pollution levels are highest at the site of emissions, winds can transport pollutants to downwind regions, so air pollution can affect all communities in the City of Los Angeles. Because of various factors—such as geography, environment, or weather—parts of the City can be affected differently.

In 2021, OEHHA finalized the CalEnviroScreen 4.0 Indicator Maps, which display pollution exposure data, including ozone, $PM_{2.5}$, diesel PM, and toxic releases from facilities. It also maps population characteristics such as asthma around the state. The CalEnviroScreen 4.0 tool generates a score for each area based on pollution exposure, population characteristics, and socioeconomic factors (OEHHA 2022b). On the OEHHA mapper, air quality pollutants are measured by percentage of the census tract in California (OEHHA 2022b). Figure 27-1 and Figure 27-2 show the CalEnviroScreen 4.0 ratings for the City of Los Angeles, (CalEnviroScreen 2023). There may be variations among communities in different geographic areas.

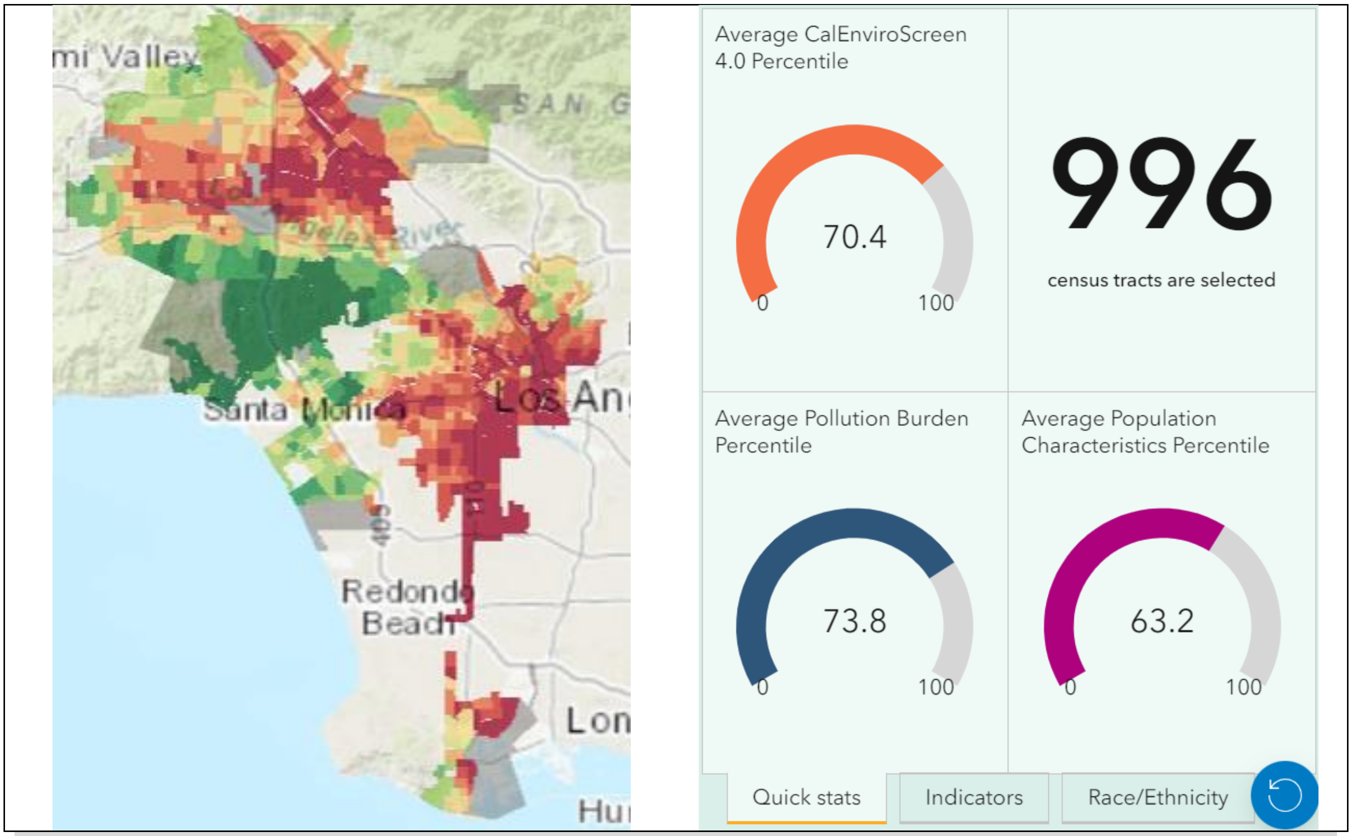


Figure 27-1. CalEnviroScreen Dashboard

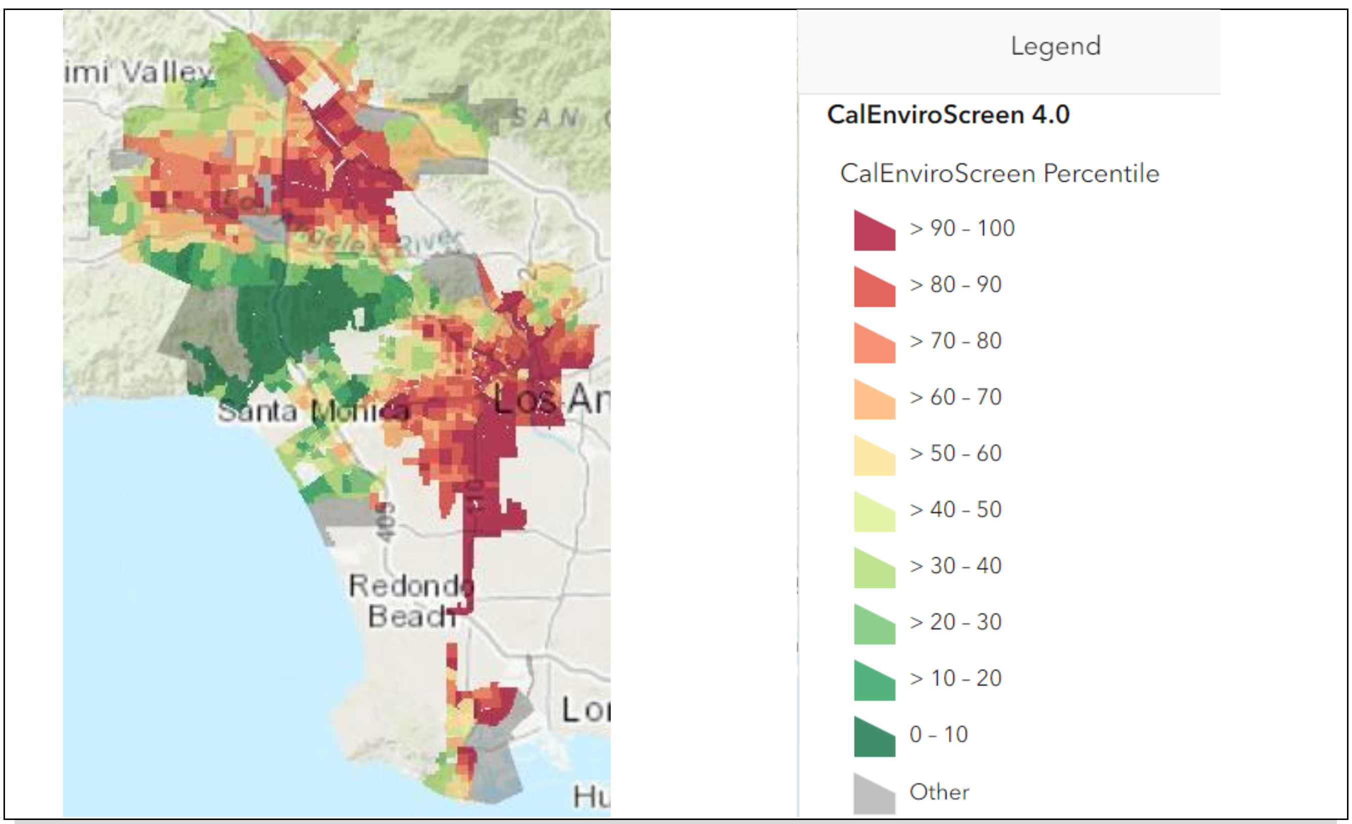


Figure 27-2. Pollution Map for the City of Los Angeles

27.2.3 Frequency

Smoke and air pollution conditions generally remain consistent over time, with significant variation only in the event of volcanic eruptions, wildfires, human-caused hazards that release pollutants into the air, or fire events such as urban structural fires. Additional actions taken to eliminate poor air quality such as regulatory initiatives, partnership programs, and individual actions may assist in reducing the impacts of smoke and air pollution on individuals in the planning area. According to the EPA, reductions in air pollution following the onset of the COVID-19 pandemic prevented more than 230,000 premature deaths, 200,000 heart attacks, 120,000 emergency room visits, and 17 million lost workdays (EPA 2023a).

Weather can play a factor in daily air quality. Wind transports air pollution from one location to another, carrying pollutants from miles away. Passing showers and periods of rain can wash pollutants out of the atmosphere or transport them to a new area. Fair weather with little wind can create stagnant air, causing vehicle and factory exhaust to concentrate over an area (University Corporation for Atmospheric Research n.d.).Similarly, air temperature can influence pollutant conditions. On cold weather days, cool air and pollutants become trapped close to ground. On hot or warm weather days, the warm air and pollutants are able to escape into the atmosphere. However, heat waves often lead to poor air quality. The extreme heat and stagnant air during a heat wave increase the amount of ozone pollution and particulate pollution. Drought conditions can also occur during a heat wave, meaning that soils are very dry. During a drought, forest fires are more common. Fires add carbon monoxide and particle pollution to the atmosphere (University Corporation for Atmospheric Research n.d.).

27.2.4 Severity

CARB identifies about 200 toxic air contaminants that may cause serious, long-term effects, such as cancer, even at low levels. Most toxic air contaminants have no known safe levels, and some may accumulate in the body from repeated exposures. Table 27-2 summarizes the most common health and environmental effects of each air pollutant with a national and/or California ambient air quality standard, as well as those of toxic air contaminants. Air monitoring in California shows over 90 percent of residents breathe unhealthy levels of one or more air pollutants during some part of the year (CARB 2022b).

27.2.5 Warning Time

There are 35 air districts in California that partner with CARB and are responsible for daily air quality planning, monitoring, and permitting (CARB 2021). The districts administer air quality improvement grant programs and provide daily air quality forecasts for their regions to inform residents of air quality and any recommendations, alerts, or warnings for the general population. Air quality is monitored, and alerts or warnings are sent out for the City of Los Angeles through the South Coast Air Quality Management District (AQMD) (CARB 2023).

Table 27-2. Common Health and Environmental Effects of Air Pollutants

Pollutant	Effects on Health and the Environment
Ozone	• Respiratory symptoms • Worsening of lung disease leading to premature death • Damage to lung tissue • Crop, forest, and ecosystem damage • Damage to a variety of materials, including rubber, plastics, fabrics, paint, and metals
$PM_{2.5}$	• Premature death • Hospitalization for worsening of cardiovascular disease • Hospitalization for respiratory disease • Asthma-related emergency room visits • Increased asthma symptoms, increased inhaler usage
PM_{10}	• Premature death and hospitalization, primarily for worsening of respiratory disease • Reduced visibility and material soiling
Nitrogen Oxides	• Lung irritation • Enhanced allergic responses
Carbon Monoxide	• Chest pain in patients with heart disease • Headache • Light-headedness • Reduced mental alertness
Sulfur Oxides	• Worsening of asthma: increased symptoms, increased medication usage, and increased emergency room visits
Lead	• Impacted mental functioning in children • Learning disabilities in children • Brain and kidney damage
Hydrogen Sulfide	• Nuisance odor (rotten egg smell) • At high concentrations, headache and breathing difficulties
Sulfate	• Same as $PM_{2.5}$, particularly worsening of asthma and other lung diseases • Reduces visibility
Vinyl Chloride	• Central nervous system effects, such as dizziness, drowsiness, and headaches • Long-term exposure: liver damage and liver cancer
Visibility-Reducing Particles	• Reduced airport safety, scenic enjoyment, road safety, and discourages tourism
Toxic Air Contaminants About 200 chemicals have been listed as toxic air contaminants	• Cancer • Reproductive and developmental effects • Neurological effects

Source: (CARB 2022a)

27.2.6 Scenario

The worst-case scenario for a smoke and air pollution would be a combination of multiple major wildfire events and consistent increases in temperature due to climate change. Wildfires would create a blanket of smoke over the City of Los Angeles and lead to significant health hazards, while increased temperatures would make sheltering indoors essential. This significant reduction in air quality would make mask-wearing indoors and outdoors essential to reduce the risk of major health effects, and persistent symptoms would include coughing and eye watering.

27.3 VULNERABILITY AND IMPACTS

27.3.1 Population

The entire population of the City of Los Angeles is vulnerable to the effects of air pollution, and many areas of the City have been identified as disproportionately affected by smoke and air pollution according to the OEHHA's CalEnviroScreen 4.0 tool. The CalEnviroScreen 4.0 tool identifies "disadvantaged communities," which are those that are disproportionately burdened by multiple sources of pollution and have population characteristics that make them more sensitive to pollution. These disadvantaged communities within the City of Los Angeles and the surrounding area as identified by the CalEnviroScreen 4.0 tool are shown in Figure 27-3.

Source: (OEHHA 2023)

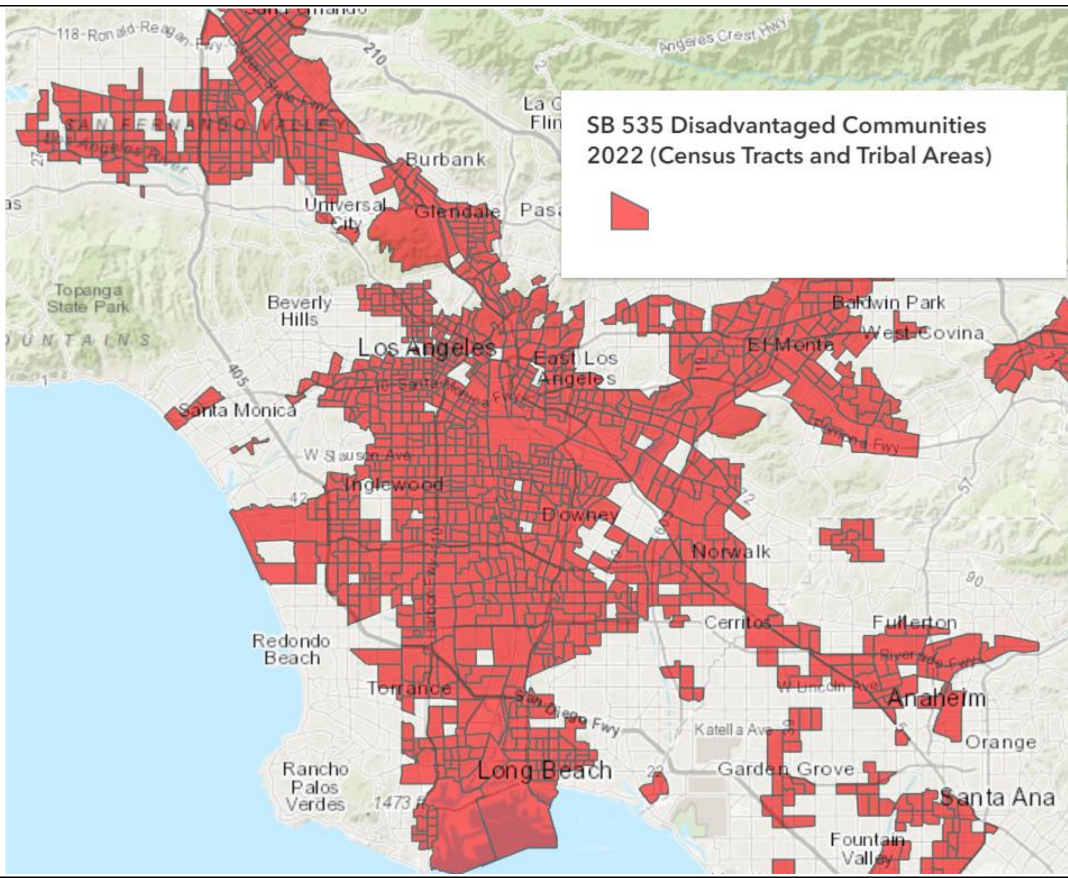


Figure 27-3. Disadvantaged Communities in and Near the City of Los Angeles

Residents and visitors dwelling within these areas of the City face significant risk of health effects due to widespread air pollution. The American Lung Association ranked the Los Angeles-Long Beach area #1 for worst high ozone days out of 227 metropolitan areas (American Lung Association 2023). Socially vulnerable communities, which are discussed in the next section, face additional risk from poor air quality.

Socially Vulnerable Populations

Socially vulnerable populations, such as those with pre-existing medical conditions; those with limited access to medical services; those located near refineries, airports, or major roadways; and those experiencing homelessness face an increased risk of health conditions caused by air pollution and smoke events. As the City of Los Angeles consistently experiences over 100 days of unhealthy air quality for sensitive groups per year, the socially vulnerable consistently face an increased risk of health effects from smoke and air pollution (Castillo 2023). According to the American Lung Association, the City of Los Angeles faces the worst ozone pollution in the United States as of 2022 (American Lung Association 2023).

People who live near large transportation routes or large industrial sources also face increased vulnerability during periods of poor air quality (Spaceshipone 2020). Children and those with reduced lung function are most vulnerable to the health effects of PM. Children are often more susceptible to harmful ozone because they spend more time outside, breathe faster, have smaller bodies, and may have less effective immune systems (State of California 2022f).

27.3.2 Property

Some air pollution, such as acid rain, can corrode building materials, requiring costly repairs to structures. When outdoor air is polluted, ventilation systems may not be able to filter the air coming inside, posing a health risk to people inside (World Green Building Council 2022). New development within the City of Los Angeles may be subject to these consequences of smoke and air pollution depending on severity. Furthermore, there is the potential for particles to be lifted from locations experiencing wildfires and deposited onto various structures, including houses.

27.3.3 Community Lifelines

Smoke and air pollution are not likely to have direct impacts on local community lifelines within the City of Los Angeles. Events involving extremely poor air quality and large amounts of smoke in the air due to wildfire may cause an increase in medical complications due to this poor air quality, but medical services are not expected to face significant strain in this event.

27.3.4 Environment

Potential environmental impacts of smoke and air pollution include the following:

- **Acid rain** is precipitation that contains harmful amounts of nitric and sulfuric acid. As it falls—in the form of rain or snow—it can damage trees and cause soils and water bodies to acidify. This makes water unsuitable for fish and wildlife (Massachusetts Department of Environmental Protection 2013).
- **Eutrophication** is a condition in a water body where high concentrations of nutrients (such as nitrogen, phosphorus, sediments, and others) stimulate algae blooms, which can then lead to killing fish and losing plants and animals. Animal waste and human activities such as agricultural runoff containing pesticides and fertilizers can accelerate naturally occurring eutrophication by increasing the rate at which nutrients enter water bodies (Massachusetts Department of Environmental Protection 2013).
- **Haze** is caused when sunlight encounters tiny pollution particles in the air, reducing the clarity and color of what people see. Particulates from haze can contribute to acid rain and ozone. Exposure to these particulates is linked to health problems and environmental damage (EPA 2006).
- **Wildfire** smoke consists of a mixture of gaseous pollutants (e.g., carbon monoxide), hazardous air pollutants (e.g., polycyclic aromatic hydrocarbons), water vapor, and particle pollution. PM represents a main component of wildfire smoke and the principal public health threat. It is a general term for a mixture of solid and liquid droplets suspended in the air. There are many sources of particle pollution; the most common is combustion-related activities such as wildfires (EPA 2022g). Among its other environmental and health effects, wildfire smoke has the potential to affect water quality (California Water Boards 2023)
- **Crops, parks, city trees, and forests** can be damaged by air pollution in a number of ways:
    - Ozone can reduce a plant's ability to photosynthesize, can damage cells, and can make plants more susceptible to disease. This can lead to reduced crop or fruit yields (State of California 2022i). Ground-level ozone can lead to reduced growth and survivability of tree seedlings and increased plant susceptibility to disease, pests, and other environmental stresses (Massachusetts Department of Environmental Protection 2013).
    - PM deposition on plants and in soil can lead to uptake by plants, resulting in affected plant yield or growth (State of California 2022f).

27.3.5 Historic and Cultural Resources

Overall, it is unlikely that smoke and air pollution will cause significant impacts on historic-cultural monuments. The health and safety of those visiting these HCMs are likely to be impacted and face increased risk if air pollution continues to worsen. Maintenance workers and others tasked with maintaining these historic sites may experience health effects due to worsening air quality, which could potentially affect the preservation of these sites long-term.

27.3.6 Economy

Increases in smoke and air pollution may cause major impacts to the economy in the City of Los Angeles. Examples of economic impacts caused by reductions in air quality include (Clean Air Fund n.d.):

- Reduced workforce productivity
- Increased workplace absences
- Premature deaths

Reductions in productivity, increased absences, and negative health impacts to employees carry the potential to greatly decrease business productivity within the City of Los Angeles. Lower crop yields throughout the State of California may increase the cost of goods for residents and visitors within the City, impacting tourism due to this increased cost. Tourism within the City may also be impacted by poor air quality as visitors are forced to avoid the area to reduce their risk of negative health effects caused by air pollution.

27.4 EFFECTS OF FUTURE CHANGE ON VULNERABILITY AND IMPACTS

27.4.1 Future Development

Future development in the planning area (including buildings and infrastructure) may impact smoke and air pollution. Pollutants may be released during the construction of new development, individuals moving into the developed areas may contribute to air pollutants via vehicular travel, and depending on the type of new development, its purpose may be linked to producing air pollutants.

27.4.2 Climate Change

Population

Climate change is anticipated to have direct consequences for air quality (EPA 2016). The air pollutants that cause climate change are a global focus for reduction (World Health Organization 2021). Many greenhouse gases (GHGs), such as methane, also have public health consequences (World Health Organization 2022). In addition, indirect impacts of climate change, such as changes in weather patterns and increases in wildfire, can exacerbate air quality challenges and introduce new ones:

- If ozone precursors (nitrogen oxides and volatile organic compounds) are present, ozone production increases with higher temperatures and greater solar radiation (CDPH 2007); (Earth.org 2022). Climate change increases the average temperature and influences more intense dry periods, which increases solar exposure (OEHHA 2022a).

- Climate change has the potential to worsen PM concentrations due to smoke and ash produced by increased incidence of wildfire.
- Dry, warm weather can result in greater amounts of dust being blown and suspended in air (State of California 2022f).
- With increasing temperatures, demand for electric power to run air conditioning will increase, and the resulting increased emission of pollutants may contribute further to poor air quality.
- Precipitation is the primary method for removing pollutants from the air; the increased risk of droughts and less rainfall caused by climate change will reduce the mitigation of air pollution.
- Solar radiation can be affected nonlinearly by PM. PM can absorb more solar radiation, thereby increasing temperature and speeding the process of ozone formation. Alternatively, PM can serve as a conduit for cloud formation, which blocks solar radiation. These competing forces make it difficult to predict future air quality events.

A decline in air quality due to climate change threatens public health because of increased risk of asthma, other respiratory ailments, and cardiovascular disease (State of California 2022f). Climate change magnifies existing health inequities, including exacerbating health impacts on vulnerable populations due to poor air quality (State of California 2022f).

Property and Community Lifelines

Smoke and air pollution are not expected to yield significant impacts to local structures or other property. The effects of climate change may increase the severity of air pollution, but poor air quality is not likely to have significant impacts on community lifelines.

Environment

In the context of climate change, smoke and air pollution may be worsened in the City of Los Angeles due to local wildfires that have been exacerbated by climate change. Changing climate conditions are expected to bring both earlier and longer springs and summers, precipitation changes, and increases in carbon dioxide levels, which may bring an increase in airborne allergens (EPA 2023a).

Air pollution may also damage crops, plants, and forests as ground-level ozone is absorbed, leading to reduced photosynthesis, slower growth, and higher sensitivity to diseases (EPA 2023a). Increased vulnerability to plant life and forest health may also impact overall air quality as fewer plants are available to produce clean oxygen in the planning area.

28. TERRORISM

28.1 General Background

The term "terrorism" refers to intentional, criminal, malicious acts. The City of Los Angeles Terrorism Prevention and Protection Annex of the 2018 City of Los Angeles Emergency Operations Plan defines terrorism as "a human-caused hazard involving the unlawful use or threatened use of force or violence against people or property with the intention of intimidating or coercing societies or governments" (City of Los Angeles 2018).

As the nature of this kind of threat evolves, the City's approach to this threat category has expanded to include targeted violence. Targeted violence refers to any incident of violence that implicates homeland security and in which a known or knowable attacker selects a particular target prior to the violent attack (DHS 2019b).

The effects of terrorism and targeted violence can include injuries, loss of life, property damage, or disruption of services such as electricity, water supplies, transportation, or communications. Effects may be immediate or delayed. Terrorists often choose targets that offer limited danger to themselves and areas with relatively easy public access. Foreign terrorists look for visible targets where they can avoid detection before and after an attack, such as international airports, large cities, major special events, and high-profile landmarks. Perpetrators of targeted violence currently assessed to pose the greatest threat to the homeland are lone actors radicalized online who look to attack soft targets with easily accessible weapons (FBI 2021).

28.1.1 Cascading and Compounding Impacts

While the severity of terrorism events will heavily dictate the effects of these potential cascading impacts, it is important to remain aware of these potential risks. The following are notable cascading impacts associated with terrorist events:

- Widespread utility failure
- Health effects resulting from bioterrorism or weapons of mass destruction
- Structural fires
- Wildfires
- Contamination of drinking water
- Economic impacts

The most common of these cascading impacts caused by terrorist events would be economic. Economic impacts from terrorism could be significant. The cost of a terrorist act would be felt in loss of life and property, disruption of business activity, and long-term emotional effects. Economic impacts of terrorism are further discussed in Section 28.3.6.

28.2 HAZARD PROFILE

28.2.1 Past Events

The following are the major past terrorism events that have affected the planning area:

- **April 29, 2019, Improvised Explosive Device (IED) Terror Plot Thwarted by FBI**—A former U.S. Army infantry soldier was arrested after receiving what he believed to be an explosive device to be used in multiple mass-casualty events across the Los Angeles area. The suspect expressed support for violent extremism and after considering attacks against the Jewish community, churches, and police officers, he sought out materials and explosive devices to cause mass-casualty incidents (MCIs). The suspect's plans included multiple targets such as the detonation of explosive devices on multiple freeways in the City of Los Angeles to kill as many people as possible. The suspect's plans were thwarted, and no injuries resulted from this incident.
- **September 16, 2010, Hawaiian Airlines Delayed after Bomb Threat**—A Hawaiian Airlines flight was delayed for nearly two hours after someone phoned in a bomb threat. The Los Angeles Police Department (LAPD) bomb squad and a canine team searched the plane, which was due to leave from the Los Angeles International Airport (LAX) for Honolulu with 225 people onboard. The Boeing 767 was carefully inspected, and passengers and luggage were re-screened.
- **September 7, 2010, Federal Authorities Investigate Threat on Thai Airways Flight**—Law enforcement authorities investigated a written threat found on a Thai Airways aircraft that landed at LAX. After landing shortly, Flight 794 was taken to a remote area of the airport, where crew members and passengers were interviewed. Bomb technicians searched the plane and authorities screened the luggage. The flight originated in Bangkok, Thailand.
- **June 19, 2010, LAX Terminal Evacuated on False Report of Explosives**—A man falsely claiming to be carrying an explosive at LAX prompted the closure of the Tom Bradley Terminal before police shot him with a stun gun and took him into custody. The incident began when the suspect grabbed a passenger's luggage outside of the terminal, ran inside and claimed the package contained a bomb. The terminal was evacuated for 20 minutes as officers pursued the man inside the facility. The package he was carrying did not contain explosives.
- **September 16, 2005, Attempted Arson**—Fire officials responded to a fire at the high-rise condominium home of the director of Los Angeles Animal Services (LAAS), after residents observed smoke coming from a recyclables/janitorial closet. First responders recovered an improvised incendiary device consisting of a 4-inch-long tube labeled "TOXIC" and using a cigarette as a fuse. The device, which had been placed next to a stack of newspapers in the recyclables/janitorial closet, had malfunctioned and only scorched the concrete floor of the closet. The Animal Liberation Front claimed responsibility for this incident.
- **July 7, 2005, Attempted Arson**—Fire officials responded to a vehicle fire in the driveway of a private residence in the City of Los Angeles. In extinguishing the fire, authorities recovered a partially melted, plastic gasoline container from behind the vehicle's left front wheel. The car belonged to a representative for the Animal Care Technicians

Union, which represents employees for the LAAS. LAAS and its affiliates have been targeted by local animal rights extremists, and the LAAS union representative had been placed on a "targets" list of individuals profiled by extremists.

- **August 22, 2003, Vandalism and Destruction of Property**—Individuals associated with the Earth Liberation Front (ELF) carried out acts of vandalism in the City, damaging roughly 125 vehicles and one commercial building. Much of the damage was caused by spray-painted graffiti, although in two cases, individuals set fire to vehicles. Some of the graffiti associated the vehicles with "terrorism."
- **October 2002 Foiled US Bank Tower "*Second Wave of 9/11*"**—Shortly after the September 11, 2001, attacks on the World Trade Center, officials from multiple states foiled an attempted attack by Al-Qaeda to fly a commercial aircraft into the tallest building on the West Coast, the US Bank Tower in the City of Los Angeles. The planned attack would have used explosives hidden in shoes to breach the cockpit door and fly the aircraft into the building. Those involved in this plot stated that this attack was to be a continuation of the September 11 attacks on the East Coast.
- **July 2002 Attack by Lone Gunman at LAX**—An Egyptian citizen opened fire with a handgun at LAX while standing in line at the ticket counter of El Al, killing two persons and wounding four others before an airline security officer shot and killed him. The FBI assumed the primary responsibility for the investigation due to the possible terrorist connection, and in March 2003, the attack was determined a terrorist crime, with the shooter acting alone and not part of an identified group.

There have been no state or federal disaster declarations for Los Angeles issued for this hazard.

28.2.2 Location

In dealing with terrorism and targeted violence, the unpredictability of human beings must be considered. People with a desire to carry out such acts may seek out targets of opportunity that may not fall into established lists of critical areas or facilities. First responders train to respond not only to organized terrorism events but also to random acts by individuals who, for a variety of reasons ranging from fear to emotional trauma to mental instability, may choose to harm others and destroy property. While acts of terrorism can occur in any place and at any time, most instances of terrorism occur in locations with high population density or locations of high economic and social value, such as stadiums, schools, or government buildings.

The City of Los Angeles has identified numerous high-profile targets for potential terrorist or targeted violence incidents. Large population centers, high visibility tourist attractions, and critical infrastructure accessible to the public present security challenges of an ongoing nature in the planning area. The Los Angeles Coliseum, Los Angeles Convention Center, Rodeo Drive area, and Griffith Park Observatory may be seen as attractive targets for terrorist attacks.

28.2.3 Frequency

According to data from the Center for Strategic and International Studies (CSIS), there were 1,040 cases of terrorist plots/attacks in the United States between 1994 to 2021. The years with the highest number of domestic terrorist plots/attacks were seen in 2020 and 2021. In 2021, there were 73 terrorist plots/attacks and 30 fatalities, a significant increase from 2020 during which there were five fatalities. According to a Congressional Testimony by CSIS, the recent increase in domestic terrorist activity began around 2014 and is still seen today (Jones 2022).

The following list identifies examples of terrorist events of various types that have impacted and may impact the planning area due to the recent increase domestic terrorism and targeted violence incident frequency:

- **Chemical**—The risk of a chemical event is present in the planning area. The agricultural community uses and stores significant amounts of chemicals that could be used in destructive ways.
- **Explosives**—Pipe bomb and suspicious package events have occurred in the City of Los Angeles in the past. While none of the events has been specifically identified as a weapon of mass destruction (WMD), the elements necessary to construct a WMD are readily available. Additionally, the agricultural communities maintain sufficient products and quantities for use in explosive events.
- **Radiological/Nuclear**—The major transportation arteries for vehicles or rail that cross through or near the planning area contribute to the risk of a radiological event. Such products can unknowingly pass through any one of the regional transportation corridors.
- **Biological**—Anthrax incidents that occurred in the United States in October 2001 demonstrate the potential for spreading terror through biological WMDs.
- **Combined Hazards**—WMD agents can be combined to have a greater total effect. When combined, the impacts of the event can be immediate and longer-term. Casualties will likely suffer from both immediate and long-term burns and contamination. Given the risks associated with chemical agents in the City of Los Angeles, the possibility exists for such a combined event to occur.

28.2.4 Severity

Multi-casualty incidents (MCIs) may result from targeted acts of violence, such as shootings or hostage situations, and from acts of terrorism. Effects may include serious injuries, loss of life, and associated property damage. An MCI is defined as any incident with three or more fatalities or critically injured. Because large numbers of patients may be involved, significant MCIs may tax local emergency medical and hospital resources, and therefore require a regional response. First responders, including fire, police, and emergency room staffs at local hospitals, follow established protocols for an MCI. Mutual aid is requested should local officials be unable to respond appropriately with available personnel and equipment.

28.2.5 Warning Time

While education, heightened awareness, and early warning of unusual circumstances may deter terrorism, intentional acts that harm people and property are possible at any time. Public safety entities must react to the threat, locating, isolating, and neutralizing further damage and investigating potential scenes and suspects to bring criminals to justice. According to experts, fewer than 5 percent of all terrorism incidents are preceded by a warning or threat.

The National Terrorism Advisory System (NTAS) is designed to communicate information about terrorist threats by providing timely, detailed information to the American public. The U.S. Department of Homeland Security (DHS) maintains the NTAS. As of September 2023, the system rates the national threat as "heightened threat environment" due to the upcoming 2024 general election cycle, the threat of domestic violent extremists and foreign terrorist organizations, and legislative or judicial decisions pertaining to sociopolitical issues (DHS 2023).

According to the Terrorism Prevention and Protection Annex of the 2018 City of Los Angeles Emergency Operations Plan, upon receipt of a credible terrorist threat, City of Los Angeles agencies will act accordingly based on the known details of the threat. The Joint Regional Intelligence Center serves as the fusion center for the Los Angeles region. The Center exists as an intake and assessment point for terrorism information and other threats to the Los Angeles region and information sharing hub regarding threats. Credible threat reporting is a priority for the Joint Regional Intelligence Center, and the emergency operations center (EOC) can anticipate receiving information for which activation would be warranted.

28.2.6 Scenario

The scenario that could have a significant impact on the planning area would be a terrorist event at a large gathering place, such as the Los Angeles Coliseum, Los Angeles Convention Center, or LAX. Terrorist events happen with little or no warning. With a population in excess of 4 million people, the City of Los Angeles does possess potential targets for terrorist activities. The City's general concept of operations for increasing security measures in an effort to combat terrorism is outlined in the Terrorism Prevention and Protection Annex of the 2018 City of Los Angeles Emergency Operations Plan (City of Los Angeles 2018).

28.3 Vulnerability and Impacts

28.3.1 Population

As the largest city in the Western United States, the City of Los Angeles has been identified as a prime target for terrorism. Numerous high-profile targets exist throughout the City. A terrorist event could range from an individual attack to a coordinated attack by multiple agents upon multiple targets. Large-scale incidents have the potential to kill or injure many people in the immediate vicinity and may also affect people a relative distance from the initial event. Variables affecting vulnerability for a WMD attack include the physical and chemical properties of the WMD, the ambient temperature, wind speed, wind direction, barometric pressure, and humidity.

Socially Vulnerable Populations

Segments of the population may face heightened vulnerable and exacerbated impacts from a terrorist event. For example, people with pre-existing health conditions may be more susceptible to physical or chemical attacks. Additionally, those with mobility issues, such as the elderly or children under age 5, may be unable to remove themselves without assistance from the targeted site.

28.3.2 Property

The City of Los Angeles is a high-profile target for terrorism and all property is vulnerable to this hazard. All structures in the planning area are physically susceptible to a terrorism event. The emphasis on accessibility, the opportunity for roof access, driveways underneath some structures, unmonitored areas, the proximity of many structures to transportation corridors and underground pipelines, and the potential for unintended structural consequences of terrorist attacks all have an effect on the susceptibility of structures. Certain properties may face heightened risk due to a variety of previously mentioned factors, and these properties may include centers of congregation, public infrastructure, and similar property within the City of Los Angeles.

28.3.3 Community Lifelines

All City-owned and leased facilities are considered vulnerable to the terrorism hazard. Certain community lifelines, such as government buildings or other essential government property, may be targeted in the event of a terrorist attack due to political tensions related to the message terrorist groups are seeking to convey through their acts of violence.

28.3.4 Environment

Terrorism has a harmful effect not only on economic and social life, but also on the environment. Terrorist activities such as bomb blasts produce enormous toxic pollutants such as carbon dioxide and sulfur dioxide, which contaminate the environment directly through the destruction of natural resources (Mannion 2003).

Terrorists also use a large scale of chemicals and heavy metals (iron, copper, steel, and depleted uranium) related to WMDs. The heavy metals possess toxic elements such as lead, cadmium, zinc, and copper. The chemicals and heavy metals contaminate soil, air, and water, which cannot be easily purified.

A terrorism event using these WMDs can kill wildlife, destroy habitat, and contaminate critical resources in the food chain. While human-caused disasters have caused significant damage to the environment, estimating damage can be difficult. Loss estimation platforms such as Hazus are not equipped to measure environmental impacts of these types of hazards. The best gauge of potential impacts on the environment would be a review of damage from past terrorism events. Capturing this data from future events could be beneficial in measuring the susceptibility of the environment for future updates.

28.3.5 Historic and Cultural Resources

Acts of terrorism in and around historical and cultural landmarks could bring devastating loss of life and property to the affected area. Acts that damage historic and cultural resources or harm people at the site of those resources have greater potential to gain widespread media attention. These locations may be vulnerable to terrorism due to the resource's sentimental value to the local community. The use of explosive devices in terrorist events would prove to be especially devastating to these historic sites as the sites are often old, subject to the elements, and materials are fragile due to aging.

28.3.6 Economy

Acts of terrorism carry the potential effect of disrupting the local economy depending on the severity and methods employed by perpetrators of terrorism events. Shootings, stabbings, or other acts of violence may result in an avoidance of the area by locals and minor disruptions in business activity during the terrorist act. Terrorist events of even greater magnitude involving the use of explosive devices, vehicles, and chemical and/or biological weapons may result in such significant loss of life or property that businesses are closed for significant periods of time, if not permanently. Events of this magnitude have the potential to bring down buildings and other significant structures, resulting in devastating consequences such as prolonged business closure, discouraged tourism, and disrupted supply chains that could all single-handedly devastate the local economy. Recovery would take significant resources and expense at the local level.

28.4 Effects of Future Change on Vulnerability and Impacts

The agencies and organizations involved with terrorism in the City of Los Angeles are examining the challenges presented by future development and expansion, specifically threat analyses and threat reduction capability studies. Individually, and in collaboration with task forces and other facilities, plans are underway for continuation, changes and/or expansion of current initiatives. Buildings and other structures constructed to resist earthquakes and fires usually have qualities that also limit damage from blasts and resist fire spread and spread of noxious fumes in the event of a terrorist attack.

The Ports of Los Angeles and Long Beach continue to collaborate with the City on security and infrastructure projects such as joint command and control, interoperable communications, linked and redundant surveillance system monitoring, and full-port access control supported by a common credentialing system.

29. Transportation Accident

29.1 GENERAL BACKGROUND

The City of Los Angeles transportation network consists of aviation, harbor, ground, and rail systems. Disruption to any part of this system would result in major safety and economic impacts on the City as well as the State of California and even the larger country.

These events can occur on all major modes of transportation. Harbors and airports—major trade points with complex infrastructures—may be interrupted by natural or human-caused factors such as earthquake, flood, storms, union strikes, or criminal activity. Such disruptions can cause delays in cargo delivery. Disruption of rail service can cause significant transportation system capacity problems resulting in blocked streets and can create safety issues.

Transportation corridors, such as the Alameda Corridor, are essential to the delivery of critical medical supplies. Ground transportation is essential for ingress and egress for emergency vehicles during disasters and is essential for police services. Access for emergency vehicles on freeways, highways, primary roads, and secondary roads due to road damage can significantly reduce response. Potential disruptions of roadway systems include the following:

- Loss of power to traffic signals could leave many intersections in the City without a traffic control device to control right-of-way. With no regulation of right-of-way, there would be a significant potential for vehicle and pedestrian accidents and congestion that could interfere with emergency response and recovery efforts.
- Disruption of Los Angeles Department of Transportation's (LADOT) Automated Traffic Surveillance and Control System would result in the loss of the ability to adjust the timing of traffic signals from a remote location, to monitor the traffic flow and equipment status at intersections and to access LADOT's network of closed-circuit cameras located throughout the City to observe traffic conditions.
- Loss of transit services, such as DASH and Commuter Express bus services, would affect the ability of millions of system users to get to work, to shop, to go to school and to get to medical appointments.
- Loss of private ambulance and non-ambulatory transportation services would affect the ability of thousands of users to get to the hospital, dialysis treatments and medical appointments.

29.1.1 Cascading and Compounding Impacts

The economic impacts would be significant if a transportation facility is rendered impassable. The loss of a roadway or railroad would have serious effects on the local economy and the ability to provide services. Loss of major travel routes would result in loss of commerce and could affect the ability to provide emergency services to residents by delaying response times or limiting routes for equipment such as fire apparatus, police vehicles, and ambulances. The ability to receive fuel deliveries would also be affected. Re-routed traffic could affect local roadways.

29.2 Hazard Profile

29.2.1 Past Events

According to LADOT Annual Report 2021 (LADOT 2021), the number of fatalities and severe injuries from traffic accidents in vehicles has increased in the since 2020 (see Figure 29-1). In 2021, there were approximately 2,050 accidents, which is a 21 percent increase from 2020 and a 19 percent increase from 2019.

Source: (University of California 2023)

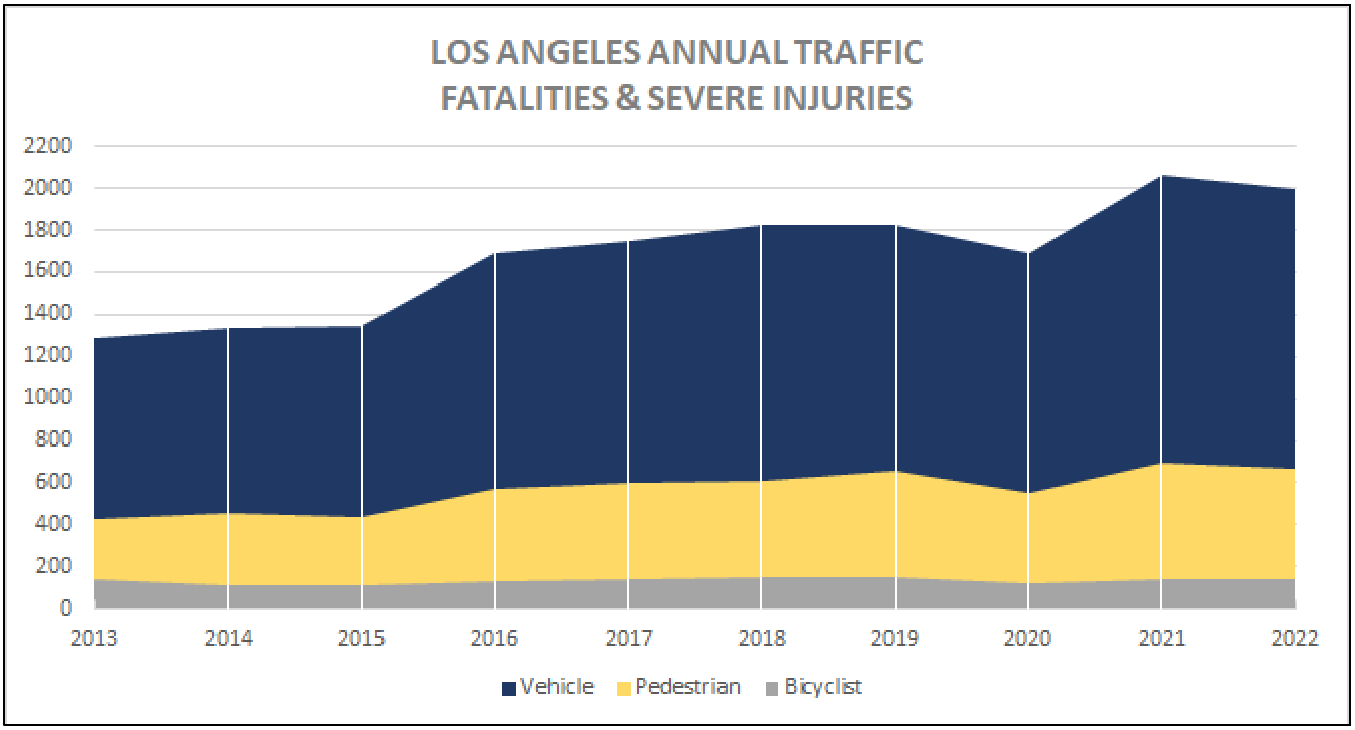


Figure 29-1. City of Los Angeles Traffic Accident Fatalities and Severe Injuries, 2013-2022

Between January 2016 and September 2023, there were 18 aviation incidents in the City, as reported by the National Transportation Safety Board (NTSB) (NTSB 2024). Of the 18 incidents at LAX, 5 had no airplane damage, 2 had minor damage, 10 had substantial damage, and 1 airplane was considered destroyed. There were three fatalities and seven serious injuries reported with these incidents.

The following event history provides information regarding the most recent reports for general aviation incidents (NTSB 2023):

- April 29, 2023—A Cessna 172S fell to the ground, fatally injuring the pilot.
- January 31, 2023—A helicopter pilot was approaching a rooftop helipad preparing to land when the helicopter began to yaw (move slightly off course) to the right despite

the pilot's control inputs. The pilot experienced a loss of the tail rotor controls and attempted to land on the helipad. Post-accident examination showed that the ring nut for the tail roto duplex bearing was backed out of the sleeve which resulted in the loss of tail rotor control.

- January 9, 2022—A Cessna 172H lost engine power at approximately 200 feet above ground level. The pilot declared an emergency to the tower controller before the aircraft made impact with the ground. The pilot of the aircraft was seriously injured in this incident.
- January 6, 2022—A Boeing 747-400 collided with a garbage bin during takeoff roll on runway 25R at LAX. No injuries were reported.
- February 19, 2021—A Piper PA-32-260 impacted a semi-truck and concrete barrier after losing engine power resulting in one fatality and one minor injury.
- November 12, 2020—After losing engine power, a Cessna 182 collided with power lines and burst into flames. The pilot of the aircraft was fatally injured.
- June 29, 2020—A helicopter pilot heard a noise that was thought to have been a bird strike and took a precautionary landing. Post flight examination led the pilot and operator to believe they collided with a drone.

Below are further aviation accident/incident reports from 2003 to 2008:

- January 25, 2008—A helicopter pilot cleared to travel to Century Boulevard collided with a high voltage transmission line and was killed.
- February 4, 2004—A Mooney M20K aircraft missed approach in instrument meteorological conditions and descended into a resident. There were two fatalities.
- June 6, 2003—A Beech A36TC aircraft entered an overcast cloud layer and then descended out of the clouds in a spinning, steep nose-down attitude, colliding with a three-story apartment building. The incident resulted in five fatalities and seven serious injuries.

On September 12, 2008, a passenger train collided head-on with eastbound Union Pacific freight train near Chatsworth, California. The accident resulted in 25 fatalities and approximately 102 injured passengers. Physical damage exceeded $12 million (Federal Railroad Administration 2019).

There have been no state or federal disaster declarations for Los Angeles issued for this hazard.

29.2.2 Location

These events typically happen in areas of significant transportation infrastructure or sites. The following transportation facilities and networks have the potential for interruption-related hazards:

- LAX
- Van Nuys Airport
- Port of Los Angeles
- U.S. Route 101 – Hollywood Freeway
- Interstate 105 – Century Freeway
- Santa Monica Boulevard

- Port of Long Beach
- Interstate 110 – Harbor Freeway
- State Route 1 – Pacific Coast Highway
- Interstate 5 – Golden State Freeway
- State Route 2 – Glendale Freeway
- Interstate 10 – Santa Monica Freeway
- State Route 47 – Alameda Street
- State Route 60 – Pomona Freeway
- State Route 134 – Ventura Freeway
- Interstate 710 – Long Beach Freeway
- Interstate 605 – San Gabriel River Freeway
- Amtrak – Passenger
- Los Angeles County Metro Rail
- Alameda Corridor
- Interstate 405 Freeway
- Hollywood Burbank Airport
- Long Beach Airport

29.2.3 Frequency

Transportation incidents, including all modes of transportation, may occur at any time in the planning area. According to the recorded Past Events, there have been 18 reported avian incidents in just the past eight years (2016-2023), and three additional incidents between 2003 and 2008. This increase in frequency of avian transportation incidents is of concern since air travel has become in increased demand. The Federal Railroad Administration Office of Safety records instances of reported Highway-Rail Grade Crossing Incidents. According to the Administration's data, between 2016 and 2023 there have been 65 reported Highway-Rail Grade Crossing Incidents in the City (Federal Railroad Administration 2024). As shown in Figure 29-1, the City has seen an increase in frequency of vehicular accidents, with the exception of the year 2020 (likely due to the pandemic), since 2015.

29.2.4 Severity

The severity of a transportation accident depends on the variety of vehicles involved and the contents of the vehicle(s) (i.e., passengers, goods, type of goods). The term mass-casualty incident (MCI) is often applied to transportation accidents involving air and rail travel, as well as multi-vehicle highway accidents, that result in three or more fatalities or critical injuries. Additional effects may include serious injuries, loss of life, and associated property damage. Because large numbers of patients may be involved, significant MCIs may tax local emergency medical and hospital resources, and therefore require a regional response. First responders, including fire, police, and emergency room staff at local hospitals, follow established protocols for an MCI. Mutual aid is requested should local officials be unable to respond appropriately with available personnel and equipment.

MCIs may occur throughout the planning area, day or night, at any time of the year. The following freeways have greater potential for MCIs because of the heavy volume of traffic, although no highway or surface street in the planning area is exempt from this hazard:

- Santa Monica Freeway (I-10)
- Harbor Freeway (I-110)
- San Diego Freeway (I-405/I-5)
- Long Beach Freeway (I-710)
- El Segundo Freeway (I-105)
- Century Freeway (I-105)
- Golden State Freeway (I-5)
- San Bernardino Freeway (I-10)
- San Gabriel Freeway (I-605).

The railroad tracks traversing the planning area, carrying Amtrak passengers as well as freight, also face the risk of an MCI, as do the LAX and Van Nuys Airport.

Severe weather may play a role in roadway, air, or rail accidents. MCIs may also result from acts of violence or terrorism, which could include a chemical, biological, or radiological incident, contaminating persons and requiring mass decontamination.

29.2.5 Warning Time

Transportation incidents occur without predictability under circumstances that give responders little time to prepare.

29.2.6 Scenario

A multi-freight train derailment near or over a body of water could result in significant impacts. Advance knowledge of shipments and their contents would play a role in preparedness for this scenario, thus reducing its potential impact. The biggest issue in response to transportation incidents is material identification and containment. As this scenario unfolds, various modes of transportation may be forced to shut down (such as buses, trains, and railcars), severely limiting the mobility of those who need to evacuate the area. Furthermore, environmental concerns may arise upon identification of the train’s freight; an understanding of how the materials may interact with water is of concern as well.

29.3 Vulnerability and Impacts

29.3.1 Population

Vehicular accidents and roadway impairments may result in injury or death to drivers and passengers on the road, the public in the immediate vicinity, and emergency services personnel. The number of people exposed to a hazard depends on population density, whether exposure occurs during day or night, mode of transport being used (bus, car, train, airplane, etc.) and percentage of the population in the accident area located indoors and outdoors.

The City is prepared to manage and respond to transportation hazards. However, the risk to first responders increases when they respond to transportation accidents near high-traffic areas. First responders may also have to take on the additional duty of controlling traffic.

29.3.2 Property

Property may be impacted by transportation accidents if a vehicle collides with a structure. A railway incident may break or destroy the rail line; vehicles in urban settings have the potential to impact nearby buildings if the driver loses control of the vehicle; an airplane accident has the potential to impact a variety of forms of property, including buildings, other vehicles, and open, public property.

29.3.3 Community Lifelines

Transportation accidents greatly impact the transportation lifeline. Transportation accidents on local roads and major highways can impact roadway travel; an aviation accident may ground multiple airplanes within a defined area, and a railroad accident may interrupt services to and from given stations if the rail is unable to be cleared. Disruption of one or more of these modes of transportation can lead to congestion of another and affect both the City and the region. Transportation accidents also may impact the delivery of emergency services, such as police, fire, and emergency medical response. Large transportation accidents may lead to an increase in patients at hospitals.

29.3.4 Environment

The environmental impacts of transportation accidents can vary greatly. For some motor vehicle crashes, train derailments, or aviation accidents, the environmental impact is minimal. However, if the accident involves a vehicle moving chemicals or other hazardous materials, the impact will be considerably larger and may include an explosion or the release of potentially hazardous material.

29.3.5 Historic and Cultural Resources

Transportation accidents in and around historic and cultural landmarks could bring loss of life and property to the affected area. Transportation accidents can occur at any location within the City but may be more likely to occur in high-traffic locations. Historical and cultural landmarks are sites frequented by visitors and local residents alike. The traffic volume, combined with the number of pedestrians, may lead to an increased likelihood of a transportation accident at these locations. Furthermore, public transportation to historic and cultural resources is readily available. An accident involving a form of public transportation, including bus and passenger rail, could potentially lead to an MCI due to the number of passengers and members of the public surrounding the public transportation systems, but also may physically impact the historic and cultural resources as well due to accident debris.

29.3.6 Economy

Because of insufficient data, a full loss estimate was not completed for the transportation accident hazard. Loss of roadway use, and public transportation services would affect thousands of commuters, employment, and day-to-day operations. Individuals involved in a transportation incident may suffer economically due to loss of pay, potential insurance costs, and potential lawsuits.

29.4 Effects of Future Change on Vulnerability and Impacts

As population grows, the number of people susceptible to the impacts of transportation incidents (located near existing or future transportation corridors) is expected to increase. Climate change is projected to increase the frequency and intensity of weather events, which could damage transportation infrastructure. Heat waves will likely be more severe, sea-level rise can amplify storm surge in coastal areas, and precipitation will be more intense. These changes could increase the risk of delays, disruptions, damage, and failure across all modes of transportation (EPA 2019).

30. Urban Structure Fire

30.1 GENERAL BACKGROUND

Urban structural fires are defined as fires in an urban area originating in and burning any part or all of any building, shelter, or other structure, which may include residential, commercial, or industrial buildings. "Urban" in this definition refers to all higher density developed areas, including both cities and suburbs. The vast majority of reported urban structural fires occur in residential buildings. The following list contains examples of major urban structural fires that represent a broader community hazard to the City of Los Angeles and are the focus of this chapter:

- **Urban conflagration**—A large disastrous and destructive fire that spreads beyond natural or artificial barriers (National Fire Sprinkler Association 2020). Urban conflagrations may be started by wildfires or civil unrest.
- **Industrial fire**—A conflagration in an industrial setting.
- **Construction fire**—A fire at a construction or renovation site, often caused by cooking equipment, electrical distribution, or lighting equipment (National Fire Protection Association 2020).
- **Fire following earthquake**—Widespread fires caused when an earthquake's shaking results in the release of flammable gases, liquids, or other combustible materials that come into contact with open flames or electrical arcing from damaged infrastructure (FM Global 2015).
- **Explosion-caused fire**—A large fire at industrial or construction sites where combustible materials and ignition sources cause an explosion, leading to fire (ARCCA 2022).

Urban structural fires can be started by a wide range of natural and human causes: lightning strikes, wildfires, earthquakes, buildings not being built to code, buildings under construction, gas leaks, chemical explosions, arson, civil unrest, or ignition sources in a home such as a pot on the stove or unattended candles. The top five causes of residential fires are candles, cooking, electrical, heating, and smoking (National Fire Protection Association 2022).

Many urban structures have sealed or locked windows. Venting by breaking thick glass windows is extremely dangerous. Falling glass can injure people on the sidewalk and cut supply hoses. Because these buildings are sealed, large volumes of heat and smoke generated by the fire become trapped in the structure. The "stack effect"—the result of temperature difference between the inside and outside of a sealed building—causes smoke to spread up or down many floors during a fire. Large volumes of smoke and heat move uncontrollably during an urban structural fire, making already difficult evacuation efforts even more challenging.

When buildings are constructed beyond the reach of a fire department's highest ladder, two important firefighting strategies are taken away from firefighters:

- Life-saving victim removals using ladders are eliminated. Searches and rescues can be accomplished only from inside stairways.
- There is no ability to extinguish the fire with an outside master stream. Firefighters must extinguish the fire using handheld hose streams advanced through heat and smoke from an inside stairway.

The response time in an urban structural fire may be 15 minutes or longer. At a high-rise building, arriving firefighters may have to walk 100 to 200 feet through an open space or large lobby, question building employees about the fire location, check an alarm panel, etc.

Firefighters battling an urban structural fire due to increased fire code provisions have building systems to aid with alerting, compartmentalization, and extinguishment to increase success in extinguishment. For example, elevator systems may be utilized must take firefighters, tools, and equipment up to the fire. The standpipe system is required to provide water pressure and volume to the upper floors. A building communication system must allow fire department firefighting radio transmission. The structural steel framework of urban structures may interfere with fire department radios.

30.1.1 Cascading and Compounding Impacts

The following are notable cascading impacts associated with urban structural fires:

- Air pollution associated with fire smoke is a cascading hazard associated with urban structural fires (Alarie 2008).
- Fires, in general, present the potential for causing hazardous material releases.
- Explosions from natural gas lines or propane tanks are a concern.
- Those who are uninsured or under insured could face displacement from their homes.
- Critical infrastructure disruptions may occur as a result of an urban structural fire event.
- Extreme fire conditions may cause structural failure and building collapse

Due to the unpredictable nature of the urban structural fire hazard, it is impossible to identify all cascading and compounding impacts of this hazard.

30.2 HAZARD PROFILE

30.2.1 Past Events

The following are the major urban structural fires in the City of Los Angeles since 1960:

- Apartment Fatality Fire (13833 W. Oxnard St.), December 8, 2022
- Commercial Building Fire, Boyd Street Fire, (327 E Boyd St.) May 16, 2020
- Residential High-Rise Structure Fire (300 S Olive Street), February 4, 2020

- Barrington Plaza Fire (1350 S. Sepulveda Blvd.), January 29, 2020
- Apartment Fatality Fire (1006 N Mariposa Ave.), March 12, 2017
- Metro Center Elevator Shaft Fire, June 23, 2021
- Westlake High-Rise Senior Living Facility Fire, October 10, 2016
- W. Olympic Blvd Fire, April 7, 2015
- Pan Pacific Auditorium Fire, May 24, 1989
- First Interstate Bank Fire (62-story building), May 4, 1988
- Los Angeles Central Library Fire, April 29, 1986
- Fickett Towers (12-story senior citizen building), 1984
- Dorothy Mae Apartment Fire, September 9, 1982
- Bunker Hill West Tower, 1979
- Ponet Square Hotel Fire, September 13, 1970

The only structure-fire-related event in Los Angeles that triggered a state or federal disaster declaration was the April 1992 civil disorder event resulted in numerous building fires (DR-942, titled "Fire during a period of civil unrest").

The sections below describe two of the most serious urban structural fire incidents in the City of Los Angeles.

First Interstate Bank Fire, May 4, 1988

The fire in this 62-story building was the most materially damaging high-rise fire in City history. It began on the 12th floor and moved upwards to the 16th floor before it was contained and suppressed. It required the combined efforts of 64 fire companies, 10 City rescue ambulances, 17 private ambulances, four helicopters, 53 command officers and support personnel, 383 firefighters and paramedics, and considerable assistance from other City departments. Following the Interstate Fire, the City required fire sprinklers in the 363 existing commercial and office buildings constructed before state sprinkler regulations became effective. The fire also underscored to private industry the need for private back-up systems and facilities to enable continuance of business operations following a fire.

Los Angeles Central Library Fire, April 29, 1986

One of the most complex and difficult fires ever fought by the Los Angeles Fire Department was the 1986 Central Library Fire. The open book stacks, narrow corridors, circuitous stairways, interference of thick walls with the walkie-talkies, lack of windows and ventilation, dense smoke, intense heat (estimated as high as 2,500 degrees in some areas), limited access and firefighter exhaustion due to heat and exertion made the fire difficult to attack. Extensive pre-planning for a potential fire in the historic structure resulted in an orderly evacuation of library staff and patrons and familiarity of the fire commanders with the building and its unique fire suppression demands. Salvage units quickly instituted procedures to protect the 1.2 million books and documents from smoke and water damage. Methods were devised to direct smoke from the building and relay fire fighters in and out of the fire areas. After seven hours, the fire was brought under control. It took another five days to mop up the hot spots and for the building to cool down. The 350 firefighters saved over a million books. Only 350,000 books were damaged by fire or water, and structure damage amounted to only 4 percent of the $500 million value of the building.

30.2.2 Location

Urban structures in the City of Los Angeles are located in almost all parts of the City, but they are concentrated in a few areas: the Central City, the Wilshire District, Westwood, West Los Angeles – Century City and Hollywood.

Los Angeles has 816 tall buildings that are over 100 feet, 54 of those being over 400 feet, and 21 over 600 feet tall. Many of the tallest buildings are the most populous and active today, such as the Wilshire Grand Center (1,110 feet tall) and the U.S. Bank Tower (1,018 feet tall).

30.2.3 Frequency

In addition to building, plumbing, and electrical codes that apply to all structures in Los Angeles, the City has adopted a High-Rise Fire Code to reduce the occurrence of urban structural fires and the resulting injuries, loss of life, and property damage (Section 57.118 *et seq.*, City of Los Angeles Fire Code). This section of the Fire Code promulgates detailed regulations related to fire control rooms, building communication systems, fire department voice communication systems, elevator systems, fire protective signaling systems, emergency smoke control systems, standby emergency power systems, stair shaft doors, and automatic sprinkler systems. In addition to requirements for new buildings, the City has taken an aggressive stance to require sprinkler system retrofit of older buildings.

30.2.4 Severity

Impacts of urban structural fires may include economic losses, environmental impact, property damage, and significant loss of life. The impact of even one life lost can be devastating. The loss of a large manufacturing facility or business that employs a large number of people can have extensive impacts on the local economy. The effects on the environment from an industrial or commercial fire can take years to measure (DellaSala 2015). The City's adoption of the High-Rise Fire Code assists in the effort to reduce the severity of urban structural fires in Los Angeles.

30.2.5 Warning Time

Generally, all urban structural fire events take place with very little to no advanced warning before the building is engulfed in flames. From a wider perspective, prolonged drought and severe winds can greatly increase the likelihood of a fire event (Goss, et al. 2020). Severe weather can be predicted, so special attention can be paid during natural hazard events that may contribute to urban fires. There is no way to predict a human-caused urban fire in advance. If an urban fire starts and spreads rapidly, residents, employees, and others may need to evacuate within minutes.

The fire and life safety systems installed in urban structures are designed to provide an early warning in the event of a fire. The challenge is to know if it is best to stay in place or descend the stairs to evacuate. Automatic fire sprinkler protection in modern buildings within the City of Los Angeles is designed to control a fire and therefore lessen the need to evacuate all occupants.

Information received at a dispatch center determines the initial type of response a fire agency will provide. Response could be a single resource, usually an engine, or an alarm level. Apparatuses that typically respond to urban fires include fire engines, fire trucks (ladder, aerial, tiller, platform), ambulances, rescue units, or battalion chiefs. Additional resources may include support units (breathing, supply, relief), hazardous materials responders, Urban Search And Rescue, Heavy Equipment, Mobile Command Unit, or Mobile Communication Unit.

30.2.6 Scenario

A worst-case scenario would be an overnight 15-story apartment building fire with tenants trapped above a fire that is out of the reach with a typical longest aerial ladder. Fire department rescue personnel would try to rescue people by the interior stairs during primary search operations, and then rescue them from the exterior using a rope, the roof, or a helicopter. Many trapped people might not have these options and might die via smoke inhalation, burning, or jumping.

30.3 VULNERABILITY

30.3.1 Population

The entire population of the City of Los Angeles is potentially exposed to the effects of the urban structural fire hazard. Residents living in higher density areas containing high-rise buildings and multi-family residences face a greater overall risk of being trapped and unable to evacuate in the event of a large-scale urban structural fire.

Socially Vulnerable Populations

In most cases, damage, injuries, and loss of life from an urban structural fire are limited to the building itself and the immediate surroundings. The concentration of telecommunications facilities in the Central City area, mostly within high-rise buildings, presents a special case. One consideration considering socially vulnerable communities within the City of Los Angeles would be the potential for those experiencing homelessness to be temporarily living in abandoned buildings that may not be up to code. In the event of an urban structural fire, these individuals would be especially vulnerable to severe injury or death.

When an urban structural fire impacts a community with high rents where multiple families live in one structure, it may be difficult for those not listed on the lease to prove that they were affected by the fire. This could result in lack of access to services or higher insurance rates. Fires in residential areas can increase the price of housing and rent, which further displaces people already affected by the fire. The number of individuals experiencing homelessness can increase (National Academies Press 2020).

30.3.2 Property

Since the late 1990s there has been a significant concentration of telecommunications facilities within a 10-square-block area in downtown Los Angeles. Most major telecommunications firms and many smaller ones serving the greater Los Angeles area have facilities in the area. The percent of space devoted to telecommunications in buildings within this area varies from about 10 percent to 100 percent. It is estimated that more than 2.4 million total square feet of floor space is devoted to telecommunications and related uses. Instead of housing office workers, these buildings house routers, switching equipment, servers, and associated support equipment.

According to The National Fire Prevention Association, 12 percent of urban structural fires in office properties are caused by electrical distribution and lighting equipment (NFPA 2017). Only cooking equipment caused more urban structural fires. Therefore, not only does this high concentration of telecommunications infrastructure pose a significant fire hazard, but a catastrophic fire in a major telecommunications structure could cause major disruption to communications within the City, as well as nationally and internationally.

30.3.3 Community Lifelines

Urban structural fires impacting community lifelines pose a significant threat to the local population. As previously mentioned, urban structural fires carry the potential to significantly disrupt the complex communications systems within the City, greatly impacting the dispatch and coordination of first responders in an emergency. Local alert and warning systems would also be impacted in this disruption. Urban structural fires present a risk to all community lifeline categories and may lead to cascading or compounding impacts such as hazardous material concerns, transportation disruptions, and disruptions to the City power grid.

30.3.4 Environment

Most fires occurring in the built environment contribute to air contamination from the fire plume (which is likely to cause land and water contamination), contamination from water runoff containing toxic products, and other environmental discharges or releases from burned materials (Fire Protection Research Foundation 2022).

30.3.5 Historic and Cultural Resources

Urban fire events affecting historic and cultural landmarks have the potential to partially damage these landmarks or entirely destroy them depending on the severity of the fire. A large number of HCMs within the City of Los Angeles are located in particularly dense population zones, increasing the risk for a devastating urban structural fire where residents and visitors may have a difficult time escaping the blaze.

30.3.6 Economy

Urban fire events can pose a significant threat to the local economy depending on the severity and location of the fire. Urban structural fires affecting multiple businesses within the City may cause widespread shutdown of business activities while the recovery process takes place, stunting economic growth. Urban structural fires also have an impact on the local real estate market, impacting the availability of local properties and affecting the perception of buyers considering the purchase of property within the City of Los Angeles.

30.4 IMPACTS

Fire impacts on urban structural buildings in the City of Los Angeles will vary with the date of construction of affected structures based on the following considerations:

- Pre-1960—Pre-1960 buildings were required to have a “dry” standpipe for firefighting and a “wet” standpipe for occupants. A “dry” standpipe does not have water or water pressure; water must be pumped through the system by firefighters from street level.
- 1960-1974—After 1960, all urban structures were required to have a combo system—wet standpipes for both occupants and firefighters. This allowed firefighters to attack fires more quickly at higher floors, since water and water pressure are available on all floors.
- Post-1974—All buildings constructed after 1974 are required to be equipped with automatic sprinkler systems, considered to be the most effective tool for fighting high-rise fires.

30.5 Effects of Future Change on Vulnerability and Impacts

There are 806 urban structures in the City of Los Angeles, concentrated in a few areas: the Central City, the Wilshire District, Westwood, West Los Angeles – Century City and Hollywood. More will continue to be built in the future. (An urban structure is often defined as how the land of a city is laid out. It can also be referred to as urban spatial structure). Despite vigorous code enforcement, building inspection, and training for owners and occupants, the potential for a future disastrous event still exists. There is no way to predict when or where such an event will occur. Another consideration regarding urban structural fire can be found among the City of Los Angeles's unhoused population. While not always inside structures, the effects of urban fire could extend to the local unhoused population if fires start within tent cities.

Climate change has the potential to exacerbate the effects of urban structural fires by increasing their size and severity through the creation of drier conditions and increase in severe wind events that may spread an event from one structure to multiple structures.

PART 5—MITIGATION STRATEGY

31. Goals and Objectives

31.1 Mission Statement

The Steering Committee affirmed the following updated mission statement drafted by the planning team for the 2024 plan update:

> Through whole community engagement, the mission of the City of Los Angeles hazard mitigation plan is to reduce risk and increase resilience through comprehensive risk analysis and identifying corresponding mitigation strategies to protect City residents, their property, community lifelines, and the environment from traditional and emerging hazards.

31.2 Goals

The Steering Committee reviewed the goals established for the 2018 HMP and updated them to reflect the most current City concerns and priorities. Table 31-1 compares the goals between the previous and current plans.

Table 31-1. Revisions to Goals for 2024 HMP

2018 HMP Goal	2024 HMP Goal	Change
1. Protect life, property, and cultural resources	1. Protect life and property, including protecting the health and safety of communities.	Text expanded
2. Increase public awareness	2. Engage the whole community to better understand the hazards of Los Angeles and ways to reduce personal vulnerability to those hazards.	Previous goal replaced with new goal
3. Coordinate with other programs that can support or enhance hazard mitigation	3. Align the City of Los Angeles hazard mitigation plan with future climate vulnerability assessments, action plans, and all levels of government's hazard mitigation goals.	Previous goal replaced with new goal
4. Increase emergency services effectiveness	4. Develop and implement hazard mitigation strategies that use public funds in an efficient and cost-effective way.	Previous goal replaced with new goal
5. Pursue cost-effective and environmentally sound mitigation measures		Previous goal deleted
6. Strive to increase adaptive capacity to reduce risk from hazard impacts based on future conditions	5. Strive to increase adaptive capacity to reduce risk from hazard impacts based on future conditions.	Goal renumbered

31.3 Objectives

The Steering Committee reviewed possible objectives, including those selected for the 2018 HMP, and affirmed the following objectives for the 2024 HMP update:

1. Where applicable, develop mitigation strategies that are inclusive of engineering, design, feasibility, cost, and co-benefits, such as ecosystem and social benefits.
2. Identify locations, potential impacts, and linkages among threats, hazards, vulnerability, and measures needed to protect life, property, and the environment.
3. Reduce repetitive property losses from various hazards by determining and implementing hazard mitigation plans and projects based on available data and science that are consistent with state, regional, and local climate action and adaptation goals, policies, and programs.
4. Where feasible, identify and implement nature-based solutions across hazards to provide resilience benefits, including but not limited to sequestering carbon to mitigate climate change, and other community benefits, including environmental justice.
5. Establish, strengthen, and maintain partnerships among all levels of government, the private sector, community-based organizations, and academic institutions that improve the ability to protect life, property, and the environment.
6. Incorporate risk-informed analysis to strengthen communication and coordination with local, state, and federal partners to reduce the potential consequences of dam-specific incidents.
7. Develop and provide updated information about threats, hazards, vulnerabilities, climate change, and mitigation strategies to local, state, and regional agencies, as well as private-sector and community groups.
8. Integrate life and property protection measures for all communities, with particular attention to socially vulnerable communities that have fewer resources and capacity to adapt or strengthen vulnerable community lifelines (critical facilities located in hazard areas).
9. Incorporate hazard mitigation measures into repairs, major alterations, new development, and redevelopment practices, targeting communities with historically underserved populations that are disproportionately impacted by disasters and climate change.
10. Prevent or reduce mitigation related disparities among under-served and under-represented communities through plans and investments that prioritize multi-objective projects and culturally competent outreach programs.
11. Identify financial and regulatory incentives to motivate stakeholders, such as property owners, renters, private sector businesses, and community-based organizations, to identify risk and mitigate hazards.
12. Utilize understanding of risk to support trainings and exercises for city staff and external stakeholders.

Five of these objectives are revised versions of objectives included in the 2018 HMP; the rest are new for this update.

32. Mitigation Best Practices

32.1 HAZARD-SPECIFIC MITIGATION BEST PRACTICES

Catalogs of hazard mitigation alternatives were developed that present a broad range of alternatives to be considered for use in the planning area, in compliance with 44 CFR (Section 201.6(c)(3)(ii)). The catalogs are adapted from mitigation ideas presented in *Mitigation Ideas; A Resource for Reducing Risk to Natural Hazards* (FEMA 2013c). One catalog was developed for each natural hazard of concern evaluated in this plan. The catalogs present alternatives that are categorized in two ways:

- Who would have responsibility for implementation:
  - Individuals (personal scale)
  - Businesses (organizational scale)
  - Government (government scale)
- What the alternative would do:
  - Reduce the probability of hazard events
  - Limit risk to new development and redevelopment
  - Reduce risk to existing structures
  - Increase ability to respond to or be prepared for hazard

The catalogs are lists of what could be considered to reduce risk from natural hazards in the planning area. They include practices that will mitigate current risk from hazards or help reduce new risk resulting from climate change. Hazard mitigation actions recommended in this plan were selected from an analysis of the best practices presented in the catalogs. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process and are consistent with the established goals and objectives. Actions were selected from the catalogs based on an analysis of the City's ability to implement them. Best practices in the catalog that are not included in the action plan were omitted for one or more of the following reasons:

- The action is not feasible
- The action is already being implemented
- The City does not have the capability to implement the action
- There is an apparently more cost-effective alternative
- The action does not have public or political support

The catalogs for each hazard are presented in Table 32-1 through Table 32-10.

Table 32-1. Alternatives to Mitigate the Dam Failure Hazard		
Personal Scale	**Organizational Scale**	**Government Scale**
• **Reduce the probability of hazard events:** ❖ None • **Limit risk to new/redeveloped structures:** ❖ Relocate out of dam failure inundation areas. • **Reduce risk to existing structures:** ❖ Elevate home to appropriate levels. • **Increase ability to respond to or be prepared for hazard:** ❖ Learn about risk reduction for the dam failure hazard. ❖ Learn the evacuation routes for a dam failure. ❖ Educate yourself on early warning systems. ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Know evacuation routes ❖ Educate yourself on where the inundation areas are and if you are located within them. ❖ Acquire educational materials on preparedness in ReadyLA.org	• **Reduce the probability of hazard events:** ❖ Remove dams. ❖ Remove levees. ❖ Harden dams. • **Limit risk to new/redeveloped structures:** ❖ Replace earthen dams with hardened structures. • **Reduce risk to existing structures:** ❖ Flood-proof facilities in dam failure inundation areas. • **Increase ability to respond to or be prepared for hazard:** ❖ Educate employees on the probable effects of a dam failure. ❖ Develop a continuity of operations plan.	• **Reduce the probability of hazard events:** ❖ Remove dams. ❖ Remove levees. ❖ Harden dams. • **Limit risk to new/redeveloped structures:** ❖ Replace earthen dams with hardened structures ❖ Relocate community lifelines out of dam failure inundation areas. ❖ Consider open space land use in designated dam failure inundation areas. • **Reduce risk to existing structures:** ❖ Adopt higher floodplain standards in mapped dam failure inundation areas. ❖ Retrofit community lifelines in dam failure inundation areas. • **Increase ability to respond to or be prepared for hazard:** ❖ Map dam failure inundation areas. ❖ Enhance emergency operations plan to include a dam failure component. ❖ Institute monthly communications checks with dam operators. ❖ Inform the public on risk reduction techniques* ❖ Adopt real-estate disclosure requirements for the sale of property located in dam failure inundation areas. ❖ Consider the probable effects of climate in assessing the risk associated with dam failure. ❖ Establish early warning capability downstream of listed high hazard dams.* ❖ Consider the residual risk associated with protection provided by dams in future land use decisions. ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ Restore and reconnect floodplains that intersect dam failure inundation areas that have been degraded by development and structural flood control.
❖ Use soft approaches for stream bank restoration and hardening. Soft approaches can include but are not limited to the introduction of large woody debris into a system.
❖ Set back levees on systems that rely on levee protection to allow the river channel to meander, which reduces erosion and scour potential.
❖ Acquire property within dam failure inundation areas, remove or relocate structures, and preserve these areas as open space in perpetuity.
❖ Preserve floodplain storage capacity by limiting or prohibiting the use of fill within the floodplain.

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-2. Alternatives to Mitigate the Drought Hazard		
Personal Scale	**Organizational Scale**	**Government Scale**
• **Reduce the probability of hazard events:** ❖ Recycle gray water • **Limit risk to new/redeveloped structures:** ❖ None • **Reduce risk to existing structures:** ❖ Drought-resistant native landscapes ❖ Reduce water system losses ❖ Modify plumbing systems (through water saving kits) • **Increase ability to respond to or be prepared for hazard:** ❖ Practice active water conservation ❖ Increased access to water testing* ❖ For homes with on-site water systems: increase storage and utilize rainwater catchment ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	• **Reduce the probability of hazard events:** ❖ Recycle gray water • **Limit risk to new/redeveloped structures:** ❖ Support alternative irrigation techniques to reduce water use and use climate-sensitive water supplies • **Reduce risk to existing structures:** ❖ Drought-resistant landscapes ❖ Reduce private water system losses ❖ For businesses with on-site water systems, increase storage and utilize rainwater catchment • **Increase ability to respond to or be prepared for hazard:** ❖ Practice active water conservation ❖ Participate in the Integrated Regional Water Management Program	• **Reduce the probability of hazard events:** ❖ Groundwater recharge through stormwater management • **Limit risk to new/redeveloped structures:** ❖ Identify and create groundwater backup sources • **Reduce risk to existing structures:** ❖ Water use conflict regulations ❖ Reduce water system losses ❖ Distribute water saving kits* • **Increase ability to respond to or be prepared for hazard:** ❖ Public education on drought resistance* ❖ Encourage water recycling ❖ Identify alternative water supplies for times of drought; mutual aid agreements with alternative suppliers ❖ Develop drought contingency plan ❖ Develop criteria "triggers" for drought-related actions ❖ Improve accuracy of water supply forecasts ❖ Modify rate structure to influence active water conservation techniques ❖ Consider the probable impacts of climate change on the risk associated with the drought hazard ❖ Support, participate in and advocate for funding for the Integrated Regional Water Management Program ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ Promote and use reclaimed water supplies
❖ Increase capacity for stored surface water to create habitats and ecosystems for aquatic species.
❖ Promote and use active groundwater recharge

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-3. Alternatives to Mitigate the Earthquake Hazard

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ None **Limit risk to new/redeveloped structures:** ❖ Locate outside of hazard area (off soft soils) ❖ Apply engineering solutions to reduce the hazard **Reduce risk to existing structures:** ❖ Retrofit structure (anchor house structure to foundation) ❖ Secure household items that can cause injury or damage (such as water heaters, bookcases, and other appliances) ❖ Build to higher design **Increase ability to respond to or be prepared for the hazard:** ❖ Practice drop, cover, and hold ❖ Develop household mitigation plan, such as a retrofit savings account, communication capability with outside, 72-hour self-sufficiency during an event ❖ Keep cash reserves for reconstruction ❖ Become informed on the hazard and risk reduction alternatives available. ❖ Develop a post-disaster action plan for your household ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	**Reduce the probability of hazard events:** ❖ None **Limit risk to new/redeveloped structures:** ❖ Locate or relocate mission-critical functions outside hazard area ❖ Apply engineering solutions that minimize or eliminate the hazard **Reduce risk to existing structures:** ❖ Build redundancy for critical functions and facilities ❖ Retrofit critical buildings and areas housing mission-critical functions **Increase ability to respond to or be prepared for hazard:** ❖ Adopt higher standard for new construction; consider "performance-based design" when building new structures ❖ Keep cash reserves for reconstruction ❖ Inform your employees on the possible effects of earthquake and how to deal with them at your work facility.* ❖ Develop a continuity of operations plan	**Reduce the probability of hazard events:** ❖ None **Limit risk to new/redeveloped structures:** ❖ Locate community lifelines or functions outside hazard area ❖ Apply engineering solutions that minimize or eliminate the hazard **Reduce risk to existing structures:** ❖ Harden infrastructure ❖ Provide redundancy for critical functions ❖ Adopt higher regulatory standards **Increase ability to respond to or be prepared for hazard:** ❖ Provide better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (e.g., tax incentives, information) ❖ Include retrofitting and replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components such as pipe, power line, and road repair materials ❖ Develop and adopt a continuity of operations plan ❖ Initiate triggers guiding improvements (such as <50% substantial damage or improvements) ❖ Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities. ❖ Develop a post-disaster action plan that includes grant funding and debris removal components. ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ None identified

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-4. Potential Opportunities to Mitigate the Extreme Cold or Freeze Hazard

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ None	**Reduce the probability of hazard events:** ❖ None	**Reduce the probability of hazard events:** ❖ None
Limit risk to new/redeveloped structures: ❖ None	**Limit risk to new/redeveloped structures:** ❖ None	**Limit risk to new/redeveloped structures:** ❖ None
Reduce risk to existing structures: ❖ Insulate residential and non-residential structures to provide greater thermal efficiency and reduce heat loss ❖ Provide redundant heat and power ❖ Ensure natural gas input/release valves do not get covered in snow and ice, leading to freezing	**Reduce risk to existing structures:** ❖ Relocate critical infrastructure (such as power lines) underground ❖ Reinforce or relocate critical infrastructure such as power lines to meet performance expectations	**Reduce risk to existing structures:** ❖ Harden infrastructure such as locating utilities underground ❖ Provide backup power sources at vital critical facilities
Increase ability to respond to or be prepared for hazard: ❖ Prepare emergency food and supplies to be self-sufficient for at least 72 hours in the event of severe winter weather ❖ Obtain an emergency generator ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	**Increase ability to respond to or be prepared for hazard:** ❖ Create redundancy ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources ❖ Provide warming centers for employees*	**Increase ability to respond to or be prepared for hazard:** ❖ Enhance public awareness. campaigns to address issues of warnings and actions to take during extreme cold events* ❖ Use the best available technology to enhance the warning systems for all severe weather events* ❖ Coordinate severe weather warning capabilities and the dissemination of warning amongst agencies with the highest degree of capability ❖ Provide NOAA weather radios to the public* ❖ Retrofit above-ground utilities to underground facilities if appropriate ❖ Create a salt reserve or research alternates to stretch salt reserve ❖ Evaluate and revise, as needed, building codes to address and mitigate extreme cold and freeze impacts on residents ❖ Establish warming centers* ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ Where available, take advantage of geothermal resources for heating assets subject to extreme cold or freeze.

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-5. Potential Opportunities to Mitigate the Extreme Heat Hazard

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ Plant trees to create shade in urban areas ❖ Remove concrete and other hard surfaces and replace them with native vegetation	**Reduce the probability of hazard events:** ❖ Plant trees in urban areas experiencing urban heat island effects or with below average tree canopy coverage* ❖ Remove concrete and other hard surfaces and replace them with native vegetation	**Reduce the probability of hazard events:** ❖ Plant trees in urban areas experiencing urban heat island effects or with below average tree canopy coverage* ❖ Remove concrete and other hard surfaces and replace them with native vegetation*
Limit risk to new/redeveloped structures: ❖ None	**Limit risk to new/redeveloped structures:** ❖ None	**Limit risk to new/redeveloped structures:** ❖ None
Reduce risk to existing structures: ❖ Insulate residential and non-residential structures to provide greater thermal efficiency ❖ Provide redundant power sources ❖ Get air conditioning installed ❖ Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program)	**Reduce risk to existing structures:** ❖ Relocate critical infrastructure (such as power lines) underground ❖ Reinforce or relocate critical infrastructure such as power lines meet resiliency expectations against all-hazard impacts ❖ Install tree wire ❖ Provide cooling centers for employees* ❖ Install "cool roofs" and "green roofs."	**Reduce risk to existing structures:** ❖ Harden infrastructure such as locating utilities underground ❖ Trim trees back from power lines ❖ Install "cool roofs," "green roofs," and other green infrastructure ❖ Use the best available technology to enhance warning systems for all severe weather events*
Increase ability to respond to or be prepared for hazard: ❖ Promote 72-hour self-sufficiency ❖ Obtain a NOAA weather radio ❖ Obtain an emergency generator or community microgrid ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	**Increase ability to respond to or be prepared for hazard:** ❖ Create redundancy in power supply ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources	**Increase ability to respond to or be prepared for hazard:** ❖ Increase communication alternatives* ❖ Enhance public awareness campaigns to address actions to take during extreme heat events* ❖ Coordinate severe weather warning capabilities and the dissemination of warning among agencies with the highest degree of capability* ❖ Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors ❖ Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines ❖ Provide NOAA weather radios to the public* ❖ Review and update heat response plan in light of climate change projections ❖ Promote programs that support community-scale microgrids ❖ Evaluate and revise, as needed, building codes to address and mitigate extreme heat impacts on residents ❖ Develop non-English and culturally sensitive educational materials.*

Personal Scale	Organizational Scale	Government Scale

Nature-based opportunities

- ❖ Green roofs can be up to 40 °F cooler than typical roofs and reduce community temperatures by up to 5 °F. They can reduce building air conditioning costs by up to 75 percent. Green roofs provide benefits up to $14 more per square foot than traditional roofs
- ❖ Trees can lower surface temperatures by providing shade and through evapotranspiration, which can reduce peak local summer temperatures by 2 °F to 9° F. Shady areas can be between 20 °F and 45 °F cooler than sunny areas, providing safe resting places outside.
- ❖ The Planting of native plants—including along parking lots, streets, and in yards—can provide cooling effects. Vertical gardens, also referred to as green or living walls, involve planting on walls to provide shade for buildings. This helps to cool the building and surrounding area
- ❖ Any solutions that convert built environments to natural environments such as forests, wetlands, and vegetation can aid in lowering temperatures. Natural environments and green vegetation provide more shade, moisture, and evaporation than built environments, all of which help reduce temperatures. These systems sequester carbon, helping to minimize future warming

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-6. Alternatives to Mitigate the Flood Hazard

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ Clear storm drains and culverts ❖ Use green infrastructure **Limit risk to new/redeveloped structures:** ❖ Locate outside of hazard area ❖ Elevate utilities above base flood elevation ❖ Use low-impact development techniques **Reduce risk to existing structures:** ❖ Raise structures above base flood elevation ❖ Elevate items within house above base flood elevation ❖ Build new homes above base flood elevation ❖ Flood-proof structures	**Reduce the probability of hazard events:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques **Limit risk to new/redeveloped structures:** ❖ Locate community lifelines or functions outside hazard area ❖ Use low-impact development techniques **Reduce risk to existing structures:** ❖ Build redundancy for critical functions or retrofit critical buildings ❖ Provide flood-proofing when new critical infrastructure must be located in floodplains	**Reduce the probability of hazard events:** ❖ Maintain drainage system ❖ Institute low-impact development techniques on property ❖ Dredging, levee construction, and providing regional retention areas ❖ Structural flood control, levees, channelization, or revetments. ❖ Stormwater management regulations and master planning ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff **Limit risk to new/redeveloped structures:** ❖ Locate or relocate community lifelines outside of hazard area* ❖ Acquire or relocate identified repetitive loss properties ❖ Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks. ❖ Adopt land development criteria such as planned unit developments, density transfers, clustering ❖ Institute low-impact development techniques on property ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff **Reduce risk to existing structures:** ❖ Harden infrastructure, bridge replacement program ❖ Provide redundancy for critical functions and infrastructure ❖ Adopt regulatory standards such as freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions. ❖ Stormwater management regulations and master planning. ❖ Adopt "no-adverse impact" floodplain management policies that strive to not increase the flood risk on downstream communities.* ❖ Expand the Stormwater Capture Parks Program to collect rainwater and urban runoff. ❖ Create Tree Canopy neighborhoods to reduce stormwater runoff by catching rainfall on branches and leaves and increasing evapotranspiration.

Personal Scale	Organizational Scale	Government Scale
Increase ability to respond to or be prepared for hazard: ❖ Buy flood insurance ❖ Develop household plan, such as retrofit savings, communication with outside, 72-hour self-sufficiency during and after an event ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	**Increase ability to respond to or be prepared for hazard:** ❖ Keep cash reserves for reconstruction ❖ Support and implement hazard disclosure for sale of property in risk zones. ❖ Solicit cost-sharing through partnerships with others on projects with multiple benefits.	**Increase ability to respond to or be prepared for hazard:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) ❖ Incorporate retrofitting or replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Maintain and collect data to define vulnerability and potential impacts ❖ Train emergency responders ❖ Create an elevation inventory of structures in the floodplain ❖ Develop and implement a public information strategy* ❖ Charge a hazard mitigation fee ❖ Integrate floodplain management policies into other planning mechanisms within the planning area. ❖ Consider the probable effects of climate change on the risk associated with the flood hazard ❖ Consider the residual risk associated with structural flood control in future land use decisions ❖ Enforce National Flood Insurance Program ❖ Adopt a Stormwater Management Master Plan ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ Restore and reconnect floodplains that have been degraded by development and structural flood control.
- ❖ Use soft approaches for stream bank restoration and hardening (e.g., introducing large woody debris into a system).
- ❖ Set back levees on systems that rely on levee protection to allow the river channel to meander, which reduces erosion and scour potential.
- ❖ Acquire property within the floodplain, remove or relocate structures, and preserve these areas as open space in perpetuity.
- ❖ Preserve floodplain storage capacity by limiting or prohibiting the use of fill in the floodplain.
- ❖ Incorporate green infrastructure into stormwater management facilities
- ❖ Protect and/or restore riparian buffers

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-7. Alternatives to Mitigate the Landslide Hazard

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Minimize vegetation removal and the addition of impervious surfaces. ❖ Apply engineering solutions that minimize/eliminate the hazard **Limit risk to new/redeveloped structures:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) **Reduce risk to existing structures:** ❖ Retrofit home **Increase ability to respond to or be prepared for hazard:** ❖ Institute warning system, and develop evacuation plan* ❖ Keep cash reserves for reconstruction ❖ Educate yourself on risk reduction techniques for landslide hazards ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	**Reduce the probability of hazard events:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Apply engineering solutions that minimize/eliminate the hazard **Limit risk to new/redeveloped structures:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) **Reduce risk to existing structures:** ❖ Retrofit at-risk facilities **Increase ability to respond to or be prepared for hazard:** ❖ Institute warning system, and develop evacuation plan* ❖ Keep cash reserves for reconstruction ❖ Develop a continuity of operations plan ❖ Educate employees on the potential vulnerability to landslide hazards and emergency response protocol.	**Reduce the probability of hazard events:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Apply engineering solutions that minimize/eliminate the hazard **Limit risk to new/redeveloped structures:** ❖ Acquire properties in high-risk landslide areas. ❖ Adopt land use policies that prohibit the placement of habitable structures in high-risk landslide areas. **Reduce risk to existing structures:** ❖ Adopt higher regulatory standards for new development within unstable slope areas. ❖ Armor/retrofit critical infrastructure against landslides. **Increase ability to respond to or be prepared for hazard:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas: better land controls, tax incentives, information ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Educate the public on the landslide hazard and appropriate risk reduction alternatives.* ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ Replace or restore native vegetation known to stabilize steep slope areas.
- ❖ Soil bioengineering can be used to mitigate risk in larger areas that have a potential for shallow, slow-moving landslides or areas abandoned after past landslides that show signs of reactivation and have a high landslide hazard potential
- ❖ Hybrid solutions refer to conventional engineering solutions that are combined with nature-based solutions using appropriate vegetation.

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-8. Alternatives to Mitigate the High Wind Hazard

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ None **Limit risk to new/redeveloped structures:** ❖ None **Reduce risk to existing structures:** ❖ Provide redundant heat and power ❖ Insulate structure ❖ Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program) ❖ Remove debris from yards ❖ Perform regular maintenance to the structure **Increase ability to respond to or be prepared for hazard:** ❖ Trim or remove trees that could affect power lines ❖ Promote 72-hour self-sufficiency ❖ Obtain a NOAA weather radio. ❖ Obtain an emergency generator. ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	**Reduce the probability of hazard events:** ❖ None **Limit risk to new/redeveloped structures:** ❖ None **Reduce risk to existing structures:** ❖ Relocate critical infrastructure (such as power lines) underground ❖ Reinforce or relocate critical infrastructure such as power lines to meet performance expectations ❖ Install tree wire **Increase ability to respond to or be prepared for hazard:** ❖ Trim or remove trees that could affect power lines ❖ Create redundancy ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources.	**Reduce the probability of hazard events:** ❖ None **Limit risk to new/redeveloped structures:** ❖ None **Reduce risk to existing structures:** ❖ Harden infrastructure such as locating utilities underground ❖ Trim trees back from power lines **Increase ability to respond to or be prepared for hazard:** ❖ Support programs that proactively manage problem areas through use of selective removal of hazardous trees, tree replacement, etc. ❖ Establish and enforce building codes that require all roofs to withstand snow loads ❖ Increase communication alternatives* ❖ Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors. ❖ Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines ❖ Provide NOAA weather radios to the public* ❖ Consider the probable impacts of climate change on risk associated with the high wind hazard ❖ Evaluate and revise, as needed, building codes to address high wind impacts on residents. ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ No nature-based solutions have been identified to mitigate high winds.

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-9. Alternatives to Mitigate the Tsunami Hazard

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ None • **Limit risk to new/redeveloped structures:** ❖ Locate outside of hazard area ❖ Implement tsunami construction measures at a project level, including elevated living spaces and debris deflection structures • **Reduce risk to existing structures:** ❖ Apply personal property mitigation techniques to your home such as anchoring your foundation and foundation openings to allow flow through • **Increase ability to respond to or be prepared for hazard:** ❖ Develop and practice a household evacuation plan. ❖ Educate yourself on the risk from the tsunami hazard and ways to minimize that risk. ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop ❖ Acquire educational materials on preparedness in ReadyLA.org	• **Reduce the probability of hazard events:** ❖ None • **Limit risk to new/redeveloped structures:** ❖ Locate structure or mission critical functions outside of hazard area whenever possible ❖ Implement tsunami construction measures at a project level, including elevated living spaces and debris deflection structures • **Reduce risk to existing structures:** ❖ Mitigate property for the impacts of tsunami ❖ Construct vertical evacuation structures • **Increase ability to respond to or be prepared for hazard:** ❖ Develop and practice a corporate evacuation plan. ❖ Educate employees on the risk from the tsunami hazard and ways to minimize that risk*	• **Reduce the probability of hazard events:** ❖ Build wave abatement structures (e.g., the "Jacks" looking structure designed by the Japanese) • **Limit risk to new/redeveloped structures:** ❖ Locate structure or functions outside of hazard area whenever possible. ❖ Harden infrastructure for tsunami impacts. ❖ Relocate identified community lifelines located in tsunami high hazard areas. • **Reduce risk to existing structures:** ❖ Adopt higher regulatory standards that will provide higher levels of protection to structures built in a tsunami inundation area. ❖ Utilize tsunami mapping once available, to guide development away from high risk areas through land use planning ❖ Construct vertical evacuation structures • **Increase ability to respond to or be prepared for hazard:** ❖ Create a probabilistic tsunami map for the planning area. ❖ Provide incentives to guide development away from hazard areas. ❖ Develop tsunami warning and response system.* ❖ Provide residents with tsunami inundation maps* ❖ Develop and communicate evacuation routes* ❖ Enhance the public information program to include risk reduction options for the tsunami hazard* ❖ Utilize multi-hazard mitigation strategies that address tsunami hazards and sea-level rise from global climate change ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ Restore wetlands, marshes, and oyster reefs, and install living shorelines to help reduce wave impacts.
❖ Preserve/restore tidal marshes
❖ Establish living shorelines (plants and natural elements designed to stabilize and protect coastlines) to prevent erosion
❖ Incentivize voluntary retreat from coastal hazard areas

* Actions that benefit underserved communities and socially vulnerable populations

Table 32-10. Alternatives to Mitigate the Wildfire Hazard

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ Clear potential fuels on property such as dry overgrown underbrush and diseased trees (consistent with required fuel management guidelines set by the Los Angeles Fire Department (LAFD) • **Limit risk to new/redeveloped structures:** ❖ Create and maintain defensible space around structures ❖ Locate outside of hazard area ❖ Mow regularly • **Reduce risk to existing structures:** ❖ Create and maintain defensible space around structures and provide water on site ❖ Use fire-retardant building materials ❖ Create defensible spaces around home	• **Reduce the probability of hazard events:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees • **Limit risk to new/redeveloped structures:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area • **Reduce risk to existing structures:** ❖ Create and maintain defensible space around structures and infrastructure and provide water on site ❖ Use fire-retardant building materials ❖ Use fire-resistant plantings in buffer areas of high wildland/urban interface fire threat.	• **Reduce the probability of hazard events:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees ❖ Implement best management practices on public lands. ❖ Remove invasive non-native hazardous fuels in riparian areas and restore native habitat • **Limit risk to new/redeveloped structures:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area ❖ Enhance building code to include use of fire resistant materials in high hazard area. ❖ Ensure compliance with State Minimum Fire Safe Regulations • **Reduce risk to existing structures:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Use fire-retardant building materials ❖ Use fire-resistant plantings in buffer areas of high wildland/urban interface fire threat. ❖ Consider higher regulatory standards (such as Class A roofing) ❖ Establish biomass reclamation activities

Personal Scale	Organizational Scale	Government Scale
• **Increase ability to respond to or be prepared for hazard:** ❖ Employ techniques from the National Fire Protection Association's Firewise Communities program to safeguard home ❖ Identify alternative water supplies for fire fighting ❖ Install/replace roofing material with non-combustible roofing materials. ❖ Sign up for NotifyLA ❖ Conduct a Ready Your LA Neighborhood Workshop	• **Increase ability to respond to or be prepared for hazard:** ❖ Support Firewise community initiatives.* ❖ Create /establish stored water supplies to be utilized for firefighting.	• **Increase ability to respond to or be prepared for hazard:** ❖ More public outreach and education efforts* ❖ Possible weapons of mass destruction funds available to enhance fire capability in high-risk areas ❖ Identify fire response and alternative evacuation routes* ❖ Seek alternative water supplies* ❖ Manage fuel load through thinning and brush removal ❖ Use academia to study impacts/solutions to wildland/urban interface fire risk ❖ Establish/maintain mutual aid agreements between fire service agencies. ❖ Create/implement fire plans ❖ Consider the probable impacts of climate change on the risk associated with the wildland/urban interface fire hazard in future land use decisions ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ Manage invasive species (i.e., Pampas Grass) that are susceptible to increased wildfire risk.
- ❖ Create riparian corridors in wildfire hazard areas as fire breaks
- ❖ Incorporate nature-based wildfire risk reduction buffers into existing ecosystem-friendly land uses (e.g., green space, trails, or community parklands)
- ❖ Implement and fund ecological thinning and prescribed fire and cultural fire and, where appropriate, manage wildfire for resource benefit
- ❖ Fund and implement ecological restoration programs to convert exotic grasslands to native scrub and chaparral and control invasive species

* Actions that benefit underserved communities and socially vulnerable populations

32.2 Climate Change Best Management Practices

32.2.1 General Approaches

Communities and governments worldwide are working to address, evaluate and prepare for climate changes that are likely to affect 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 effects 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 likely 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.

32.2.2 Adaptive Capacity

Adaptive capacity is defined as “the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences” (IPCC, 2014). The following are general alternatives that can be considered to build capacity for adapting to current and future risks associated with climate change:

- Incorporate climate change adaptation into relevant local and regional plans and projects.
- Establish a climate change adaptation and hazard mitigation public outreach and education program.
- Build collaborative relationships between regional entities and neighboring communities to promote complementary adaptation and mitigation strategy development and regional approaches.
- Establish an ongoing monitoring program to track local and regional climate impacts and adaptation strategy effectiveness.
- Increase participation of low-income, immigrant, non-English-speaking, racially and ethnically diverse, and special-needs residents in planning and implementation.
- Ask local employers and business associations to participate in local efforts to address climate change and natural hazard risk reduction.

- Conduct a communitywide assessment and develop a program to address health, socioeconomic, and equity vulnerabilities.
- Focus planning and intervention programs on neighborhoods that currently experience social or environmental injustice or bear a disproportionate burden of potential public health impacts.
- Incorporate consideration of climate change impacts as part of infrastructure planning and operations.
- Conduct a climate impact assessment on community infrastructure.
- Identify gaps in legal and regulatory capabilities and develop ordinances or guidelines to address them.
- Identify and pursue new sources of funding for mitigation and adaptation activities.
- Hire new staff or provide training to current staff to ensure an adequate level of administrative and technical capability to pursue mitigation and adaptation activities.

Adaptive capacity goes beyond human systems. Some ecosystems can adapt to change and buffer surrounding areas from the effects 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. Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall strategy to help people adapt to the adverse effects of climate change. This includes the sustainable management, conservation and restoration of specific ecosystems that provide key services.

33. ACTION PLAN

33.1 Status of Previous Plan Actions

33.1.1 Mitigation Actions

The 2018 City of Los Angeles HMP identified 135 mitigation actions for implementation. For the current update, these actions were reviewed by City Departments, partner agencies, and Steering Committee members, and members of the public. For each action, it was determined whether the action had been completed, was in progress or had not been started. Incomplete actions were reviewed to determine if they should be carried over to the 2024 update or removed from the plan due to a change in priorities, capabilities, or feasibility.

Of the 135 identified actions identified in the 2018 plan, 29 were carried over to the 2024 update and 106 were withdrawn based on a review by the planning team. The carried over actions include the 16 that are in progress but not complete. The withdrawn actions include the 10 that have already been completed. The reasons for withdrawal of the other actions ranged from the action no longer being considered feasible to the action being identified as a core capability by the 2018 planning process. Each action carried over has a new action number assigned to it for the 2024 update, and many were reworded to state their intent more clearly. Appendix F summarizes the status of all recommended actions from 2018.

33.1.2 Status of Plan Integration Efforts

Federal guidelines require hazard mitigation plan updates to describe completed steps to integrate hazard mitigation into other planning activities. The 2011 City of Los Angeles Hazard Mitigation Plan did not identify actions or metrics of sufficient clarity to measure successful integration into other planning mechanisms. The 2018 HMP improved clearly defined actions and metrics for successful integration.

This 2024 City of Los Angeles Hazard Mitigation Plan builds upon the improvements of the 2018 hazard mitigation plan by continuing to identify clear actions for plan integration with clear metrics to monitor their completion, meeting the objectives of 44 CFR 201.6(c)(4)(ii).

33.2 Action Plan

The action plan for this HMP update consists of all actions carried over from the previous City of Los Angeles HMP as well as new actions developed to address the City's current goals and needs. The sections below provide complete information about each recommended action. The tables of actions are divided into sections identifying the office, department or agency responsible for implementing the recommended mitigation actions.

The timelines indicated are defined as follows:

- Short-term = Completion within 5 years
- Long-term = Completion within 10 years

33.2.1 Actions Carried Over from 2018 HMP

Table 33-1 lists the mitigation actions from the 2018 HMP that have been carried over for inclusion in the 2024 plan update action plan.

Table 33-1. Action Items Carried Over From 2018 HMP

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Department of Water and Power (LADWP)				
DWP-2018-01— Generation Backup Program.				
New & existing	1, 8	1, 5	DPW Operations Fund, HMA	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Some socially vulnerable populations experience homelessness and are reliant on public facilities to provide water and power on a regular basis. Backup generators for water and power facilities allow these public facilities to continue supplying power and water to those individuals.				
DWP-2018-02— Integrate Customer Connect with existing centers.				
Existing	1, 5, 8	1, 2	General Fund	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: A new alternate EOC facility will provide for Continuity of Operations should the primary EOC be unavailable. The alternate EOC will assist in the protection of life and property throughout the City by providing a location to assess, order, and deploy resources to maintain control of an emergency. Continuity of emergency operations would enable facilitation of assistance to City residents especially those with access and function needs and those socially vulnerable communities.				
DWP-2018-03— Security Lighting Upgrade Program.				
Existing	2, 8	1	Staff Time, General Fund	Short-Term
Hazards Mitigated: Earthquake; Flood; High Wind; Landslide; Tsunami; Wildfire				
Socially Vulnerable Population Impacts: Socially vulnerable populations are often the most at-risk from hazards due to pre-existing conditions and socioeconomic status. This action will educate and inform all populations, including the socially vulnerable, on the hazards which may occur in the City and how to mitigate the risk associated with those hazards.				
DWP-2018-04—Install perimeter security walls at RS-C, RS-G, RS-F, and River SS. All four stations have a long history of break-ins, vandalism, and theft. They could be targets for terrorism as well. RS-F and RS-G are medium low level CIP identified stations. Walls have been effective deterrents in other LADWP stations.				
Existing	2, 8	1	Staff Time, General Fund	Short-Term

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
DWP-2018-06— Identify new needs and enhance existing facilities through the LADWP Pump Station Refurbishment Program.				
New & existing	1, 2, 8, 9	1, 3	DPW Operations Fund, HMA	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Protection and upgrades of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
DWP-2018-07— Identify new needs and enhance existing facilities through the Regulator Stations Program.				
New & existing	1, 2, 8, 9	1, 3	DPW Operations Fund, HMA	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Protection and upgrades of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
DWP-2018-08— Identify new and enhance existing trunk lines and major system connections through the Trunk Lines and Major System Connections Program.				
New & existing	1, 2, 8, 9	1, 3	DPW Operations Fund, HMA	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: The section overview portion of the Emergency Plan covers a discussion of a variety of topics, including population distribution and locations, including any concentrated populations of individuals with disabilities, others with access and functional needs, or individuals with limited English proficiency.				
DWP-2018-09— Identify HMA eligible projects in the Infrastructure Reservoir Improvements Program (tanks only).				
New & existing	1, 2, 8, 9	1, 3	DPW Operations Fund, HMA	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Many HMA grant projects include supporting and assisting socially vulnerable populations.				
DWP-2018-10— Griffith Park Improvements Project.				
New	2, 4, 8, 9	1, 5	DPW Operations Fund, HMA	Short-Term

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Many FEMA grant opportunities require showing how or if a project will benefit socially vulnerable populations. This action will guide City departments, office, and divisions how to write successful mitigation grant applications.				
DWP-2018-12— Water Quality Additions and Betterments.				
Existing	2, 9	1, 4	Staff Time, General Fund	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Socially vulnerable populations are dependent on public water sources that are easily accessible to them. By bettering the water quality, people experiencing homelessness can access clean, drinkable water.				
DWP-2018-13— Infrastructure Reservoir Improvements Program (dams only).				
Existing	1, 2, 6, 9	1, 3, 4, 5	Staff Time, General Fund, BRIC	Long-Term
Hazards Mitigated: Dam Failure				
Socially Vulnerable Population Impacts: Some socially vulnerable populations may be located in a dam inundation area and are at a greater risk from dam failure. Infrastructure improvements to these dams will further protect the infrastructure integrity of the dam, which will further protect socially vulnerable populations that are located in a dam inundation area.				
DWP-2018-14— Water Quality Improvement Project Reservoir Improvement Program.				
Existing	1, 2, 6, 8	1, 3, 4	Staff Time, General Fund, BRIC	Long-Term
Hazards Mitigated: Dam Failure				
Socially Vulnerable Population Impacts: Socially vulnerable populations are dependent on public water sources that are easily accessible to them. By bettering the water quality, people experiencing homelessness can access clean, drinkable water.				
DWP-2018-15— Seismic Strengthen of DS Yard walls.				
Existing	1, 2, 9	1, 3, 4	Staff Time, General Fund, BRIC	Long-Term
Hazards Mitigated: Earthquake				
Socially Vulnerable Population Impacts: Many FEMA grant opportunities require showing how or if a project will benefit socially vulnerable populations. This action will guide City departments, office, and divisions how to write successful mitigation grant applications.				
DWP-2018-16— S. Haiwee Reservoir Spillway Channel Modifications. Harden Spillway channel upstream and downstream to prevent Erosion and Scour. Needed to protect new LADWP-owned Facilities downstream of S. Haiwee Dam.				
Existing	1, 2, 6, 8	1, 3, 4, 5	DPW Operations Fund, BRIC	Short-Term
Hazards Mitigated: Dam Failure; Flood; High Wind;				
Socially Vulnerable Population Impacts: Some socially vulnerable populations may be located in a dam inundation area and are at a greater risk from dam failure. Infrastructure improvements to these dams will further protect the infrastructure integrity of the dam, which will further protect socially vulnerable populations that are located in a dam inundation area.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
DWP-2018-17— Tinemaha Reservoir Spillway Channel Improvement Project. Earthen Spillway channel requires a hardened invert and approach apron to prevent excessive Erosion and Scour. Higher Side Berms and Hardened Arizona crossings are needed to protect the channel from breaching its banks and preventing back flows towards the toe of the Dam. Increased spillway channel capacity back to the Owens River will reduce the risks of flooding State Highway 395 and reduce the risk of Dam failure.				
Existing	1, 6, 8, 9	1, 3, 4, 5	DPW Operations Fund	Short-Term
Hazards Mitigated:	Dam Failure; Flood			
Socially Vulnerable Population Impacts:	Some socially vulnerable populations may be located in a dam inundation area and are at a greater risk from dam failure. Infrastructure improvements to these dams will further protect the infrastructure integrity of the dam, which will further protect socially vulnerable populations that are located in a dam inundation area.			
DWP-2018-18— Four Culverts Replacement Project – Bishop Flood Bypass Channel. This facility was severely damaged during High flow events in Run-off Season 2017. The entire system of four CMP culverts and Regulatory slide gates, retaining walls and wing walls require 100 % rebuild. This release facility protects the City of Bishop, CA from flood damage by rerouting flood waters to a Flood Control Channel designed by the Army Corps of Engineers.				
Existing	1, 2, 3, 8, 9	1, 3, 4	DPW Operations Fund, BRIC	Short-Term
Hazards Mitigated:	Flood			
Socially Vulnerable Population Impacts:	Socially vulnerable populations are impacted by flooding due to aging infrastructure. New Culverts reduce flooding and reduce problems that socially vulnerable populations may have relating to flooding.			
DWP-2018-19— Self-Propelled Suction Dredge for Sediment Removal along the LAA. A self-propelled suction dredge is required for sand trap cleaning, sediment removal operations in our aqueduct, and channel maintenance for flows through our reservoirs from inlet to outlet structures. The last suction Dredge was decommissioned in the late 1980's and needs to be replaced. New uses are channel maintenance for major Environmental Mitigation Projects like the 62-mile long Lower Owens River Project.				
Existing	1, 8, 9	1, 3, 4	DPW Operations Fund	Short-Term
Hazards Mitigated:	Flood			
Socially Vulnerable Population Impacts:	Many FEMA grant opportunities require showing how or if a project will benefit socially vulnerable populations. This action will guide City departments, office, and divisions how to write successful mitigation grant applications.			
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Emergency Management Department (EMD)				
EMD-2018-01— Coordinate the implementation and maintenance of the 2024 City of Los Angeles Hazard Mitigation Plan.				
New & existing	2, 5, 6, 7	1, 2, 5	Staff Time, General Fund, HMA	Short-Term
Hazards Mitigated:	Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire			
Socially Vulnerable Population Impacts:	FEMA's new requirements of explicitly addressing socially vulnerable populations means the implementation of this plan will directly benefit socially vulnerable populations, especially in relation to action implementation.			

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Housing Department (LAHD, formerly HCID)				
LAHD-2018-01—Pre-Disaster Housing Recovery Strategy for the City. This plan will provide the framework and strategy for how the City will: 1) manage the transition from mass care and shelter response to housing-related recovery in future disasters; 2) collect and analyze data and information related to the disaster; and 3) design effective housing recovery programs that may be implemented to maximize and leverage available recovery resources and funding to rehouse displaced residents and reconstruct damaged housing of all types.				
New & existing	1, 12	1, 2, 4	City Staff time, FEMA Planning Grant, CDBG-DR	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: A plan for housing recovery could include communities and groups that are marginalized or socially vulnerable and ways to assist them.				
LAHD-2018-02—Seismic Retrofit Program. This program seeks to complete mandatory seismic retrofitting of residential properties with identified soft-story hazards, as required by City Ordinance 184081 enacted in February 2016. In addition, other residential seismic retrofit needs in the City will be researched (e.g. non-ductile concrete buildings).				
Existing	1, 6, 12	1, 4, 5	Apartment owner funds; Cost recovery from tenants (i.e., rent increases and/or surcharges); City Staff time, HMA	Short-Term
Hazards Mitigated: Earthquake				
Socially Vulnerable Population Impacts: Facilities that accommodate or host socially vulnerable communities could be included in the seismic retrofitting program.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Police Department (LAPD)				
LAPD-2018-01— Regional Explosive Device Detection, Imaging and Mitigation Maintenance Project.				
New & existing	1, 8	1, 4	Staff Time, General Fund, Urban Areas Security Initiative (UASI), State Homeland Security Grant Program (SHSGP)	Short-Term
Hazards Mitigated: Radiological Incidents; Terrorism; Hazardous Materials Release				
Socially Vulnerable Population Impacts: Socially vulnerable populations such as those suffering from homelessness may face additional risk from explosive devices as they may rely on public facilities for hygiene and sheltering needs.				
LAPD-2018-02— Bomb Squad Robot Upgrade Project.				
Existing	2, 8	1	Staff Time, General Fund, SHSGP	Long-Term
Hazards Mitigated: Radiological Incidents; Terrorism; Hazardous Materials Release				
Socially Vulnerable Population Impacts: Socially vulnerable populations can be more at risk from bomb threats and hazardous materials releases due to those that suffer from homelessness being more dependent on relocating to public facilities where most people have access to.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: City Planning				
CP-2018-01— Create a City of Los Angeles Climate Vulnerability Assessment that builds on the work of the HMP and the LA County Climate Vulnerability Assessment by offering additional guidance on how best to plan for the intersection of physical and social vulnerability to ensure that climate equity is central in all future climate planning efforts.				
New & existing	2, 3, 5, 6, 8, 9, 10	1, 3, 4, 5	Staff Time, FEMA Planning Grant, CDBG, EPA	Short-Term
Hazards Mitigated: Extreme Heat; Extreme Cold; Flood; High Wind; Sea-Level Rise; Wildfire				
Socially Vulnerable Population Impacts: This action addresses the socially vulnerable population and offers additional guidance and help on how to ensure climate equity.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Fire Department (LAFD)				
LAFD-2018-03— Update/maintain Wild Land Operational Plan with best available data and science on wildfire risk and severity within the operational area.				
New & existing	1, 2, 8	1, 4, 5	LAFD Operations Funds, HMA	Short-Term
Hazards Mitigated: Wildfire				
Socially Vulnerable Population Impacts: Socially vulnerable populations may be unaware of prominent wildfire areas. By updating and making this plan accessible to all socially vulnerable populations, the risk to socially vulnerable populations is lowered.				
LAFD-2018-04— Security/Safety action for memorial training center at 1700 stadium way. The current project is re securing the property by installing iron security fencing around the property.				
Existing	1, 12	1	LAFD Operations Funds	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Nature-based solutions offer significant benefits which may impact socially vulnerable populations, including economic growth, green jobs, increased property values, and improvements to public health, including better disease outcomes and reduced injuries and loss of life.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles World Airport (LAWA)				
LAWA-2018-01— Improved LAX Airport Passenger Access and Airfield Modifications to Improve Safety and Efficiency (Airfield Expansions).				
New & existing	1, 7, 8	1, 4	Staff Time, General Fund, HMA	Short-Term
Hazards Mitigated: Earthquake				
Socially Vulnerable Population Impacts: Some socially vulnerable populations may not speak English and may have difficulty hearing/seeing. By improving safety and efficiency, LAWA will have to ensure that modifications are made to serve these populations.				
LAWA-2018-02— Assess and install crash cushion on critical power line poles on Pershing Drive and other key locations throughout the perimeter of LAX.				
New & existing	1, 7, 8	1, 4	Staff Time, HMA	Short-Term
Hazards Mitigated: Transportation Accident, Geomagnetic Storm, Public Health				
Socially Vulnerable Population Impacts: Nature-based solutions offer significant benefits which may impact socially vulnerable populations, including economic growth, green jobs, increased property values, and improvements to public health, including better disease outcomes and reduced injuries and loss of life.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAWA-2018-03— Purchase two X-Ray Vans or robots which can detect solid and liquid explosives in checked baggage.				
New & existing	1, 7, 8	1, 4	Staff Time, FEMA Planning Grant, CDBG, UASI, SHSGP	Long-Term
Hazards Mitigated: Terrorism				
Socially Vulnerable Population Impacts: Some socially vulnerable populations may not speak English and may have difficulty hearing/seeing sirens and warnings related to explosives. By purchasing the robots, more explosives will be identified prior to entering the airport which reduces the threat.				
LAWA-2018-04— Install Earthquake Early Warning technology into all terminals to connect to the airports' existing 3,700 InformaCast endpoints (Cisco phones, speakers, desktops and digital signage) over PA/audio and visual alerting interfaces. An audible alert will be played to warn occupants in the event of anticipated shaking equal to or greater than a 5 Modified Mercalli Intensity (MMI) value.				
New & existing	1, 7, 8	1	Staff Time, HMA, FAA, DOT	Long-Term
Hazards Mitigated: Earthquake				
Socially Vulnerable Population Impacts: Some socially vulnerable populations may not speak English as a primary language and may have difficulty hearing/seeing warnings related to earthquakes. LAWA will ensure physical and verbal alerts are both made in different languages to warn these individuals.				

33.2.2 New Actions for 2024

City department representatives selected and created actions to be included in this hazard mitigation action plan. A memo from the HMP Steering Committee to department representatives provided resources for identifying new mitigation actions, and Tetra Tech and EMD hosted two workshops on how use those resources to develop mitigation actions, including nature-based solutions. The selection of actions was based on the risk assessment of identified hazards of concern and the updated hazard mitigation goals and objectives. Table 33-2 lists the new hazard mitigation actions included in the action plan.

Table 33-2. New Actions Identified for This HMP Update

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
Citywide Mitigation Actions				
CLA-01—Designate, develop, and equip a new central Incident Command Center(s).				
New & existing	1, 8, 9, 10	1, 5	General Fund, EMPG	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: A new central Incident Command Center(s) will assist in the protection of life and property throughout the City by providing a location to assess, order, and deploy resources to maintain control of an emergency.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
CLA-02—Identify and obtain a new EOC alternate facility that will allow EMD to secure the location or open the location anytime.				
New & Existing	1, 8, 9	1, 5	General Fund, EMPG	Long-Term
Hazards Mitigated:	Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire			
Socially Vulnerable Population Impacts:	A new alternate EOC facility will provide for Continuity of Operations should the primary EOC be unavailable. The alternate EOC will assist in the protection of life and property throughout the City by providing a location to assess, order, and deploy resources to maintain control of an emergency.			
CLA-03—Implement education and outreach awareness programs utilizing media, social media, flyers, etc. to educate community members of hazards that can threaten the area and mitigation measures to reduce injuries, fatalities, and property damages.				
New & existing	10	1, 2, 4	General Fund, HMA, EMPG	Long-Term
Hazards Mitigated:	Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire			
Socially Vulnerable Population Impacts:	Socially vulnerable populations are often the most at-risk from hazards due to pre-existing conditions and socioeconomic status. This action will educate and inform all populations, including the socially vulnerable, on the hazards which may occur in the City and how to mitigate the risk associated with those hazards.			
CLA-04—Identify citywide critical facilities that need to be re-wired and retrofitted to meet the new standard for upgrading the HVAC system, installation /upgrading back-up power, and earthquake early warning systems.				
New & existing	2, 6, 8	1, 4	General Fund, BRIC, HMA	Long-Term
Hazards Mitigated:	Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire			
Socially Vulnerable Population Impacts:	Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.			
CLA-05—Install or upgrade back-up power to City-owned facilities such as three-way switch and solar power.				
Existing	1, 4, 8, 9	1, 4	General Fund, BRIC, HMA	Long-Term
Hazards Mitigated:	Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire			
Socially Vulnerable Population Impacts:	Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.			

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
CLA-06—Install earthquake early warning systems to city owned critical facilities.				
New & existing	1, 8, 9	1, 4, 5	General Fund, BRIC, HMA	Long-Term
Hazards Mitigated: Earthquake				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
CLA-07—Annually update the Department Emergency Plan and Continuity of Operations Plan.				
New & existing	5, 6, 8, 10	1, 2, 3, 4, 5	General Fund, EMPG	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: The section overview portion of the Emergency Plan covers a discussion of a variety of topics, including population distribution and locations, including any concentrated populations of individuals with disabilities, others with access and functional needs, or individuals with limited English proficiency.				
CLA-08— Identify and implement nature-based hazard mitigation practices, including but not limited to increasing landscape permeability and urban tree reforestation, replacing existing vegetation with drought-tolerant vegetation, and clearing invasive plants that use more water than native species				
New & existing	1, 2, 4	3, 4, 5	General Fund, BRIC	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; Tsunami and Seiche; Wildfire; Public Health				
Socially Vulnerable Population Impacts: Nature-based solutions offer significant benefits which may impact socially vulnerable populations, including economic growth, green jobs, increased property values, and improvements to public health, including better disease outcomes and reduced injuries and loss of life.				
CLA-09—Develop citywide guidance on mitigation grant applications.				
New & existing	2, 5, 6, 9	3, 4, 5	General Fund, BRIC, HMGP	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Many FEMA grant opportunities require showing how or if a project will benefit socially vulnerable populations. This action will guide City departments, office, and divisions how to write successful mitigation grant applications.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Department of Recreation and Parks (RAP)				
RAP-01— Identify and implement appropriate erosion control measures for the City's parks to mitigate potential flash floods and landslides during heavy rainfall or storms.				
New & existing	1, 2, 3	1, 4, 5	General Fund, BRIC	Long-Term
Hazards Mitigated: Flood, Landslide;				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding from the park. Furthermore, this action will assist in keeping roadways clear of flood waters for the populations which may need to attend medical appointments or require medical attention from first responders.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
RAP-02—Identify and implement measures to fortify critical park infrastructure, addressing failing infrastructure within and surrounding the park. Failing infrastructure includes roadways and retaining walls to access park amenities.				
Existing	1, 2	1, 4, 5	General Fund, BRIC	Long-Term
Hazards Mitigated: Landslide, Earthquake				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding near the park. Furthermore, this action will assist in keeping roadways clear of flood waters for the populations which may need to attend medical appointments or require medical attention from first responders.				
RAP-03—Increase tree trimming and maintenance for over 16,000 acres of parkland is critical in preventive maintenance and clean-up of fallen trees after a high wind or storm event.				
New & existing	1, 2, 4, 5	1, 4, 5	General Fund	Short-Term
Hazards Mitigated: Flood; High Wind				
Socially Vulnerable Population Impacts: Some socially vulnerable population rely on power utilities for everyday care. If power outages are caused by a lack of tree maintenance, lives could potentially be at risk.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Department of Public Works Bureau of Engineering (BOE)				
BOE-01—Construction of a steel and concrete bulkhead and new pavement (495 N. Quail Dr., 9192 W. Crescent Dr., 711 N. Enchanted Way, 22430 Domingo Rd. [Sueno Rd.], 8529 to 8569 W. Nash Dr., 805 Mount Washington Dr., 7200 W. Sunnydip Trail, Vista Del Mar).				
New	1, 2, 9	1, 5	General Fund, Special Gas Tax, SB1 Road & Maintenance Rehabilitation Fund, BRIC	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding near the identified roadways. Furthermore, this action will assist in keeping roadways clear of flood waters for the populations which may need to attend medical appointments or require medical attention from first responders.				
BOE-02—Extend an existing sidehill bridge and construct a bulkhead and new pavement to address the loss of lateral support of roadways.				
New & existing	1, 2, 9	1, 5	General Fund, Special Gas Tax, SB1 Road & Maintenance Rehabilitation Fund, BRIC	Short-Term
Hazards Mitigated: Earthquake; Flood; Landslide				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding near the bridge. Furthermore, construction of a bulkhead will result in a lowered likelihood of to property and decreased loss of life will occur in hazard prone areas, leading to reduced recovery costs and flood insurance claims. This action will also assist in keeping roadways clear of flood waters for the populations which may need to attend medical appointments or require medical attention from first responders.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
BOE-03—Construct bridges to span locations susceptible to the landslide hazard.				
New	1, 2, 9	1, 5	General Fund, Special Gas Tax, SB1 Road & Maintenance Rehabilitation Fund, BRIC	Short-Term
Hazards Mitigated: Landslide				
Socially Vulnerable Population Impacts: This action ensures transportation routes remain open and accessible for daily and medical use and evacuation needs. This action will assure there is a point of access for first responders into communities that may have faced damage from a hazard event on either side of the bridge.				
BOE-04—Construct new and/or retrofit existing stormwater facilities identified in the DPW CIP to manage stormwater from severe storm and flood events.				
New & existing	1, 2, 9	1, 5	DPW Operation funds, FEMA Hazard Mitigation Assistance programs	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts:				
BOE-05 —Identify and prioritize flood control projects for the City's Capital Improvement Program, such as bank stabilization and restoration, dune restoration, wetland restorations, floodplain and steam channel restorations, and shoreline restoration				
New & existing	1, 2, 3, 5, 9	1, 4, 5	DPW Operation funds, FEMA Hazard Mitigation Assistance programs	Long-Term
Hazards Mitigated: Flood; High Wind; Tsunami and Seiche; Sea-Level Rise, Coastal Erosion				
Socially Vulnerable Population Impacts: Vulnerable populations surrounding the location of the identified and prioritized flood control projects will benefit from this action, as it will reduce the flood risk surrounding the community				
BOE-06— Provide flood zone information to all residents. Provide notifications when flood insurance is required. Provide notifications when FEMA-designated flood zone changes are made.				
Existing	2, 3, 5, 6, 7, 8	1, 2, 4	General Funds	Short-Term
Hazards Mitigated: Flood; Tsunami; Sea-Level Rise				
Socially Vulnerable Population Impacts: This action will educate residents on the flood hazard, its risks to properties, and how to be notified if or when flood zone changes are made by FEMA; furthermore, this action will educate property owners on the necessity of flood insurance.				
BOE-07—Upon request, participate in flood organizations such as the CA Floodplain Management Association, the Association of State Floodplain Managers, and National Association of Stormwater and Floodplain Managers.				
Existing	1, 2, 3, 5, 6, 7, 9	1, 3	General Funds	Short-Term
Hazards Mitigated: Flood; Tsunami; Sea-Level Rise				
Socially Vulnerable Population Impacts: Officials that are up to date on flood risk are more likely to encourage development outside areas of high flood risk, which is where socially vulnerable populations have historically resided. Safer dwellings may be developed in a less vulnerable location.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
BOE-08—Continue to support a Certified Floodplain Manager initiative within DPW by providing funds for personnel to study and take the test to become Certified Floodplain Managers.				
Existing	1, 2, 3, 6, 7, 9	1, 3	General Funds	Short-Term
Hazards Mitigated: Flood; Tsunami; Sea-Level Rise				
Socially Vulnerable Population Impacts: Officials that are up to date on flood risk are more likely to encourage development outside areas of high flood risk, which is where socially vulnerable populations have historically resided. Safer dwellings may be developed in a less vulnerable location.				
BOE-09—Conduct National Flood Insurance Program Seminar for the City staff with a role in floodplain management for the City.				
New & existing	1, 2, 3, 6, 7, 9, 12	1, 2, 3	General Funds	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: Officials that are up to date on flood risk are more likely to encourage development outside areas of high flood risk, which is where socially vulnerable populations have historically resided. Safer dwellings may be developed in a less vulnerable location.				
BOE-10— Maintain geographic information system mapping and modeling capability to support the stormwater facilities condition assessment program.				
New & existing	1, 2, 3, 6, 7	1, 3, 5	DPW Operation funds, FEMA Hazard Mitigation Assistance programs	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
BOE-11—Create an online system to record and track flood complaints. This online system could be a collected list, a submission form for the public to submit locations which flood, a GIS application which would have users drop a pin to identify a flooding location, or a combination of all the above.				
New & existing	2, 7	1, 2, 5	General Funds	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will allow populations which may be otherwise unable to attend in-person meetings or visit offices an opportunity to submit a complaint regarding repetitively flooded areas.				
BOE-12—Identify new stormwater projects through the DPW CIP.				
New	1, 2, 3, 7, 9	1, 3, 4, 5	DPW Operation funds, FEMA Hazard Mitigation Assistance programs	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: Vulnerable populations surrounding the location of the identified projects will benefit from this action, as it will reduce the flood risk surrounding the community				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
BOE-13—Coordinate the implementation and maintenance of the 2020 City of Los Angeles Floodplain Management Plan (FMP) with the implementation of this hazard mitigation plan. The 2020 City of Los Angeles FMP and all its actions and recommendation are considered to be fully integrated with this local hazard mitigation plan by reference.				
New & existing	2, 3, 5, 6, 7	1, 2, 3, 5	DPW Operation funds, FEMA Hazard Mitigation Assistance programs	Short-Term
Hazards Mitigated: Flood; Tsunami; Sea-Level Rise				
Socially Vulnerable Population Impacts: Integrating local plans can assist in ensuring projects which would benefit socially vulnerable populations become identified and pursued. Plan implementation and maintenance allows for new vulnerabilities to be adopted into the plan(s).				
BOE-14—Continue to maintain good standing and compliance under the National Flood Insurance (NFIP). This will be accomplished through the floodplain management programs that will, at a minimum, meet the requirements of the NFIP: Enforce the flood damage prevention ordinance, Participate in floodplain identification and mapping updates, Provide public assistance/information on floodplain requirements and impacts.				
Existing	1, 2, 3, 5, 6, 7, 11	1, 3	DPW operation funds, Department of Building and Safety operation funds	Short-Term
Hazards Mitigated: Flood; Tsunami; Sea-Level Rise				
Socially Vulnerable Population Impacts: Officials that are up to date on flood risk are more likely to encourage development outside areas of high flood risk, which is where socially vulnerable populations have historically resided. Safer dwellings may be developed in a less vulnerable location.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Department of Public Works Los Angeles Sanitation and Environment (LASAN)				
LASAN-01—Install infrastructure along Lankershim Blvd to improve stormwater management, infiltration, and community enhancement.				
New & existing	1, 2, 9	1, 4, 5	Safe Clean Water Regional Project, general fund, BRIC	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-02—Install infrastructure along Oro Vista Avenue to improve stormwater management, infiltration, and community enhancements.				
New & existing	1, 2, 9	1, 4, 5	Safe Clean Water Regional Project, general fund, BRIC	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LASAN-03—Install curbs and gutters to handle stormwater runoff collected from properties adjacent to the street.				
New & existing	1, 2, 9	1, 4, 5	Assessment District or Special funding source, BRIC	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-04—Develop a feasibility study (concept report) to develop a scope of work to address flooding and install stormwater BMP for infiltration and greening along the corridor.				
Existing	1, 2, 3, 6, 9	1, 3, 5	Safe Clean Water Regional Project, SB 1 funding, general fund, BRIC	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-05—Install reinforced concrete pipe (main line) along Dickens St and connect to the existing Los Angeles City Storm Drain (per plan D-5293).				
New & existing	1, 2, 9	1, 4, 5	SB 1 funding, general fund, BRIC	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-06—Replace inadequate drains and culverts throughout the City to reduce the impacts of flood on pedestrian traffic, vehicular traffic, and to protect residences during the rainy season.				
New & existing	1, 2, 9	1, 4, 5	SB 1, Stormwater Pollution Abatement Fund, BRIC	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-07—Construct a storm drain (Orion Avenue between Nordhoff Street and Roscoe Boulevard, Rayen Street between Orion Avenue and Langdon Avenue, Langdon Ave from Rayen Street to Nordhoff Street) to connect existing storm drains and eliminate flooding of Langdon elementary school.				
New	1, 2, 9	1, 4, 5	SB 1, Stormwater Pollution Abatement Fund, BRIC	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads, ensure roadways are clear for emergency response and daily use, and keep the Langdon elementary school from flooding impacts.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LASAN-08—Construct a storm drain in Tyler Street, connecting to Los Angeles County Project 9208 in Herrick Avenue, extending NE to Glenoaks Boulevard, NW to Cobalt Street, NE to Fellows Avenue, and NW to Roxford Street				
New	1, 2, 9	1, 4, 5	SB 1, Stormwater Pollution Abatement Fund, BRIC	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-09—Construct a storm drain in Branford Street between Laurel Canyon Boulevard and Arleta Avenue and connect to proposed storm drain in Branford Street near Arleta Avenue				
New	1, 2, 9	1, 4, 5	SB 1, Stormwater Pollution Abatement Fund, BRIC	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-10—Construct a storm drain in Lasaine Avenue from the graded channel north of Oxnard street to Hatteras Street, and then east to Graves Avenue.				
New	1, 2, 9	1, 4, 5	SB 1, BRIC	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
LASAN-11—Construct Los Angeles-Glendale Water Reclamation Plant Primary Effluent Equalization Storage and Campus Plan (CIP# 4176) to provide hydraulic relief to the NOS by diverting additional wet-weather flows to the plant for storage and attenuation of peak flows.				
New	1, 2, 9	1, 3, 4, 5	Sewer Construction and Maintenance Fund, Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) Grant Program, Flood Mitigation Assistance (FMA) Program, City General Fund	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding in the area and will ensure roadways are clear for emergency response and daily use.				
LASAN-12—Assess the feasibility of purchasing or entering an MOU with an applicable company or institution, a mobile hazardous material collection program. This action will help the City plan and implement mobile household hazardous waste collection events, which may lead to increased participation.				
Existing	2, 8	1	Special Fund, HSGP	Long-Term
Hazards Mitigated: Hazardous Material Release				
Socially Vulnerable Population Impacts: Hazardous materials which are unsafely collected or disposed may pose risks to populations living near garbage collection locations, landfills, and incinerators. This action will ensure these materials are collected and disposed of properly and safely.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LASAN-13—The Industrial Waste Management Division of the City's Sanitation Department maintains the health and safety of the public and environment while protecting the City's water reclamation plants and their byproducts, biosolids, and treated wastewater. Despite being charge of the regulation, monitoring, and control of the wastewater discharges for over 16,000 industrial users into the City sewers, the Industrial Waste Management Division does not have an Industrial Waste and Spill Prevention Program to protect stormwater structures/system. With stakeholders, create an Industrial Waste and Spill Prevention Program which will consist of education and outreach on hazards associated with waste discharges into waterways and water systems, formalize standard operating procedures, and specify permitting requirements.				
Existing	1, 2, 3, 9	1, 3	General Fund	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Socially vulnerable populations will learn how the City protects the local waterways and sources while preventing pollutants from infiltrating the potable water.				
LASAN-14—The City operates more than 6,700 miles of public sewers that convey about 400 million gallons per day of flow from residences and businesses to the City's four wastewater treatment and water reclamation plants. To accelerate sewer repairs, create an online reporting system for the public to submit sewerage problems in the City. Additionally, work with the City's On-site Wastewater Treatment Systems (OWTS) group to provide education to homeowners with private septic system on how to avoid the common issues of spills and overflows and proactively explore several funding sources to assist OWTS owners who would like to properly abandon the OWTS and connect to the City sewer.				
Existing	1, 2, 9	1, 3, 4, 5	Sewer Operations & Maintenance Fund (SCMO) or Sewer Capital Fund, BRIC	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will educate populations on how to avoid the common issues of spills and overflows and provide several funding sources to assist OWTS owners who would like to properly abandon the OWTS and connect to the City sewer.				
LASAN-15—Implementation of Flash Flood Warning System for Donald C. Tilman Plant, Los Angeles-Glendale Plant, Pumping Plant #3, and Pumping Plant #49.				
New	1, 2, 9	1, 3, 5	Sewer Construction and Maintenance (SCM) Fund, HMGP, PDM Grant Program, FMA Program, General Fund	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
LASAN-16—Revise the map of hillside areas to identify urban flooding "hot-spots" for maintenance needs and the identification of future stormwater management projects.				
New & existing	1, 2, 6, 7	1, 4	Stormwater Pollution Abatement Fund, General Funds, SB 1	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding in the area and will ensure roadways are clear for emergency response and daily use.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LASAN-17—Perform Watershed Protection and Stormwater Pollution Prevention Public Outreach and Education to the public, with outreach methods to include newsletter, website resources and references, webinars, and the sharing of the City's Stormwater Pollution Prevention Plan and Stormwater Management Plan. Furthermore, provide these materials in both English and Spanish to ensure socially vulnerable populations can understand the outreach initiative.				
Existing	2, 7, 12	1, 2	Stormwater Pollution Abatement Fund, Measure W	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: Socially vulnerable populations will learn how the City protects the local watersheds and water sources while preventing pollutants from infiltrating the potable water.				
LASAN-18—Perform a flood study on the City's stormwater system to identify structural deficiencies which could exacerbate flooding conditions and potential flood mitigation measures which could be taken to reduce the flood risk in the City. Assess the identified flood mitigation measures and implement where applicable.				
New	1, 2, 3, 4, 6, 7, 8, 9, 10, 11	1, 3, 4	Stormwater Pollution Abatement Fund, SCM	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding in the area and will ensure roadways are clear for emergency response and daily use.				
LASAN-19—Continue to improve the City's Cybersecurity Posture to protect IT infrastructure and Data.				
New & existing	2, 5, 7	1, 4	GASP funded (GF, CRTF, SPA, SCMO, and SWRF)	Long-Term
Hazards Mitigated: Cyber Threats				
Socially Vulnerable Population Impacts: Socially vulnerable populations may not be impacted by cyber-attack events to the extent of other social groups and populations. Socially vulnerable populations are often reliant on government or community programs for access to technology, such as laptops and desktops. Access to those items would be indirectly impacted if the agency or organization providing those services were directly impacted.				
LASAN-20—Recycle 100% of the City's wastewater for beneficial use.				
New & existing	1, 5, 6, 8, 9, 12	4, 5	Sewer Construction and Maintenance Funds, BRIC	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: Through the City's reuse of wastewater, less potable water will be utilized, reducing the City's overall potable water consumption for tasks which could use graywater. While this action will not increase the availability or amount of potable water, it will reduce its use of potable water which can be allocated or used elsewhere.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LASAN-21—Hyperion Water Reclamation Plant: Stabilize retaining walls, implement landslide prevention measures, construct emergency backup power to prevent disruption of critical services during power failure, and continue to evaluate tsunami risks to critical infrastructure.				
New & existing	1, 7, 8	1, 4, 5	Sewer Construction and Maintenance Funds, HMGP, Pre-Disaster Mitigation Grant Program (PDM), FEMA Flood Mitigation Assistance (FMA) Program, General Fund, CiSCo	Long-Term
Hazards Mitigated: Landslide, Tsunami				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
LASAN-22—Terminal Island Water Reclamation Plant: Construct flood walls, structures, gates, and obtain a backup generator to provide flood control prevention measures and prevent disruption of critical services during power failure.				
New & existing	1, 7, 8	1, 4, 5	Sewer Construction and Maintenance Funds, HMGP, Pre-Disaster Mitigation Grant Program (PDM), FEMA Flood Mitigation Assistance (FMA) Program, General Fund	Short-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Department of Public Works Street Services (BSS)				
BSS-01—Cool Neighborhood Project: Install gray-colored cool pavement coating on city blocks to reduce the effects of the urban heat island throughout the City.				
New	1, 2, 9	4	State Grant: Transforming Climate Communities	Short-Term
Hazards Mitigated: Extreme Heat				
Socially Vulnerable Population Impacts: This action will reduce the effects of the urban heat island throughout the City, improving health for the entire population and visitors.				
BSS-02—Clean California Medians: Identify medians to enhance with turf in public rights-of-way throughout the City of Los Angeles. This project will use native Californian landscaping to mitigate the urban heat island effect and provide biodiversity benefits, replacing the old irrigation to water efficient system, and reduce debris withing the City's right-of-way.				
New	1, 2, 9	4, 5	State Grant: Clean CA Local Grant Fund	Short-Term
Hazards Mitigated: Extreme Heat, Flood				
Socially Vulnerable Population Impacts: This action will reduce the effects of the urban heat island throughout the City, improving health for the entire population and visitors.				
BSS-03—Sidewalk and Transit Amenities Program: throughout the City, install bus shelters for shade, safety, and comfort for bus riders.				
Existing	1, 2, 9, 10	1, 4	Public Works Trust Fund Loan	Long-Term
Hazards Mitigated: Extreme Heat, High Wind				
Socially Vulnerable Population Impacts: This action will protect the health of populations from hazards while waiting for public transit.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Zoo				
ZOO-01—Conduct annual fire, earthquake, animal escape, and Zoo evacuation exercises at the Los Angeles Zoo and Botanical Gardens.				
Existing	2, 5, 7, 12	1, 4	General Fund, EMPG	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard events.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Harbor Department/Port of Los Angeles (POLA)				
POLA-01—Conduct improvements and maintenance of bridges at the Port of Los Angeles.				
New & existing	1, 2, 9	1, 4	Harbor Department Capital Improvement, BRIC, HMGP	Short-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-02—Continue to conduct and update Sea-Level Rise Adaptation Study to address the impact of sea-level rise at the Port of Los Angeles and use data for planning efforts.				
Existing	1, 2, 9	1, 3, 5	Harbor Department Capital Improvement, BRIC, HMGP	Long-Term
Hazards Mitigated: Flood; Landslide; Sea-Level Rise				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-03—Conduct improvements and maintenance of wharfs at the Port of Los Angeles.				
Existing	1, 2, 9	1, 4	Harbor Department Capital Improvement, BRIC, HMGP	Short-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-04—Continue the Port of Los Angeles Infrastructure Maintenance Program to perform infrastructure maintenance and mitigation improvement projects throughout the Port of Los Angeles.				
Existing	1, 3, 4, 10	1, 3, 4	Harbor Department Capital Improvement, BRIC, HSGP	Short-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
POLA-05—Reduce the risk of a cyber-attacks that could disrupt the flow of cargo at the Port of Los Angeles.				
Existing	2, 5, 7	1, 4	Harbor Department Capital Improvement, BRIC, HSGP	Long-Term
Hazards Mitigated: Cyber Threats; Civil Disorder; Terrorism				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-06—Purchase and maintain communications and surveillance equipment for the Port of Los Angeles and Port Police.				
New & existing	2, 5, 7	1, 4	Harbor Department Capital Improvement, HSGP	Short-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami; Wildfire; Terrorism; Cyber Threats				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by enhancing the City's capabilities for surveillance and information sharing to keep its response personnel informed of situational awareness.				
POLA-07—Conduct improvements and maintenance of roadways and ramps at the Port of Los Angeles.				
New & existing	1, 2, 9	1, 4	Harbor Department Capital Improvement, BRIC, HMGP	Short-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-08—Conduct improvements and maintenance of railroad system at the Port of Los Angeles.				
New & existing	1, 2, 9	1, 4	Harbor Department Capital Improvement, BRIC, HMGP	Short-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-09—Conduct electrical improvements throughout the Port of Los Angeles facilities and terminals.				
New & existing	1, 2, 9	1, 4	Harbor Department Capital Improvement, BRIC, HMGP	Long-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
POLA-10—Conduct seismic improvements to prevent operation disruptions in the Port of Los Angeles.				
New & existing	1, 2, 9	1, 4	Harbor Department Capital Improvement, BRIC, HMGP	Short-Term
Hazards Mitigated: Earthquake				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-11—Continue dredging projects to maintain existing waterways throughout the Port of Los Angeles.				
New & existing	1, 2, 9	1, 4, 5	Harbor Department Capital Improvement, BRIC, HMGP	Long-Term
Hazards Mitigated: Earthquake; Flood; Landslide; Tsunami				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-12—Enhance the fire protection system for the Port of Los Angeles facilities and terminals.				
Existing	1, 2, 9	1, 4	Harbor Department Capital Improvement	Long-Term
Hazards Mitigated: Earthquake; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
POLA-13—Design and construct a new storm drain system to replace the existing one to provide proper drainage and reduce roadway flooding.				
New & existing	1, 2, 9	1, 4, 5	Harbor Department Capital Improvement, BRIC, HMGP	Long-Term
Hazards Mitigated: Flood				
Socially Vulnerable Population Impacts: This action will assist socially vulnerable populations whose properties are impacted by flooding along flood prone roads and will ensure roadways are clear for emergency response and daily use.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: City Planning				
CP-01—Integrate the City's local hazard mitigation plan into future updates to the General Plan in compliance with California state mandates (AB2140, SB379, SB1000).				
Existing	1, 2, 4, 5, 6, 7, 8, 9, 10	3, 4, 5	General Fund	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Integrating local plans can assist in ensuring projects which would benefit socially vulnerable populations become identified and pursued. Plan implementation and maintenance allows for new vulnerabilities to be adopted into the plan(s).				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
CP-02—All future updates to plans and programs that manage land use within the City will utilize the best available data, including the analysis in the local hazard mitigation plan on the risk exposure and vulnerability to all potential hazards in the City.				
New & existing	2, 3, 6, 7	2, 3, 4, 5	General Fund	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Integrating local plans can assist in ensuring projects which would benefit socially vulnerable populations become identified and pursued. Plan implementation and maintenance allows for new vulnerabilities to be adopted into the plan(s).				
CP-03—Assess and identify appropriate and applicable mitigation and resiliency regulatory standards that benefit socially vulnerable areas, especially in hazard prone areas, that also align with the City's core capabilities.				
New & existing	2, 3, 7, 8, 9, 10	2, 3, 4, 5	General Fund	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Integrating local plans can assist in ensuring projects which would benefit socially vulnerable populations become identified and pursued. Plan implementation and maintenance allows for new vulnerabilities to be adopted into the plan(s).				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Climate Emergency Mobilization Office (CEMO)				
CEMO-01—Create, coordinate, and monitor the implementation of the City of Los Angeles's Heat Action & Resilience Plan, which includes expanding resilience, cooling Centers, and hubs with the lens on Equity and Reducing Health Risks created by extreme heat in coordination with various City divisions, departments, and offices, including the Office of the Mayor. Ensure centers have back-up power. Identify resiliency hubs as heating and cooling centers by providing temperature controlled environments to protect most at-risk populations.				
New	6, 9, 10	1, 2, 3, 4, 5	General Fund, ICARP Extreme Heat and Community Resilience Program	Short-Term
Hazards Mitigated: Extreme Heat and cold; High Wind				
Socially Vulnerable Population Impacts: Integrating local plans can assist in ensuring projects which would benefit socially vulnerable populations become identified and pursued. Plan implementation and maintenance allows for new vulnerabilities to be adopted into the plan(s).				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Fire Department (LAFD)				
LAFD-01—Conduct a feasibility study to determine the funding needs to compensate for the lapse identified in Standards of Coverage analysis. It is a vital mitigation strategy for earthquake, tsunami, and wildfire hazards. This would show the needed funds to ensure the Los Angeles Fire Department maintains staffing to perform its mission as an all-risk, all-hazard provider for the City of Los Angeles. Specifically tailored to address the functionality required during large-scale disasters such as earthquakes, tsunamis, or wildfires, this initiative aligns with the core capabilities of mitigation and response to seismic, coastal, and wildfire threats. Funding this feasibility study will contribute to enhancing preparedness, response, and overall resilience in the face of these significant hazards.				
New & existing	1, 2, 7	3, 4, 5	Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response, (SAFER), Urban Areas Security Initiative (UASI), Cal Fire Grants (Wildland focus)	Short-Term
Hazards Mitigated: Earthquake; Tsunami; Wildfire; Urban Structure Fire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard events.				
LAFD-02—Maintain Department Emergency Plans, including integration of hazard mitigation principles, plan development, plan review, and functional exercises.				
Existing	1, 2, 7, 12	3, 4, 5	General Fund, Assistance to Firefighters Grants (AFG), Fire Prevention & Safety Grants, State Homeland Security Program (SHSP), Urban Areas Security Initiative (UASI), Cal Fire Grants (Wildland focus), Community Wildfire Defense Grant Program (US Forest Service), Los Angeles County Measure B (EMS/Bioterrorism), Hazard Mitigation Grant Program (HMGP)	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: The section overview portion of the Emergency Plan covers a discussion of a variety of topics, including population distribution and locations, including any concentrated populations of individuals with disabilities, others with access and functional needs, or individuals with limited English proficiency.				
LAFD-03—Develop fully qualified Type 3 Department Operations Center and Field and Incident Management Teams to support large incidents. Seek grant funding to train and implement strategy.				
New & existing	1, 2, 7, 12	1, 3	General Fund, Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response (SAFER), State Homeland Security Program (SHSP), Urban Areas Security Initiative (UASI), Cal Fire Grants (Wildland focus), Hazard Mitigation Grant Program (HMGP)	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard events.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAFD-04—The homelessness crisis presents a significant challenge in mitigating natural or human-c**aused** disasters. To assess the necessary resources and fulfill the LAFD mission of addressing concerns related to homelessness during disasters, a feasibility study is required to determine the funding needed to address the potential impacts to provide for mitigation effort of the persons within very high severity hazard fire zones, flood, inundation zones.				
New	1, 2, 7, 8, 10	1, 3	General Fund, Fire Prevention & Safety Grants, Cal Fire Grants (Wildland focus), Community Wildfire Defense Grant Program (US Forest Service), Hazard Mitigation Grant Program (HMGP)	Long-Term
Hazards Mitigated: Earthquake; Tsunami; Wildfire; Urban Structure Fire; Oil spills				
Socially Vulnerable Population Impacts: This action will assess the necessary resources and fulfill the LAFD mission of addressing concerns related to homelessness during disasters, particularly focusing on mitigation effort of the persons within very high severity hazard fire zones, flood, inundation zones.				
LAFD-05—Expand code enforcement personnel and policy to reduce the risk of wildland fires with cooperating and assisting agencies.				
New & existing	1, 2, 5	3, 5	General Fund, Cal Fire Grants (Wildland focus), Community Wildfire Defense Grant Program (US Forest Service)	Long-Term
Hazards Mitigated: Wildfire				
Socially Vulnerable Population Impacts: Officials and policies that are up to date on wildfire risk are more likely to encourage development outside areas of high risk. Safer dwellings may be developed in a less vulnerable location.				
LAFD-06—Support an all-hazards response by enhancing the level availability of specialty operations (Aircraft, Rescue, and Marine). This would include fire fighter training, apparatus, Add a Type I Helitanker to the LAFD fleet, and staffing.				
New & existing	2, 5	1, 4	General Fund, Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response (SAFER), Urban Areas Security Initiative (UASI), Community Wildfire Defense Grant Program (US Forest Service)	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire; Urban Structure Fire; Oil Spills; Smoke and Air Pollution				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard events.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAFD-07—Weather related incidents often create conditions where heavy machinery is necessary to remove debris, make the area hospitable, and to ensure safe conditions. Develop hazard reduction projects, requiring heavy equipment to support the initiative. This includes hiring and training personnel, purchasing or obtaining MOUs for heavy equipment, and standard operating procedures.				
Existing	1, 2, 7, 12	1, 3	General Fund, Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response (SAFER), Fire Prevention & Safety Grants, Urban Areas Security Initiative (UASI), Cal OES Community Resiliency & Listos Grants, Los Angeles County Measure B (EMS/Bioterrorism), Hazard Mitigation Grant Program (HMGP)	Short-Term
Hazards Mitigated:	Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Hazardous Material Release; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire			
Socially Vulnerable Population Impacts:	This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard events.			
LAFD-08—Increase the equipment, staffing, and Training for the Department's Chemical, Biological, Radiological, Nuclear, and Explosives detection and response capabilities.				
New & existing	1, 2, 7, 12	1, 5	General Fund, Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response (SAFER), Fire Prevention & Safety Grants, Urban Areas Security Initiative (UASI), Cal OES Community Resiliency & Listos Grants, Los Angeles County Measure B (EMS/Bioterrorism), Hazard Mitigation Grant Program (HMGP)	Long-Term
Hazards Mitigated:	Hazardous Material Release			
Socially Vulnerable Population Impacts:	This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard events.			

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAFD-09—To decrease the Communication infrastructure vulnerabilities, include installation specifications and testing procedures to enhance the emergency responder radio system in alignment to current conditions of weather, interference, and areas or zones with limited communication and voice radio system to improve geographic coverage, add a VHF channel layer, and allow interoperability with allied agencies.				
New & existing	2, 5, 7	1, 4, 5	General Fund, Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response (SAFER), Fire Prevention & Safety Grants, Urban Areas Security Initiative (UASI), Cal OES Community Resiliency & Listos Grants, Los Angeles County Measure B (EMS/Bioterrorism), Hazard Mitigation Grant Program (HMGP)	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to communicate during hazard events.				
LAFD-10—Enhance and create interoperability for resource tracking, evacuation, and mapping during a large-scale incident and integration during a multi-agency area or region unified command incident.				
New & existing	1, 2, 7	1, 5	General Fund, Fire Prevention & Safety Grants, Urban Areas Security Initiative (UASI), Cal Fire Grants (Wildland focus), Community Wildfire Defense Grant Program (US Forest Service)	Short-Term
Hazards Mitigated: High Wind;Wildfire				
Socially Vulnerable Population Impacts: This action will create a smooth response operation, providing responders with the capability to access or reach vulnerable, impacted locations.				
LAFD-11—The effects of natural disasters, weather, and other failures require upgrades to the Los Angeles Fire Department's alerting and communication systems to maintain functionality during disaster or power failure. A comprehensive survey has been completed to positively affect a plan to remedy such failures and acquire funding to implement backup sources and systems.				
New & existing	1, 2, 7	1, 4, 5	General Fund, Fire Prevention & Safety Grants, Urban Areas Security Initiative (UASI), Cal Fire Grants (Wildland focus), Community Wildfire Defense Grant Program (US Forest Service)	Short-Term
Hazards Mitigated: High Wind;Wildfire				
Socially Vulnerable Population Impacts: This action will ensure alerts will reach individuals in high-risk areas.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAFD-12—Collaborate with stakeholders to update disaster plans and geographic services to bolster community resilience, emphasizing the importance of training, family assistance centers, and "repopulation" functions within the Unified Incident Command System.				
New & existing	1, 2, 5, 7, 12	3, 4, 5	General Fund, Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response (SAFER), Fire Prevention & Safety Grants, Urban Areas Security Initiative (UASI), Cal Fire Grants (Wildland focus), Community Wildfire Defense Grant Program (US Forest Service)	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This plan covers a discussion of a variety of topics, including population distribution and locations, including any concentrated populations of individuals with disabilities, others with access and functional needs, or individuals with limited English proficiency.				
LAFD-13—Conduct feasibility and implementation plan to install and utilize solar energy and solar energy capturing systems within all fire department stations.				
New & existing	1, 2	3, 5	General Fund, Fire Prevention & Safety Grants, Urban Areas Security Initiative (UASI), Los Angeles County Measure B (EMS/Bioterrorism), Hazard Mitigation Grant Program (HMGP)	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: The energy collected from the solar energy systems will assist in the generation of power which can be dispersed through the City's utility system for public consumption, either at private residences or through use at public facilities.				
LAFD-14—Develop funding and operational guidelines to ensure safe storage and disposal of hazardous materials within all Dept facilities.				
Existing	2, 7, 12	1	General Fund, Fire Prevention & Safety Grants, Hazard Mitigation Grant Program (HMGP)	Short-Term
Hazards Mitigated: Hazardous Material Release				
Socially Vulnerable Population Impacts: Hazardous materials which are unsafely collected or disposed may pose risks to populations living near garbage collection locations, landfills, and incinerators. This action will ensure these materials are collected and disposed of properly and safely.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAFD-15—Decrease carbon dioxide emissions by funding and purchasing electric vehicles in alignment with cities mandate to create zero emission fleet. This includes installation of EV charging stations to support fleet vehicles and employee-owned vehicles in each department facility.				
New & existing	1, 4	3	General Fund, Fire Prevention & Safety Grants, Hazard Mitigation Grant Program (HMGP)	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by increasing the response fleet. Furthermore, by purchasing electric vehicles, the air in the City will be cleaner, and contain fewer pollutants which would otherwise impact vulnerable populations.				
LAFD-16—Conduct a feasibility study to assess existing and future evacuation routes throughout the greater Los Angeles area, especially in wildland-urban interface areas.				
Existing	2, 7	1, 3	General Fund, Fire Prevention & Safety Grants, State Homeland Security Program (SHSP), Urban Areas Security Initiative (UASI), Cal Fire Grants (Wildland focus), Community Wildfire Defense Grant Program (US Forest Service)	Short-Term
Hazards Mitigated: Earthquake; Flood; Wildfire				
Socially Vulnerable Population Impacts: Having pre-determined evacuation routes can assist socially vulnerable populations in preparing themselves and those within their community to evacuate in a safe, timely fashion.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Police Department (LAPD)				
LAPD-01—Develop an Incident Command Post Center and Incident Management Teams to support large scale incidents and events. Seek grant funding to train and implement strategy.				
New & existing	5, 6, 12	1, 4	General Fund, UASI, SHSGP	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to large scale incidents and events.				
LAPD-02—Identify critical facilities with inadequate back-up power supplies for extended periods of operation during power disruption incidents. Acquire and install backup generators.				
New & existing	1, 2, 8, 9	1, 5	General Fund, UASI	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAPD-03—Increase deployment and development of Hazardous Materials personnel with detection and identification equipment for all chemical, biological, nuclear, and radiological incidents in support of the operational area needs.				
New & existing	6, 9, 12	1, 4	General Fund, HSGP	Short-Term
Hazards Mitigated: Hazardous Material Release; Radiological Accident; Terrorism				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard scenarios.				
LAPD-04—Advance explosive detection technology by improving remote platform capabilities, enhancing x-ray capabilities for actionable intelligence, and ensuring training opportunities align with emerging threat response protocols.				
New & existing	8, 10, 12	1, 4	General Fund, UASI	Short-Term
Hazards Mitigated: Terrorism, Civil Disorder				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to detect emerging threats, including acts terrorism.				
LAPD-05—Enhance regional technological capabilities for detecting, deterring, and responding to chemical, biological, and radiological incidents by acquiring additional equipment and identifying needs aligned with current threats and mitigation tactics.				
New & existing	1, 8	1, 4	General Fund, UASI	Short-Term
Hazards Mitigated: Hazardous Material Release; Radiological Accident; Terrorism; Civil Disorder				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by enhancing the City's capabilities for detecting, deterring, and responding to chemical, biological, and radiological incidents.				
LAPD-06—Continuously enhance all-hazards response capabilities by acquiring additional mobile command infrastructure, identifying a minimum of 4 suitable locations for command center operations, securing funding for training evolutions, and conducting preparedness activities for major, natural, and human-caused events in the city.				
New & existing	1, 2, 5, 8, 12	1, 4	General Fund, UASI	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by ensuring first responders have the capability to train for and respond to hazard scenarios.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LAPD-07—Acquire a modern and robust video downlink/surveillance capability and ensure simplicity of deployment for all city agencies and within the operational area, coupled with a secure web-based system for efficient information sharing and situational awareness.				
New & existing	5, 6, 7	1, 4	General Fund, UASI	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will assist in ensuring the safety of the entire population of the City, including socially vulnerable populations, by enhancing the City's capabilities for surveillance and information sharing to keep its response personnel informed of situational awareness.				
LAPD-08—Develop funding and procedures to ensure safe collection and disposal of expired hazardous materials within all department facilities.				
New & existing	2, 11	1, 4	General Fund	Short-Term
Hazards Mitigated: Hazardous Material Release; Terrorism				
Socially Vulnerable Population Impacts: Hazardous materials which are unsafely collected or disposed may pose risks to populations living near garbage collection locations, landfills, and incinerators. This action will ensure these materials are collected and disposed of properly and safely.				
LAPD-09—Create implementation plan to install and utilize solar carports at Emergency Services Division facilities.				
New & existing	1, 8, 9	4	General Fund, UASI	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: The energy collected from the solar carports will assist in the generation of power which can be dispersed through the City's utility system for public consumption, either at private residences or through use at public facilities.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Housing Department				
LAHD-01—Conduct a study and complete a report on the risks and recommended mitigation solutions for unreinforced masonry buildings.				
Existing	1, 2, 7, 9	1, 3	General Fund, BRIC, HMGP	Long-Term
Hazards Mitigated: Earthquake; Wildfire				
Socially Vulnerable Population Impacts: This action will increase the safety of populations living in unreinforced masonry buildings. Many of these buildings were not built using modern building codes and are much more likely to experience damage or collapse during an earthquake.				
LAHD-02—Conduct a study and complete a report on the risks and recommended mitigation solutions for mid- and high-rise multi-family buildings lacking fire suppression sprinklers.				
Existing	1, 2, 7, 9	1, 3	General Fund, BRIC, HMGP	Long-Term
Hazards Mitigated: Earthquake; Wildfire				
Socially Vulnerable Population Impacts: This action will increase the safety of populations living in mid- and high-rise multi-family buildings. Many of these buildings were not built using modern building codes, nor do the buildings have an updated fire suppression system and are much more likely to experience damage or collapse during an earthquake.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Emergency Management Department (EMD)				
EMD-01— Upgrade the City's local hazard mitigation webpage to include upcoming public workshops on mitigation efforts, opportunities to reduce risk to properties (i.e., grant or financial opportunities), information on how to reduce hazard risk to their property, and resources available to provide further education.				
New & existing	2, 4, 5, 7, 10	1, 3, 4, 5	General Fund, HMGP	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Socially vulnerable populations are often the most at-risk from hazards due to pre-existing conditions and socioeconomic status. This action will educate and inform all populations, including the socially vulnerable, on the hazards which may occur in the City and how to mitigate the risk associated with those hazards.				
EMD-02—Develop a comprehensive mitigation program with related action items which will include the creation of the City's mitigation task force.				
New & existing	1, 2, 3, 4, 5, 6, 7, 11, 12	1, 3, 4, 5	General Fund, HMGP	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: The mitigation task force will include members of the public so items which may otherwise go unnoticed will be addressed. This will give the population the opportunity to be included in mitigation initiatives and include the whole community.				
EMD-03—Develop, update, and maintain GIS inventories of critical facilities, at-risk buildings and infrastructure and prioritize mitigation projects.				
New & existing	1, 2, 3, 7	1, 3, 4, 5	General Fund	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind;and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
EMD-04—Identify innovative data sources to understand the effects of climate change on a more granular level.				
New & existing	1, 2, 3, 7	1, 3, 4, 5	General Fund	Short-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: City employees and personnel understanding the impacts of climate change will have a positive impact on socially vulnerable populations, as programs and projects may be developed to assist the populations with identified hazards and identified projected hazard risks.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
EMD-05—Assess gaps in alert and warning systems in areas with degraded cell phone connectivity and implement solutions to ensure alerts will reach individuals in high-risk areas with little cell coverage.				
Existing	2, 7, 8	1, 3, 4, 5	General Fund, EMPG	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: This action will ensure alerts will reach individuals in high-risk areas with little cell coverage.				
EMD-06—Conduct a vulnerability assessment study to critical infrastructure.				
Existing	1, 2, 3, 7, 8	1, 3, 4	General Fund, BRIC	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; Severe Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
EMD-07—The City will consider sponsoring eligible grant applications for the FEMA BRIC grant program from private non-profit entities within the City's defined planning area when it has sufficient capacity and capability to submit and administer applications on behalf of the private non-profit entities. "Eligible" grant applications means that the project fits FEMA's prescribed eligibility criteria for plans or projects, the project is feasible and has been shown to be cost-effective following FEMA methodologies.				
New & existing	5, 11	1, 3, 4	General Fund, BRIC	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Many FEMA grant opportunities require showing how or if a project will benefit socially vulnerable populations. This action will sponsor grant applications from private non-profit entities, which may otherwise not be submitted.				
RESPONSIBLE OFFICE, DEPARTMENT, OR AGENCY: Los Angeles Department of Water and Power (LADWP)				
LADWP-01—Install perimeter security walls at RS-C, RS-G, RS-F, and River SS. All four stations have a long history of break-ins, vandalism, and theft. They could be targets for terrorism as well. RS-F and RS-G are medium low-level CIP identified stations. Walls have been effective deterrents in other LADWP stations.				
Existing	1, 2	1, 4	General Fund, HSGP	Short-Term
Hazards Mitigated: Terrorism				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
LADWP-02—Weed Abatement to reduce the risk of wildfires.				
Existing	1, 2	1, 4, 5	General Fund	Short-Term
Hazards Mitigated: Wildfire				
Socially Vulnerable Population Impacts: Socially vulnerable populations in the City may be located within fuel risk areas for wildfires. Removing vegetative fuels increases the ignition resistance of homes and property.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LADWP-03—Identify new needs and enhance existing facilities through the LADWP Pump Station Refurbishment Program.				
New & existing	1, 2, 7	1, 4, 5	DPW Operational Funds, BRIC, HMGP	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Vulnerable areas that may otherwise experience a loss of water during heavy rain or flooding will be more likely to retain services.				
LADWP-04—Identify new and enhance existing trunk lines and major system connections through the Trunk Lines and Major System Connections Program.				
New & existing	1, 2, 9	1, 4	DPW Operational Funds, BRIC	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: Protection of critical facilities and infrastructure provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
LADWP-05—Identify Hazard Mitigation Assistance eligible projects in the Infrastructure Reservoir Improvements Program (tanks only) and apply for eligible grants opportunities that mitigate identified issues				
New & Existing	1, 2, 6, 7	1, 4	DPW Operational Funds, BRIC, HMGP, PDM, FMA	Long-Term
Hazards Mitigated: Dam Failure; Drought; Earthquake; Extreme Cold or Freeze; Extreme Heat; Flood; Landslide; Sea-Level Rise, Coastal Flood and Erosion; High Wind; Tsunami and Seiche; Wildfire				
Socially Vulnerable Population Impacts: The action will result in better preparedness within the Special Flood Hazard Area and inundation areas where significant risk to socially vulnerable populations exists.				
LADWP-06—Seismic Strengthen of DS Yard walls.				
Existing	1, 2, 3, 7	1, 4, 5	General Fund, BRIC	Long-Term
Hazards Mitigated: Earthquake				
Socially Vulnerable Population Impacts: Protection of critical facilities provides an opportunity for first responders, utility workers, and emergency managers to stage and deploy resources to vulnerable and hazard prone areas.				
LADWP-07—Tinemaha Dam Replacement project: Dam and critical appurtenances will be replaced to reduce the risk of dam-related hazards such as earthquake and flooding.				
Existing	1, 2, 3, 6	1, 4, 5	General Funds, High-Hazard Potential Dam Grant	Long-Term
Hazards Mitigated: Dam Failure; Earthquake; Flood				
Socially Vulnerable Population Impacts: The action will result in better preparedness within the Special Flood Hazard Area and inundation areas where significant risk to socially vulnerable populations exists.				

Benefits new or existing assets	Objectives Met	Goals Met	Sources of Funding	Timeline
LADWP-08—S. Haiwee Reservoir Spillway Channel Modifications. Harden Spillway channel upstream and downstream to prevent Erosion and Scour. Needed to protect new LADWP-owned Facilities downstream of S. Haiwee Dam.				
Existing	1, 2, 3, 6	1, 4, 5	General Funds, High-Hazard Potential Dam Grant	Long-Term
Hazards Mitigated: Dam Failure; Flood				
Socially Vulnerable Population Impacts: The action will result in better preparedness within the Special Flood Hazard Area and inundation areas where significant risk to socially vulnerable populations exists.				
LADWP-09—Infrastructure Reservoir Improvements Program to reduce long-term vulnerabilities for high hazard and extremely high hazard dams owned by LADPW as identified for the risk assessment in this plan.				
Existing	1, 2, 3, 6	1, 3, 4, 5	General Funds, High-Hazard Potential Dam Grant	Long-Term
Hazards Mitigated: Dam Failure				
Socially Vulnerable Population Impacts: The action will result in better preparedness within the Special Flood Hazard Area and inundation areas where significant risk to socially vulnerable populations exists.				
LADWP-10—Water Quality Improvement Project Reservoir Improvement Program.				
Existing	1, 2, 3, 6	1, 3, 4, 5	General Funds, High-Hazard Potential Dam Grant	Long-Term
Hazards Mitigated: Dam Failure				
Socially Vulnerable Population Impacts: The action will result in better preparedness within the Special Flood Hazard Area and inundation areas where significant risk to socially vulnerable populations exists.				

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years

33.3 Action Plan Prioritization

The actions recommended in the action plan were prioritized based on the following factors:

- Cost and availability of funding
- Benefit, based on likely risk reduction to be achieved
- Number of plan objectives achieved
- Timeframe for project implementation
- Eligibility for grant funding programs
- Activity benefits socially vulnerable populations
- Activity leverages nature-based solutions

Two priorities were assigned for each action:

- A high, medium, or low priority for implementing the action
- A high, medium, or low priority for pursuing grant funding for the action

The sections below describe the analysis of benefits and costs and the assignment of the two priority ratings.

33.3.1 Benefit/Cost Review

The action plan must be prioritized according to a benefit/cost analysis of the proposed actions (44 CFR, Section 201.6(c)(3)(iii)). For this hazard mitigation plan, a qualitative benefit-cost review was performed for each action by assigning ratings for benefit and cost as follows:

- Cost:
  - **High**—Existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
  - **Medium**—The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.
  - **Low**—The action could be funded under the existing budget. The action is part of or can be part of an ongoing existing program.
- Benefit:
  - **High—**Action will provide an immediate reduction of risk for life and property.
  - **Medium—**Action will provide a long-term reduction of risk for life and property, or an immediate reduction in risk for property.
  - **Low—**Long-term benefits of the action are difficult to quantify in the short term.

To assign priorities, each action with a benefit rating equal to or higher than its cost rating (such as high benefit/medium cost, medium benefit/medium cost, medium benefit/low cost, etc.) was considered to be cost-beneficial. This is not the detailed level of benefit/cost analysis required for some FEMA hazard-related grant programs. Such analysis would be performed at the time a given action is being submitted for grant funding.

33.3.2 Implementation Priority

The priority for implementing each action was assigned based on the following definitions:

- **High Priority**—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
- **Medium Priority**—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short term (1 to 5 years) once funding is secured. Medium-priority actions become high-priority actions once funding is secured.
- **Low Priority**—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions are generally “wish-list” actions. They may be eligible for grant funding from programs that have not yet been identified.

33.3.3 Grant Pursuit Priority

The priority for pursuing grant funding for each action was assigned based on the following definitions:

- **High Priority**—An action that meets identified grant eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for grant funding.
- **Medium Priority**—An action that meets identified grant eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
- **Low Priority**—An action that has not been identified as meeting any grant eligibility requirements.

33.3.4 Prioritization Summary for Mitigation Actions

The priority of each recommended action is listed in Table 33-3 for the actions carried over from the previous HMP and in Table 33-4 for the new actions identified in this update.

Table 33-3. Mitigation Action Priority for Actions Carried Over from Previous HMP

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Benefit SVPs?	Nature-Based Solution?	Implementation Priority	Grant Priority
LADWP-2018-01	2	High	High	Yes	Yes	Yes	Yes	No	Medium	Medium
LADWP-2018-02	3	High	High	Yes	No	Yes	Yes	No	Low	N/A
LADWP-2018-03	2	Medium	Medium	Yes	No	Yes	Yes	No	Low	N/A
LADWP-2018-04	2	Medium	Medium	Yes	No	Yes	Yes	No	Low	N/A
LADWP-2018-06	4	Medium	Medium	Yes	Yes	Yes	Yes	No	Low	Low
LADWP-2018-07	4	Low	Low	Yes	Yes	Yes	Yes	No	Low	Low
LADWP-2018-08	4	Medium	Medium	Yes	Yes	Yes	Yes	No	Low	Low
LADWP-2018-09	4	Medium	Medium	Yes	Yes	Yes	Yes	No	Medium	Low
LADWP-2018-10	4	Low	Low	Yes	Yes	Yes	Yes	No	Low	Low
LADWP-2018-12	2	Medium	Medium	Yes	No	Yes	Yes	No	Medium	N/A
LADWP-2018-13	4	Medium	Medium	Yes	No	Yes	Yes	No	Medium	Medium
LADWP-2018-14	4	Medium	Medium	Yes	No	Yes	Yes	No	Medium	Low
LADWP-2018-15	3	Medium	Medium	Yes	No	Yes	Yes	No	Low	Low
LADWP-2018-16	4	High	High	Yes	No	Yes	Yes	No	High	Medium
LADWP-2018-17	4	Medium	Medium	Yes	No	Yes	Yes	No	Medium	Medium
LADWP-2018-18	4	High	High	Yes	No	Yes	Yes	No	High	High
LADWP-2018-19	3	Medium	Medium	Yes	No	Yes	Yes	No	Low	N/A
EMD-2018-01	4	High	High	Yes	Yes	Yes	Yes	No	High	N/A
LAHD-2018-01	2	Medium	Medium	Yes	Yes	Yes	Yes	No	Medium	Low
LAHD-2018-02	3	High	High	Yes	Yes	Yes	Yes	No	Medium	Medium
LAPD-2018-01	2	Medium	Medium	Yes	Yes	Yes	Yes	No	Low	Low
LAPD-2018-02	2	Low	Low	Yes	Yes	Yes	Yes	No	Low	Low
CP-2018-01	7	High	High	Yes	Yes	Yes	Yes	No	High	High
LAFD-2018-03	3	High	Medium	Yes	Yes	Yes	Yes	No	High	Medium

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Benefit SVPs?	Nature-Based Solution?	Implementation Priority	Grant Priority
LAFD-2018-04	2	Medium	Medium	Yes	No	Yes	Yes	No	Low	N/A
LAWA-2018-01	3	High	High	Yes	Yes	Yes	Yes	No	Medium	Medium
LAWA-2018-02	3	High	High	Yes	Yes	Yes	Yes	No	Medium	Medium
LAWA-2018-03	3	High	High	Yes	Yes	Yes	Yes	No	Low	Low
LAWA-2018-04	3	High	High	Yes	Yes	No	Yes	No	Low	Low

Table 33-4. Mitigation Action Priority for New Actions Identified in this Update

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Benefit SVPs?	Nature-Based Solution?	Implementation Priority	Grant Priority
CLA-01	4	High	High	Equal	Yes	Yes	Yes	No	Low	Medium
CLA-02	3	High	High	Equal	Yes	Yes	Yes	No	Low	Medium
CLA-03	1	High	Low	Exceed	Yes	Yes	Yes	No	Medium	Medium
CLA-04	3	High	Low	Exceed	Yes	Yes	Yes	No	Low	Low
CLA-05	4	High	High	Equal	Yes	Yes	Yes	No	Low	Low
CLA-06	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Medium
CLA-07	4	High	Low	Exceed	Yes	Yes	Yes	No	High	Low
CLA-08	3	High	High	Equal	Yes	Yes	Yes	Yes	Medium	Medium
CLA-09	4	High	Low	Exceed	Yes	Yes	Yes	No	High	Low
RAP-01	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
RAP-02	2	High	High	Equal	Yes	Yes	Yes	No	Low	Low
RAP-03	4	Medium	Low	Exceed	No	Yes	Yes	Yes	High	N/A
BOE-01	3	High	High	Equal	Yes	Yes	Yes	No	High	Low
BOE-02	3	High	High	Equal	Yes	Yes	Yes	No	High	Low

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Benefit SVPs?	Nature-Based Solution?	Implementation Priority	Grant Priority
BOE-03	3	High	High	Equal	Yes	Yes	Yes	No	High	Low
BOE-04	3	High	High	Equal	Yes	Yes	Yes	No	Low	Medium
BOE-05	5	High	Low	Exceed	Yes	Yes	Yes	No	Medium	Low
BOE-06	6	High	Low	Exceed	No	Yes	Yes	No	High	N/A
BOE-07	7	High	Low	Exceed	No	Yes	Yes	No	High	N/A
BOE-08	6	High	Low	Exceed	No	Yes	Yes	No	High	N/A
BOE-09	7	High	Low	Exceed	No	Yes	Yes	No	High	N/A
BOE-10	5	High	Medium	Exceed	Yes	Yes	Yes	No	High	Low
BOE-11	2	Medium	Low	Exceed	No	Yes	Yes	No	High	N/A
BOE-12	5	High	Low	Exceed	Yes	Yes	Yes	No	Medium	Low
BOE-13	5	High	Medium	Exceed	Yes	Yes	Yes	No	High	Low
BOE-14	7	High	Medium	Exceed	No	Yes	Yes	No	High	N/A
LASAN-01	3	High	High	Equal	Yes	Yes	Yes	No	High	Medium
LASAN-02	3	High	High	Equal	Yes	Yes	Yes	No	High	Medium
LASAN-03	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LASAN-04	5	High	Medium	Exceed	Yes	Yes	Yes	No	Low	Low
LASAN-05	3	High	High	Equal	Yes	Yes	Yes	No	High	Medium
LASAN-06	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LASAN-07	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LASAN-08	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LASAN-09	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LASAN-10	3	High	High	Equal	Yes	Yes	Yes	No	Low	Low
LASAN-11	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LASAN-12	2	High	High	Equal	Yes	Yes	Yes	No	Low	Low
LASAN-13	4	High	Low	Exceed	No	Yes	Yes	No	High	N/A

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Benefit SVPs?	Nature-Based Solution?	Implementation Priority	Grant Priority
LASAN-14	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LASAN-15	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
LASAN-16	4	High	Medium	Exceed	No	Yes	Yes	No	Medium	N/A
LASAN-17	3	High	Low	Exceed	No	Yes	Yes	No	Medium	N/A
LASAN-18	10	High	Low	Exceed	No	Yes	Yes	No	Low	N/A
LASAN-19	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
LASAN-20	6	High	Medium	Exceed	Yes	Yes	Yes	Yes	Low	Low
LASAN-21	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LASAN-22	3	High	High	Equal	Yes	Yes	Yes	No	High	Medium
BSS-01	3	High	High	Equal	Yes	No	Yes	No	Medium	Medium
BSS-02	3	High	High	Equal	Yes	No	Yes	Yes	Medium	Medium
BSS-03	4	Medium	Medium	Equal	Yes	No	Yes	No	Low	Low
ZOO-01	4	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
POLA-01	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Medium
POLA-02	3	High	Medium	Exceed	Yes	Yes	Yes	No	Low	Low
POLA-03	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
POLA-04	4	High	Medium	Exceed	No	Yes	Yes	No	High	N/A
POLA-05	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
POLA-06	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
POLA-07	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
POLA-08	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
POLA-09	3	High	High	Equal	Yes	Yes	Yes	No	Low	Low
POLA-10	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
POLA-11	3	High	High	Equal	Yes	Yes	Yes	Yes	Low	Low
POLA-12	3	High	High	Equal	No	Yes	Yes	No	Low	N/A

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Benefit SVPs?	Nature-Based Solution?	Implementation Priority	Grant Priority
POLA-13	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
CP-01	9	High	Low	Exceed	No	Yes	Yes	No	High	N/A
CP-02	4	High	Low	Exceed	No	Yes	Yes	No	High	N/A
CP-03	6	High	Low	Exceed	No	Yes	Yes	No	High	N/A
CEMO-01	3	High	Low	Exceed	Yes	Yes	Yes	No	High	High
LAFD-01	3	High	Medium	Exceed	Yes	No	Yes	No	Medium	N/A
LAFD-02	4	High	Low	Exceed	Yes	Yes	Yes	No	Medium	Medium
LAFD-03	4	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Medium
LAFD-04	5	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
LAFD-05	3	Medium	Medium	Equal	Yes	Yes	Yes	No	Medium	Low
LAFD-06	2	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LAFD-07	4	Medium	Medium	Equal	Yes	Yes	Yes	No	Medium	Medium
LAFD-08	4	High	Medium	Exceed	Yes	Yes	Yes	No	Low	Low
LAFD-09	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LAFD-10	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LAFD-11	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
LAFD-12	5	High	Low	Exceed	Yes	Yes	Yes	No	Medium	Low
LAFD-13	2	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
LAFD-14	3	High	Low	Exceed	Yes	Yes	Yes	No	High	Low
LAFD-15	2	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LAFD-16	2	High	Medium	Exceed	Yes	Yes	Yes	No	High	High
LAPD-01	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Medium
LAPD-02	4	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LAPD-03	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LAPD-04	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Benefit SVPs?	Nature-Based Solution?	Implementation Priority	Grant Priority
LAPD-05	2	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LAPD-06	5	High	High	Equal	Yes	Yes	Yes	No	Medium	Medium
LAPD-07	3	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LAPD-08	3	High	Medium	Exceed	No	Yes	Yes	No	High	N/A
LAPD-09	3	High	Medium	Exceed	Yes	Yes	Yes	No	High	Low
LAHD-01	4	Medium	Low	Exceed	Yes	Yes	Yes	No	Medium	Low
LAHD-02	4	Medium	Low	Exceed	Yes	Yes	Yes	No	Medium	Low
EMD-01	5	High	Low	Exceed	Yes	Yes	Yes	No	High	Low
EMD-02	9	High	Low	Exceed	Yes	Yes	Yes	No	High	Low
EMD-03	4	High	Low	Exceed	No	Yes	Yes	No	High	N/A
EMD-04	4	High	Low	Exceed	No	Yes	Yes	No	High	N/A
EMD-05	3	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
EMD-06	5	High	Medium	Exceed	Yes	Yes	Yes	No	Medium	Low
EMD-07	2	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LADWP-01	2	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LADWP-02	2	Medium	Low	Exceed	No	Yes	Yes	Yes	Medium	N/A
LADWP-03	3	Medium	Medium	Equal	Yes	Yes	Yes	No	Medium	Low
LADWP-04	3	Medium	Medium	Equal	Yes	Yes	Yes	No	Medium	Low
LADWP-05	4	High	Low	Exceed	Yes	Yes	Yes	No	Medium	Low
LADWP-06	4	High	High	Equal	Yes	Yes	Yes	No	Medium	Low
LADWP-07	4	High	High	Equal	Yes	Yes	Yes	No	High	Low
LADWP-08	4	High	High	Equal	Yes	Yes	Yes	No	High	Low
LADWP-09	4	High	High	Equal	Yes	Yes	Yes	No	High	Low
LADWP-10	4	High	High	Equal	Yes	Yes	Yes	No	High	Low

33.4 CLASSIFICATION OF ACTIONS

Using FEMA's expanded mitigation categories, each recommended action was classified based on the hazard it addresses and the type of mitigation it involves. Mitigation types used for this classification are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**—Actions to inform residents and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Climate Resilience**—Actions that incorporate methods to mitigate and/or adapt to the impacts of climate change. Includes aquifer storage and recovery activities, incorporating future conditions projections in project design or planning, or actions that specifically address jurisdiction-specific climate change risks, such as sea-level rise or urban heat island effect.
- **Community Capacity Building**—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

Table 33-5 shows the classification based on this analysis.

Table 33-5. Classification of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Earthquake	LAFD-1, LAFD-16, LAHD-1, LAHD-2, EMD-6, CLA-9	BOE-2, POLA-1, POLA-3, POLA-4, POLA-7, POLA-9, POLA-10, POLA-11, POLA-12, LAHD-1, LAHD-2, EMD-3, LADWP-1, CLA-4, CLA-0, CLA-6, DPW-2018-01, DPW-2018-03, DPW-2018-04, DPW-2018-09, DPW-2018-15, LAFD-2018-04, LAHD-2018-02	CP-3, LAFD-4, LAFD-9, EMD-1, EMD-5, CLA-3, LAHD-2018-01	RAP-2, CP-1, CP-2, EMD-4, CLA-8, DPW-2018-12	ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, DPW-2018-12, EMD-2018-01, LAWA-2018-04	BOE-2, POLA-7, POLA-10, LAHD-1, LADWP-1, LADWP-3, LADWP-4, LADWP-5, LADWP-6, LADWP-7, LAPD-1, LAPD-2, LAPD-9, DPW-2018-03, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10, DPW-2018-15, LAHD-2018-02, LAWA-2018-01	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4	LASAN-13, POLA-6, POLA-8, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01
Medium-Risk Hazards								
High Wind	BOE-5, BOE-13, LASAN-18, LAFD-11, EMD-6, CLA-9	EMD-3, LADWP-1, CLA-4, CLA-0, DPW-2018-01, DPW-2018-03, DPW-2018-04, DPW-2018-09, LAFD-2018-04, LAHD-2018-02	BOE-6, CP-3, LAFD-9, EMD-1, EMD-5, CLA-3, LAHD-2018-01	RAP-3, BOE-12, CP-1, CP-2, EMD-4, DPW-2018-12, DPW-2018-16	ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-10, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	LADWP-1, LADWP-3, LADWP-4, LADWP-5, LAPD-1, LAPD-2, LAPD-9, DPW-2018-03, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10, DPW-2018-16,	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4, BSS-3, CP-2018-01	BOE-5, CP-1, CP-2, CEMO-1, EMD-2, EMD-7, CLA-7, LAHD-2018-01

	Action Addressing Hazard, by Mitigation Type							
Hazard Type	**Prevention**	**Property Protection**	**Public Education & Awareness**	**Natural Resource Protection**	**Emergency Services**	**Structural Projects**	**Climate Resilience**	**Community Capacity Building**
Landslide	POLA-2, EMD-6, CLA-9	BOE-2, POLA-1, POLA-3, POLA-4, POLA-7, POLA-9, POLA-11, EMD-3, LADWP-1, LASAN-21, DPW-2018-01, DPW-2018-03, DPW-2018-04, DPW-2018-09, LAFD-2018-04, LAHD-2018-02	CP-3, LAFD-9, EMD-1, EMD-5, CLA-3, LAHD-2018-01	RAP-1, RAP-2, BOE-3, CP-1, CP-2, EMD-4, CLA-8, DPW-2018-12	ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	BOE-2, POLA-7, LADWP-1, LADWP-3, LADWP-4, LADWP-5, LAPD-1, LAPD-2, LAPD-9, DPW-2018-03, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4	LASAN-13, POLA-6, POLA-8, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01
Wildfire	LAFD-1, LAFD-5, LAFD-11, LAFD-16, LAHD-1, LAHD-2, EMD-6, CLA-9	POLA-1, POLA-3, POLA-4, POLA-7, POLA-9, POLA-12, LAHD-1, LAHD-2, EMD-3, LADWP-2, DPW-2018-01, DPW-2018-03, DPW-2018-04, DPW-2018-09, LAFD-2018-03, LAFD-2018-04, LAHD-2018-02	CP-3, LAFD-4, LAFD-7, LAFD-9, EMD-1, EMD-5, CLA-3, LAFD-2018-03, LAHD-2018-01	CP-1, CP-2, EMD-4, LADWP-2, CLA-8, DPW-2018-12	ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-10, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	LAHD-1, LADWP-1, LADWP-3, LADWP-4, LADWP-5, LAPD-1, LAPD-2, LAPD-9, DPW-2018-03, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4, CP-2018-01	LASAN-13, POLA-6, POLA-8, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01
Drought	EMD-6, CLA-9	EMD-3, LADWP-1, DPW-2018-01, DPW-2018-04, DPW-2018-09, LAFD-2018-04	CP-3, LAFD-9, EMD-1, EMD-5, CLA-3	CP-1, CP-2, EMD-4, CLA-8, DPW-2018-12	ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	LADWP-1, LADWP-3, LADWP-4, LADWP-5, LAPD-1, LAPD-2, LAPD-9, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4, CP-2018-01	LASAN-13, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01

Hazard Type	Action Addressing Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
Dam Failure	EMD-6, CLA-9	EMD-3, LADWP-1, DPW-2018-01, LADPW-2018-04, DPW-2018-09, DPW-2018-13, LAFD-2018-04, LAHD-2018-02	CP-3, LAFD-9, EMD-1, EMD-5, CLA-3, LAHD-2018-01	CP-1, CP-2, EMD-4, LADWP-10, CLA-8, DPW-2018-12, DPW-2018-14, DPW-2018-16, DPW-2018-17	ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	LADWP-1, LADWP-3, LADWP-4, LADWP-5, LADWP-7, LADWP-8, LADWP-9, LAPD-1, LAPD-2, LAPD-9, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10, DPW-2018-13, DPW-2018-16, DPW-2018-17	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4	LASAN-13, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01
Extreme Heat	CLA-9, CP-2, EMD-6	CLA-4, CLA-5, LASAN-13, EMD-3, DPW-2018-01, DPW-2018-04, DPW-2018-09, LAFD-2018-04, LAHD-2018-02	CP-3, CLA-3, LASAN-13, LAFD-9, EMD-1, EMD-5, LAHD-2018-01	CP-1, CP-2, CLA-8, EMD-4, DPW-2018-12	CLA-1, CLA-2, CLA-7, ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-12, LAPD-1, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	CLA-1, CLA-2, LAFD-7, LAPD-1, LAPD-2, LAPD-9, LADWP-3, LADWP-4, LADWP-5, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10	CP-1, CP-2, CLA-3, CLA-8, LAFD-13, LAFD-15, BSS-1, BSS-2, BSS-3, CP-2018-01	CLA-1, CLA-2, CLA-5, CLA-7, LASAN-13, CP-1, CP-2, CEMO-1, LAFD-2, LAFD-9, LAFD-12, LAPD-1, LAPD-9, EMD-2, EMD-7, LAHD-2018-01
Extreme Cold	CLA-9, CP-2, EMD-6	CLA-4, CLA-5, LASAN-13, EMD-3, DPW-2018-01, DPW-2018-04, DPW-2018-09, LAFD-2018-04, LAHD-2018-02	CP-3, CLA-3, LASAN-13, LAFD-9, EMD-1, EMD-5, LAHD-2018-01	CP-1, CP-2, CLA-8, EMD-4, DPW-2018-12	CLA-1, CLA-2, CLA-7, ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-12, LAPD-1, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	CLA-1, CLA-2, LAFD-7, LAPD-1, LAPD-2, LAPD-9, LADWP-3, LADWP-4, LADWP-5, DPW-2018-06, DPW-2018-08, DPW-2018-09, DPW-2018-10	CP-1, CP-2, CLA-3, CLA-8, LAFD-13, LAFD-15, CP-2018-01	CLA-1, CLA-2, CLA-5, CLA-7, LASAN-13, CP-1, CP-2, CEMO-1, LAFD-2, LAFD-9, LAFD-12, LAPD-1, LAPD-9, EMD-2, EMD-7, LAHD-2018-01

Hazard Type	Action Addressing Hazard, by Mitigation Type: Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
Flood	BOE-5, BOE-9, BOE-10, BOE-11, BOE-13, LASAN-4, LASAN-16, LASAN-18, POLA-2, LAFD-16, EMD-6, CLA-9	BOE-1, BOE-2, BOE-4, BOE-12, BOE-14, LASAN-2, LASAN-3, LASAN-5, LASAN-6, LASAN-7, LASAN-8, LASAN-9, LASAN-10, LASAN-11, LASAN-22, POLA-1, POLA-3, POLA-4, POLA-7, POLA-9, POLA-11, POLA-13, EMD-3, LADWP-1, DPW-2018-01, DPW-2018-04, DPW-2018-09, LAFD-2018-04, LAHD-2018-02	BOE-6, LASAN-15, LASAN-17, CP-3, LAFD-9, EMD-1, EMD-5, CLA-3, LAHD-2018-01	RAP-1, RAP-3, BOE-4, BOE-12, LASAN-16, LASAN-20, CP-1, CP-2, EMD-4, CLA-8, DPW-2018-12, DPW-2018-16, DPW-2018-17, DPW-2018-19	LASAN-16, ZOO-1, LAFD-2, LAFD-3, LAFD-6, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	BOE-1, BOE-2, BOE-4, BOE-12, LASAN-1, LASAN-2, LASAN-3, LASAN-5, LASAN-6, LASAN-7, LASAN-8, LASAN-9, LASAN-10, LASAN-11, LASAN-14, POLA-7, POLA-13, LADWP-1, LADWP-3, LADWP-4, LADWP-5, LADWP-7, LADWP-8, LAPD-1, LAPD-2, LAPD-9, DPW-2018-03, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10, DPW-2018-16, DPW-2018-17, DPW-2018-18	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4, BSS-2, CP-2018-01	BOE-5, BOE-7, BOE-8, LASAN-13, POLA-6, POLA-8, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01
Low-Risk Hazards								
Sea-Level Rise	BOE-5, BOE-13, POLA-2, EMD-6, CLA-9	BOE-14, EMD-3, LADWP-1, DPW-2018-01, DPW-2018-04, DPW-2018-09, LAFD-2018-04, LAHD-2018-02	BOE-6, CP-3, LAFD-9, EMD-5, CLA-3, LAHD-2018-01	CP-1, CP-2, EMD-4, CLA-8, DPW-2018-12	ZOO-1, LAFD-2, LAFD-3, LAFD-5, LAFD-12, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	LADWP-1, LADWP-3, LADWP-4, LADWP-5, LAPD-1, LAPD-2, LAPD-9, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10	CP-1, CP-2, LAFD-13, LAFD-15, EMD-4, CP-2018-01	BOE-5, BOE-7, BOE-8, LASAN-13, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01

Hazard Type	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
	Action Addressing Hazard, by Mitigation Type							
Tsunami	BOE-5, BOE-13, LAFD-1, EMD-6, CLA-9	BOE-14, POLA-1, POLA-3, POLA-4, POLA-7, POLA-9, POLA-11, EMD-3, LADWP-1, LASAN-21, DPW-2018-01, DPW-2018-03, DPW-2018-04, DPW-2018-09, LAFD-2018-04, LAHD-2018-02	BOE-6, CP-3, LAFD-4, LAFD-9, EMD-5, CLA-3, LAHD-2018-01	CP-1, CP-2, CLA-8, DPW-2018-12	ZOO-1, LAFD-2, LAFD-3, LAFD-6, CLA-1, CLA-2, LAPD-6, LAPD-7, DPW-2018-01, DPW-2018-02, EMD-2018-01	POLA-7, LADWP-1, LADWP-3, LADWP-4, LADWP-5, LAPD-1, LAPD-2, LAPD-9, DPW-2018-06, DPW-2018-07, DPW-2018-08, DPW-2018-09, DPW-2018-10	CP-1, EMD-4	BOE-5, BOE-7, BOE-8, LASAN-13, POLA-6, POLA-8, CP-1, CP-2, EMD-2, EMD-7, CLA-7, LAHD-2018-01
Unranked Hazards								
Hazardous Material Release	—	—	—	—	LAFD-8, LAPD-3, LAPD-5, LAPD-2018-01, LAPD-2018-02	—	—	LASAN-12, LAFD-14, LAPD-8
Cyber Threats	—	POLA-5	—	—	—	—	—	LASAN-19
Radiological Accident	—	—	—	—	LAPD-3, LAPD-5, LAPD-2018-01, LAPD-2018-02	—	—	—
Terrorism	—	—	—	—	LAPD-3, LAPD-4, LAPD-5, LAPD-8, LAPD-2018-01, LAPD-2018-02, LAWA-2018-03	LADWP-1	—	—
Geomagnetic Storm	—	LAWA-2018-02	—	—	—	—	—	—
Transportation Accident	—	LAWA-2018-02	—	—	—	—	—	—
Civil Disorder	—	—	—	—	LAPD-4, LAPD-5, POLA-05	—	—	—

Hazard Type	Action Addressing Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
Public Health	—	—	CLA-08	CLA-08	LAWA-2018-01	—	—	—
Oil Spill	—	—	—	LAFD-6	LAFD-4, LAFD-6	—	—	—
Urban Structure Fire	—	—	—	—	LAFD-1, LAFD-4, LAFD-6	—	—	—

— Indicates the hazard was not included in any actions under this mitigation type

34. Plan Adoption, Implementation and Maintenance

34.1 Plan Adoption

A hazard mitigation plan must document that it has been formally adopted by the governing body of the jurisdiction requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). DMA compliance and its benefits cannot be achieved until the plan is adopted. This plan will be submitted for review to Cal OES prior to adoption. Following approval by Cal OES, the plan will be forwarded to FEMA for review and approval. Once the City has received FEMA approval, the plan will be submitted to City Council for adoption. A copy of the resolution is provided in Appendix H.

34.2 Plan Implementation

The effectiveness of the hazard mitigation plan depends on its implementation and incorporation of its action items into existing local plans, policies and programs. Together, the action items in the Plan provide a framework for activities that the City of Los Angeles can implement over the next 5 years. The planning team and the Steering Committee have established goals and objectives and have prioritized mitigation actions that will be implemented through existing plans, policies, and programs.

The City's Emergency Management Department's Planning Division Chief will have lead responsibility for overseeing and orchestrating the HMP implementation and maintenance strategy. Plan implementation and evaluation will be a shared responsibility among all agencies identified as lead agencies in the mitigation action plan and coordinated by the EMD Planning Division Chief.

34.3 Plan Maintenance

Plan maintenance is the formal process for achieving the following:

- Ensuring that the hazard mitigation plan remains an active and relevant document and that the City maintains its eligibility for applicable funding sources
- Monitoring and evaluating the plan annually and producing an updated plan every five years
- Integrating public participation throughout the plan maintenance and implementation process
- Incorporating the mitigation strategies outlined in this plan into existing planning mechanisms and programs, such as any relevant comprehensive land-use planning process, climate adaptation plans and policies, capital improvement planning process, and building code enforcement and implementation

To achieve these ends, a hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A method and schedule for monitoring, evaluating, and updating the mitigation plan within a 5-year cycle
- An approach for how the community will continue public participation in the plan maintenance process
- A process by which local governments will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate

This section details the formal process that will ensure that the hazard mitigation plan remains an active and relevant document and that the City of Los Angeles maintains its eligibility for applicable funding sources. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing an updated plan every five years. This section also describes how public participation will be integrated throughout the plan maintenance and implementation process. It explains how the mitigation strategies outlined in this Plan will be incorporated into existing planning mechanisms and programs, such as comprehensive land-use planning processes, climate adaptation plans and policies, capital improvement planning, and building code enforcement and implementation.

Table 34-1 summarizes the plan maintenance strategy. The new HMP task force to be formed under Action EMD-02 will play a key role in the strategy. The sections below further describe each element.

34.3.1 Integration with Other Planning Mechanisms

The City is committed to integrate the Local Hazard Mitigation Plan into existing plans and programs, such as comprehensive land-use planning processes, capital improvement planning, and building enforcement implementation. The hazard mitigation plan's format allows sections to be reviewed and updated as new data becomes available, resulting in a plan that remains current and relevant.

The City, through adoption of a General Plan and zoning ordinance, has planned for the impact of natural hazards. The process of updating this hazard mitigation plan provided the opportunity to review and expand on policies in these planning mechanisms. The information on hazard, vulnerability, impacts, and mitigation contained in this hazard mitigation plan is based on the best science and technology available at the time this plan was prepared. The General Plan and the hazard mitigation plan are complementary documents that work together to achieve the goal of reducing risk. The General Plan is an integral part of this plan. An update to the General Plan may trigger an update to the hazard mitigation plan.

The City of Los Angeles will create a linkage between the hazard mitigation plan and the General Plan by identifying a mitigation action (Action CP-01) as such and giving that action a high priority.

Table 34-1. Plan Maintenance Strategy

Approach	Timeline	Lead Responsibility
Integration into Other Planning Mechanisms		
Create a linkage between the hazard mitigation plan and the City's General Plan or similar plans identified in the core capability assessments	Continuous over the 5-year performance period of the plan	EMD Planning Division Chief with necessary support from relevant Hazard Mitigation Task Force members
Plan Monitoring		
Track the implementation of actions over the performance period of the plan	Continuous over the 5-year performance period of the plan	EMD Planning Division Chief with necessary support from relevant Hazard Mitigation Task Force members
Plan Evaluation		
Review the status of previous actions; assess changes in risk; evaluate success of integration	Upon initiation of hazard mitigation plan update, comprehensive General Plan update, or major disaster	EMD Planning Division Chief with necessary support from relevant Hazard Mitigation Task Force members
Progress Report		
Meet and evaluate the progress of individual actions	At least once a year for the next 4 years on or about the plan's approval anniversary date	EMD Planning Division Chief with necessary support from relevant Hazard Mitigation Task Force members
Grant Monitoring and Coordination		
As grant opportunities present themselves, the City will consider options to pursue grants to fund actions identified in this plan	As grants become available	EMD Planning Division Chief with necessary support from relevant Hazard Mitigation Task Force members
Plan Update		
Begin the process, at a minimum, every 5 years to develop a comprehensive update of the plan.	Every 5 years or upon comprehensive update to General Plan or major disaster; funding and organizing for plan update will begin in FY 2026/2027	EMD Planning Division Chief with necessary support from relevant Hazard Mitigation Task Force members
Continuing Public Participation		
Keep a website maintained, hold public meeting once a year, and receive comments through the website. The website and comments will be maintained over the course of the plan.	Continuous over the 5-year performance period of the plan	EMD Planning Division Chief with necessary support from relevant Hazard Mitigation Task Force members.

Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan include the following:

- City of Los Angeles General Plan
- Climate Action Plans

- Resilience Plans
- Recovery Plan
- Emergency response plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Master fire protection plans.

Some action items do not need to be implemented through regulation. Instead, these items can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be integrated via the update process.

34.3.2 Plan Monitoring

The Planning Division Chief from the City of Los Angeles Emergency Management Department will have lead responsibility for overseeing the plan by tracking the status of all recommended mitigation actions in the action plan.

34.3.3 Plan Evaluation

The plan will be evaluated by how successfully the implementation of identified actions has helped to achieve the goals and objectives identified of the plan. This will be assessed by a review of the changes in risk that occur over the performance period and by the degree to which mitigation goals and objectives are incorporated into existing plans, policies and programs. Plan evaluation will be the responsibility of the City of Los Angeles Hazard Mitigation Task Force. The mayor and City Council may recommend changes to the hazard mitigation plan based on evaluation findings.

34.3.4 Progress Report

An annual progress report is an effective tool to position the City for future updates. This report will provide the City with a streamlined approach for fulfilling update requirements delineated in 44 CFR 201.6(d)(3) during the next plan update initiative. Any trigger of a comprehensive update to the *City of Los Angeles Hazard Mitigation Plan* as described in Section 34.3.6 will require completion of a performance period progress report.

The objective of the progress report will be to evaluate the progress of individual actions at the annual review of this HMP. The first progress report will be completed one year from the date of plan approval by FEMA, or upon initiation of an accelerated plan update as described under Section 34.3.6, whichever occurs first. The review will include the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on the planning area
- Review of mitigation success stories
- Review of continuing public involvement
- Brief discussion about why targeted strategies were not completed
- Reevaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
- Recommendations for new projects
- Changes in or potential for new funding options (grant opportunities)
- Impact of any other planning programs or initiatives that involve hazard mitigation

The City has created a template to guide its departments in preparing a progress report (see Appendix G). This report will be used as follows:

- Posted on a website dedicated to the hazard mitigation plan
- Presented to the Emergency Operations Board at a regularly scheduled public meeting

Progress reporting is not a requirement specified under 44 CFR. However, it may enhance the City's opportunities for funding. While failure to implement this component of the plan maintenance strategy will not jeopardize the City's compliance under the DMA, it may jeopardize its opportunity to partner and leverage funding opportunities with other stakeholders within the planning area.

34.3.5 Grant Monitoring and Evaluation

EMD will identify potential grant funding opportunities. Once these opportunities are identified, City agency stakeholders will convene in a short meeting to review the hazard mitigation plan and pursue a strategy to capture that grant funding. The respective City department associated with the action item will assume lead responsibility for planning and facilitating grant opportunity meetings, with technical assistance from the Office of the City Administrative Officer and EMD as needed. Review of the hazard mitigation plan at these meetings can include the following:

- Discussion of any hazard events that occurred during the prior year and their impact on the planning area
- Impact of potential grant opportunities on the implementation of mitigation actions

- Re-evaluation of the action plans to determine if the timeline for identified actions needs to be amended (such as changing a long-term action to a short-term action because of funding availability)
- Recommendations for new actions
- Impact of any other planning programs or initiatives that involve hazard mitigation

34.3.6 Plan Update

FEMA requires the hazard mitigation plan to be revised and resubmitted for review and approval by Cal OES and FEMA prior to the five-year anniversary date of the plan's adoption in order to remain eligible for benefits under the DMA (44 CFR, Section 201.6(d)(3)). To meet this timeline, EMD will implement the Steering Committee's plan revision process at least one year prior to the anniversary date of the adoption. The City may choose to accelerate this cycle to less than five years based on the following triggers:

- A federal disaster declaration that affects the City of Los Angeles
- A hazard event that causes loss of life
- A comprehensive update of the City of Los Angeles General Plan

The hazard mitigation plan five-year revision will, at a minimum, include the following elements:

- The revision process will be convened through a new steering committee
- The hazard risk assessment will be reviewed and, if necessary, revised using best available information and technologies
- The action plan will be reviewed for any actions completed, ongoing, or withdrawn, and will be reconciled to account for changes in the risk assessment or new policies identified under other plans (such as the General Plan)
- The draft plan revision will be sent to appropriate departments and divisions for comment
- The public will be given an opportunity to comment on the revised plan prior to adoption
- The Los Angeles City Council will adopt the updated plan once the reviews by Cal OES and FEMA have been conducted

34.3.7 Continuing Public Involvement

The public will continue to be apprised of the plan's progress through a City website, annual reports, and presentations at the public meetings of the Emergency Operations Board. The website will house the final plan and provide information regarding the plan, plan implementation, and the revision process. Hard copies will be provided upon request. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the City of Los Angeles at the time of the update.

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APPENDICES

A. Definitions & Acronyms

°F—Degrees Fahrenheit

0.2 percent-annual-chance flood—The flood that has a 0.2 percent chance of being equaled or exceeded in any given year; often referred to as the 500-year flood

1 percent-annual-chance flood—The flood that has a 1 percent chance of being equaled or exceeded in any given year; often referred to as the 100-year flood

AB—Assembly Bill

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Acts of Terrorism—The unlawful use or threatened use of force or violence against people or property with the intention of intimidating or coercing societies or governments. Terrorism is either foreign or domestic, depending on the origin, base, and objectives of the terrorist or organization.

ADA—Americans with Disabilities Act

Agricultural Drought—Inadequate soil moisture to meet the needs of a particular crop at a particular time.

asset—Any manufactured or natural feature that has value, including people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks

base flood—The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1 percent-annual-chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program (NFIP) are protected to the same degree against flooding.

basin—The area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as "watersheds."

benefit/cost analysis—A systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

benefit—A net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit/cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

BRIC—Building Resilient Infrastructure and Communities

CAL FIRE—California Department of Forestry and Fire Protection

Cal OES—California Office of Emergency Services

capability assessment—An analysis of a community's capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out.

CARB—California Air Resources Board

CCR—California Code of Regulations

CDBG-DR—Community Development Block Grant Disaster Recovery grants

CDC—Centers for Disease Control and Prevention

CEQA—California Environmental Quality Act

CFR—Code of Federal Regulations

CGS—California Geological Survey

CIP—Capital Improvement Program

civil unrest— A violent public disturbance of the peace by three or more individuals. Civil unrest is a result of displeasure with or protest against socio-political problems and varies in severity. The tactics can range from permitted protest to criminal activities, all of which can escalate into chaos for those participating in the activities as well as for the general public.

climate change—A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

community lifeline—The most fundamental services in the community that, when stabilized, enable all other aspects of society to function

Community Rating System (CRS)—A voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Critical Area: An area defined by state or local regulations as deserving special protection because of unique natural features or its value as habitat for a wide range of species of flora and fauna. A sensitive/critical area is usually subject to more restrictive development regulations.

Critical Asset—Any entity or location—physical or virtual—whose compromise would have a profound and negative effect on critical infrastructure, cause mass casualty, or have a profound and negative symbolic or psychological impact.

critical facilities—Physical facilities and infrastructure that are critical to the health and welfare of the population. Such facilities are a type of community lifeline. They become especially important after any hazard event occurs.

CRS—Community Rating System

CRS—Community Rating System

CWA—Clean Water Act

cyber attack—An attempt to damage, disrupt, or gain unauthorized access to a computer, computer system, or electronic communications network.

dam failure—An uncontrolled release of impounded water due to a partial or complete breach in a dam (or levee) that impacts its integrity.

dam—Any artificial barrier or controlling mechanism that can or does impound or divert water.

debris flow—Dense mixtures of water-saturated debris that move down-valley, looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

DFIRM—Digital Flood Insurance Rate Map

Disaster Mitigation Act (DMA; Public Law 106-390)—The latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving certain federal financial assistance.

DMA —Disaster Mitigation Act

drought—The cumulative impacts of long periods of dry weather. These can include deficiencies in surface and subsurface water supplies and general impacts on health, well-being, and quality of life.

DSOD—Division of Safety of Dams

DTSC—Department of Toxic Substances Control

DWR—Department of Water Resources (California)

EAP—Emergency action plan

earthquake—The shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates.

ecosystem services—An ecosystem service is any positive benefit that wildlife or ecosystems provide to people. The benefits can be direct or indirect—small or large.

EDD—Employment Development Department (California)

EF— Enhanced Fujita Scale

EMD—City of Los Angeles Emergency Management Department

emergency action plan—A formal document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency.

EMPG—Emergency Management Performance Grant

EPA—U.S. Environmental Protection Agency

epicenter—The point on the earth’s surface directly above the hypocenter of an earthquake. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth.

epidemic—The spread of an infectious disease beyond a local population, reaching people in a wider geographical area. Several factors determine whether an outbreak will become an epidemic: the ease with which the disease spreads from vectors, such as animals, to people, and the ease with which it spreads from person to person.

ESA—Endangered Species Act

extreme heat—Temperatures that hover 10 °F or more above the average high temperature for a region and last for several days.

fault—A fracture in the earth’s crust along which two blocks of the crust have slipped with respect to each other.

FBI—Federal Bureau of Investigation

federal disaster declaration—Declarations for events that cause more damage than state and local governments and resources can handle without federal government assistance. A federal disaster declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, to help disaster victims, businesses, and public entities.

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

FHSZ—Fire hazard severity zone

fire behavior—the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

fire frequency—the broad measure of the rate of fire occurrence in a particular area. An estimate of the area most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

FIRM—Flood Insurance Rate Map

flash flood—A flood that occurs with little or no warning when water levels rise at an extremely fast rate

flood control system—A system of open channels, flood control basins, storm drains, catch basins, culverts, low-flow diversion structures, pump stations, debris basins, detention basins, and spreading grounds developed to protect the citizens of Los Angeles from flooding.

Flood Insurance Rate Map (FIRM)—The official maps on which the Federal Emergency Management Agency delineate the Special Flood Hazard Area.

Flood Insurance Study—A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

floodplain—The land area along the sides of a river that becomes inundated with water during a flood.

flood—The inundation of normally dry land resulting from the rising and overflowing of a body of water.

floodway—area within a floodplain that is reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

FMA—Flood Mitigation Assistance grant program

FRA—Federal Responsibility Area (for firefighting)

freeboard—The margin of safety added to the base flood elevation.

frequency—How often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita scale of tornado intensity—Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour (mph)) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

geographic information system (GIS)—A computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

g—gravity (%g, percent acceleration force of gravity)

GIS—Geographic Information System

goal—A general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

greenhouse gases—Methane, nitrous oxide and other gases that trap heat and warm the Earth, as a greenhouse traps heat from the sun.

ground shaking—The result of rapid ground acceleration caused by seismic waves passing beneath buildings, roads, and other structures.

HACLA—Housing Authority of the City of Los Angeles

Hazard Mitigation Grant Program (HMGP)—Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

hazard—A source of potential danger or adverse condition that could harm people and/or cause property damage.

hazardous material—A substance or combination of substances (biological, chemical, radiological, and/or physical) that, because of its quantity, concentration, or physical, chemical or infectious characteristics, has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Hazus (Hazards U.S. Multi-Hazard Loss Estimation Program)—A GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus software program assesses risk in a quantitative manner to estimate damage and losses associated with natural hazards.

HCM—Historic-Cultural Monument

high-hazard dam—Dams that can cause loss of human life from the failure or improper operation of the dam.

high-rise/high-occupancy building fire— A fire in a building that exceeds the aerial reach of local fire department equipment (usually 75 feet – 7 to 8 stories). Such structures are generally classified as residential, hotel/motel, office, hospital, or other.

HMA—Hazard Mitigation Assistance (federal grant program)

HMGP—Hazard Mitigation Grant program

HMP—hazard mitigation plan

hydrological drought—Deficiencies in surface and subsurface water supplies.

hypocenter—The region underground where an earthquake's energy originates

IBC—International Building Code

impact—the consequences or effects of a hazard, often expressed in value of loss or damage incurred.

influenza—A viral infection that attacks the respiratory system; commonly called flu.

intensity—The measure of the effects of a hazard.

interface area—An area susceptible to wildfires and where wildland vegetation and urban or suburban development occur together. An example would be smaller urban areas and dispersed rural housing in forested areas.

inventory—The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs, and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

IPCC—Intergovernmental Panel on Climate Change

IRC—International Residential Code

LACDA—Los Angeles County Drainage Area

LACoDPH—Los Angeles County Department of Public Health

LADOT—Los Angeles Department of Transportation

LADWP—Los Angeles Department of Water and Power

landslide—The movement of masses of loosened rock and soil down a hillside or slope. Slope failures occur when the strength of the soils forming the slope is exceeded by the pressure, such as weight or saturation, acting upon them.

LAPD—Los Angeles Police Department

LiMWA—limit of moderate wave action

liquefaction—Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

local government—Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

LRA—Local Responsibility Area (for firefighting)

magnitude—The measure of the strength of an earthquake.

mass movement—A collective term for landslides, debris flows, falls and sinkholes.

MCI—Multi-casualty incident

meteorological drought—Precipitation at levels below normal over a period of time. Meteorological measurements are the first indicators of drought and are usually region-specific.

mitigation actions—Specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

mitigation—A preventive action taken in advance of an event to reduce or eliminate risk to life or property.

MM—Modified Mercalli Scale

Mw—Moment Magnitude Scale

N/A—Not applicable

NASA—National Aeronautics and Space Administration

NCEI—National Centers for Environmental Information

NEHRP—National Earthquake Hazard Reduction Program

NFIP—National Flood Insurance Program

NIMS—National Incident Management System

NMDC—National Drought Mitigation Center

NOAA—National Oceanic and Atmospheric Administration

NWS—National Weather Service

Objective—a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

OEHHA—California Office of Environmental Health Hazard Assessment

OSPR— California Office of Spill Prevention and Response

pandemic—An epidemic of infectious disease that has spread through human populations across a large region, multiple continents, or worldwide.

PDM—Pre-Disaster Mitigation Grant Program

peak ground acceleration (PGA)—A measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

PGA—peak ground acceleration

ppm—part per million

preparedness—Actions that strengthen the capability of government, people, and communities to respond to disasters.

presidential disaster declaration—These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

probability of occurrence—A statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

radiological incidents—An incident involving radioactive materials that can occur wherever radioactive materials are used, stored, or transported.

recurrence interval —The recurrence interval (sometimes called the return period) is based on the probability that the given event will be equaled or exceeded in any given year.

repetitive loss property—Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced—Four or more paid flood losses in excess of $1000.00; or two paid flood losses in excess of $1000.00 within any 10-year period since 1978; or three or more paid losses that equal or exceed the current value of the insured property.

residual risk—The risk that remains after controls are accounted for.

return period—The average number of years between occurrences of a hazard (equal to the inverse of the annual likelihood of occurrence).

riparian area—The area along the banks of a natural watercourse.

risk assessment—The process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards

risk ranking—Process to score and rank hazards based on the probability that they will occur and the consequence they will have if they do.

risk—The likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

riverine—Of or produced by a river. Riverine floodplains have readily identifiable channels.

Robert T. Stafford Act—The statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs (Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107). Signed into law November 23, 1988; amended by the Disaster Relief Act of 1974 (Public Law 93-288).

SARS—Severe Acute Respiratory Syndrome

sea-level rise—An increase of the volume of water in the world's oceans, resulting in an increase in global mean sea level.

SEMS—Standardized Emergency Management System

SFHA—Special Flood Hazard Area

significant-hazard dam—Dams that can cause economic loss, environmental damage, or disruption of lifeline facilities, or can impact other concerns, but not necessarily loss of life.

socioeconomic drought—Drought impacts on health, wellbeing, and quality of life.

space weather—variations in the space environment between the sun and earth. It can influence the performance of technology used on Earth.

special events—An activity on public or private property that will affect the standard and ordinary use of public streets, rights-of-way, or sidewalks, and/or which requires extraordinary levels of City services. The special event may increase the likelihood of human-caused incidents such as terrorism, civil unrest or building fires.

special flood hazard area—The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations and zone V in coastal situations. The SFHA may or may not encompass all of a community's flood problems

SPI—Standardized Precipitation Index

SRA—State Responsibility Area (for firefighting)

stakeholder—business leaders, civic groups, academia, non-profit organizations, major employers, managers of community lifelines, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

steep slope—generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 33%.

surface fault rupture—an offset of the ground surface when fault rupture extends to the Earth's surface.

technological hazards—Hazards from accidents associated with human activities such as the manufacture, transportation, storage and use of hazardous materials.

terrorism—The unlawful use or threatened use of force or violence against people or property with the intention of intimidating or coercing societies or governments. Terrorism is either foreign or domestic, depending on the origin, base, and objectives of the terrorist or organization.

tornado—funnel clouds of varying sizes that touch ground. They can affect an area up to three-quarters of a mile wide, with a path of varying length. Tornadoes are measured using the Fujita Scale ranging from F0 to F5, or the Enhanced Fujita Scale.

transportation incident—A major incident related to a means of transportation such air, rail or highway travel resulting in death, serious injury, or extensive property loss or damage.

TRI—Toxics Release Inventory

Tsunami—A series of traveling ocean waves of extremely long wavelength usually caused by displacement of the ocean floor and typically generated by seismic or volcanic activity or by underwater landslides.

UHI—Urban heat island

USDA—U.S. Department of Agriculture

USDM—U.S. Drought Monitor

USGS—U.S. Geological Survey

vector—An organism (such as an insect or rodent) that transmits pathogens that cause disease

vector-borne illness—Diseases transmitted to people from insects and other animals. These include, but are not limited to, hantavirus, plague, tularemia, Lyme disease, West Nile virus and the zika virus.

vulnerability—the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

watershed—An area that drains downgradient from areas of higher land to areas of lower land to the lowest point.

weapons of mass destruction—chemical, biological, radiological, nuclear, and explosive weapons associated with terrorism.

wildfire—Fires that result in uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property in non-urban areas. Because of their distance from firefighting resources, they can be difficult to contain and can cause a great deal of destruction.

windstorm—A storm featuring violent winds. Windstorms are generally short-duration events involving straight-line winds or gusts of over 50 mph, strong enough to cause property damage.

WMD—Weapon of mass destruction

WNV—West Nile virus

WRCC—Western Regional Climate Center

zoning ordinance—Ordinance that designates allowable land use and intensities for a local jurisdiction.

B. Survey & Stakeholder Outreach

Community input and feedback serves to inform the content of the City of Los Angeles Hazard Mitigation Plan and ensure that community priorities and concerns are integrated into the plan. Hazard mitigation plans are required to provide opportunities for stakeholders and the public to be involved during the planning process (44 CFR, Section 201.6(b)(1), 201.6(b)(2), 201.6(c)(1)). The following sections provide additional details regarding outreach and engagement.

Stakeholder Holder Engagement

The planning process engaged a diverse set of stakeholders including those representing socially vulnerable individuals and underserved communities. These stakeholders were given an opportunity to be included and provide comments throughout the planning process. A detailed list of participants from the DAFN Coalition is available in Table B-1 and a full list of senior centers that received HMP materials is available in Table B-2.

Table B-1. DAFN Coalition Group Stakeholders

Organization Title	Organization Title
Access Services	Koreatown Immigrant Workers Alliance (KIWA)
Alicia Broadous Duncan Multipurpose Senior Center	Los Angeles LGBT CENTER
Alzheimer's Association - SoCal Chapter	LA Voice
Angelus Plaza	LIFT - Los Angeles
APLA Health - HIVE MSM 50+ contract	Little Tokyo Service Center
APLA Health - Proyecto Impacto contract	Los Angeles Community Action Network (LA-CAN)
Arming Minorities Against Addiction and Disease (AMAAD)	Los Angeles County HIV Commission
Asian American Drug Abuse Program, Inc.	Meals on Wheels
Asian Americans Advancing Justice - Los Angeles	Midnight Mission
Asian Pacific Islander Forward Movement	My Safe LA
Bienestar	North Los Angeles County Regional Center
Black AIDS Institute (BAI)	PALS for Health
Catholic Charities	Planned Parenthood Los Angeles

Organization Title	Organization Title
Center for Health Justice	REACH LA
Central American Resource Center (CARECEN)	Safe Kids Inc.
Children's Hospital Los Angeles - TG	San Gabriel/Pomona Regional Center
Coalition for Human Immigrant of Los Angeles (CHIRLA)	School Emergency Preparation and Management
Communities Actively Living Independent & Free (CALIF-ILC)	South Central Los Angeles Regional Center
Community Development Technologies (CDTech)	Special Service for Groups
Community Health Project LA (CHPLA)	St. Barnabas Senior Services
Consulate General of Mexico	St. John's Community Health
Covenant House California	State Council on Developmental Disabilities (SCDD)
Disability Community Resource Center (DCRC)	Strategic Actions for a Just Economy (SAJE)
East Los Angeles Women's Center (ELAWC)	Strategic Concepts in Organizing and Policy Education (SCOPE)
Eastern Los Angeles Regional Center	Tarzana Treatment Centers, Inc.
Eastside Leads	The Alliance for Community Transit (ACT-LA)
El Centro del Pueblo (ECDP)	The Immigration Center for Women and Children (ICWC)
Esperanza Community Housing Corporation	The Los Angeles Alliance for a New Economy (LAANE)
Fiesta Educativa	The People Concern
Frank D. Lanterman Regional Center	UCLA Labor Center
Good Shepherd Manor	Unified Homelessness Response Center
Harbor Regional Center	Urban Indian Health Institute (UIHI)
Homeless Health Care Los Angeles	Venice Family Clinic
Homeless Outreach Program Integrated Care System (HOPICS)	Vision y Compromiso
International Institute of Los Angeles (IILA)	Wayfinder Family Services
Iris Episcopal Diocese of Los Angeles	West Side Regional Center
Jewish Family Service (JFS)	Western Community Housing
Jovenes	

Table B-2. List of Recreation and Parks Senior Centers

Organization Title	Organization Title
Ahmanson Senior Citizen Center - Expo	Lincoln Park Senior Citizen Center
Anderson Memorial Senior Citizen Center	Lou Costello Senior Citizen Center
Betty Hill Senior Citizen Center	Mid-Valley Senior Citizen Center
Boyle Heights Senior Citizen Center	Montecito Heights Senior Citizen Center
Canoga Park Senior Citizen Center	North Hollywood Senior Citizen Center
Claude Pepper Senior Citizen Center	Robert M Wilkinson Multipurpose Center
El Sereno Senior Citizen Center	Sherman Oaks East Valley Adult Center
Fairfax Senior Citizen Center	Slauson Recreation/ Senior Citizen Center
Felicia Mahood Multipurpose Center	South La Sports Activity Center
Glassell Senior Citizen Center	Sunland Senior Citizen Center
Highland Park Adult Senior Citizen Center	Vineyard Recreation/ Senior Citizen Center
Jim Gilliam Senior Citizen Center	Watts Senior Citizen Center
Las Palmas Senior Citizen Center	Westchester Senior Citizen Center

Example Outreach Materials Distributed by Email

Example informational material distributed by email are provided on the following pages to illustrate the typical outreach communications used in the development of this HMP update.

City of Los Angeles

Local Hazard Mitigation Plan Frequently Asked Questions

March 2024

What is Hazard Mitigation?

Natural hazards have the potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. While an important aspect of emergency management deals with disaster recovery – those actions that a community must take to repair damages and make itself whole in the wake of a natural disaster – an equally important aspect of emergency management involves hazard mitigation.

Hazard mitigation measures are efforts taken before a disaster happens to lessen the impact that future disasters of that type will have on people and property in the community. They are things you do today to be more protected in the future.

Hazard mitigation actions taken in advance of a hazard event are essential to breaking the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, hazard mitigation actions can be long-term, cost-effective means of reducing the risk of loss and help create a more disaster-resistant and sustainable community.

What is a Local Hazard Mitigation Plan (LHMP)?

A Hazard Mitigation Plan is prepared by local governments in response to the Disaster Mitigation Act of 2000 (Public Law 106-390). These plans act as a key to federal funding afforded under the Robert T. Stafford Act. These plans meet statutory requirements that include:

- Organizing resources
- Assessing Risk
- Engaging the public
- Identifying Goals and Objectives
- Identifying actions
- Developing plan maintenance and implementation strategies

Why is the City of Los Angeles Local Hazard Mitigation Plan important?

The City of Los Angeles Local Hazard Mitigation Plan ("LHMP") sets the City's mitigation priorities, strategies, and actions. The plan also describes how risk assessment and mitigation strategy information is coordinated and linked to the State of California's Hazard Mitigation Plan. Local Governments must review and revise their LHMP and resubmit it for FEMA approval at least every five years (5) pursuant to 44 Code of Federal Regulations §201.6 to ensure the continued eligibility of Stafford Act funding. This includes eligibility for FEMA's hazard mitigation assistance programs:

- Hazard Mitigation Grant Program (HMGP)
- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA).

What hazards will the mitigation plan address?

At a minimum, the plan must address the natural hazards of concern that could impact the defined planning area. It may also include a select number of technological or human-caused hazards, but they are not required. It should also be noted that many secondary hazards are directly attributable to these primary hazards, which the plan will also address as part of the analysis of the primary hazard of concern.

How can I find out more about hazards and associated risks in my neighborhood?

Go to the City of Los Angeles Hazard Mapper for a visual depiction of the hazards being analyzed.

Will Climate Change be addressed in the LHMP?

Yes. While climate change will not be viewed as a stand-alone hazard in this plan, there will be detailed discussions of the potential impact of climate change on those applicable hazards of concern.

In addition to the LHMP, the City is preparing a Climate Vulnerability Assessment (CVA) to examine the anticipated impacts of climate change across the City and to identify the areas and communities most vulnerable to those impacts. The CVA will coordinate with the update of the City's LHMP and other relevant data sources to map projected climate hazards and analyze impacts related to:

- Extreme Heat
- Sea Level Rise and Coastal Flooding
- Extreme Precipitation and Flooding
- Wildfires
- Drought

What is the difference between Disaster Recovery Assistance and Hazard Mitigation Grants?

Disaster Recovery manages and coordinates presidential declared disaster programs including Public Assistance and Hazard Mitigation. When damages during an event exceed the predetermined per capita threshold, a Presidential Declaration results and activates federal disaster recovery programs. This federal disaster recovery program includes Public Assistance and Individual Assistance.

Public Assistance Program (PA)

Provides aid to state or local governments to pay part of the costs of repairing or rebuilding a community's damaged public infrastructure, public buildings, and public parks to pre-disaster conditions. Generally, public assistance programs pay for 75 percent of the approved project costs. Public Assistance may include debris removal, emergency protective measures, and public services, repair of damaged public property, community loans for essential government functions, and grants for public schools. The remaining 25 percent is a shared state and local responsibility.

Individual, Households, & Other Needs Assistance Program (IA)

Provides funding assistance up to predetermined limits for home damage repair, transportation repair or replacement, and funeral expenses. IA provides several areas of assistance to include limited funding for crisis counseling, unemployment assistance, and loans from the Small Business Administration. IA funds will not duplicate any funds being covered by insurance or any other federal program. IA funds are restricted in total amount that will be paid out. The cost share equates to 75 percent federal and 25 percent state.

Hazard Mitigation Assistance Program (e.g. HMGP, BRIC, FMA)

Provides funding for projects that will reduce or permanently eliminate future risk to lives and property. Home acquisition from floodways and floodplains, infrastructure protective measures (roads and bridges), storm water management (culverts, diversions, flap gates, floodgates, detention basins, and other local flood control measures), and mitigation planning are examples of the many types of qualifying projects.

What is a Risk Assessment?

The risk assessment is the "hub of the wheel" for any hazard mitigation plan. Understanding risk is mission-critical to the ability to identify actions to reduce risk. For the Los Angeles LHMP, risk has been defined as the probability of a hazard event occurring, times the impact that hazard can have on the people, property, economy, and environment of a defined planning area (Probability x Impact). The Los Angeles risk assessment uses the best available spatial data (GIS datasets) to map the extent and location of each identified hazard of concern to measure the exposure and vulnerability of the people, property, economy and environment. Models have been utilized to estimate the losses that can be expected for each hazard event. This is a very important aspect of any risk assessment, because for a project to be eligible for FEMA Grant funding, the net benefits of a project must equal or exceed the total costs for that project. For FEMA grants, a "benefit" is defined as an avoided loss.

What type of mitigation activities can these plans consider?

Possible mitigation activities may include:

- Adoption and enforcement of regulatory tools, including ordinances, regulations, and building codes, to guide and inform land use, development, and redevelopment decisions in areas affected by hazards.
- Acquisition or elevation of flood-damaged homes or businesses
- Retrofitting public buildings, schools, and critical facilities to withstand extreme wind events or ground shaking from earthquakes.
- Creating a buffer area by protecting natural resources, such as floodplains, wetlands, or sensitive habitats. Additional benefits to the community may include improved water quality and recreational opportunities.
- Create Stormwater parks, which are recreational spaces designed to flood during extreme events.
- Implement outreach programs to educate property owners and the public about risk and about mitigation measures to protect homes and businesses.

Why does the LHMP not address how the City responds to disasters?

While the LHMP mainly focuses on identifying the actions to mitigate the impact of natural hazards, the Emergency Operations Plan (EOP) is the plan that delineates the functions, roles, and responsibilities of all emergency response agencies and the overall emergency management system for the City of Los Angeles.

Why is the LHMP implementation and monitorning important?

History shows that hazard mitigation planning and implementing risk reduction activities can significantly reduce the physical, financial, and emotional losses caused by disasters. Putting the plan into action will be an ongoing process that may include initiating and completing mitigation projects and integrating mitigation strategies into other community plans and programs. Monitoring the plan's implementation helps to ensure it remains relevant as community priorities and development patterns change.

To implement and monitor this plan, the Emergency Management Department is creating a new Mitigation Task Force, composed of City departments, stakeholders, and community members, to ensure the City is putting this plan into action.

Is it possible to add more mitigation actions in the LHMP?

Absolutely! Once the LHMP has been approved by FEMA and adopted by the City, the LHMP is considered a living document. This means the City can identify and add more mitigation actions.

Does the LHMP expire?

Yes. Once the City adopts the LHMP, FEMA requires that the LHMP be updated every five years.

Ciudad de Los Ángeles

Preguntas frecuentes sobre el plan local de mitigación de riesgos

Marzo 2024

¿Qué es la mitigación de riesgos?

Los peligros naturales tienen el potencial de causar pérdidas de propiedad, pérdida de vidas, dificultades económicas y amenazas a la salud y la seguridad públicas. Si bien un aspecto importante del manejo de emergencias tiene que ver con la recuperación de desastres – (aquellas acciones que una comunidad debe tomar para reparar los daños y recuperarse después de un desastre natural) – un aspecto igualmente importante del manejo de emergencias implica la mitigación de peligros.

Las medidas de mitigación de peligros son esfuerzos que se toman antes de que ocurra un desastre para disminuir el impacto que futuros desastres de ese tipo tendrán en las personas y las propiedades de la comunidad. Son cosas que haces hoy para estar más protegido en el futuro.

Las medidas de mitigación de riesgos adoptadas antes de un evento peligroso son esenciales para romper el ciclo típico de desastre de daños, reconstrucción y daños repetidos. Con una selección cuidadosa, las acciones de mitigación de riesgos pueden ser medios rentables y a largo plazo para reducir el riesgo de pérdidas y ayudar a crear una comunidad más sostenible y resistente a los desastres.
community.

¿Qué es un plan local de mitigación de riesgos?

Los gobiernos locales preparan un Plan de Mitigación de Riesgos en respuesta a la Ley de Mitigación de Desastres de 2000 (Ley Pública 106-390). Estos planes actúan como vía clave para la financiación federal otorgada en virtud de la Ley Robert T. Stafford. Estos planes cumplen con los requisitos legales que incluyen:

- Organización de recursos
- Evaluación de riesgos
- Involucrando al público
- Identificación de metas y objetivos
- Identificando acciones
- Desarrollando estrategias de mantenimiento e implementación del plan

¿Por qué es importante el Plan Local de Mitigación de Riesgos de la Ciudad de Los Ángeles?

El Plan Local de Mitigación de Riesgos ("LHMP") de la Ciudad de Los Ángeles establece las prioridades, estrategias y acciones de mitigación de la Ciudad. El plan también describe cómo se coordina y vincula la información sobre la evaluación de riesgos y la estrategia de mitigación con el Plan de mitigación de riesgos del estado de California. Los gobiernos locales deben revisar y revisar su LHMP y volver a presentarlo para la aprobación de FEMA al menos cada cinco años (5) de conformidad con el Código 44 de Regulaciones Federales §201.6 para garantizar la elegibilidad continua de los fondos de la Ley Stafford. Esto incluye la elegibilidad para los programas de asistencia para la mitigación de riesgos de FEMA:

- Programa de subvenciones para mitigación de riesgos (HMGP)
- Construyendo infraestructuras y comunidades resilientes (BRIC)
- Asistencia para la mitigación de inundaciones (FMA).

¿Qué peligros abordará el plan de mitigación?

Como mínimo, el plan debe abordar los peligros naturales preocupantes que podrían afectar el área de planificación definida. También puede incluir un número selecto de peligros tecnológicos o causados por el hombre, pero no son obligatorios. También cabe señalar que muchos peligros secundarios son directamente atribuibles a estos peligros primarios, que el plan también abordará como parte del análisis del peligro principal de preocupación.

¿Cómo puedo obtener más información sobre los peligros y los riesgos asociados en mi vecindario?

Vaya al Mapeador de peligros de la ciudad de Los Ángeles para obtener una descripción visual de los peligros que se están analizando.

¿Se abordará el cambio climático en el LHMP?

Sí. Si bien el cambio climático no será visto como un peligro independiente en este plan, habrá discusiones detalladas sobre el impacto potencial del cambio climático en aquellos peligros aplicables que sean motivo de preocupación.

Además del LHMP, la Ciudad está preparando una Evaluación de Vulnerabilidad Climática (CVA) para examinar los impactos anticipados del cambio climático en toda la Ciudad e identificar las áreas y comunidades más vulnerables a esos impactos. El CVA se coordinará con la actualización del LHMP de la Ciudad y otras fuentes de datos relevantes para mapear los peligros climáticos proyectados y analizar los impactos relacionados con:

- Calor extremo
- Aumento del nivel del mar e inundaciones costeras
- Precipitaciones e inundaciones extremas
- Incendios forestales
- Sequía

¿Cuál es la diferencia entre asistencia para la recuperación de desastres y subvenciones para mitigación de riesgos?

Recuperación de Desastres gestiona y coordina los programas de desastre declarados por el presidente, incluida la asistencia pública y la mitigación de peligros. Cuando los daños durante un evento exceden el umbral per cápita predeterminado, se genera una Declaración Presidencial que activa los programas federales de recuperación de desastres. Este programa federal de recuperación de desastres incluye Asistencia Pública y Asistencia Individual.

El Programa de Asistencia Pública (PA)

Brinda ayuda a los gobiernos estatales o locales para pagar parte de los costos de reparación o reconstrucción de la infraestructura pública, los edificios públicos y los parques públicos dañados de una comunidad debido a las condiciones previas al desastre. Generalmente, los programas de asistencia pública pagan el 75 por ciento de los costos del proyecto aprobado. La asistencia pública puede incluir remoción de escombros, medidas de protección de emergencia y servicios públicos, reparación de propiedad pública dañada, préstamos comunitarios para funciones gubernamentales esenciales y subvenciones para escuelas públicas. El 25 por ciento restante es una responsabilidad estatal y local compartida.

El Programa de Asistencia para Individuos, Hogares y Otras Necesidades (IA)

Brinda asistencia financiera hasta límites predeterminados para reparación de daños en el hogar, reparación o reemplazo de transporte y gastos funerarios. IA proporciona varias áreas de asistencia que incluyen fondos limitados para asesoramiento en caso de crisis, asistencia por desempleo y préstamos de la Administración de Pequeñas Empresas. Los fondos de IA no duplicarán ningún fondo cubierto por un seguro o cualquier otro programa federal. Los fondos de IA están restringidos en cuanto al monto total que se pagará. El costo compartido equivale al 75 por ciento federal y al 25 por ciento estatal.

Mientras tanto, el Programa de Asistencia para la Mitigación de Riesgos (por ejemplo, HMGP, BRIC, FMA)

Proporciona financiación para proyectos que reducirán o eliminarán permanentemente riesgos futuros para vidas y propiedades. La adquisición de viviendas en cauces y llanuras aluviales, medidas de protección de infraestructura (carreteras y puentes), gestión de aguas pluviales (alcantarillas, desvíos, compuertas abatibles, compuertas, cuencas de detención y otras medidas locales de control de inundaciones) y planificación de mitigación son ejemplos de los muchos tipos de calificación de proyectos.

¿Qué es una evaluación de riesgos?

La evaluación de riesgos es el “centro de la rueda” de cualquier plan de mitigación de riesgos. Comprender el riesgo es fundamental para poder identificar acciones para reducirlo. Para el LHMP de Los Ángeles, el riesgo se ha definido como la probabilidad de que ocurra un evento peligroso multiplicado por el impacto que ese peligro puede tener en las personas, la propiedad, la economía y el medio ambiente de un área de planificación definida (Probabilidad x Impacto). La evaluación de riesgos de Los Ángeles utiliza los mejores datos espaciales disponibles (conjuntos de datos de Sistema de Información Geográfica (SIG)) para mapear la extensión y ubicación de cada peligro identificado de preocupación para medir la exposición y vulnerabilidad de las personas, las propiedades, la economía y el medio ambiente. Se han utilizado modelos para estimar las pérdidas que se pueden esperar para cada evento peligroso. Este es un aspecto muy importante de cualquier evaluación de riesgos, porque para que un proyecto sea elegible para recibir financiamiento de la subvención de FEMA, los beneficios netos de un proyecto deben igualar o exceder los costos totales de ese proyecto. Para las subvenciones de FEMA, un “beneficio” se define como una pérdida evitada.

¿Qué tipo de actividades de mitigación pueden considerar estos planes?

Las posibles actividades de mitigación pueden incluir:

- Adopción y aplicación de herramientas reglamentarias, incluidas ordenanzas, reglamentos y códigos de construcción, para guiar e informar las decisiones sobre el uso de la tierra, el desarrollo y la reurbanización en áreas afectadas por peligros.
- Adquisición o elevación de viviendas o negocios dañados por inundaciones
- Modernizar edificios públicos, escuelas e instalaciones críticas para resistir vientos extremos o temblores de tierra provocados por terremotos.
- Crear un área de amortiguamiento protegiendo los recursos naturales, como llanuras aluviales, humedales o hábitats sensibles. Los beneficios adicionales para la comunidad pueden incluir una mejor calidad del agua y oportunidades recreativas.
- Crear parques para aguas pluviales, que son espacios recreativos diseñados para inundarse durante eventos extremos.
- Implementar programas de extensión para educar a los propietarios y al público sobre los riesgos y las medidas de mitigación para proteger hogares y negocios.

¿Por qué el LHMP no aborda cómo responde la ciudad a los desastres?

Si bien el LHMP se centra principalmente en identificar las acciones para mitigar el impacto de los peligros naturales, el Plan de Operaciones de Emergencia (EOP) es el plan que delinea las funciones, roles y responsabilidades de todas las agencias de respuesta a emergencias y el sistema general de gestión de emergencias de la Ciudad de Los Ángeles.

¿Por qué es importante la implementación y el seguimiento del LHMP?

La historia muestra que la planificación de la mitigación de peligros y la implementación de actividades de reducción de riesgos pueden reducir significativamente las pérdidas físicas, financieras y emocionales causadas por los desastres. Poner el plan en acción será un proceso continuo que puede incluir iniciando y completando proyectos de mitigación e integrando estrategias de mitigación en otros planes y programas comunitarios. Monitorear la implementación del plan ayuda a garantizar que siga siendo relevante a medida que cambian las prioridades de la comunidad y los patrones de desarrollo.

Para implementar y monitorear este plan, el Departamento de Manejo de Emergencias está creando un nuevo Grupo de Trabajo de Mitigación, compuesto por departamentos de la Ciudad, partes interesadas y miembros de la comunidad, para garantizar que la Ciudad esté poniendo este plan en acción.

¿Es posible agregar más acciones de mitigación en el LHMP?

¡Absolutamente! Una vez que FEMA haya aprobado el LHMP y la Ciudad lo haya adoptado, el LHMP se considera un documento vivo. Esto significa que la Ciudad puede identificar y agregar más acciones de mitigación.

¿Caduca el LHMP?

Sí. Una vez que la Ciudad adopte el LHMP, FEMA exige que el LHMP se actualice cada cinco años.

THE PORT OF LOS ANGELES

Emergency Management

POLAEmergencyManagement@portla.org

Hello POLA Colleagues,

April 2024 Monthly Bulletin

This month the Emergency Management Bulletin will focus on:

- 2024 Local Hazard Mitigation Plan
- Emergency Preparedness Training Opportunities
- National Financial Capability Month
- Noteworthy Disaster Events in April History

2024 Local Hazard Mitigation Plan

The City of Los Angeles is updating its Local Hazard Mitigation Plan (LHMP) under the leadership and guidance of the Emergency Management Department. The LHMP serves to identify and assess the hazards to which the City is most vulnerable, and City Departments contribute strategies that will be implemented over the next five-years to reduce the impacts of natural and human-made disasters. Los Angeles is committed to a Whole Community Approach in the emergency planning processes; the 2024 LHMP Draft is now available for review and public comment through **April 15, 2024.**

Additionally, the Emergency Management Department is hosting a virtual event on **Saturday, April 6, 2024 at 10:00 am** to share more information about the 2024 LHMP Draft and an opportunity for the public to provide feedback – your input matters! For more details, please visit the following link: https://emergency.lacity.gov/Local-Hazard-Plan.

Emergency Preparedness Training Opportunities

POLA Emergency Management is delighted to offer emergency preparedness training opportunities:
1) First Aid/CPR/AED/Stop the Bleed involves a comprehensive full day of training and upon completion, you receive a certificate and wallet card attesting you are CPR certified.
2) Refresher First Aid/CPR/AED/Stop the Bleed is a topic focused 2-hour training that serves as a refresher and provides an opportunity to further refine your First Aid, CPR, AED and/or Stop the Bleed skills.

To sign up for these trainings, please contact Lynette Ursery at lursery@portla.org and/or Jennifer Maradiaga-Contreras at jmaradiaga-contreras@portla.org.

National Financial Capability Month

Both big disasters and unexpected bills take time, money, and resources away from other priorities. So why are we not doing more to get prepared? National Financial Capability Month is observed in April and the goal is to raise awareness on what one can do to be financial literate and have important financial information readily available in a moment's notice.

Individuals and families at all income levels have experienced the challenges of rebuilding their lives after a disaster or other emergency. In these stressful times, having access to personal financial, insurance, medical and other records is crucial for starting the recovery process quickly and efficiently. The Federal Emergency Management Agency (FEMA) recommends through their Emergency Financial First Aid Kit (EFFAK) to:

1. **Gather** financial and critical personal, household and medical information.
2. **Consider saving money** in an emergency savings account that could be used in any crisis. Keep a small amount of cash at home in a safe place. It is important to have small bills on hand because ATMs and credit cards may not work during a disaster when you need to purchase necessary supplies, fuel or food.
3. **Review your insurance policy** to make sure the amount and types of coverage you have meets the requirements for all possible hazards. Homeowners insurance does not typically cover flooding, so you may need to purchase flood insurance from the National Flood Insurance Program.

For more helpful financial preparedness tips, download the Emergency Financial First Aid Kit (EFFAK) to get started planning today.

Noteworthy Disaster Events in April History

April 19, 1995 – The Oklahoma City bombing was a domestic terrorist incident that destroyed the Alfred P. Murrah Federal Building in Oklahoma City, sadly killed 168 people and injured 680. This bombing incident was the deadliest act of terrorism in the United States history, prior to the September 11 attacks. The bomb blast destroyed and damaged 324 other buildings in the areas and caused an estimated $652 million worth of damage.

Local, state, federal and worldwide agencies engaged and supported in search and rescue efforts. FEMA activated 11 of its Urban Search and Rescue Task Forces, consisting of 665 rescue workers. In response to the bombing, legislature passed to increase the protection around federal buildings to deter future terrorist attacks.

Stay Safe and Be Prepared,
TEAM POLA EM

BEEP CORNER

Did you know AED Cabinets are equipped with Stop the Bleed Kits?

Check out your Building Emergency Plan on iPOLA to get more information specific to your workplace building.

City of Los Angeles
Hazard Mitigation Plan Update
Core Planning Team Meeting
Tuesday, March 14, 2023

AGENDA

Welcome & introductions

- Los Angeles – Jon Brown
- Tetra Tech – Rob Flaner

Project Planning – Bart Spencer

- Operations & oversight
  - Core Planning Team
  - Steering Committee
- Tasks
  - Timeline
  - Goals, objectives, mission statement
  - Action Items review
  - Project Coordination methodology
- New FEMA guidance
  - Hazard list
  - Climate change
  - Social vulnerability – including outreach
  - High hazard dams

Hazards

- Review of existing hazards
- Update hazard list
- Data request

2018 Natural Hazards

Hazard	Risk Category
Earthquake	High
Adverse / Severe Weather	High
Landslide / Debris Flow	High
Wildfire	High
Drought	Medium
Flood	Medium
Dam Failure	Medium
Sea Level Rise	Low
Tsunami	Low

Other Hazards of Interest

- Critical Infrastructure, High Rise/High Occupancy Building Fire, Special Events
- Cyber Attacks and Space Weather
- Hazardous Material, Transportation and Radiological Incidents
- Public Health Hazards
- Terrorism, WMD, Civil Unrest

Public Engagement

- StoryMap
- Website
- Outreach strategy
  - Survey
  - Specifically document groups (under severed communities) – how and what groups and how could be involved

Style guide

City of Los Angeles
Hazard Mitigation Plan Update
Steering Committee Meeting
Tuesday, April 25, 2023

AGENDA

Welcome & Introductions

- City of Los Angeles – Jon Brown, Division Chief – Planning & Resilience
- Carol Parks, EMD Director
- Tetra Tech – Rob Flaner, Hazard Mitigation Program Director | Project Manager

Project Outline – Bart Spencer, Project Lead

- What is hazard mitigation
- Recently updated FEMA guidance
- Project overview, timeline, and LA City HMP update

Project Oversight & Management – Bart Spencer

- Core Planning Team
- Steering Committee

Project Coordination – Bart Spencer

- Planning Process
- Timeline

Hazard Assessment & Risk Analysis – Bart Spencer & Rob Flaner

- Overview & process

Public Engagement – Megan Brotherton, Project Coordinator

- Processes & strategies

Steering Committee

- Responsibilities & expectations
- Chair – Jon Brown & Vice Chair, Travis Longcore
    - Roles & responsibilities
- Quorum – *decision needed* – 15 SC people; majority present and voting
- Ground rules – *accepted*

PUBLIC SURVEY

The public survey was developed to gain additional information from stakeholders and community members regarding hazards impacting the City, household preparedness, and awareness and knowledge of risks.

For the English version of the survey, the plurality of respondents were within the 65 and older age range, representing 31.54 percent of responses. The plurality of respondents for the Spanish version were within the 45 to 54 age range, representing 44.00 percent of responses. Both versions of the survey received responses from a diverse range of zip codes throughout the City.

When asked about what disasters have impacted respondents directly, the top choices were earthquake, extreme heat, adverse weather, drought, flooding, and wildfire. These hazards were reviewed by the Steering Committee as a hazard of concern and included in the risk assessment. For human-caused hazards, respondents selected public health, civil unrest, critical infrastructure failure, and transportation incidents. The responses from the survey served to ground-truth the selection of the hazards of concern and may serve as a starting point for identifying additional hazards of concern for future updates.

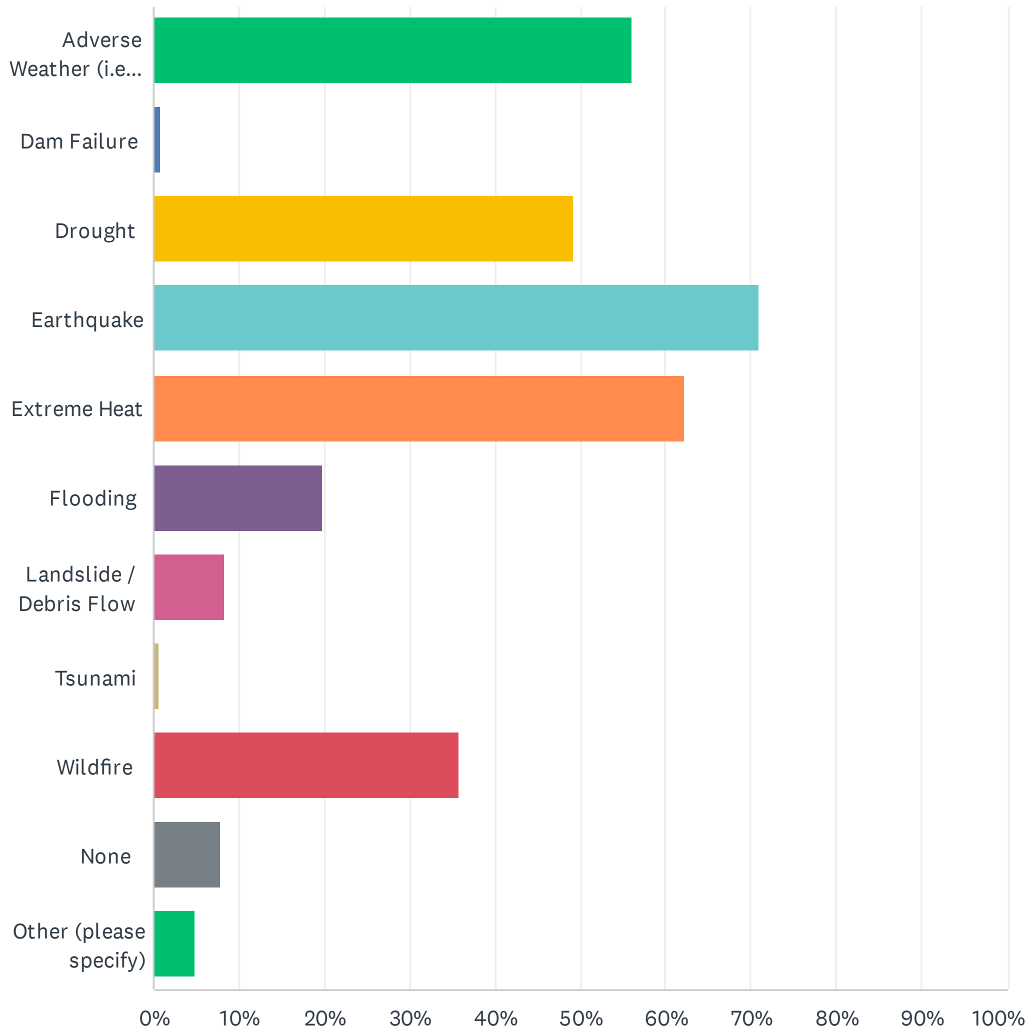
In addition to contributing to the confirmation of the hazards of concern, the survey results contributed to the development of mitigation actions based on what measures respondents are currently taking to stay informed and reduce risks.

A complete summary by question can be found at the end of this appendix for the English and Spanish versions of the plan.

SURVEY RESULTS
ENGLISH

Q1 Which of the following natural hazards have you ever been impacted by within the City of Los Angeles? (Check all that apply)

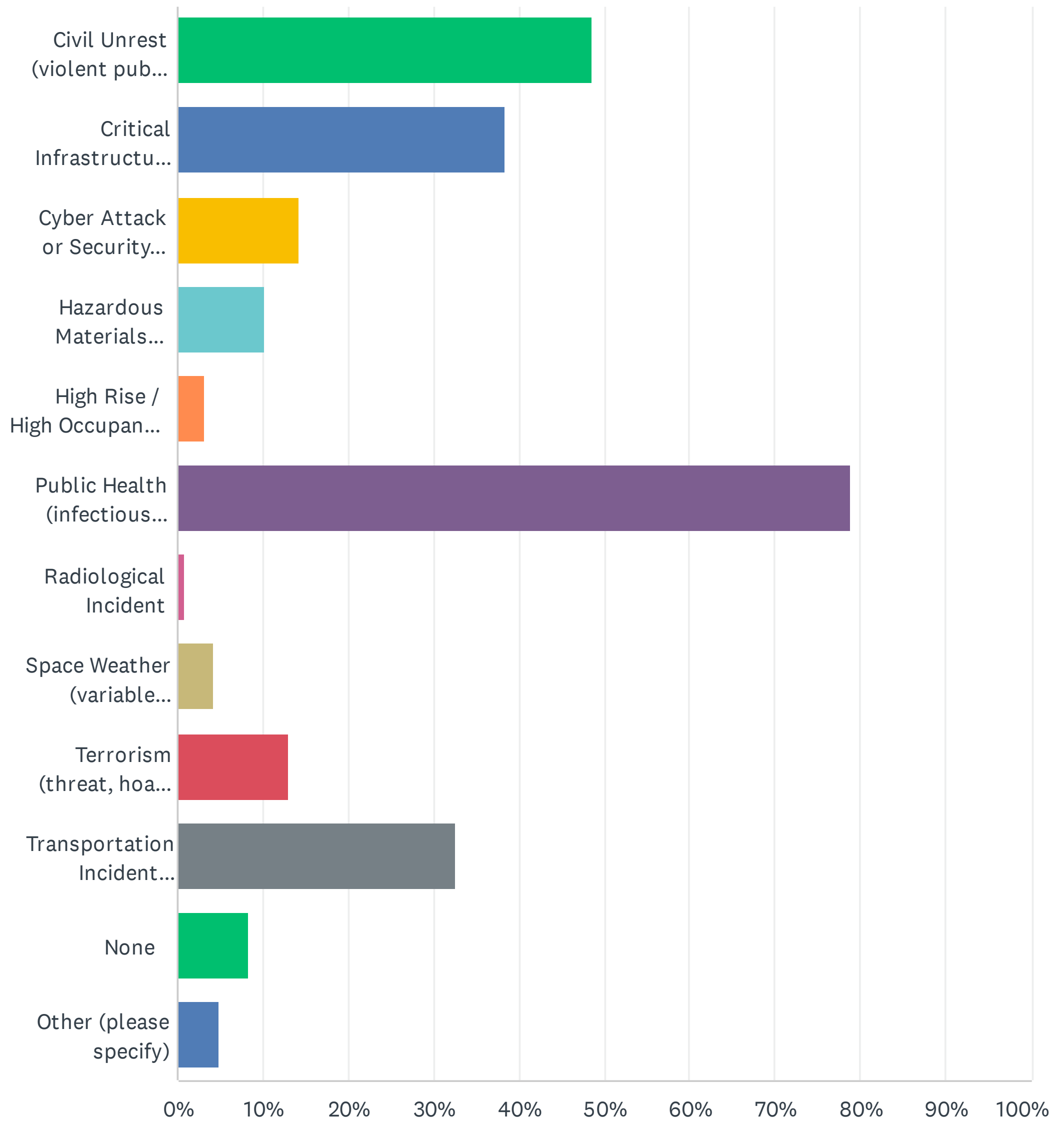
Answered: 5,374 Skipped: 26



ANSWER CHOICES	RESPONSES	
Adverse Weather (i.e., wind, lightning, extreme cold, winter storm, tornado, etc.)	56.05%	3,012
Dam Failure	0.95%	51
Drought	49.29%	2,649
Earthquake	71.10%	3,821
Extreme Heat	62.30%	3,348
Flooding	19.76%	1,062
Landslide / Debris Flow	8.28%	445
Tsunami	0.60%	32
Wildfire	35.76%	1,922
None	7.82%	420
Other (please specify)	4.84%	260
Total Respondents: 5,374		

Q2 Which of the following additional hazards have you ever been impacted by within the City of Los Angeles? (Check all that apply)

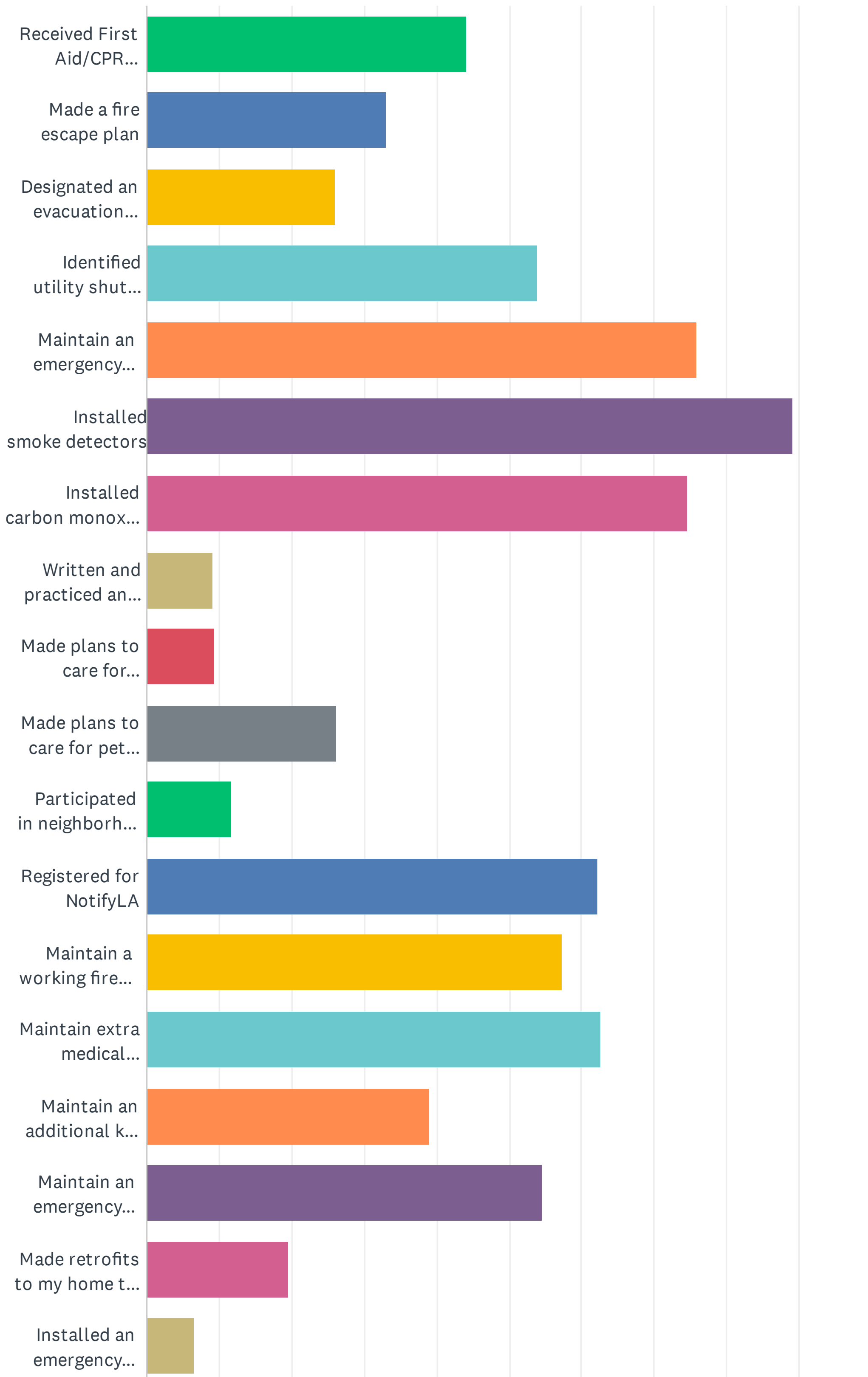
Answered: 5,317 Skipped: 83

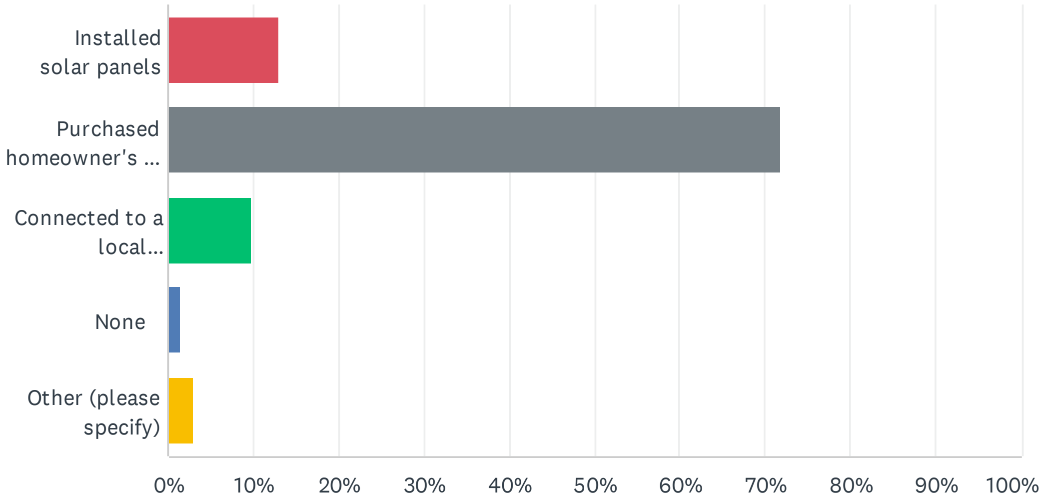


ANSWER CHOICES	RESPONSES	
Civil Unrest (violent public disturbance of the peace)	48.62%	2,585
Critical Infrastructure Failure (utility, transportation, electrical, or communications systems)	38.33%	2,038
Cyber Attack or Security Incident	14.35%	763
Hazardous Materials (spill or release)	10.21%	543
High Rise / High Occupancy Building Fire	3.16%	168
Public Health (infectious disease, epidemic, pandemic)	78.88%	4,194
Radiological Incident	0.79%	42
Space Weather (variable conditions on the sun and in space that can influence the performance of technology)	4.34%	231
Terrorism (threat, hoax, actual incident)	12.92%	687
Transportation Incident (roadways, rail, airport, waterways)	32.65%	1,736
None	8.31%	442
Other (please specify)	4.85%	258
Total Respondents: 5,317		

Q3 What steps has your household taken to prepare for a disaster? (Check all that apply)

Answered: 5,380 Skipped: 20

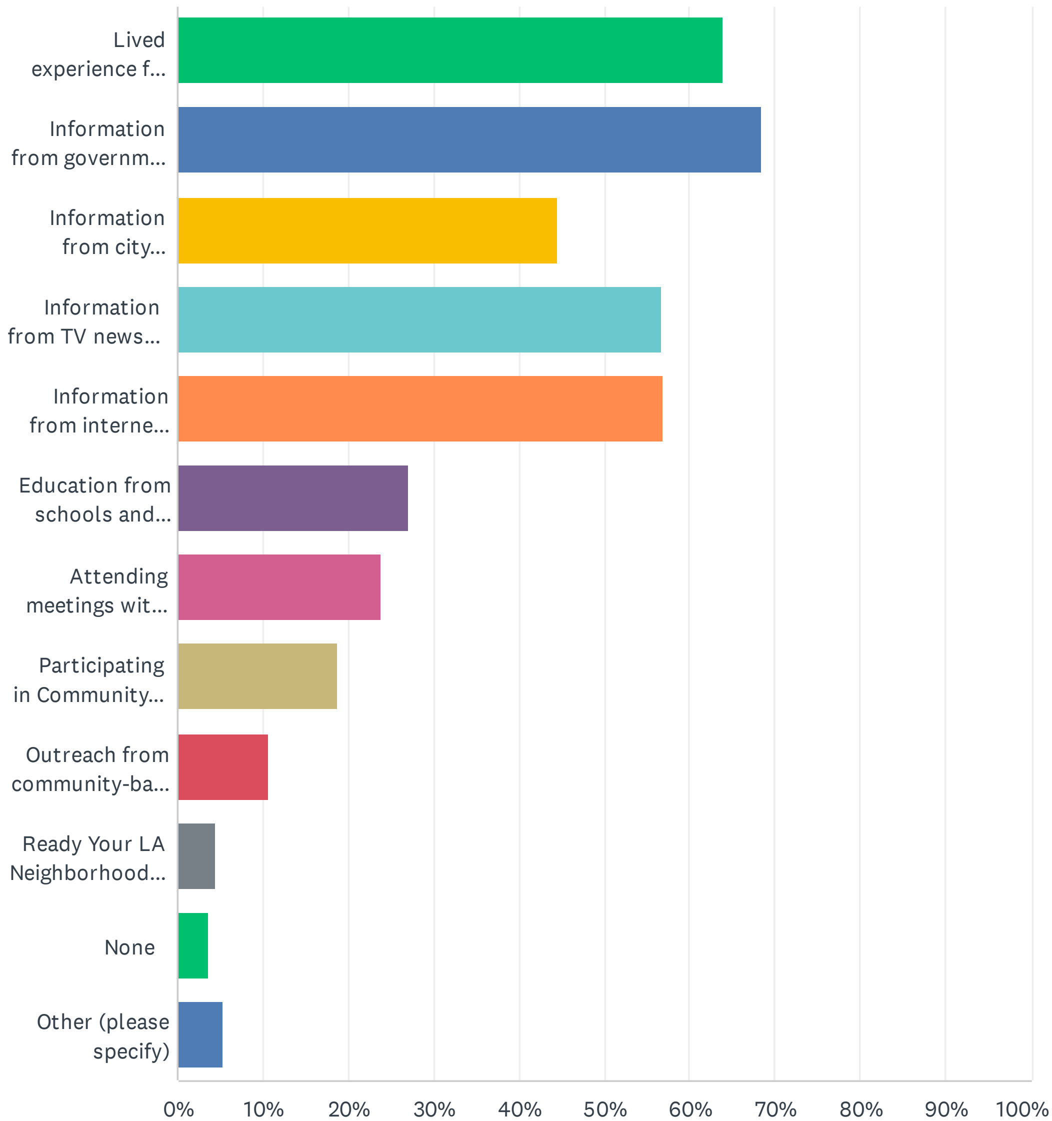



Installed solar panels
Purchased homeowner's ...
Connected to a local...
None
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Received First Aid/CPR training	44.20%	2,378
Made a fire escape plan	33.09%	1,780
Designated an evacuation meeting place	26.04%	1,401
Identified utility shutoff locations	53.87%	2,898
Maintain an emergency supply kit (e.g. batteries, flashlights, battery-powered radio, food/water)	75.87%	4,082
Installed smoke detectors	89.11%	4,794
Installed carbon monoxide detectors	74.61%	4,014
Written and practiced an individual or family disaster plan	9.22%	496
Made plans to care for elderly family members during and after a disaster	9.42%	507
Made plans to care for pets during and after a disaster	26.21%	1,410
Participated in neighborhood preparedness and planning	11.77%	633
Registered for NotifyLA	62.30%	3,352
Maintain a working fire extinguisher at home	57.38%	3,087
Maintain extra medical supplies (e.g. first aid kit, medications)	62.58%	3,367
Maintain an additional kit for car/work	38.92%	2,094
Maintain an emergency potable water and food supply	54.57%	2,936
Made retrofits to my home to withstand a disaster	19.70%	1,060
Installed an emergency generator	6.52%	351
Installed solar panels	12.92%	695
Purchased homeowner's or renter's insurance	71.80%	3,863
Connected to a local community-based organization and/or service provider	9.74%	524
None	1.41%	76
Other (please specify)	3.03%	163
Total Respondents: 5,380		

Q4 What resources/experiences have helped you to become prepared? (Check all that apply)

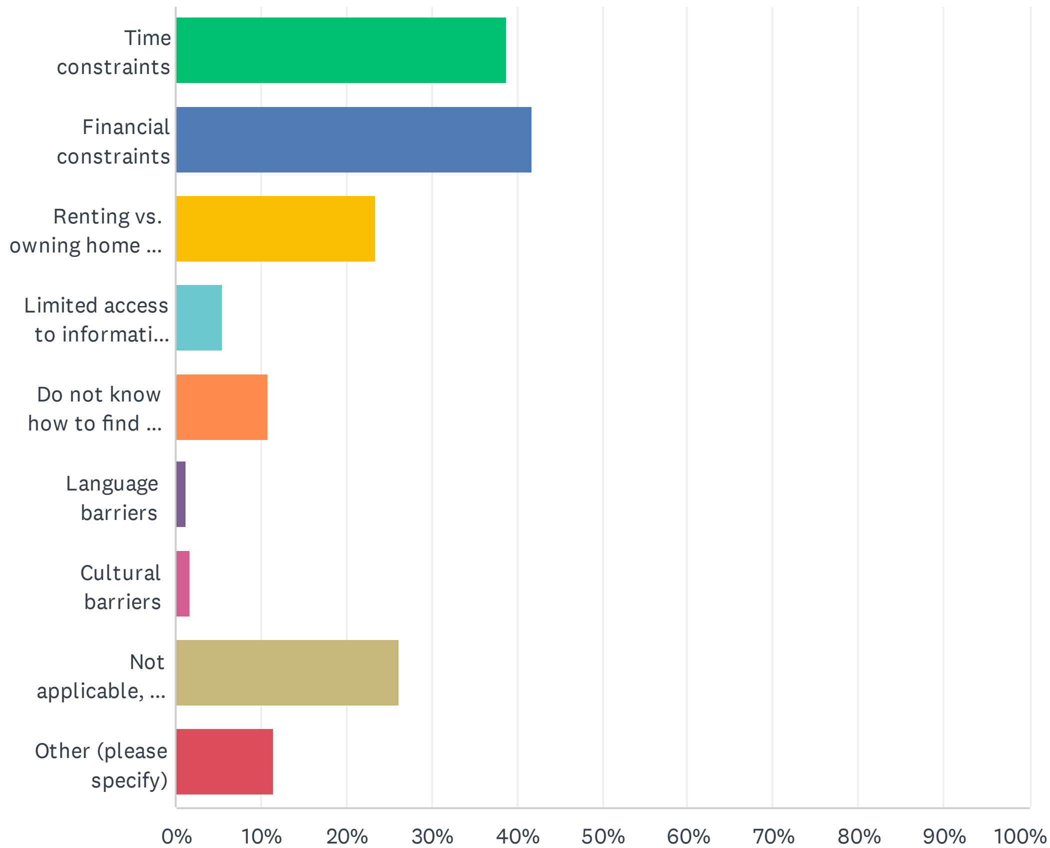
Answered: 5,329 Skipped: 71



ANSWER CHOICES	RESPONSES	
Lived experience from one or more hazards or disasters	64.05%	3,413
Information from government sources (e.g. federal, state, or local)	68.46%	3,648
Information from city websites	44.64%	2,379
Information from TV news, radio news	56.71%	3,022
Information from internet or social media	56.95%	3,035
Education from schools and other academic institutions	27.13%	1,446
Attending meetings with information on disaster preparedness	23.85%	1,271
Participating in Community Emergency Response Training (CERT) or other disaster training program	18.75%	999
Outreach from community-based organizations	10.58%	564
Ready Your LA Neighborhood (RYLAN)	4.41%	235
None	3.53%	188
Other (please specify)	5.25%	280
Total Respondents: 5,329		

Q5 What are the hurdles preventing you from being prepared? (Check all that apply)

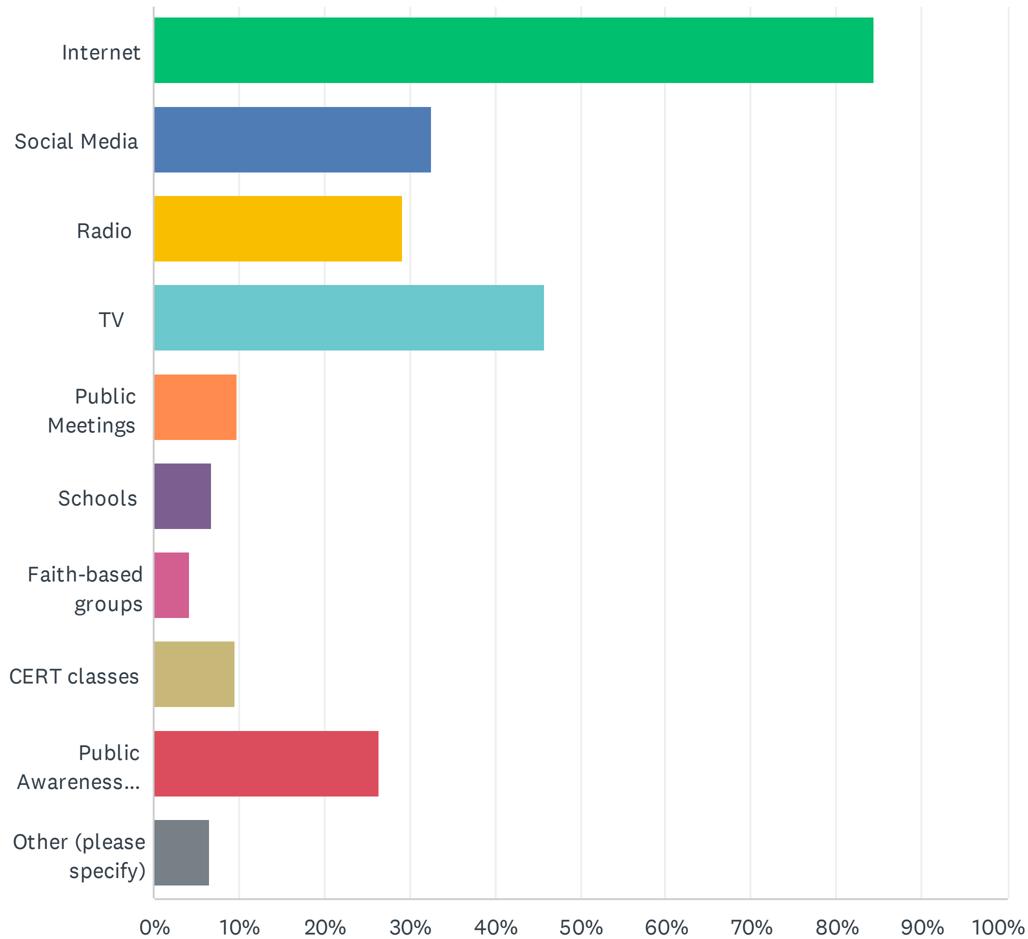
Answered: 5,011 Skipped: 389



ANSWER CHOICES	RESPONSES	
Time constraints	38.81%	1,945
Financial constraints	41.69%	2,089
Renting vs. owning home or business	23.37%	1,171
Limited access to information resources	5.49%	275
Do not know how to find out if I am in a hazard area	10.98%	550
Language barriers	1.22%	61
Cultural barriers	1.72%	86
Not applicable, I feel adequately prepared already	26.12%	1,309
Other (please specify)	11.55%	579
Total Respondents: 5,011		

Q6 Which information sources on emergency preparedness do you use the most? (Check all that apply)

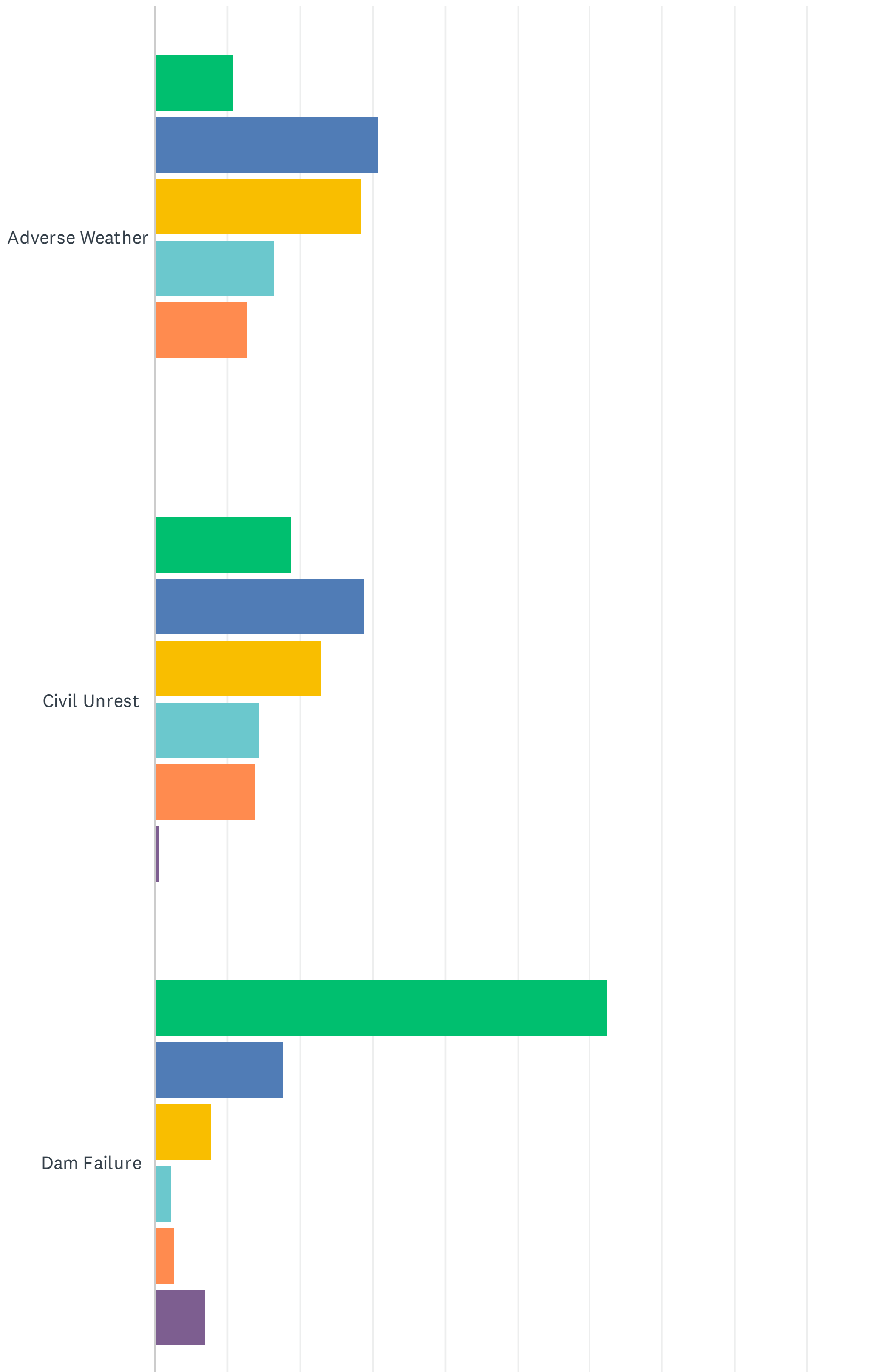
Answered: 5,333 Skipped: 67

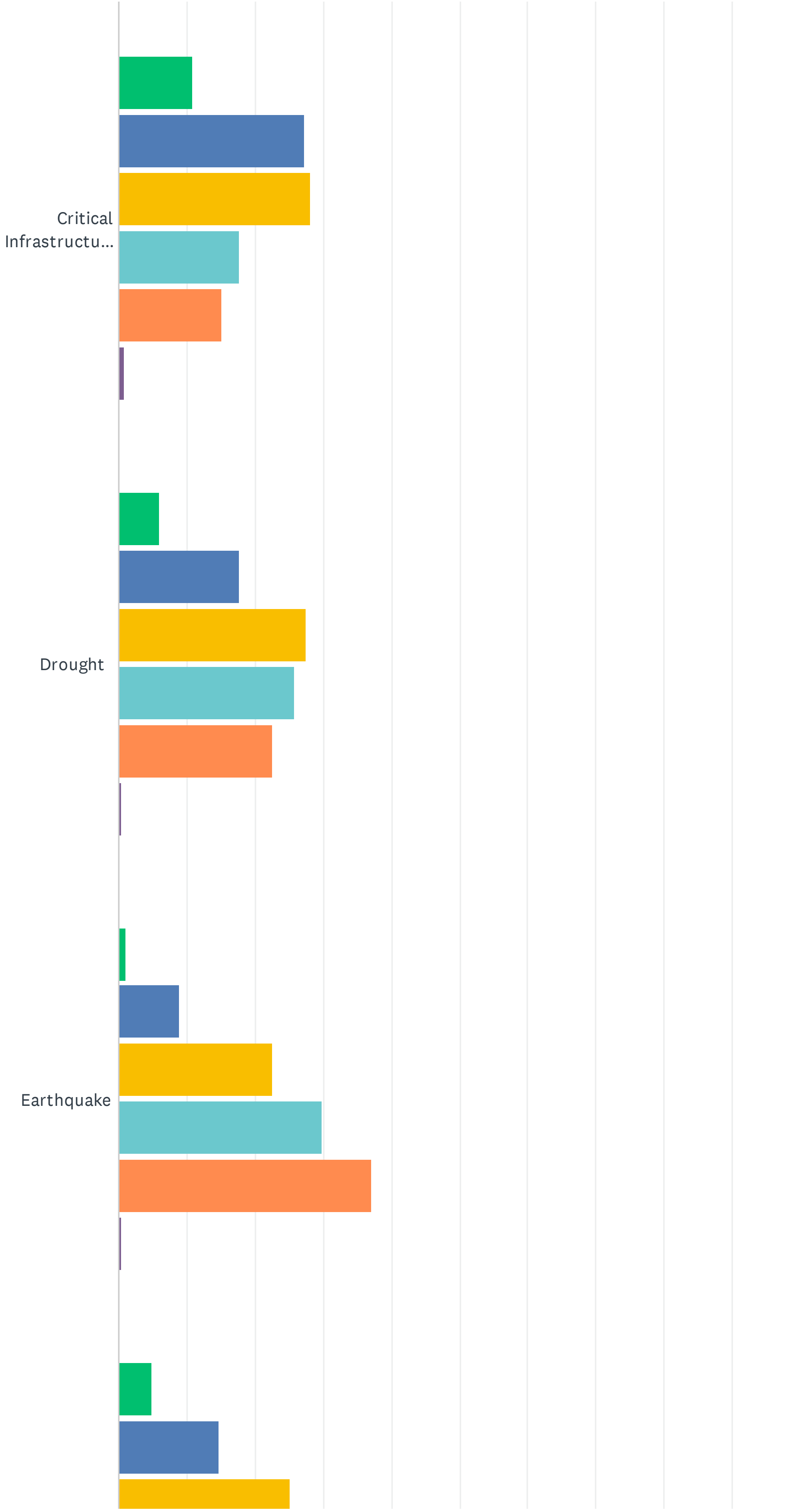


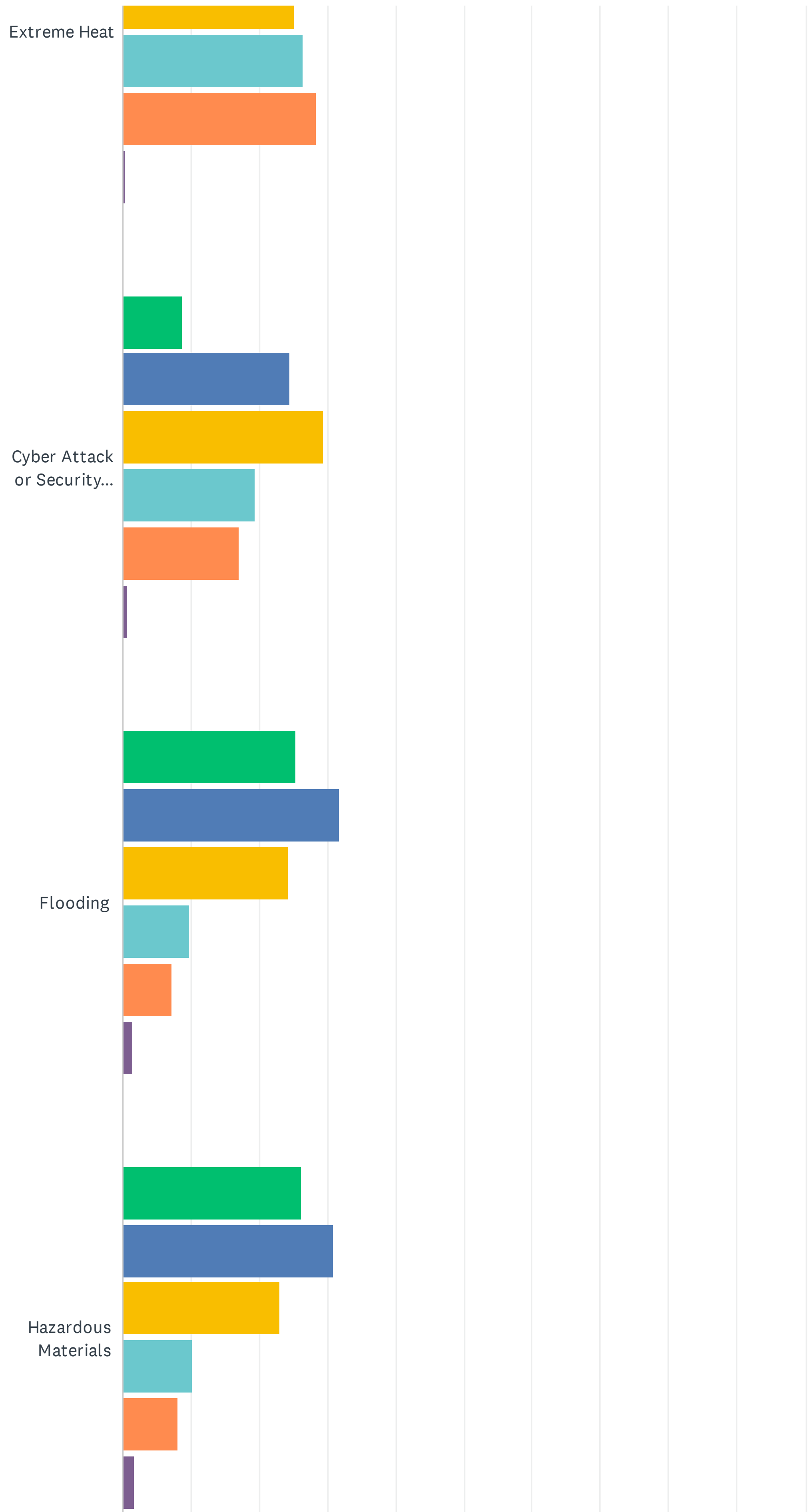
ANSWER CHOICES	RESPONSES	
Internet	84.42%	4,502
Social Media	32.63%	1,740
Radio	29.18%	1,556
TV	45.90%	2,448
Public Meetings	9.73%	519
Schools	6.73%	359
Faith-based groups	4.26%	227
CERT classes	9.58%	511
Public Awareness Campaigns	26.48%	1,412
Other (please specify)	6.66%	355
Total Respondents: 5,333		

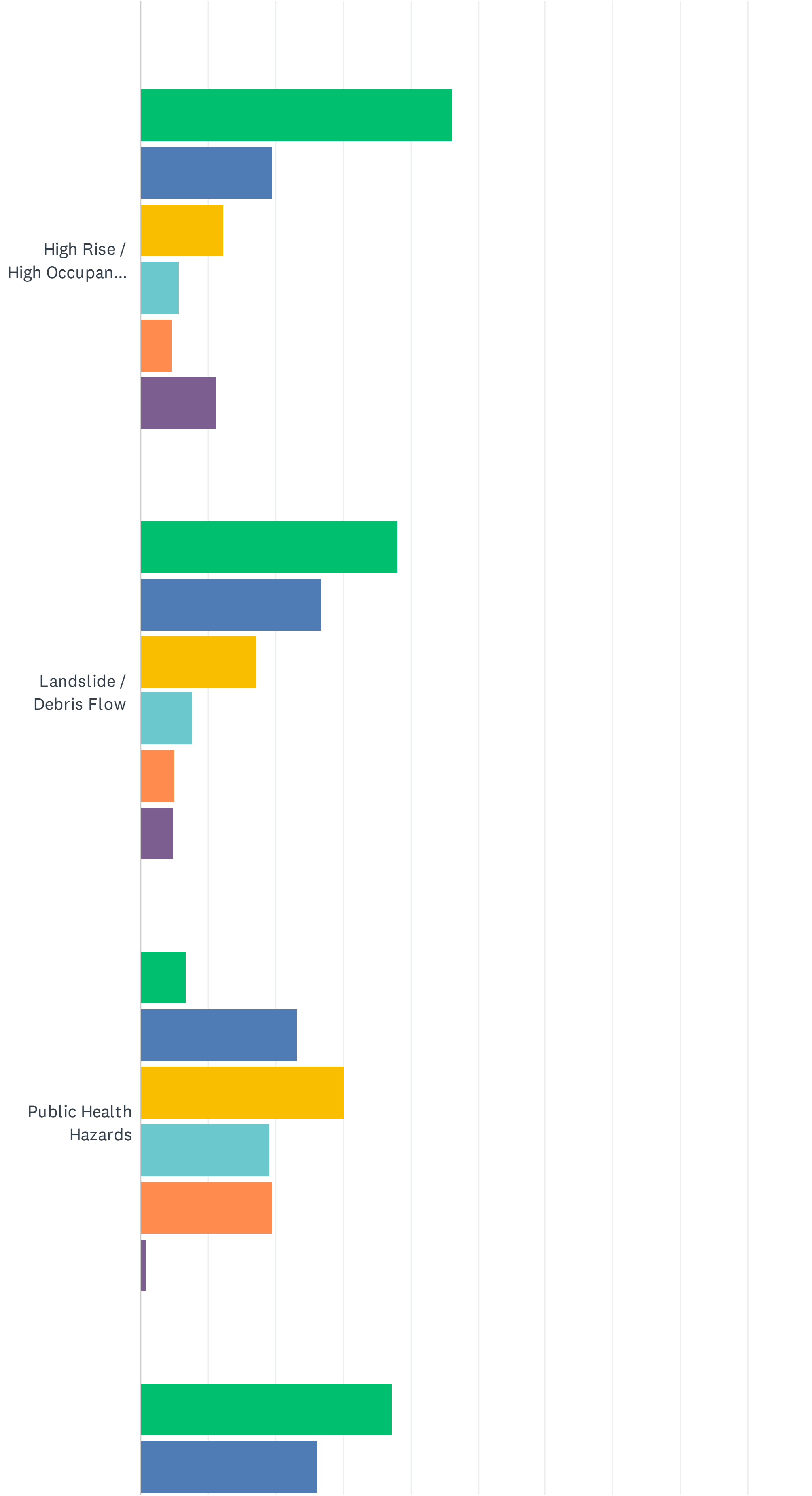
Q7 How concerned are you about the following hazards? (Check one response for each hazard)

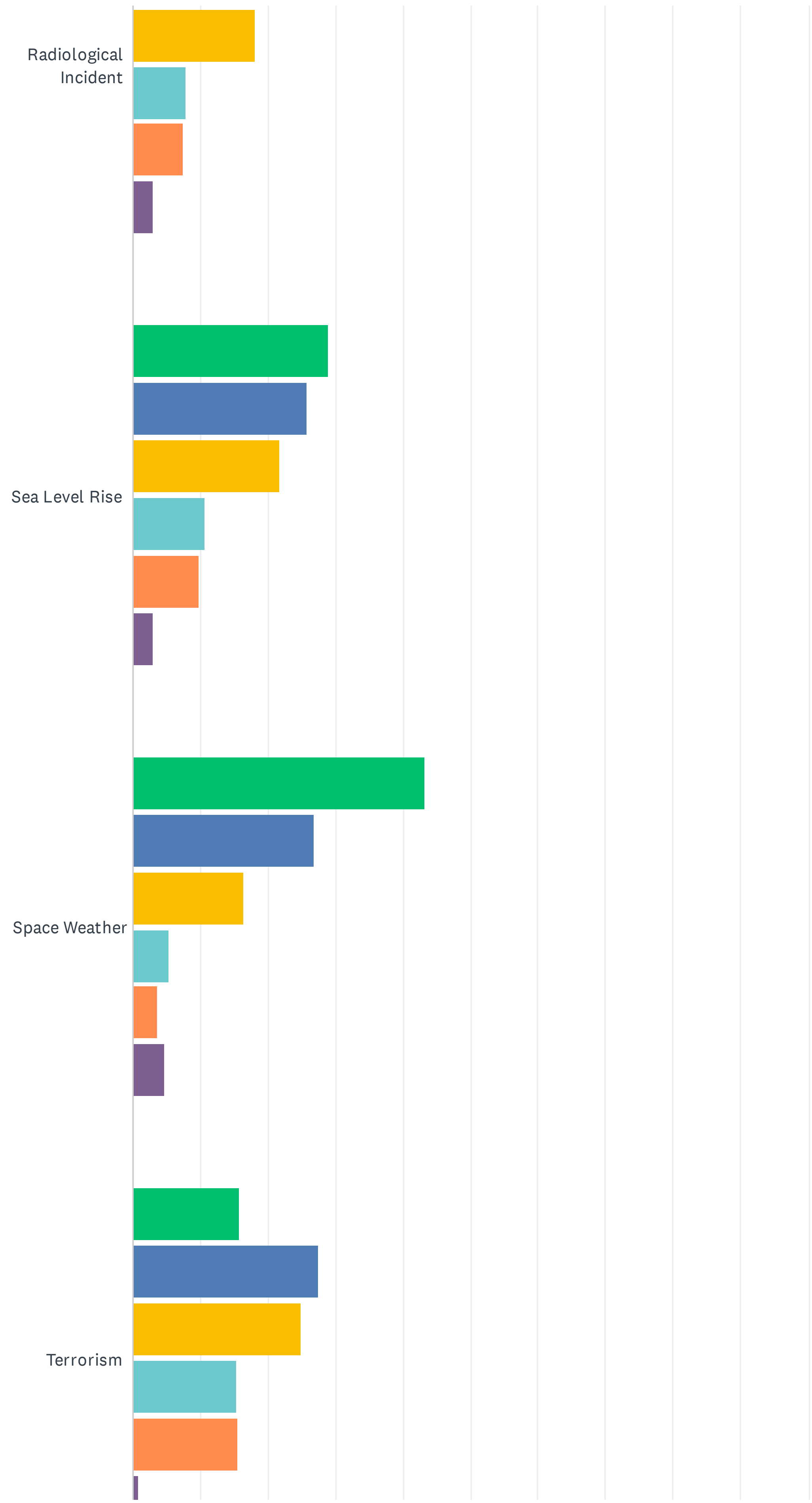
Answered: 5,368 Skipped: 32

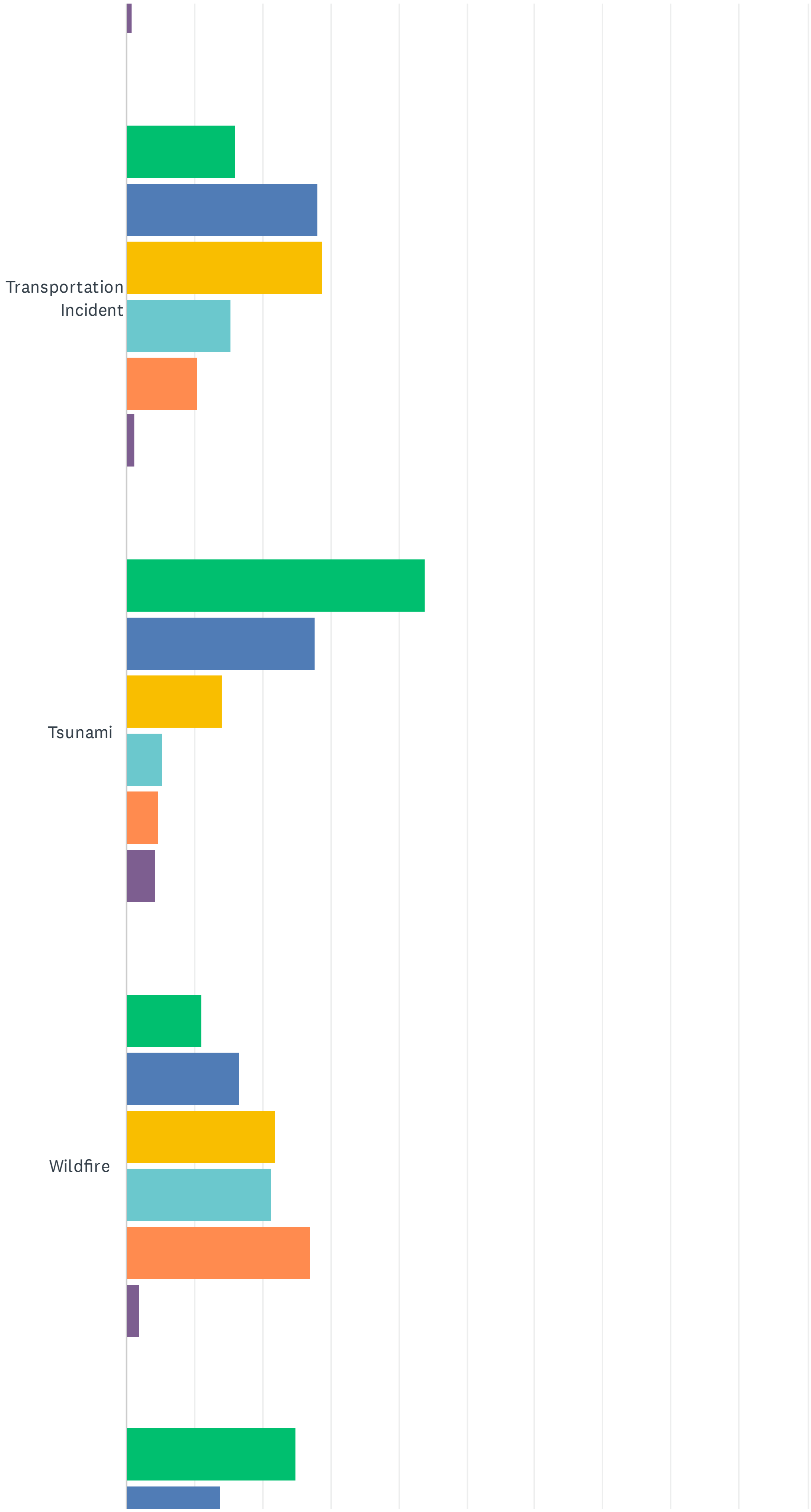


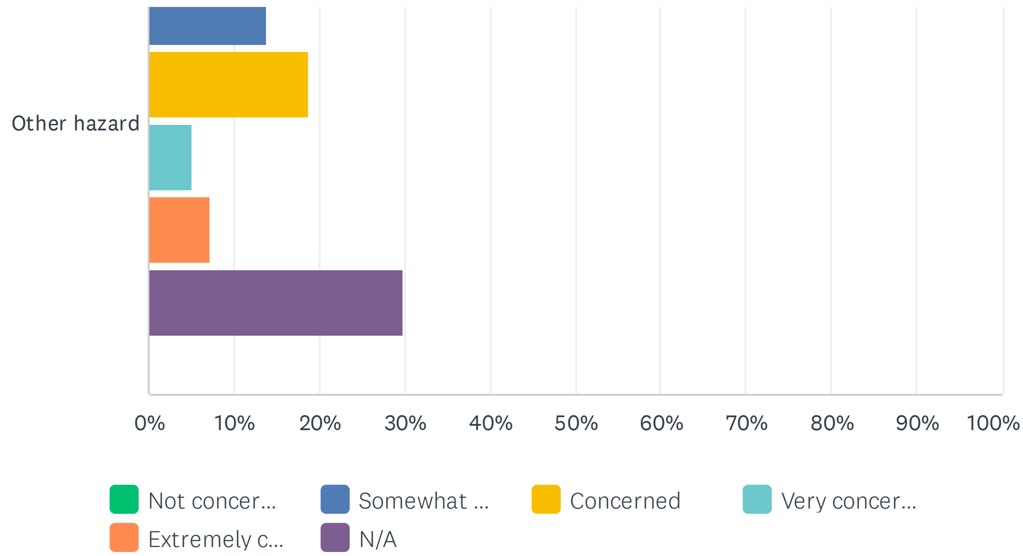

Critical
Infrastructu...
Drought
Earthquake


Extreme Heat
Cyber Attack or Security...
Flooding
Hazardous Materials


High Rise /
High Occupan...
Landslide /
Debris Flow
Public Health
Hazards


Radiological Incident
Sea Level Rise
Space Weather
Terrorism

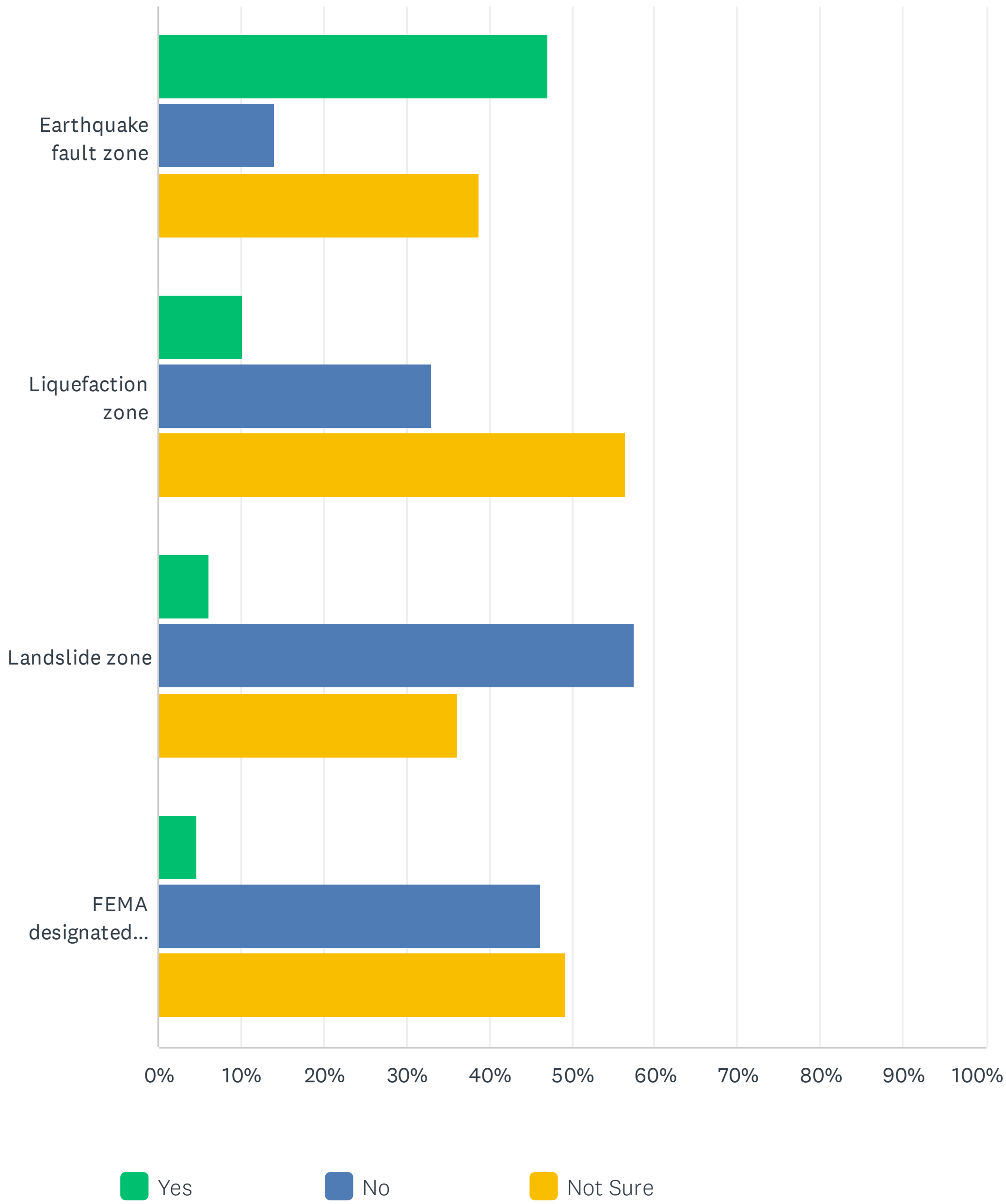

Transportation Incident
Tsunami
Wildfire


Other hazard
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Not concer...
Somewhat ...
Concerned
Very concer...
Extremely c...
N/A

	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	N/A	TOTAL	WEIGHTE AVERAGE
Adverse Weather	10.93% 580	30.93% 1,642	28.50% 1,513	16.56% 879	12.83% 681	0.24% 13	5,308	2.8
Civil Unrest	19.01% 1,003	28.98% 1,529	23.05% 1,216	14.56% 768	13.78% 727	0.63% 33	5,276	2.7
Dam Failure	62.52% 3,223	17.65% 910	7.90% 407	2.25% 116	2.74% 141	6.94% 358	5,155	1.5
Critical Infrastructure Failure	10.98% 578	27.31% 1,438	28.07% 1,478	17.64% 929	15.13% 797	0.87% 46	5,266	2.9
Drought	5.96% 315	17.70% 936	27.44% 1,451	25.89% 1,369	22.60% 1,195	0.40% 21	5,287	3.4
Earthquake	0.99% 53	9.04% 483	22.60% 1,208	29.78% 1,592	37.14% 1,985	0.45% 24	5,345	3.9
Extreme Heat	4.82% 255	14.77% 781	25.06% 1,325	26.50% 1,401	28.45% 1,504	0.40% 21	5,287	3.5
Cyber Attack or Security Incident	8.84% 466	24.53% 1,293	29.43% 1,551	19.43% 1,024	17.13% 903	0.65% 34	5,271	3.1
Flooding	25.38% 1,331	31.84% 1,670	24.23% 1,271	9.82% 515	7.21% 378	1.53% 80	5,245	2.4
Hazardous Materials	26.14% 1,360	30.92% 1,609	23.03% 1,198	10.21% 531	8.07% 420	1.63% 85	5,203	2.4
High Rise / High Occupancy Building Fire	46.32% 2,401	19.52% 1,012	12.46% 646	5.73% 297	4.75% 246	11.23% 582	5,184	1.9
Landslide / Debris Flow	38.20% 1,990	26.83% 1,398	17.33% 903	7.64% 398	5.03% 262	4.97% 259	5,210	2.1
Public Health Hazards	6.88% 362	23.22% 1,222	30.29% 1,594	19.18% 1,009	19.56% 1,029	0.87% 46	5,262	3.2
Radiological Incident	37.22% 1,928	26.12% 1,353	18.20% 943	7.97% 413	7.51% 389	2.97% 154	5,180	2.2
Sea Level Rise	29.05% 1,512	25.73% 1,339	21.69% 1,129	10.64% 554	9.84% 512	3.05% 159	5,205	2.4
Space Weather	43.22% 2,215	26.79% 1,373	16.35% 838	5.37% 275	3.57% 183	4.70% 241	5,125	1.9
Terrorism	15.81% 828	27.43% 1,436	24.92% 1,305	15.41% 807	15.49% 811	0.94% 49	5,236	2.8
Transportation Incident	16.06% 837	28.21% 1,470	28.73% 1,497	15.29% 797	10.44% 544	1.27% 66	5,211	2.7
Tsunami	43.89% 2,277	27.72% 1,438	14.11% 732	5.34% 277	4.70% 244	4.24% 220	5,188	1.9
Wildfire	11.02% 579	16.67% 876	21.98% 1,155	21.27% 1,118	27.04% 1,421	2.02% 106	5,255	3.3
Other hazard	24.98% 1,003	13.87% 557	18.85% 757	5.18% 208	7.30% 293	29.81% 1,197	4,015	2.3

Q8 Is your current residence located within a mapped hazard area? (Check all that apply)

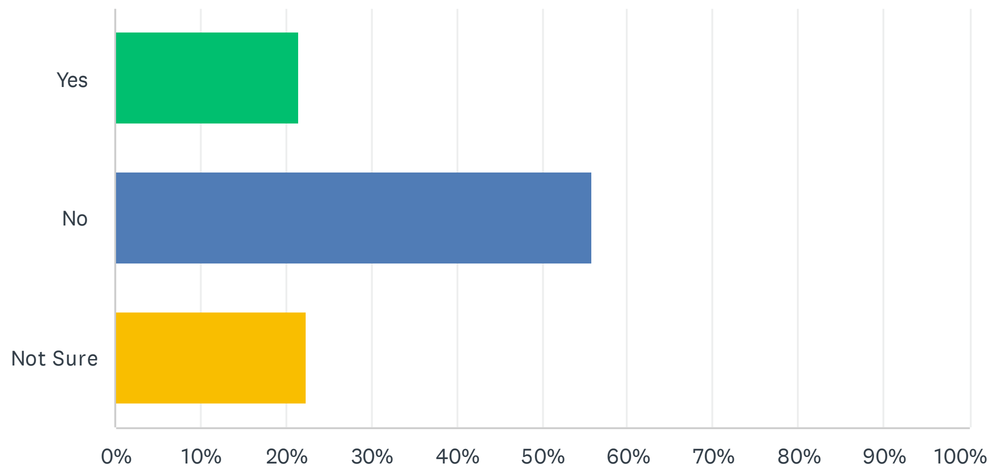
Answered: 5,314 Skipped: 86



	YES	NO	NOT SURE	TOTAL
Earthquake fault zone	47.06% 2,488	14.11% 746	38.83% 2,053	5,287
Liquefaction zone	10.32% 531	33.09% 1,703	56.59% 2,912	5,146
Landslide zone	6.22% 319	57.53% 2,949	36.25% 1,858	5,126
FEMA designated floodplain	4.59% 235	46.20% 2,365	49.21% 2,519	5,119

Q9 Is your current residence in a high-risk area for wildfire?

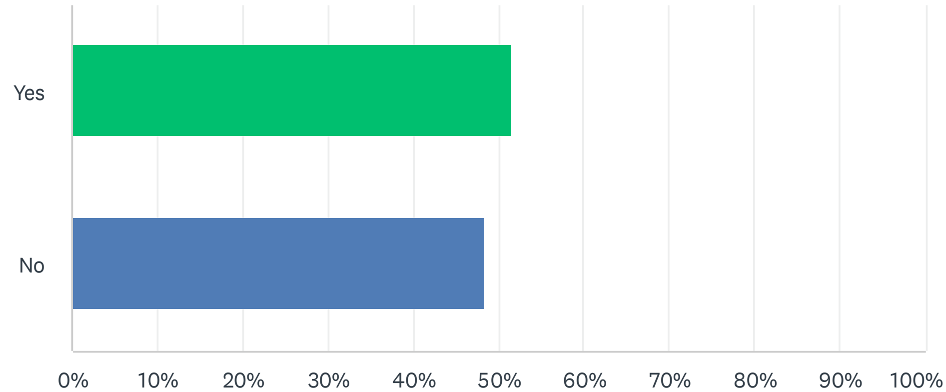
Answered: 5,351 Skipped: 49



ANSWER CHOICES	RESPONSES	
Yes	21.60%	1,156
No	55.91%	2,992
Not Sure	22.48%	1,203
TOTAL		5,351

Q10 Are you aware that California law requires the disclosure of a natural hazard risk zone (e.g. earthquake fault zone, dam failure zone, or high fire risk area) before you purchase or move into a home?

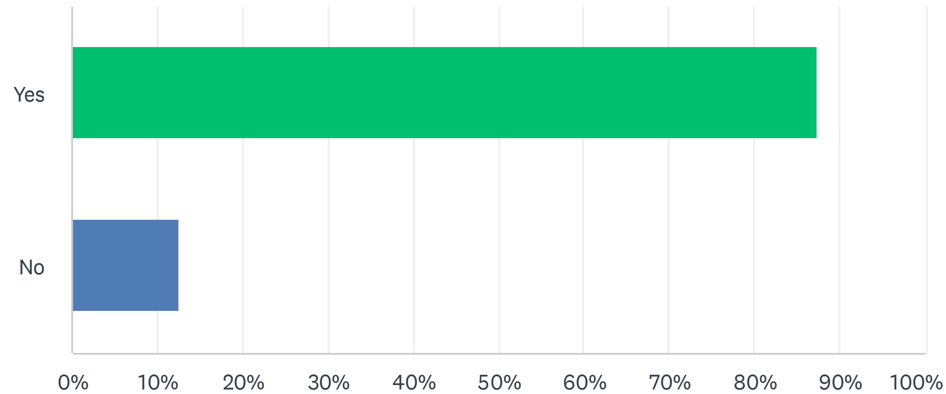
Answered: 5,346 Skipped: 54



ANSWER CHOICES	RESPONSES	
Yes	51.65%	2,761
No	48.35%	2,585
TOTAL		5,346

Q11 Would the disclosure of natural hazard information influence your decision to purchase or move into a home today?

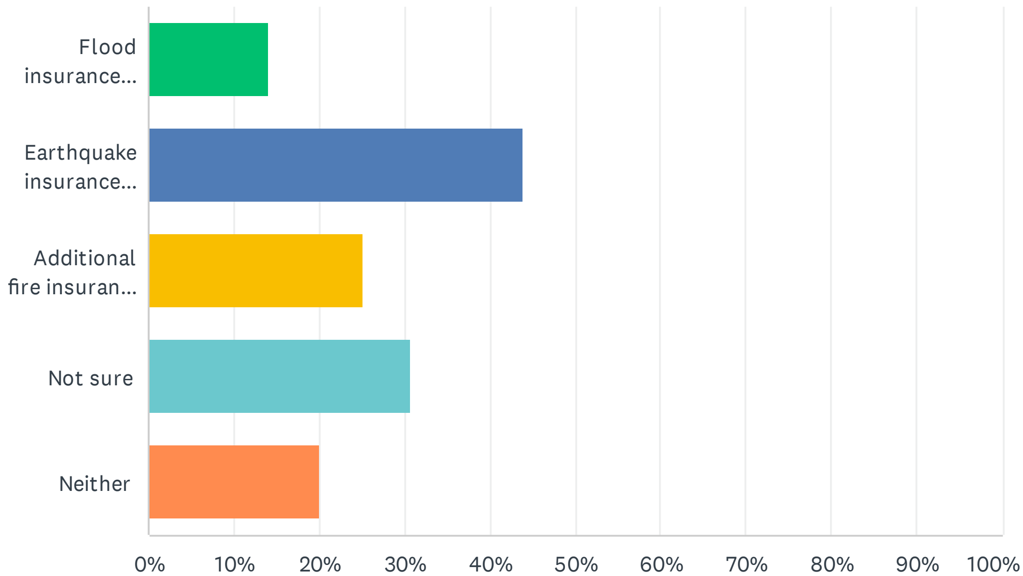
Answered: 5,337 Skipped: 63



ANSWER CHOICES	RESPONSES	
Yes	87.31%	4,660
No	12.69%	677
TOTAL		5,337

Q12 To the best of your knowledge, does the home in which you live have: (Check all that apply)

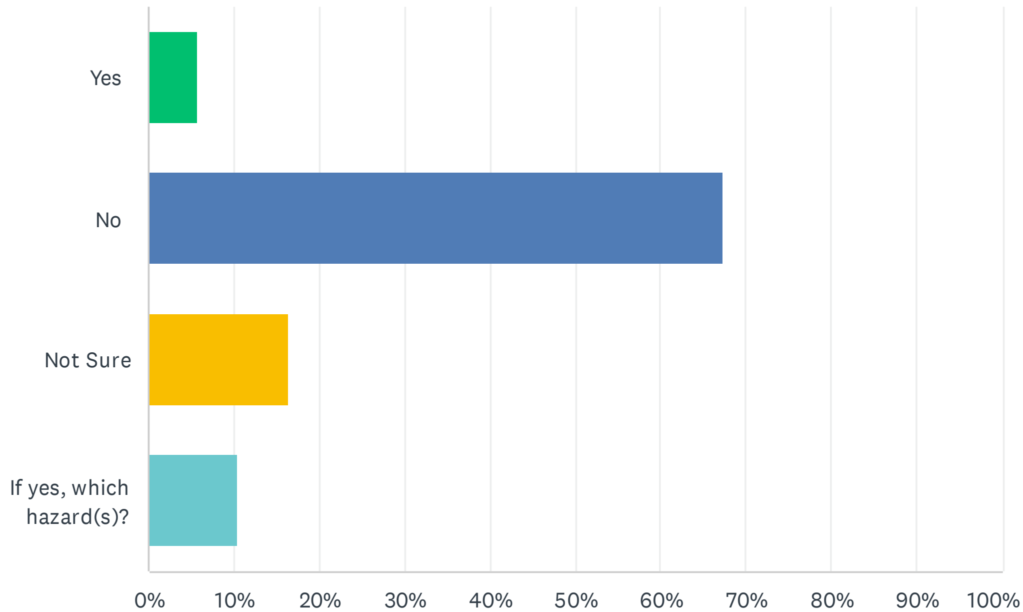
Answered: 5,340 Skipped: 60



ANSWER CHOICES	RESPONSES	
Flood insurance policy	13.97%	746
Earthquake insurance policy	43.90%	2,344
Additional fire insurance policy	25.11%	1,341
Not sure	30.71%	1,640
Neither	20.09%	1,073
Total Respondents: 5,340		

Q13 Have you ever had difficulty obtaining homeowners or renters insurance due to risks from natural hazards?

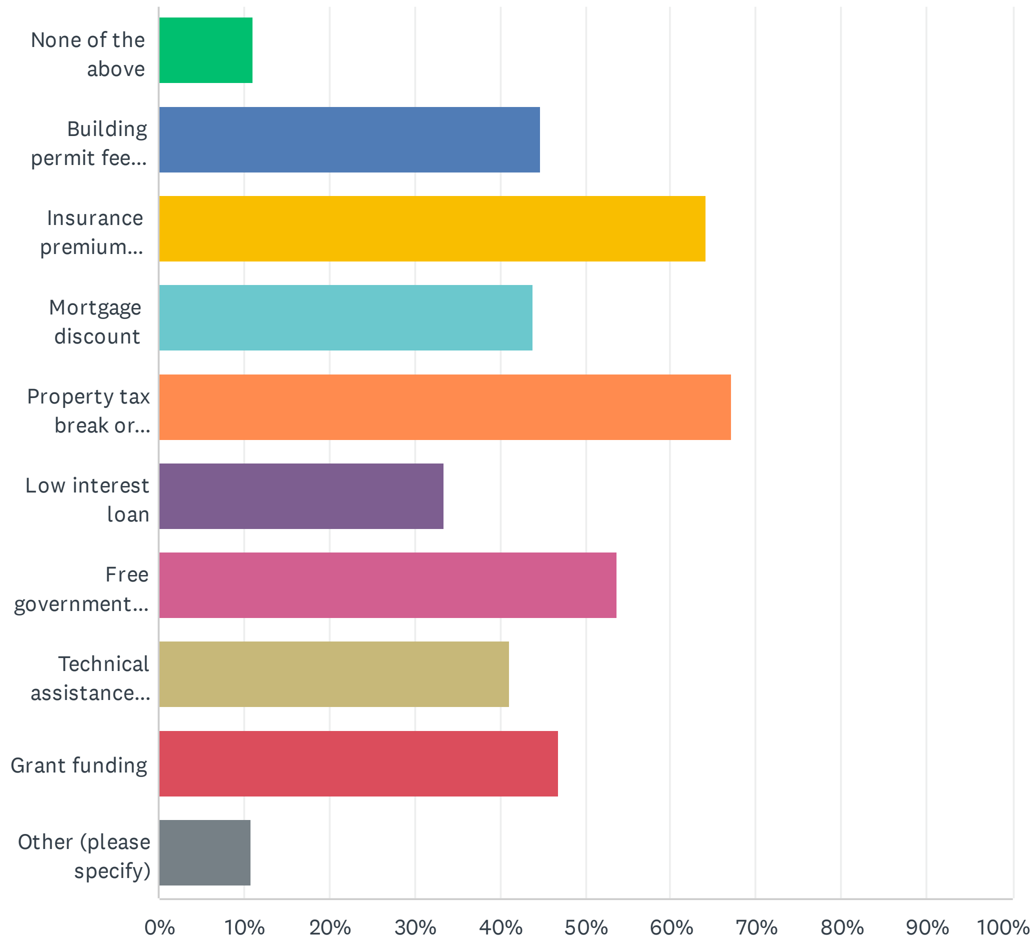
Answered: 5,326 Skipped: 74



ANSWER CHOICES	RESPONSES	
Yes	5.67%	302
No	67.46%	3,593
Not Sure	16.41%	874
If yes, which hazard(s)?	10.46%	557
TOTAL		5,326

Q14 Which incentives would encourage you to retrofit your home to protect against natural disasters? (Check all that apply)

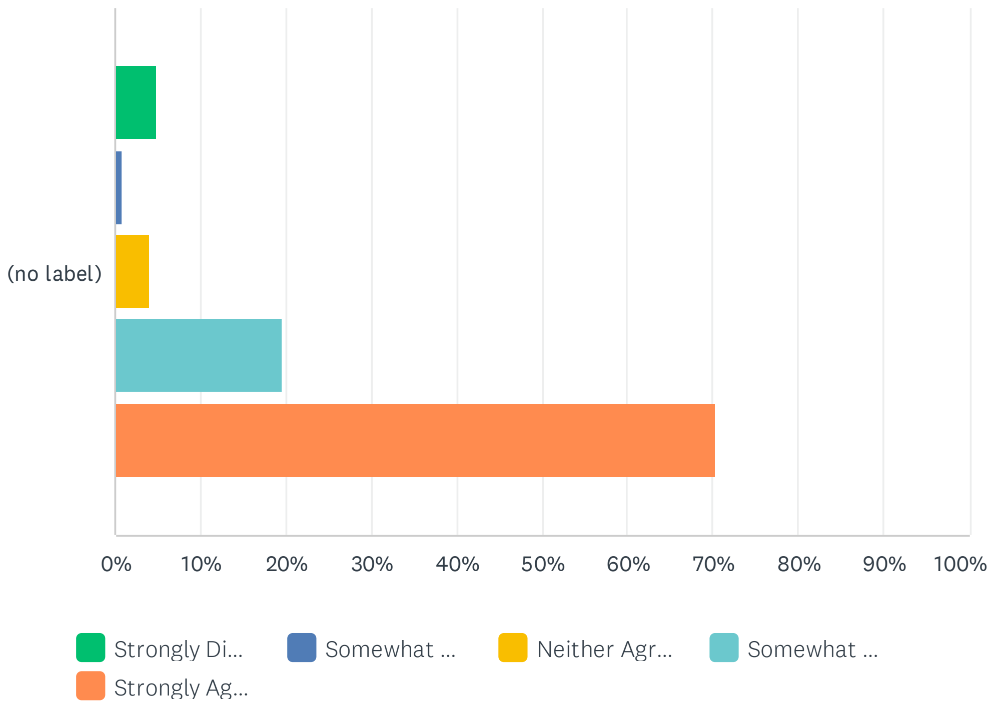
Answered: 5,205 Skipped: 195



ANSWER CHOICES	RESPONSES	
None of the above	11.09%	577
Building permit fee waiver	44.76%	2,330
Insurance premium discount	64.09%	3,336
Mortgage discount	43.98%	2,289
Property tax break or incentive	67.22%	3,499
Low interest loan	33.47%	1,742
Free government technical assistance	53.79%	2,800
Technical assistance during a retrofitting process	41.06%	2,137
Grant funding	46.99%	2,446
Other (please specify)	10.84%	564
Total Respondents: 5,205		

Q15 Please indicate how you feel about the following statement:"I think it is important to provide education and programs that promote community members to take action to reduce their exposure and risks to natural hazards."

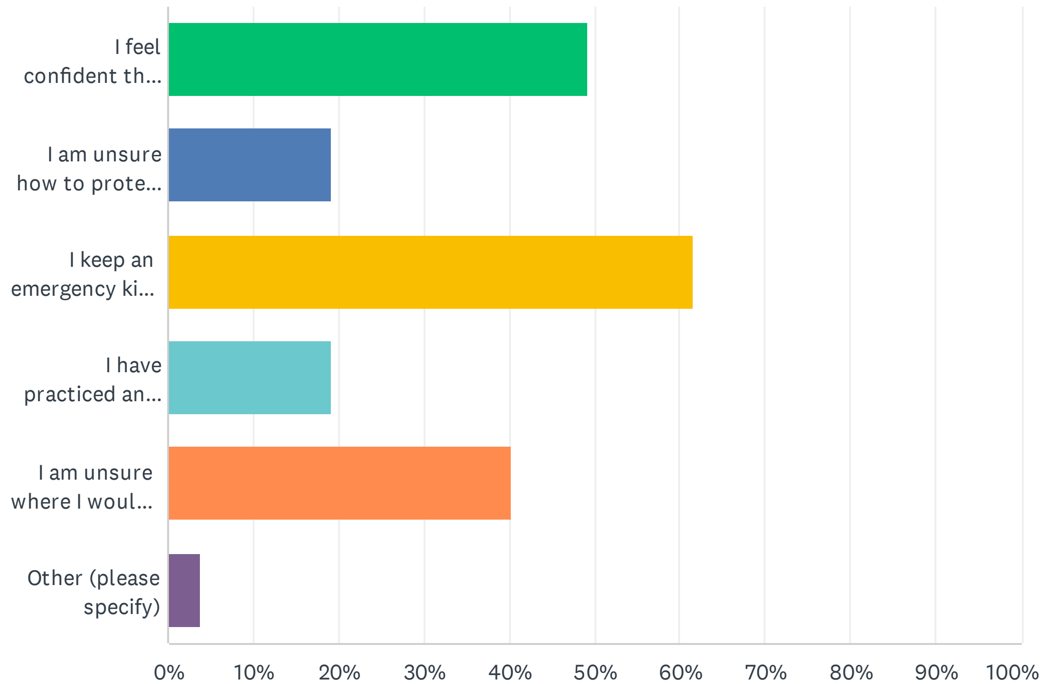
Answered: 5,299   Skipped: 101



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	5.00% 265	0.92% 49	4.06% 215	19.70% 1,044	70.32% 3,726	5,299	4.49

Q16 If a natural disaster such as a large earthquake were to strike tomorrow... (Check all that apply)

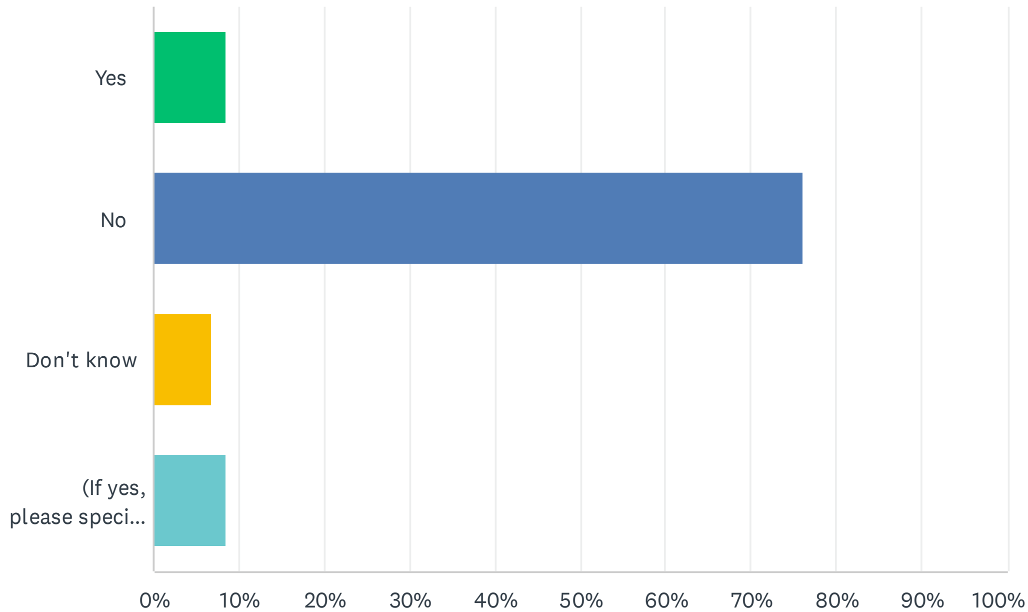
Answered: 5,332 Skipped: 68



ANSWER CHOICES	RESPONSES	
I feel confident that I know how to protect myself during an earthquake or other disaster	49.21%	2,624
I am unsure how to protect myself during an earthquake or other disaster	19.28%	1,028
I keep an emergency kit with spare food and water for myself and my family	61.55%	3,282
I have practiced an evacuation plan and/or know where I and my family would go if we needed to evacuate our home	19.11%	1,019
I am unsure where I would go if I needed to evacuate my home	40.27%	2,147
Other (please specify)	3.73%	199
Total Respondents: 5,332		

Q17 Does your street (or another nearby street) typically flood during rain events, high tides, or storm surge events?

Answered: 5,326 Skipped: 74



ANSWER CHOICES	RESPONSES	
Yes	8.51%	453
No	76.02%	4,049
Don't know	6.87%	366
(If yes, please specify the intersection or street name that typically experiences flooding during rain events)	8.60%	458
TOTAL		5,326

Q18 What is the zip code where you live?

Answered: 5,230 Skipped: 170

Showing results for zip codes with 10 or more respondents

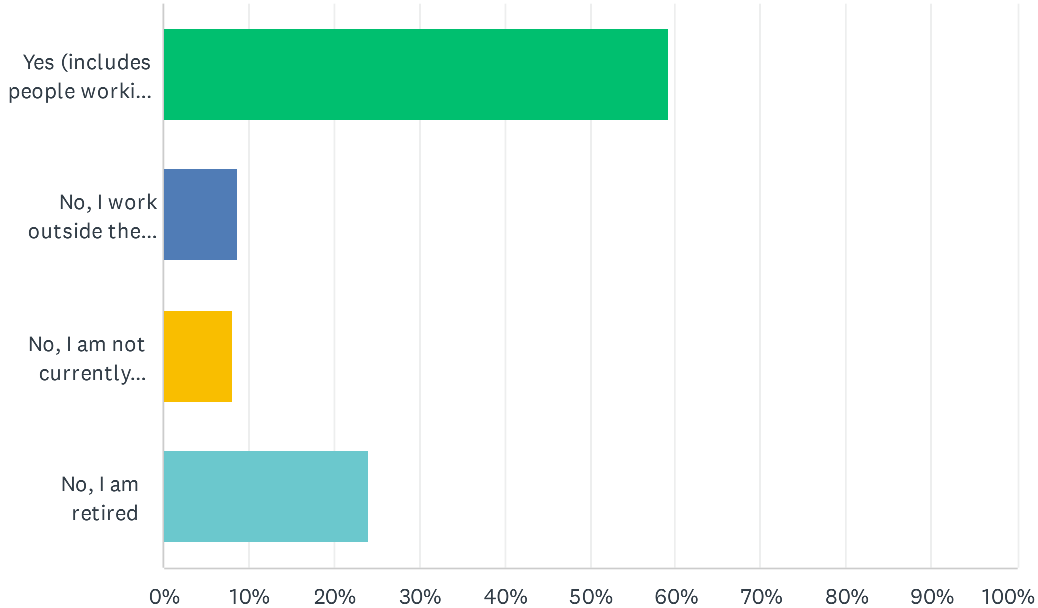
Zip Code	Respondents
90004	46
90005	26
90006	19
90007	10
90008	27
90011	13
90012	37
90013	18
90015	17
90016	35
90017	16
90018	31
90019	49
90020	25
90023	13
90024	47
90025	71
90026	83
90027	85
90028	29
90029	23
90031	32
90032	41
90033	20
90034	91
90035	58
90036	57
90038	22
90039	61
90041	48
90042	92
90043	27
90044	24
90045	64
90046	87
90047	23
90048	38
90049	157
90056	10
90057	13
90062	13
90063	18
90064	50
90065	71
90066	90

Zip Code	Respondents
90068	107
90069	32
90077	26
90094	19
90210	14
90230	27
90232	11
90245	12
90247	16
90266	13
90272	87
90277	13
90278	10
90290	13
90291	51
90292	41
90293	41
90302	11
90402	13
90403	19
90404	14
90405	27
90503	12
90505	11
90640	14
90650	12
90710	16
90731	51
90732	23
90744	10
90745	10
91001	23
91016	15
91030	14
91040	33
91042	34
91104	14
91106	12
91107	12
91205	12
91206	14
91208	15
91214	14
91301	11
91302	10

Zip Code	Respondents
91304	56
91306	28
91307	24
91311	58
91316	45
91321	13
91324	31
91325	46
91326	67
91331	27
91335	59
91340	10
91342	69
91343	42
91344	44
91345	14
91351	10
91352	28
91355	10
91356	31
91364	43
91367	53
91381	13
91387	11
91401	54
91402	14
91403	58
91405	24
91406	78
91411	15
91423	55
91436	40
91501	12
91502	10
91505	16
91601	45
91602	42
91604	54
91605	18
91606	24
91607	60
91722	10
91776	11
91801	18
93551	10

Q19 Do you work in the City of Los Angeles?

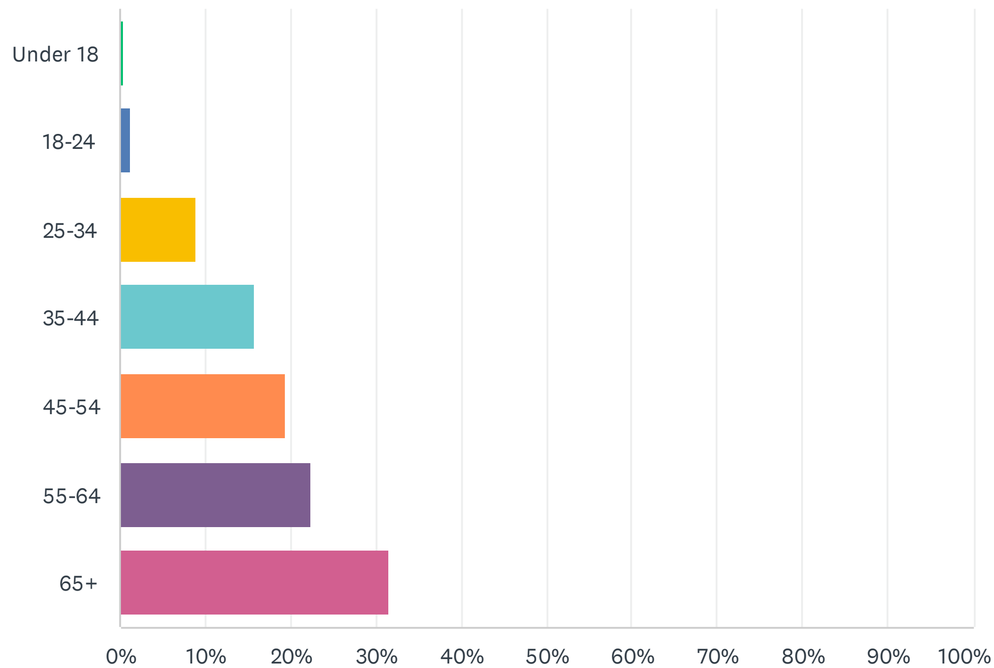
Answered: 5,333 Skipped: 67



ANSWER CHOICES	RESPONSES	
Yes (includes people working remotely from home)	59.20%	3,157
No, I work outside the City	8.74%	466
No, I am not currently employed	8.04%	429
No, I am retired	24.02%	1,281
TOTAL		5,333

Q20 Please indicate your age range:

Answered: 5,317 Skipped: 83



ANSWER CHOICES	RESPONSES	
Under 18	0.34%	18
18-24	1.30%	69
25-34	9.03%	480
35-44	15.87%	844
45-54	19.45%	1,034
55-64	22.48%	1,195
65+	31.54%	1,677
TOTAL		5,317

Q21 Please indicate the primary language spoken in your household.

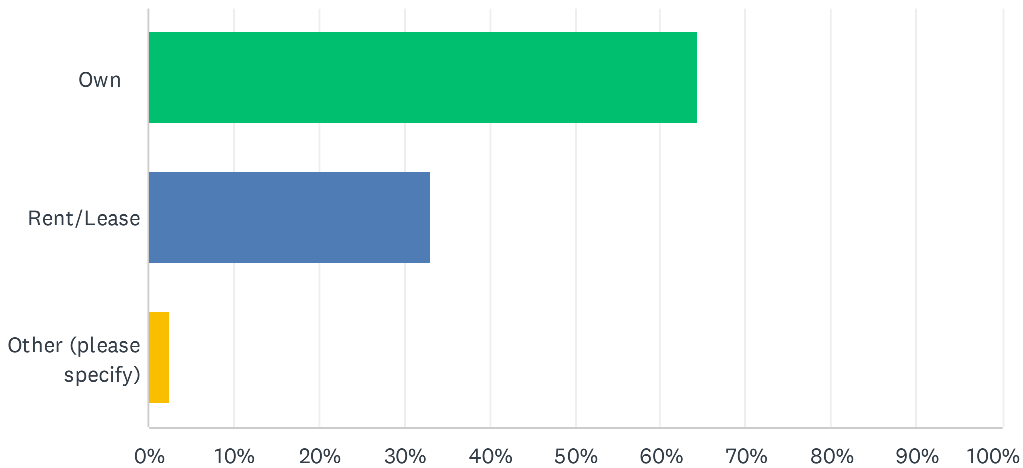
Answered: 5,335 Skipped: 65


English
Spanish
Arabic
Armenian
Chinese (Cantonese)
Chinese (Mandarin)
Farsi
French
Greek
Hebrew
Hindi
Japanese
Korean
Persian
Russian
Tagalog
Vietnamese
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
English	93.33%	4,979
Spanish	2.91%	155
Arabic	0.07%	4
Armenian	0.28%	15
Chinese (Cantonese)	0.34%	18
Chinese (Mandarin)	0.49%	26
Farsi	0.09%	5
French	0.15%	8
Greek	0.04%	2
Hebrew	0.09%	5
Hindi	0.04%	2
Japanese	0.11%	6
Korean	0.22%	12
Persian	0.00%	0
Russian	0.06%	3
Tagalog	0.64%	34
Vietnamese	0.09%	5
Other (please specify)	1.05%	56
TOTAL		5,335

Q22 Do you own or rent your home?

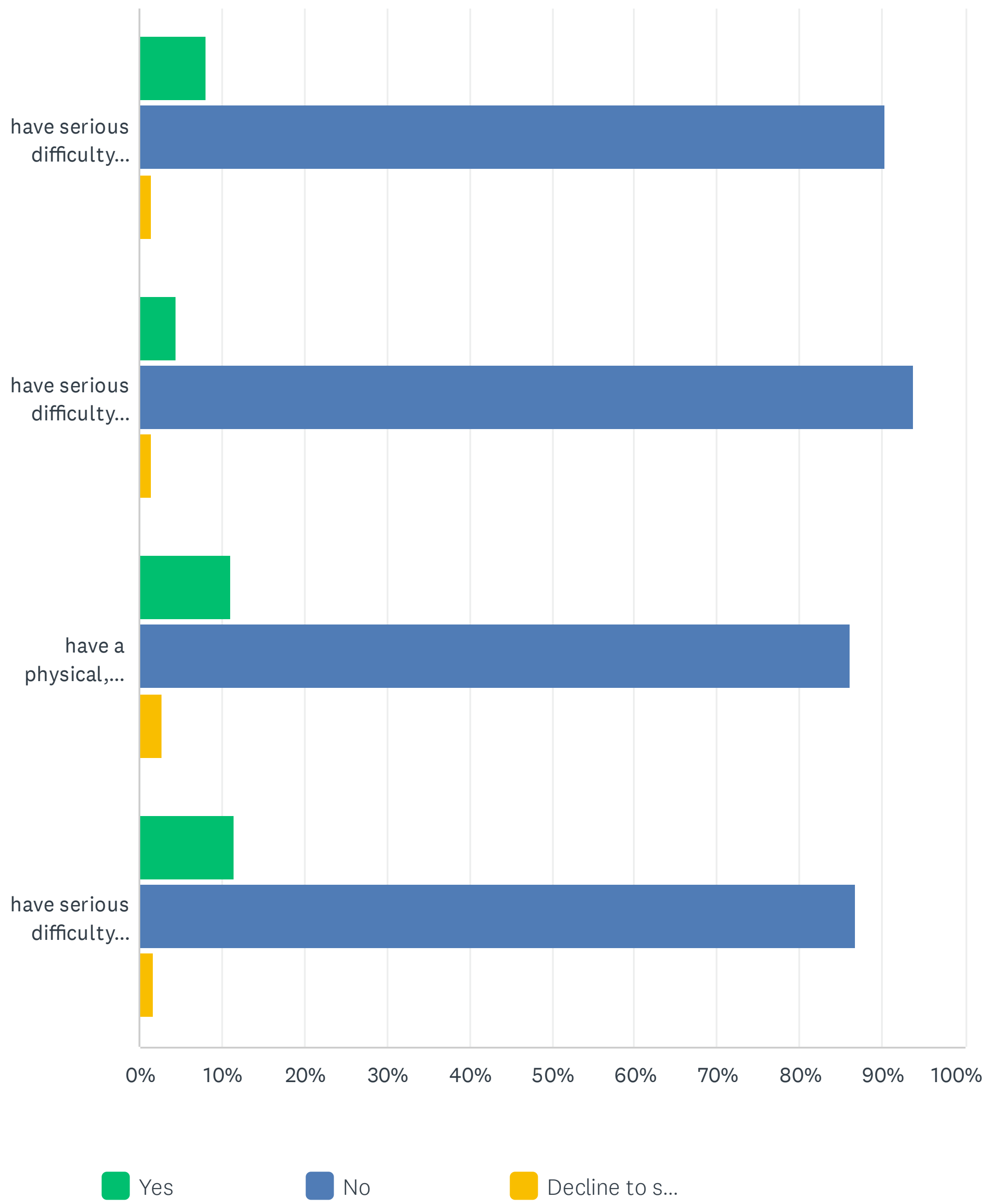
Answered: 5,301 Skipped: 99



ANSWER CHOICES	RESPONSES	
Own	64.44%	3,416
Rent/Lease	32.97%	1,748
Other (please specify)	2.58%	137
TOTAL		5,301

Q23 Do you, or anyone in your household:

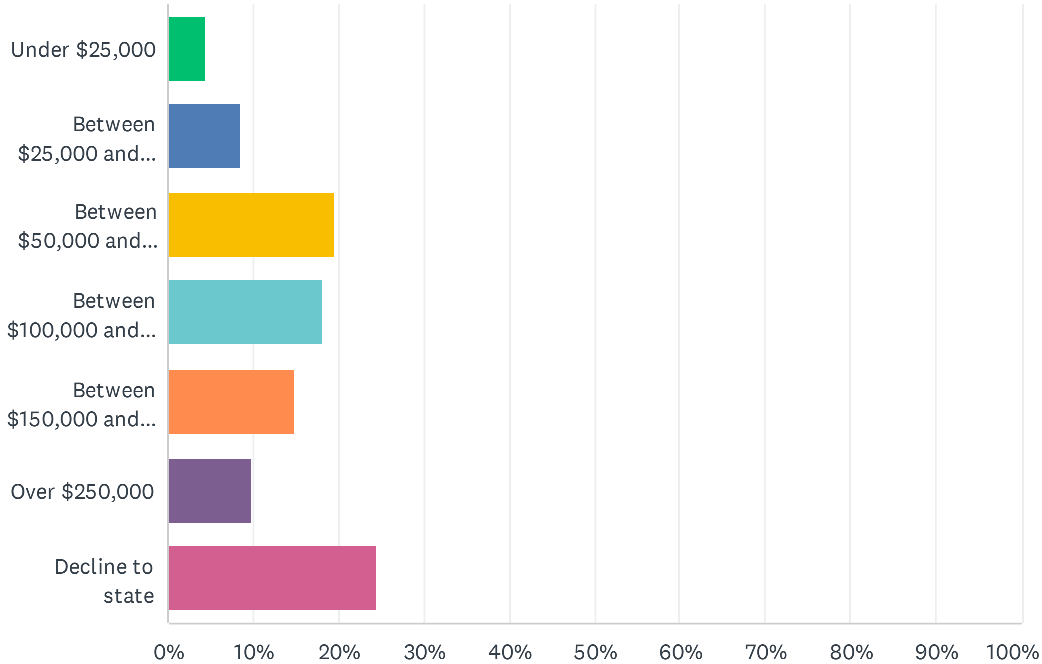
Answered: 5,323 Skipped: 77



	YES	NO	DECLINE TO STATE	TOTAL
have serious difficulty hearing or identify as deaf	8.15% 432	90.41% 4,791	1.43% 76	5,299
have serious difficulty seeing even when wearing glasses or identify as blind	4.58% 242	93.86% 4,955	1.55% 82	5,279
have a physical, mental, or emotional condition that makes it difficult to concentrate, remember, or make decisions	11.19% 591	86.09% 4,548	2.73% 144	5,283
have serious difficulty walking	11.43% 601	86.88% 4,570	1.69% 89	5,260

Q24 What is your annual (gross) household income?

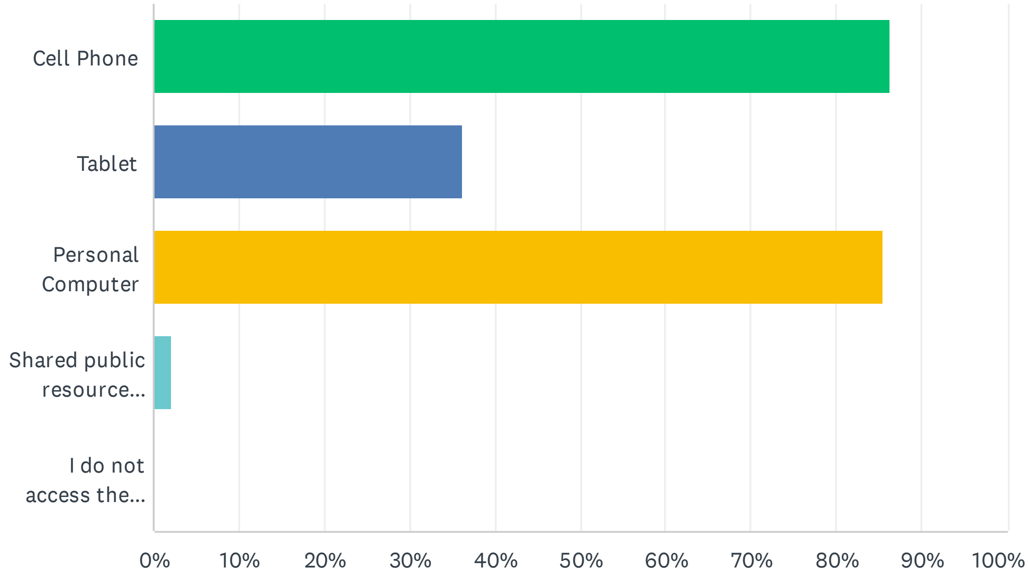
Answered: 5,313 Skipped: 87



ANSWER CHOICES	RESPONSES	
Under $25,000	4.44%	236
Between $25,000 and $49,999	8.45%	449
Between $50,000 and $99,999	19.71%	1,047
Between $100,000 and $149,999	18.18%	966
Between $150,000 and $249,999	14.83%	788
Over $250,000	9.84%	523
Decline to state	24.54%	1,304
TOTAL		5,313

Q25 How do you typically access the internet? (Check all that apply)

Answered: 5,340 Skipped: 60

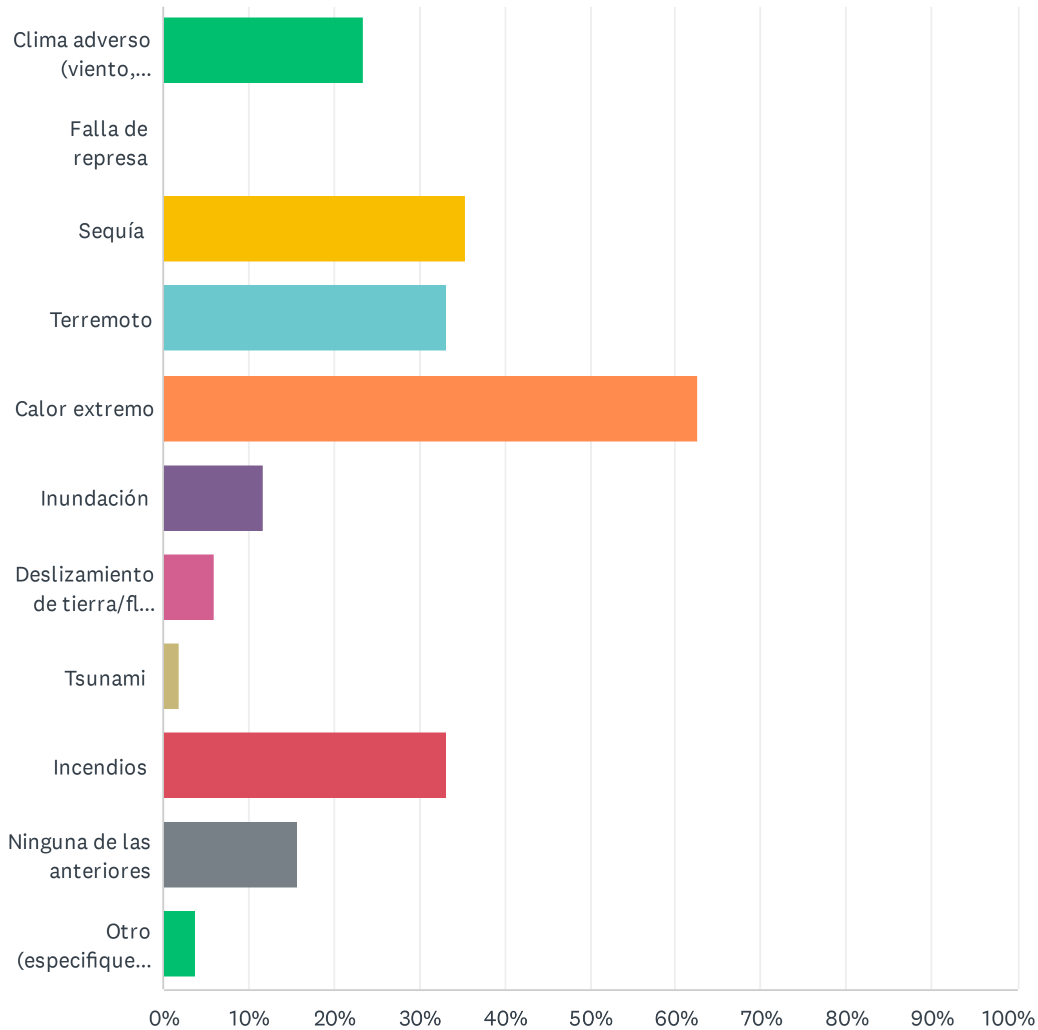


ANSWER CHOICES	RESPONSES	
Cell Phone	86.37%	4,612
Tablet	36.27%	1,937
Personal Computer	85.51%	4,566
Shared public resource computer (e.g., library)	2.08%	111
I do not access the internet	0.15%	8
Total Respondents: 5,340		

SURVEY RESULTS
SPANISH

Q1 ¿Cuál de los siguientes peligros naturales le ha afectado alguna vez dentro de la ciudad de Los Ángeles? (Marque todo lo que corresponda)

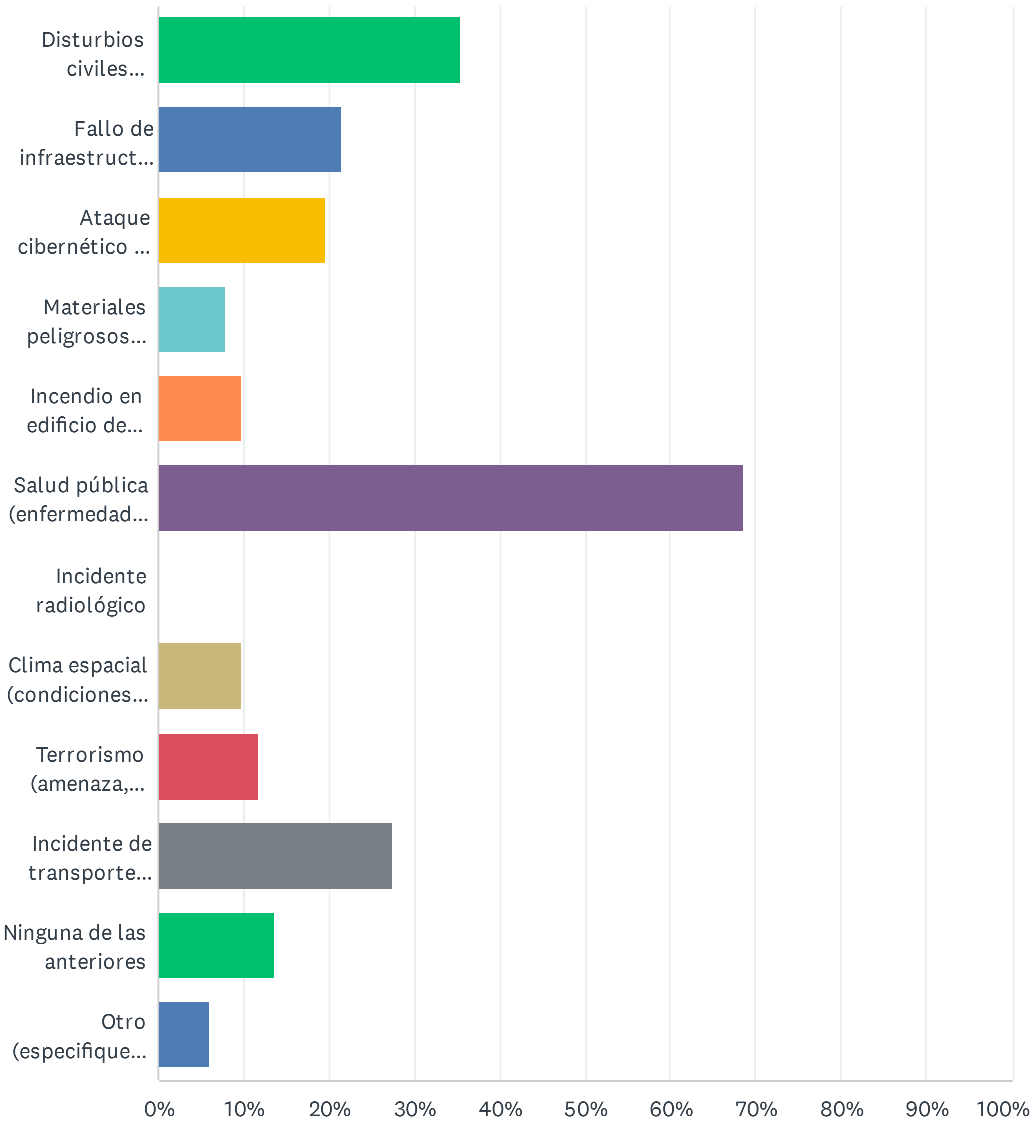
Answered: 51 Skipped: 0



ANSWER CHOICES	RESPONSES	
Clima adverso (viento, relámpagos, frío extremo, tormenta de invierno, tornado, etc.)	23.53%	12
Falla de represa	0.00%	0
Sequía	35.29%	18
Terremoto	33.33%	17
Calor extremo	62.75%	32
Inundación	11.76%	6
Deslizamiento de tierra/flujo de escombros	5.88%	3
Tsunami	1.96%	1
Incendios	33.33%	17
Ninguna de las anteriores	15.69%	8
Otro (especifique, por favor)	3.92%	2
Total Respondents: 51		

Q2 ¿Cuál de los siguientes peligros adicionales le ha afectado alguna vez en la ciudad? (Marque todo lo que corresponda)

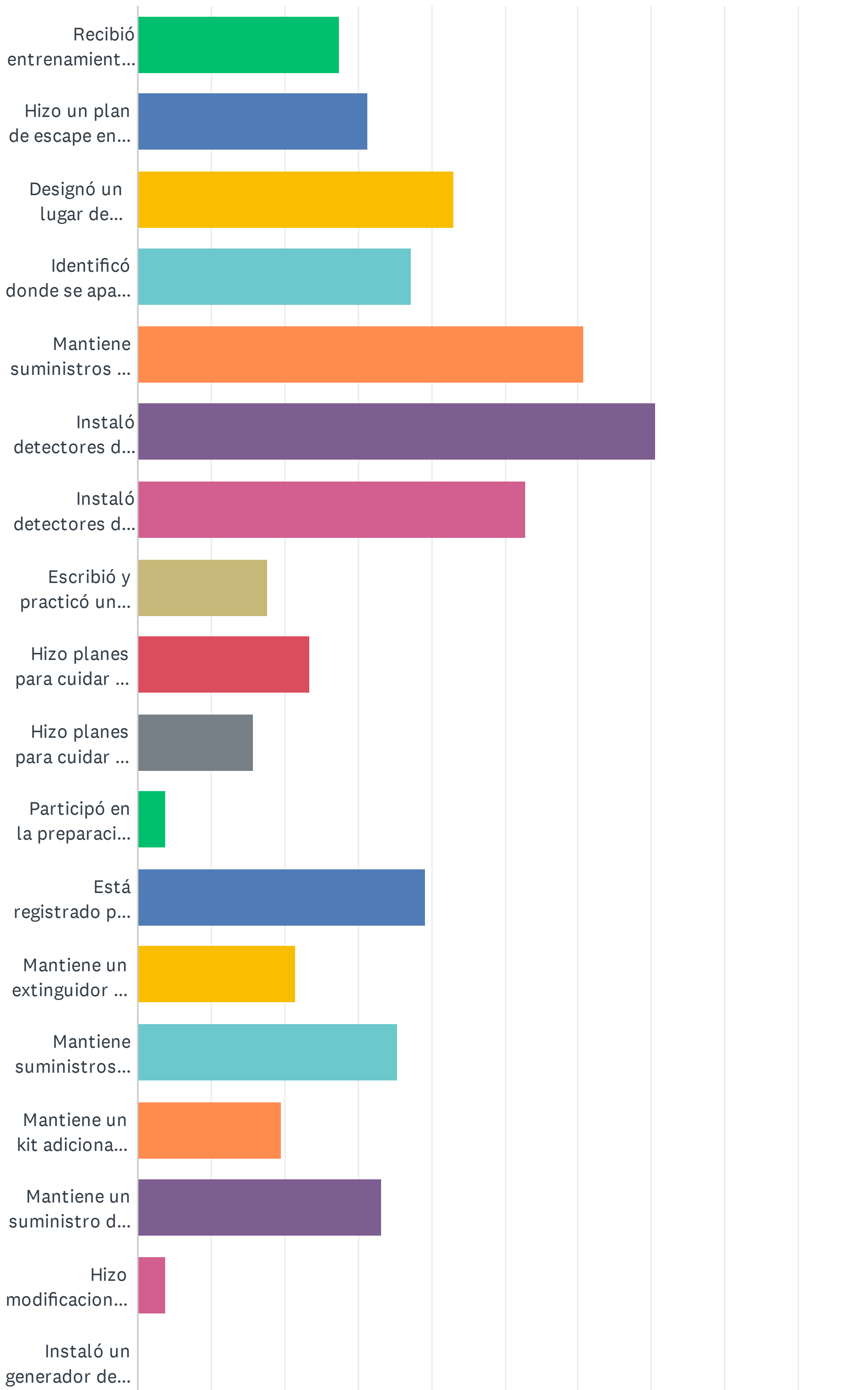
Answered: 51 Skipped: 0

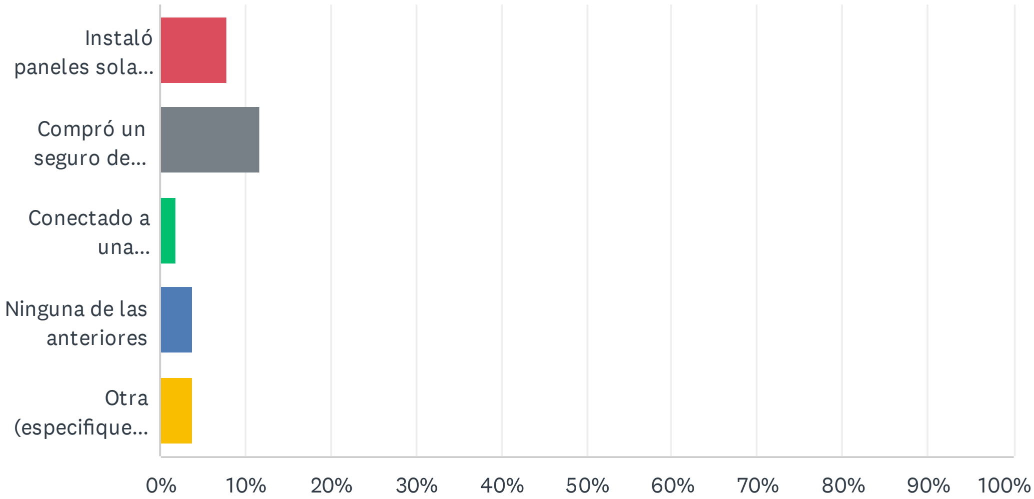


ANSWER CHOICES	RESPONSES	
Disturbios civiles (disturbio violento de la paz pública)	35.29%	18
Fallo de infraestructura crítica (sistemas de servicios públicos, transporte, eléctricos o de comunicaciones)	21.57%	11
Ataque cibernético o incidente de seguridad	19.61%	10
Materiales peligrosos (derrame o escape)	7.84%	4
Incendio en edificio de gran altura/alta ocupación	9.80%	5
Salud pública (enfermedad infecciosa, epidemia, pandemia)	68.63%	35
Incidente radiológico	0.00%	0
Clima espacial (condiciones variables en el sol y en el espacio que pueden influir en el rendimiento de la tecnología)	9.80%	5
Terrorismo (amenaza, broma, incidente real)	11.76%	6
Incidente de transporte (carreteras, ferrocarril, aeropuerto, vías fluviales)	27.45%	14
Ninguna de las anteriores	13.73%	7
Otro (especifique, por favor)	5.88%	3
Total Respondents: 51		

Q3 ¿Qué medidas ha tomado su hogar para prepararse para un desastre? (Marque todo lo que corresponda)

Answered: 51 Skipped: 0

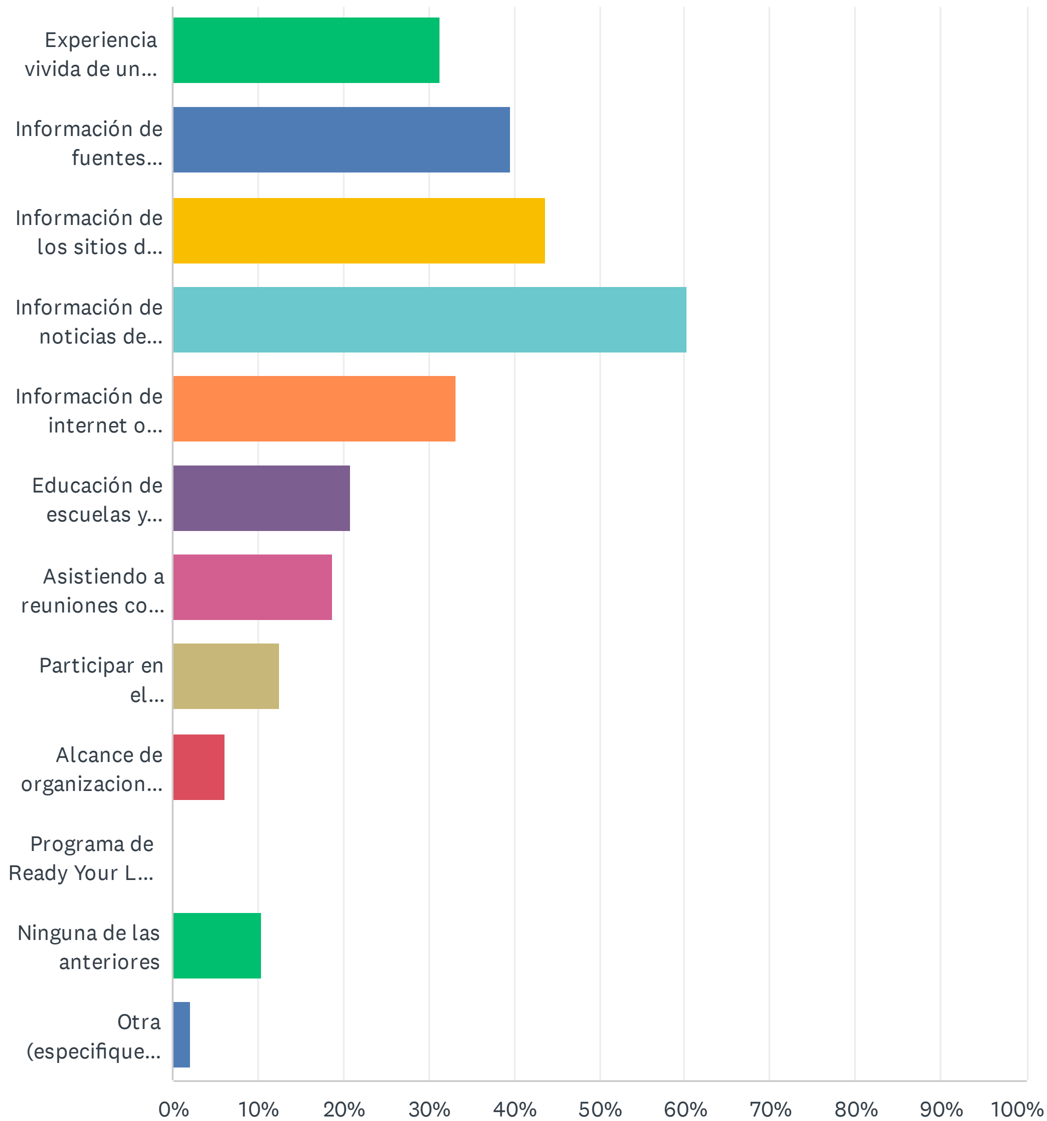



Instaló paneles sola...
Compró un seguro de...
Conectado a una...
Ninguna de las anteriores
Otra (especifique...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Recibió entrenamiento de primeros auxilios/RCP	27.45%	14
Hizo un plan de escape en caso de incendio	31.37%	16
Designó un lugar de reunión en caso de una evacuación	43.14%	22
Identificó donde se apagan las utilidades	37.25%	19
Mantiene suministros de emergencia (por ejemplo, baterías, linternas, radio de batería/pilas, comida/agua)	60.78%	31
Instaló detectores de humo	70.59%	36
Instaló detectores de monóxido de carbono	52.94%	27
Escribió y practicó un plan de desastre individual o familiar	17.65%	9
Hizo planes para cuidar a familiares mayores durante y después de un desastre	23.53%	12
Hizo planes para cuidar a las mascotas durante y después de un desastre	15.69%	8
Participó en la preparación y planificación del vecindario	3.92%	2
Está registrado para NotifyLA	39.22%	20
Mantiene un extinguidor de incendios que funciona en la casa	21.57%	11
Mantiene suministros médicos adicionales (por ejemplo, botiquín de primeros auxilios, medicamentos)	35.29%	18
Mantiene un kit adicional para el carro/trabajo	19.61%	10
Mantiene un suministro de emergencia de agua potable y alimentos	33.33%	17
Hizo modificaciones en su casa para resistir un desastre	3.92%	2
Instaló un generador de emergencia	0.00%	0
Instaló paneles solares	7.84%	4
Compró un seguro de propietario o de inquilino	11.76%	6
Conectado a una organización comunitaria local y/o proveedor de servicios	1.96%	1
Ninguna de las anteriores	3.92%	2
Otra (especifique, por favor)	3.92%	2
Total Respondents: 51		

Q4 ¿Qué recursos/experiencias te han ayudado a estar más preparado? (Marque todo lo que corresponda)

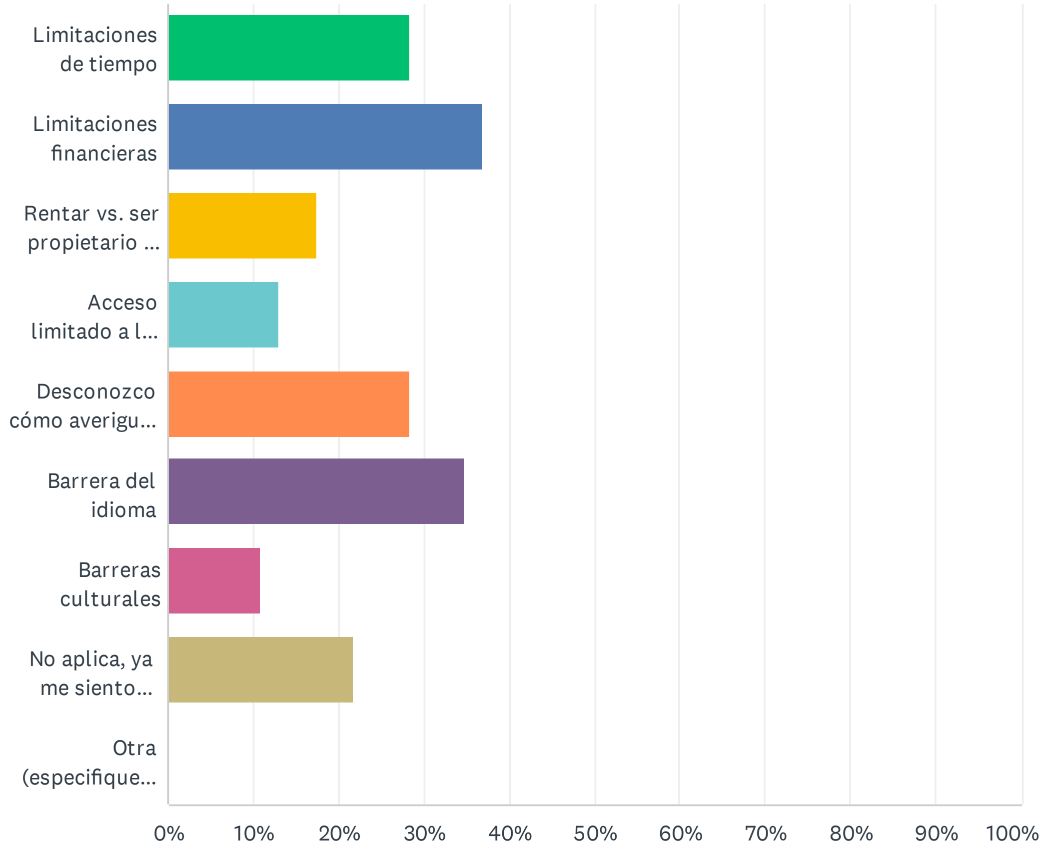
Answered: 48 Skipped: 3



ANSWER CHOICES	RESPONSES	
Experiencia vivida de uno o más peligros o desastres	31.25%	15
Información de fuentes gubernamentales (por ejemplo, federal, estatal o local)	39.58%	19
Información de los sitios de web de la ciudad	43.75%	21
Información de noticias de televisión y de radio	60.42%	29
Información de internet o redes sociales	33.33%	16
Educación de escuelas y otras instituciones académicas	20.83%	10
Asistiendo a reuniones con información sobre preparación para desastres	18.75%	9
Participar en el entrenamiento de Equipo de Respuesta a Emergencias Comunitarias (CERT, por sus siglas en inglés) o otro programa de capacitación en desastres	12.50%	6
Alcance de organizaciones comunitarias	6.25%	3
Programa de Ready Your LA Neighborhood (RYLAN)	0.00%	0
Ninguna de las anteriores	10.42%	5
Otra (especifique, por favor)	2.08%	1
Total Respondents: 48		

Q5 ¿Cuáles son los obstáculos que te impiden estar preparado?

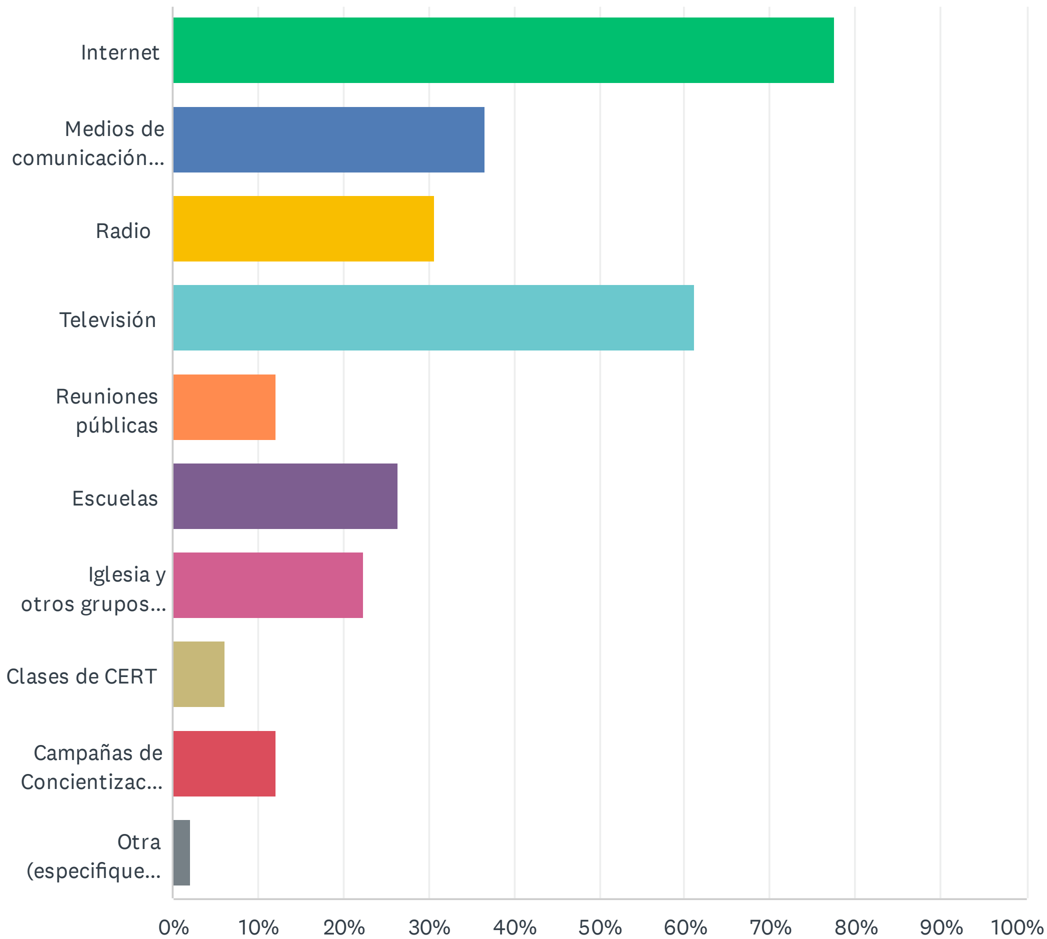
Answered: 46 Skipped: 5



ANSWER CHOICES	RESPONSES	
Limitaciones de tiempo	28.26%	13
Limitaciones financieras	36.96%	17
Rentar vs. ser propietario de una casa o negocio	17.39%	8
Acceso limitado a los recursos de información	13.04%	6
Desconozco cómo averiguar si estoy en una zona de peligro	28.26%	13
Barrera del idioma	34.78%	16
Barreras culturales	10.87%	5
No aplica, ya me siento adecuadamente preparado	21.74%	10
Otra (especifique, por favor)	0.00%	0
Total Respondents: 46		

Q6 ¿Qué fuentes de información sobre preparación para emergencias utiliza más? (Marque todo lo que corresponda)

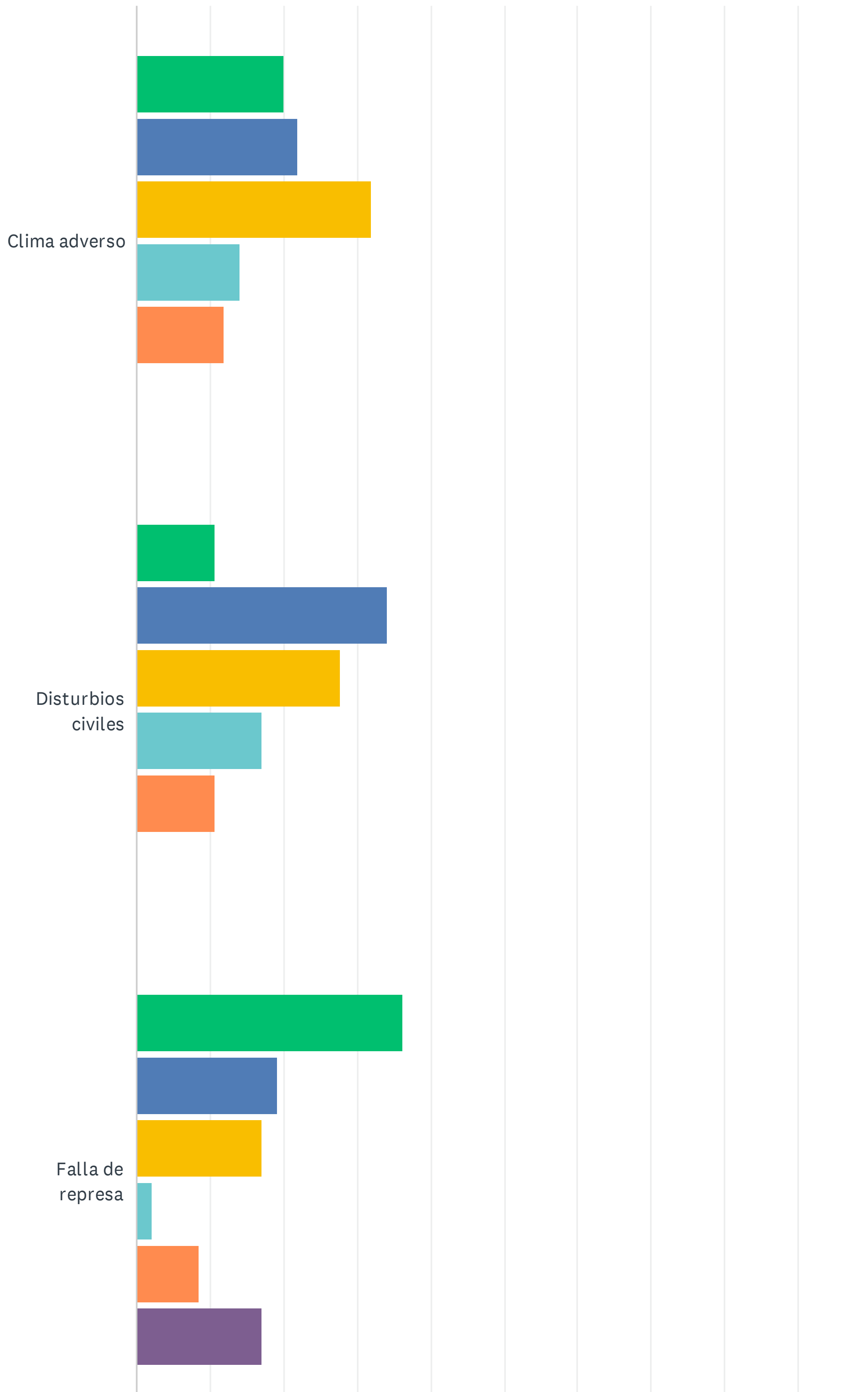
Answered: 49 Skipped: 2

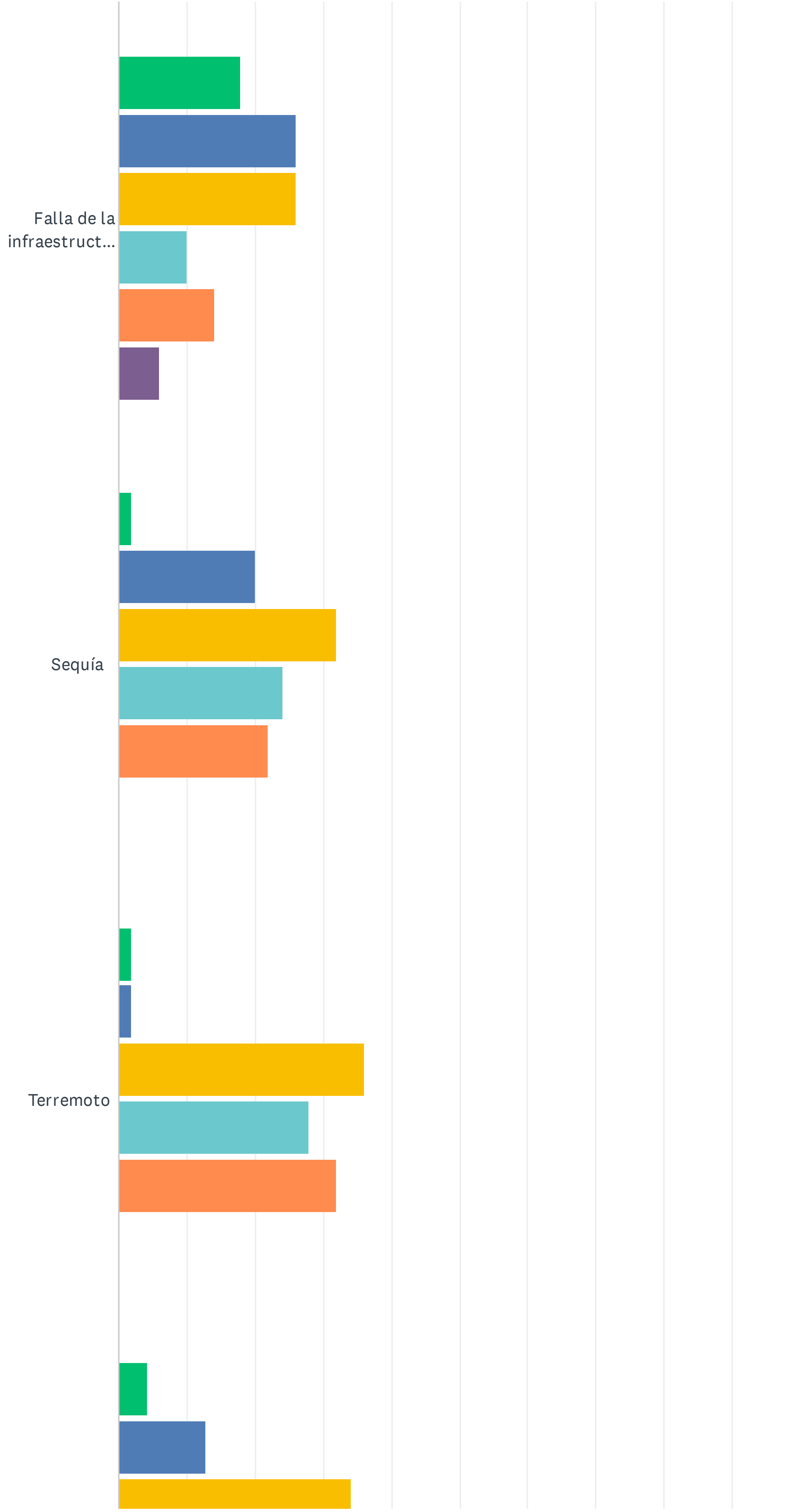


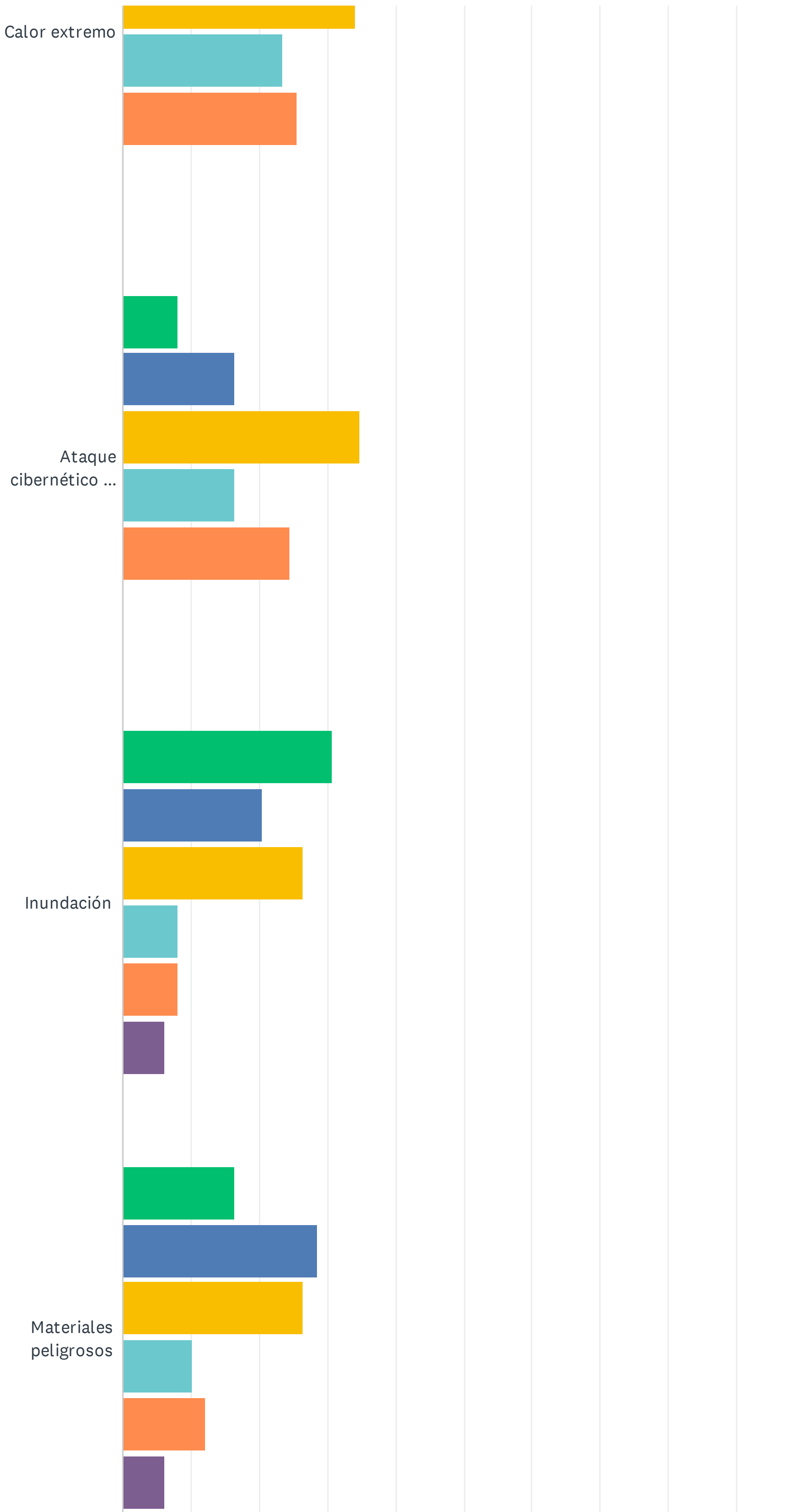
ANSWER CHOICES	RESPONSES	
Internet	77.55%	38
Medios de comunicación social	36.73%	18
Radio	30.61%	15
Televisión	61.22%	30
Reuniones públicas	12.24%	6
Escuelas	26.53%	13
Iglesia y otros grupos religiosos	22.45%	11
Clases de CERT	6.12%	3
Campañas de Concientización Pública	12.24%	6
Otra (especifique, por favor)	2.04%	1
Total Respondents: 49		

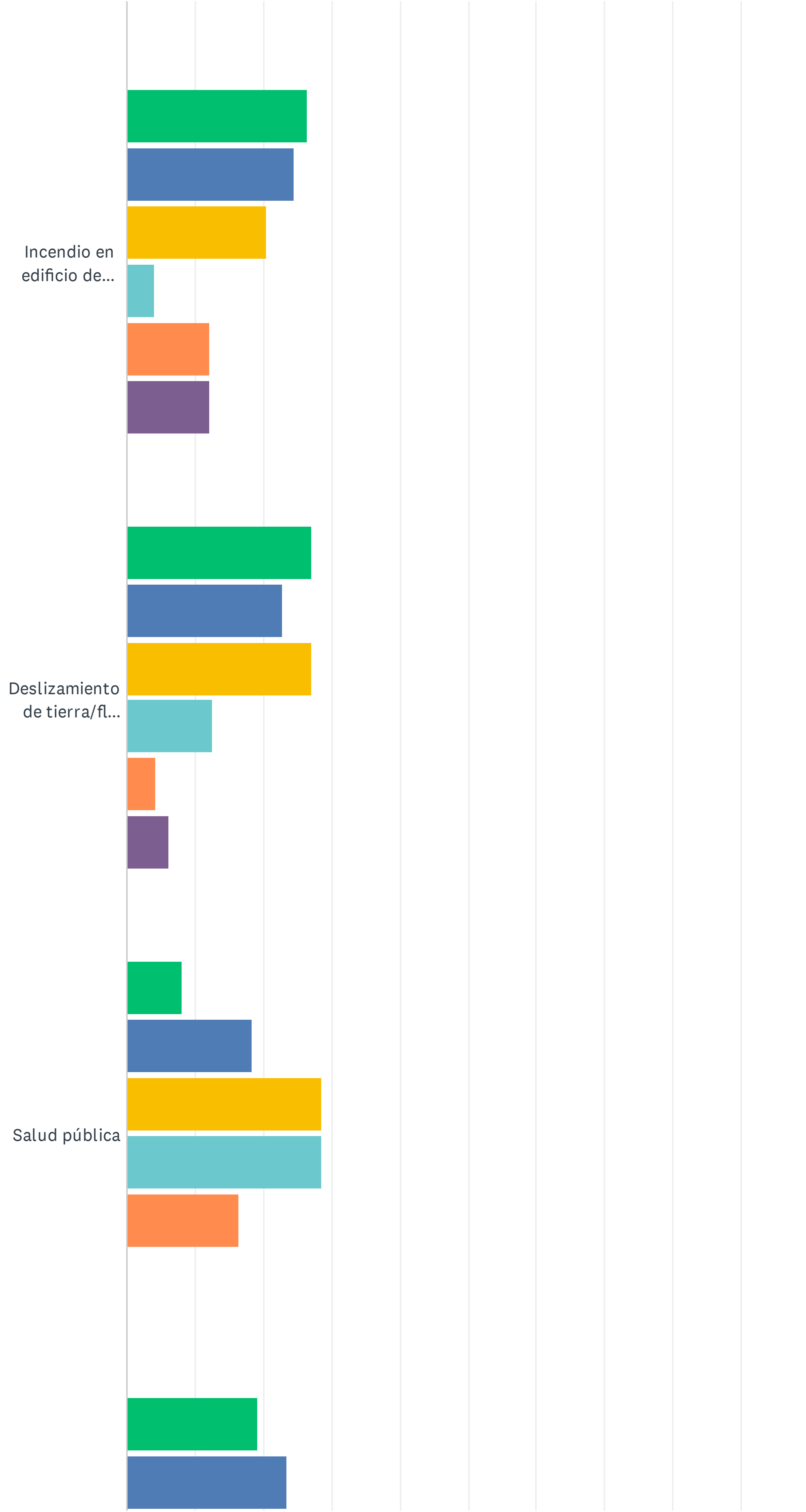
Q7 ¿Que Tan preocupado está usted por los siguientes peligros? (Marque una respuesta para cada peligro)

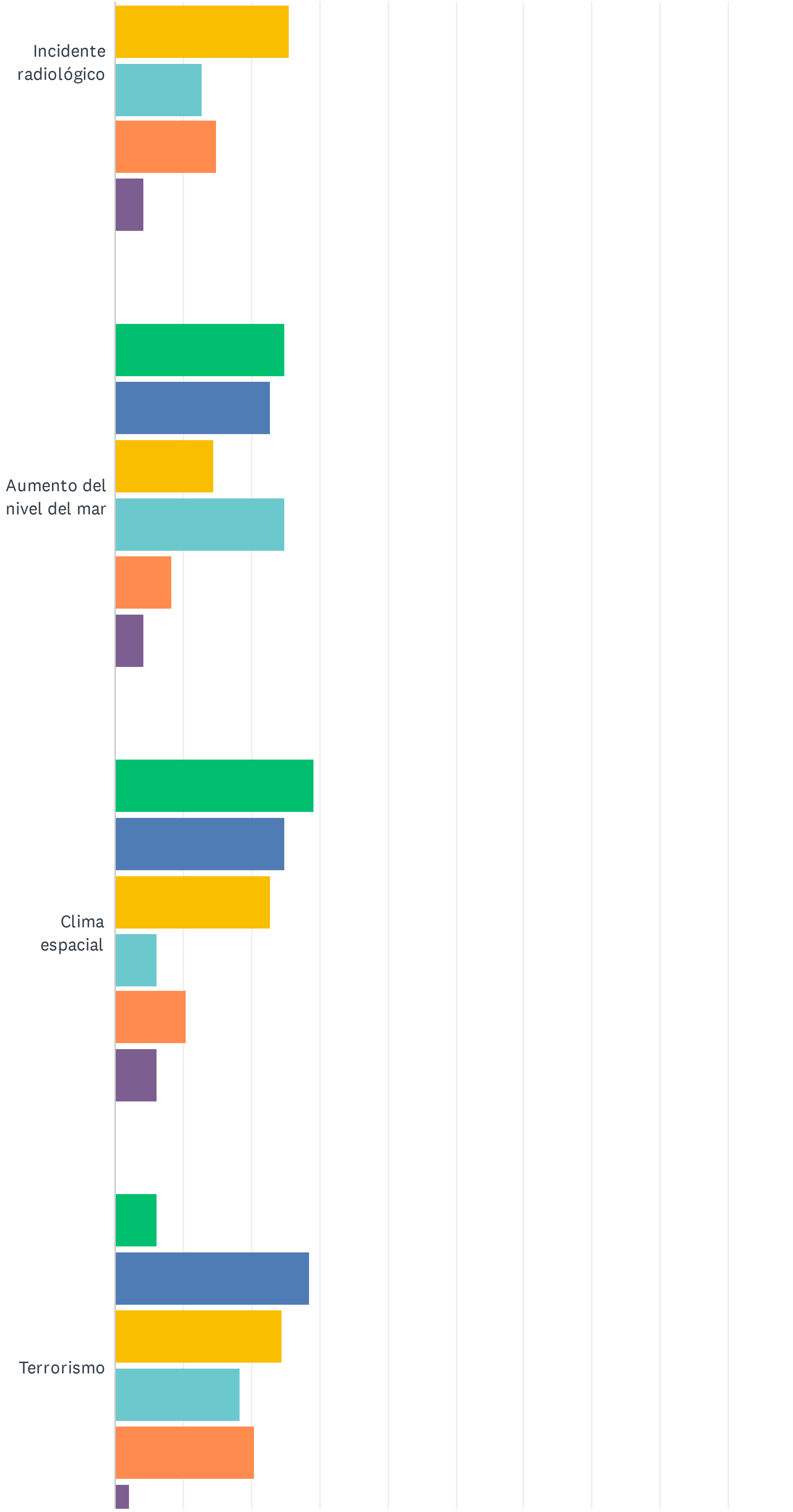
Answered: 50   Skipped: 1

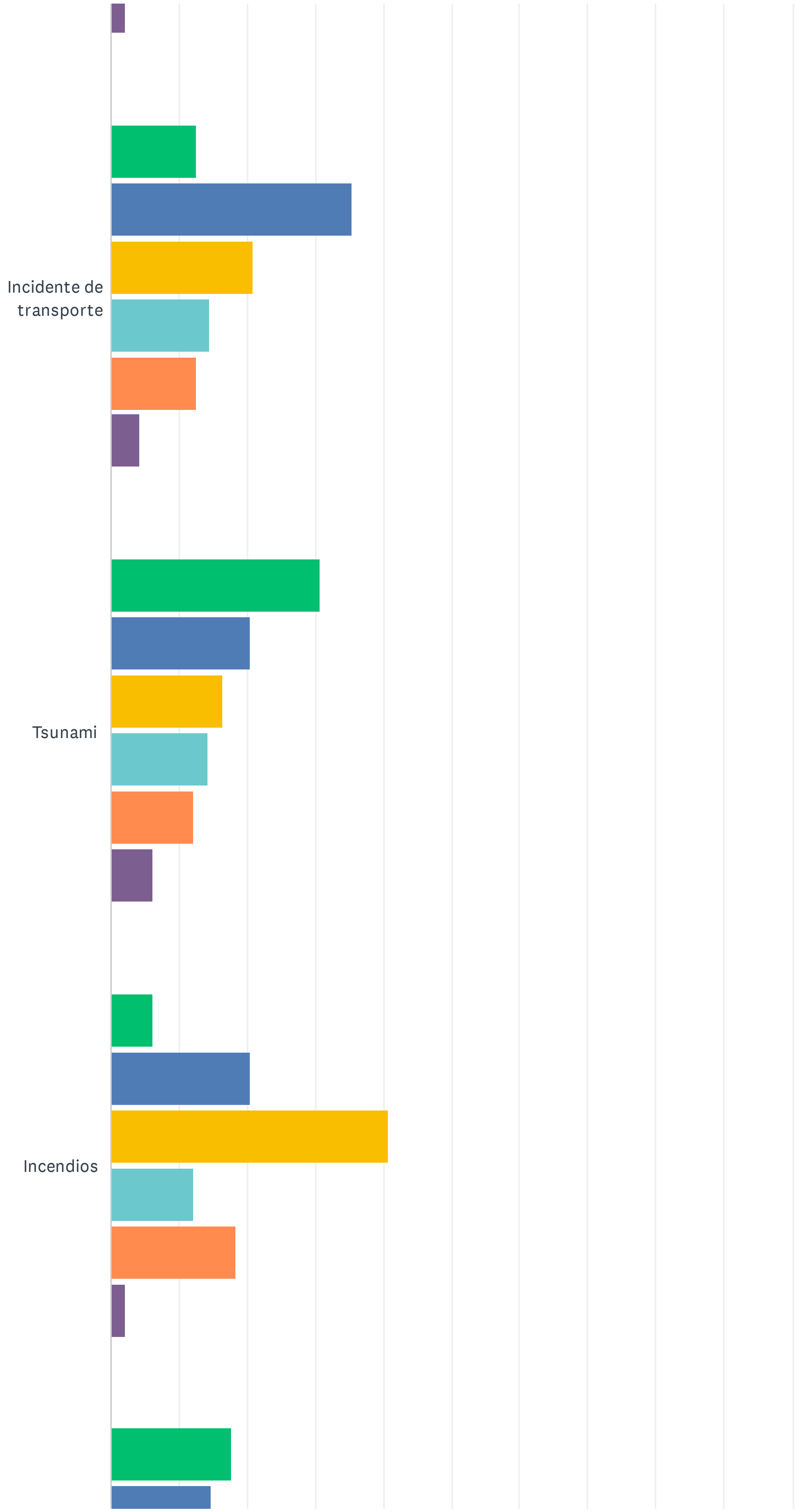


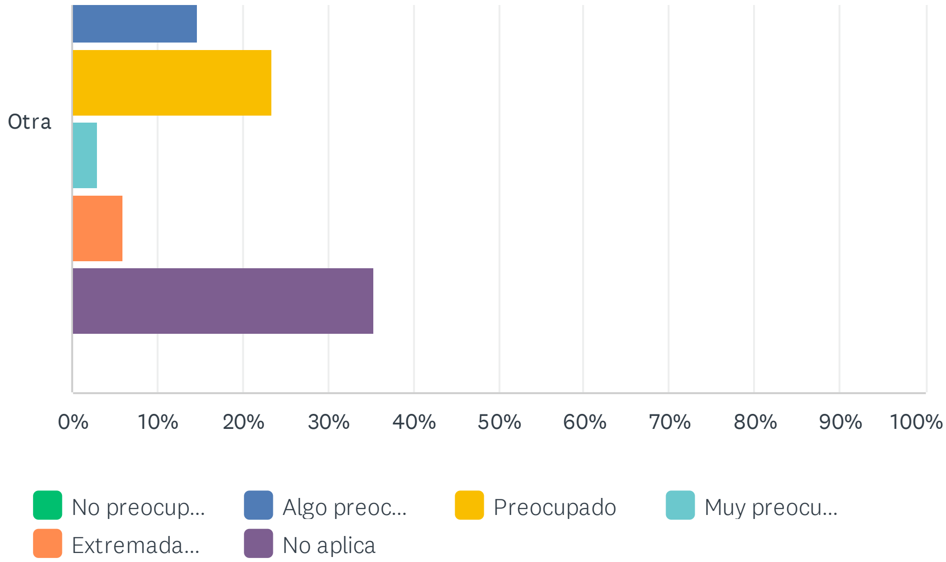

Falla de la infraestruct...
Sequía
Terremoto


Calor extremo
Ataque cibernético ...
Inundación
Materiales peligrosos


Incendio en edificio de...
Deslizamiento de tierra/fl...
Salud pública


Incidente radiológico
Aumento del nivel del mar
Clima espacial
Terrorismo


Incidente de transporte
Tsunami
Incendios

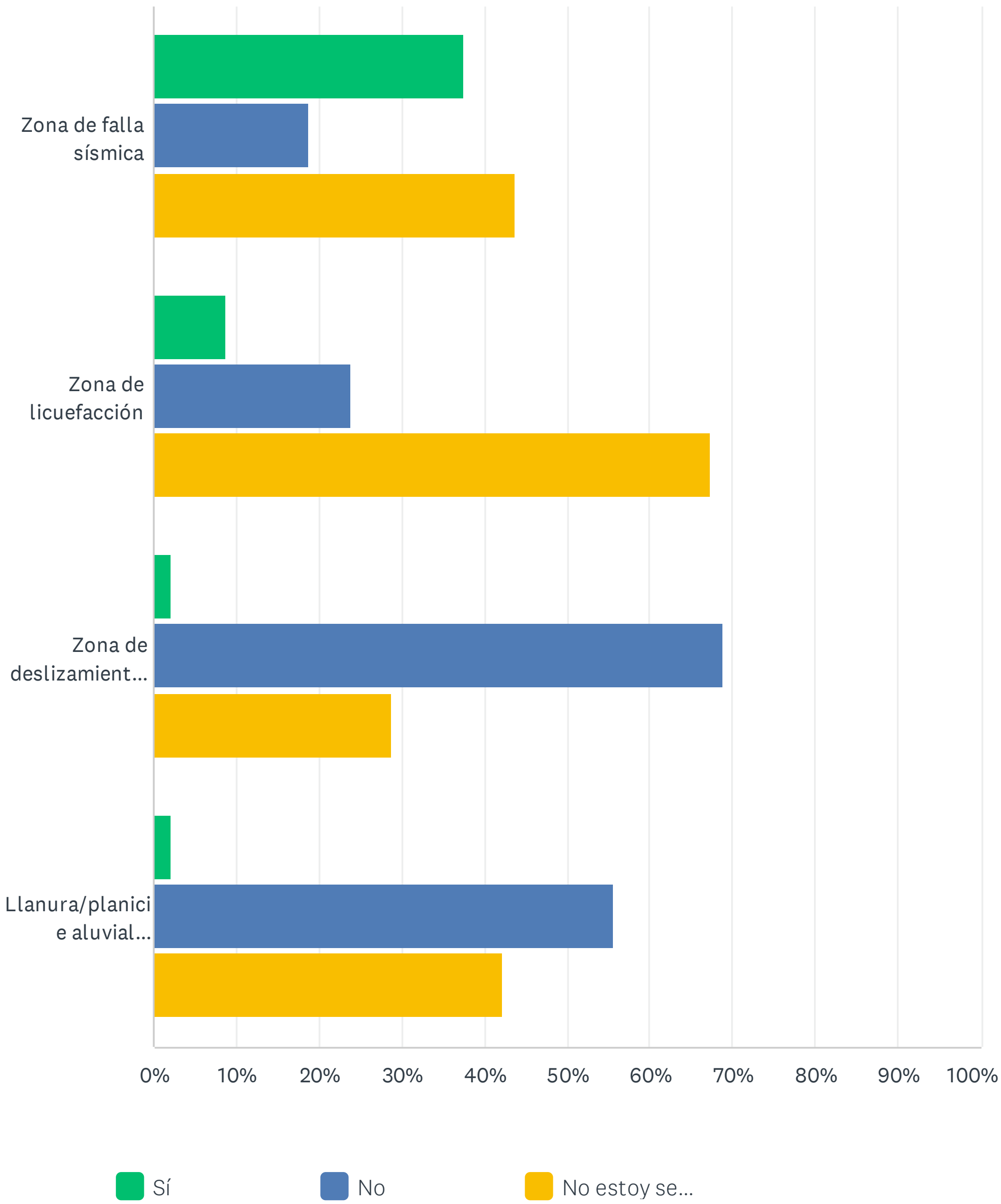

Otra
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
No preocup...
Algo preoc...
Preocupado
Muy preocu...
Extremada...
No aplica

	NO PREOCUPADO	ALGO PREOCUPADO	PREOCUPADO	MUY PREOCUPADO	EXTREMADAMENTE PREOCUPADO	NO APLICA	TOTAL
Clima adverso	20.00% 10	22.00% 11	32.00% 16	14.00% 7	12.00% 6	0.00% 0	5
Disturbios civiles	10.64% 5	34.04% 16	27.66% 13	17.02% 8	10.64% 5	0.00% 0	4
Falla de represa	36.17% 17	19.15% 9	17.02% 8	2.13% 1	8.51% 4	17.02% 8	4
Falla de la infraestructura crítica	18.00% 9	26.00% 13	26.00% 13	10.00% 5	14.00% 7	6.00% 3	5
Sequía	2.00% 1	20.00% 10	32.00% 16	24.00% 12	22.00% 11	0.00% 0	5
Terremoto	2.00% 1	2.00% 1	36.00% 18	28.00% 14	32.00% 16	0.00% 0	5
Calor extremo	4.26% 2	12.77% 6	34.04% 16	23.40% 11	25.53% 12	0.00% 0	4
Ataque cibernético o incidente de seguridad	8.16% 4	16.33% 8	34.69% 17	16.33% 8	24.49% 12	0.00% 0	4
Inundación	30.61% 15	20.41% 10	26.53% 13	8.16% 4	8.16% 4	6.12% 3	4
Materiales peligrosos	16.33% 8	28.57% 14	26.53% 13	10.20% 5	12.24% 6	6.12% 3	4
Incendio en edificio de gran altura/alta ocupación	26.53% 13	24.49% 12	20.41% 10	4.08% 2	12.24% 6	12.24% 6	4
Deslizamiento de tierra/flujo de escombros	27.08% 13	22.92% 11	27.08% 13	12.50% 6	4.17% 2	6.25% 3	4
Salud pública	8.16% 4	18.37% 9	28.57% 14	28.57% 14	16.33% 8	0.00% 0	4
Incidente radiológico	19.15% 9	23.40% 11	25.53% 12	12.77% 6	14.89% 7	4.26% 2	4
Aumento del nivel del mar	25.00% 12	22.92% 11	14.58% 7	25.00% 12	8.33% 4	4.17% 2	4
Clima espacial	29.17% 14	25.00% 12	22.92% 11	6.25% 3	10.42% 5	6.25% 3	4
Terrorismo	6.12% 3	28.57% 14	24.49% 12	18.37% 9	20.41% 10	2.04% 1	4
Incidente de transporte	12.50% 6	35.42% 17	20.83% 10	14.58% 7	12.50% 6	4.17% 2	4
Tsunami	30.61% 15	20.41% 10	16.33% 8	14.29% 7	12.24% 6	6.12% 3	4
Incendios	6.12% 3	20.41% 10	40.82% 20	12.24% 6	18.37% 9	2.04% 1	4

Otra	17.65% 6	14.71% 5	23.53% 8	2.94% 1	5.88% 2	35.29% 12	34

Q8 ¿Está su residencia actual ubicada dentro de un área de peligro en los mapas? (Marque todo lo que corresponda)

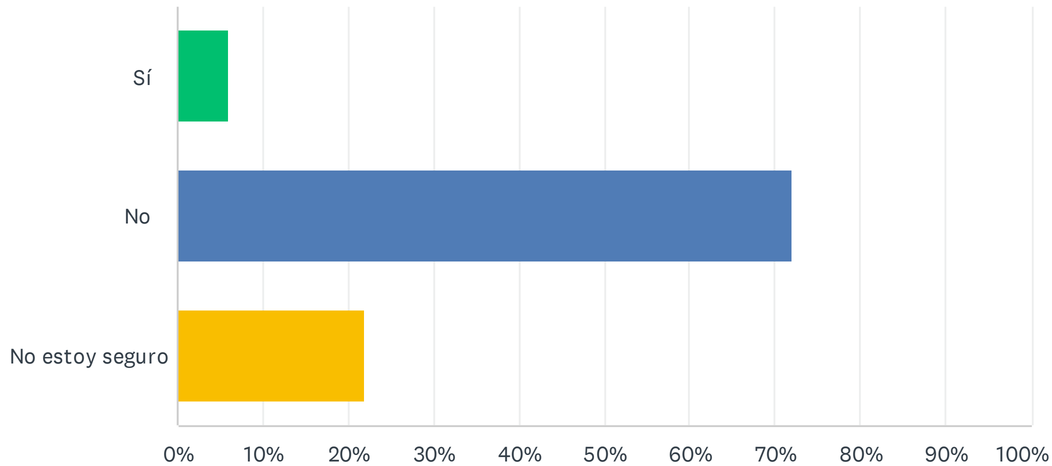
Answered: 48 Skipped: 3



	SÍ	NO	NO ESTOY SEGURO	TOTAL
Zona de falla sísmica	37.50% 18	18.75% 9	43.75% 21	48
Zona de licuefacción	8.70% 4	23.91% 11	67.39% 31	46
Zona de deslizamiento de tierra	2.22% 1	68.89% 31	28.89% 13	45
Llanura/planicie aluvial designada por FEMA	2.22% 1	55.56% 25	42.22% 19	45

Q9 ¿Está su residencia actual en un área de alto riesgo de incendios forestales?

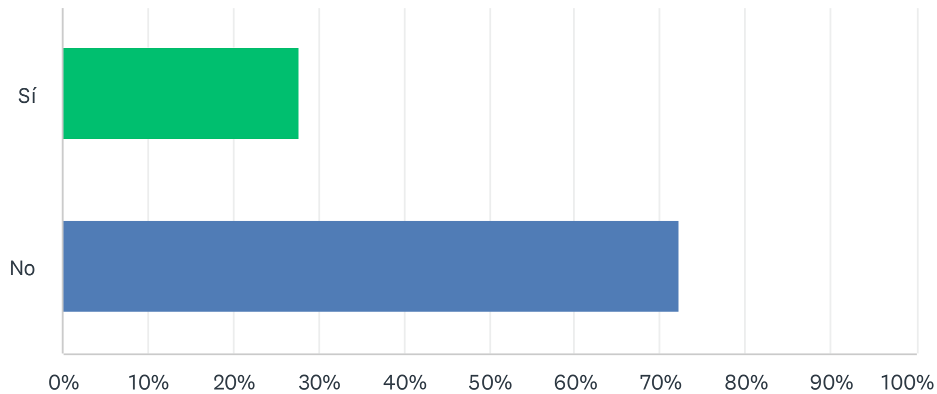
Answered: 50 Skipped: 1



ANSWER CHOICES	RESPONSES	
Sí	6.00%	3
No	72.00%	36
No estoy seguro	22.00%	11
TOTAL		50

Q10 ¿Sabía que la ley de California requiere la divulgación de una zona de riesgo de peligro natural (por ejemplo, zona de falla sísmica, zona de falla de represa o área de alto riesgo de incendio) antes de comprar o mudarse a una casa?

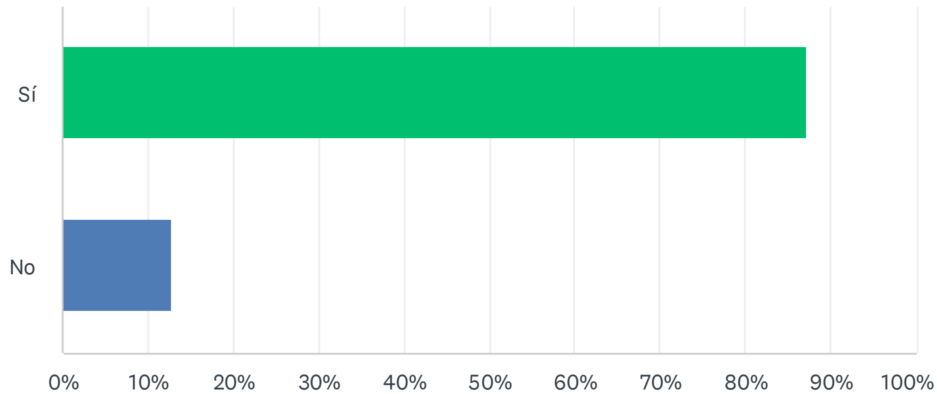
Answered: 47   Skipped: 4



ANSWER CHOICES	RESPONSES	
Sí	27.66%	13
No	72.34%	34
TOTAL		47

Q11 ¿Influiría la divulgación de información sobre peligros naturales en su decisión de comprar o mudarse a una casa hoy?

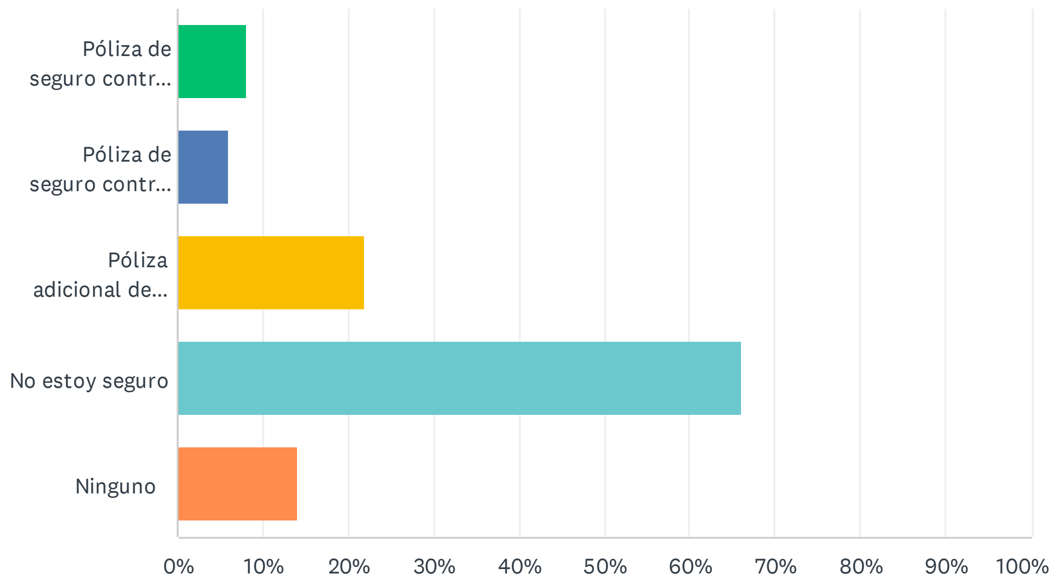
Answered: 47 Skipped: 4



ANSWER CHOICES	RESPONSES	
Sí	87.23%	41
No	12.77%	6
TOTAL		47

Q12 Según su mejor entendimiento, la casa en la que vive tiene:

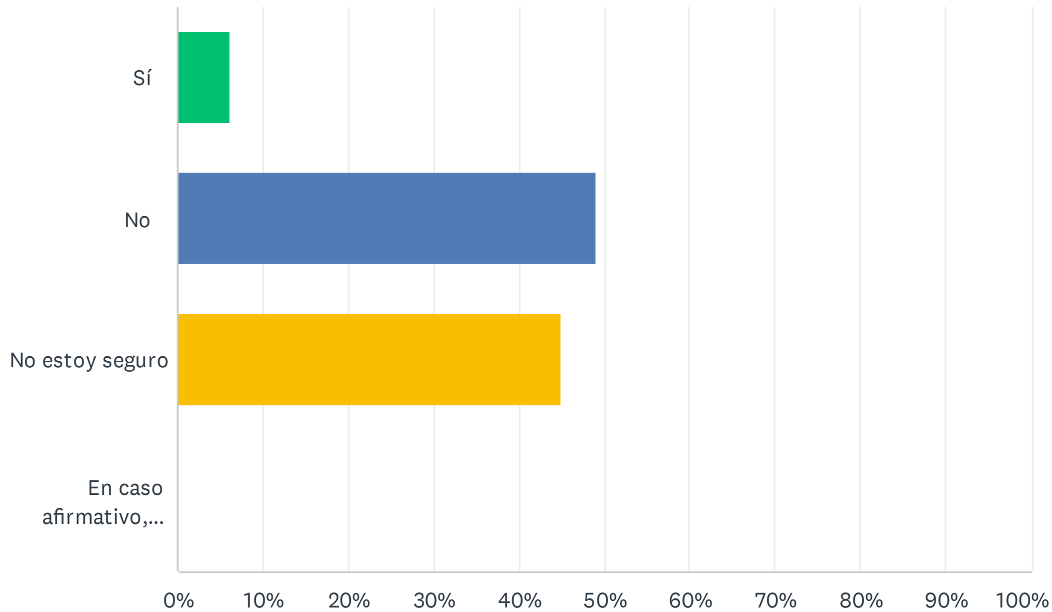
Answered: 50   Skipped: 1



ANSWER CHOICES	RESPONSES	
Póliza de seguro contra inundaciones	8.00%	4
Póliza de seguro contra terremotos	6.00%	3
Póliza adicional de seguro contra incendios	22.00%	11
No estoy seguro	66.00%	33
Ninguno	14.00%	7
Total Respondents: 50		

Q13 ¿Alguna vez ha tenido dificultades para obtener un seguro de propietario o inquilino debido al riesgo de los peligros naturales?

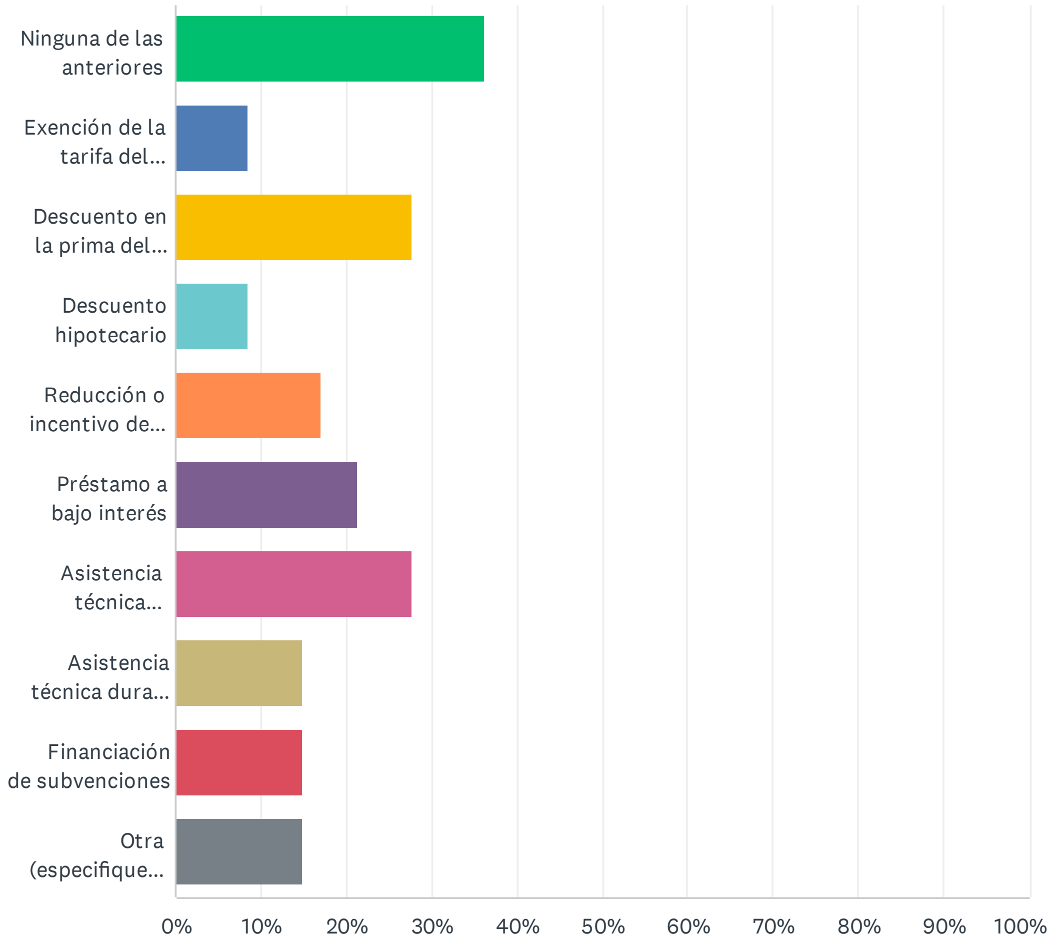
Answered: 49 Skipped: 2



ANSWER CHOICES	RESPONSES	
Sí	6.12%	3
No	48.98%	24
No estoy seguro	44.90%	22
En caso afirmativo, ¿cuál peligro(s)?	0.00%	0
TOTAL		49

Q14 ¿Qué incentivos lo alentaría para modernizar su hogar para protegerse contra los desastres naturales? (Marque todo lo que corresponda)

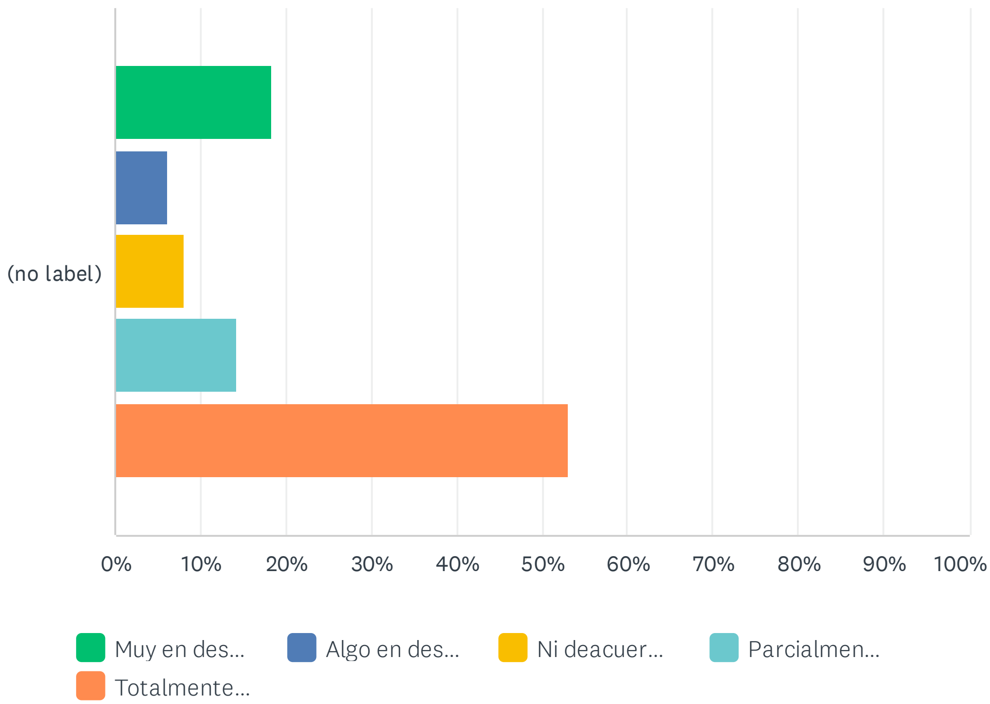
Answered: 47 Skipped: 4



ANSWER CHOICES	RESPONSES	
Ninguna de las anteriores	36.17%	17
Exención de la tarifa del permiso de construcción	8.51%	4
Descuento en la prima del seguro	27.66%	13
Descuento hipotecario	8.51%	4
Reducción o incentivo del impuesto de la propiedad	17.02%	8
Préstamo a bajo interés	21.28%	10
Asistencia técnica gratuita del gobierno	27.66%	13
Asistencia técnica durante un proceso de readaptación	14.89%	7
Financiación de subvenciones	14.89%	7
Otra (especifique, por favor)	14.89%	7
Total Respondents: 47		

Q15 Por favor, indique cómo se siente acerca de la siguiente declaración:"Creo que es importante brindar educación y programas que promuevan a los miembros de la comunidad a tomar medidas para reducir su exposición y los riesgos a los peligros naturales".

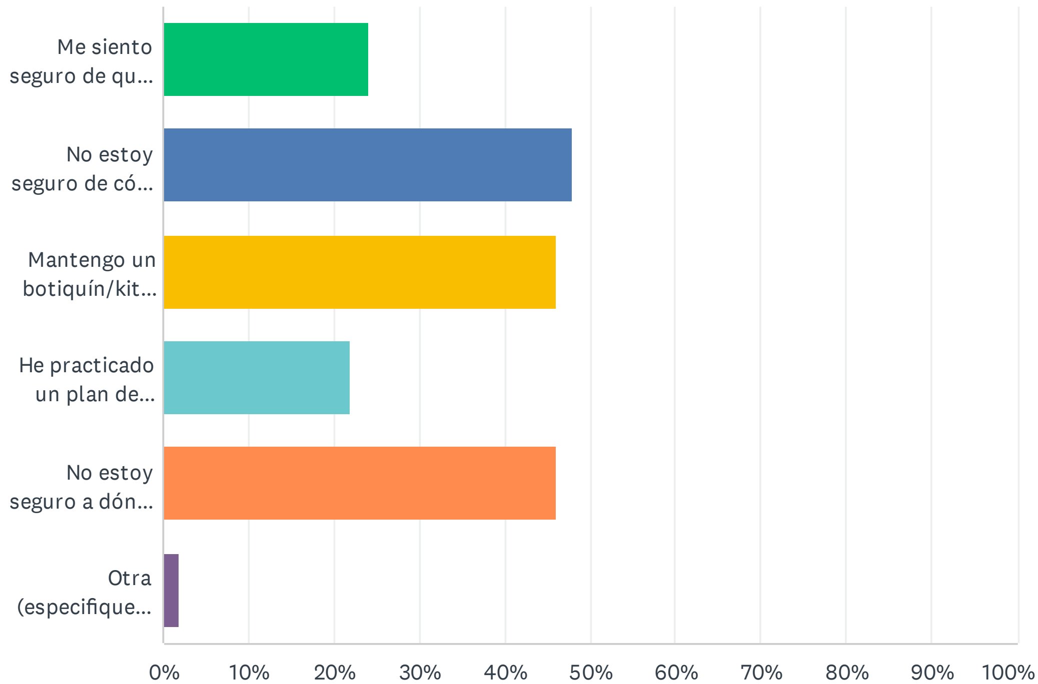
Answered: 49   Skipped: 2



	MUY EN DESACUERDO	ALGO EN DESACUERDO	NI DEACUERDO, NI EN DESACUERDO	PARCIALMENTE DE ACUERDO	TOTALMENTE DE ACUERDO	TOTAL	WEIGHTED AVERAGE
(no label)	18.37% 9	6.12% 3	8.16% 4	14.29% 7	53.06% 26	49	3.78

Q16 Si mañana ocurriera un desastre natural como un gran terremoto... (Marque todo lo que corresponda)

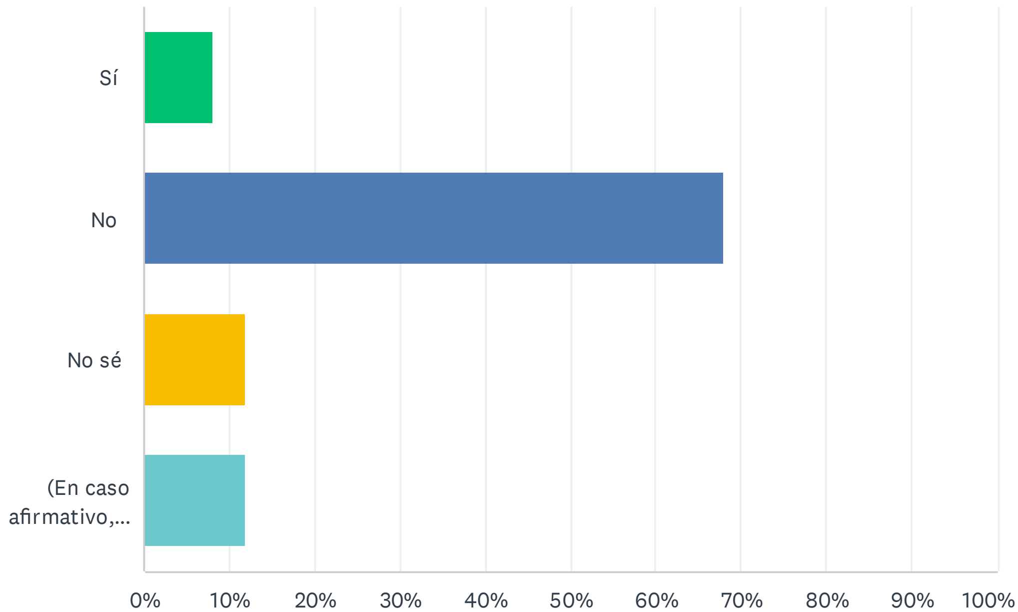
Answered: 50 Skipped: 1



ANSWER CHOICES	RESPONSES	
Me siento seguro de que sé cómo protegerme durante un terremoto o otro desastre	24.00%	12
No estoy seguro de cómo protegerse durante un terremoto o otro desastre	48.00%	24
Mantengo un botiquín/kit de emergencia con comida y agua de repuesto para mí y mi familia.	46.00%	23
He practicado un plan de evacuación y no sé a dónde iríamos mi familia y yo si tuviéramos que evacuar nuestra casa.	22.00%	11
No estoy seguro a dónde iría si tuviera que evacuar mi casa	46.00%	23
Otra (especifique, por favor)	2.00%	1
Total Respondents: 50		

Q17 ¿Su calle (o otra calle cercana) generalmente se inunda durante eventos de lluvia, mareas altas o marejadas ciclónicas?

Answered: 50 Skipped: 1



ANSWER CHOICES	RESPONSES	
Sí	8.00%	4
No	68.00%	34
No sé	12.00%	6
(En caso afirmativo, especifique la intersección o el nombre de la calle que normalmente experimenta inundaciones durante los eventos de lluvia)	12.00%	6
TOTAL		50

Q18 ¿Cuál es el código postal donde vives?

Answered: 47 Skipped: 4

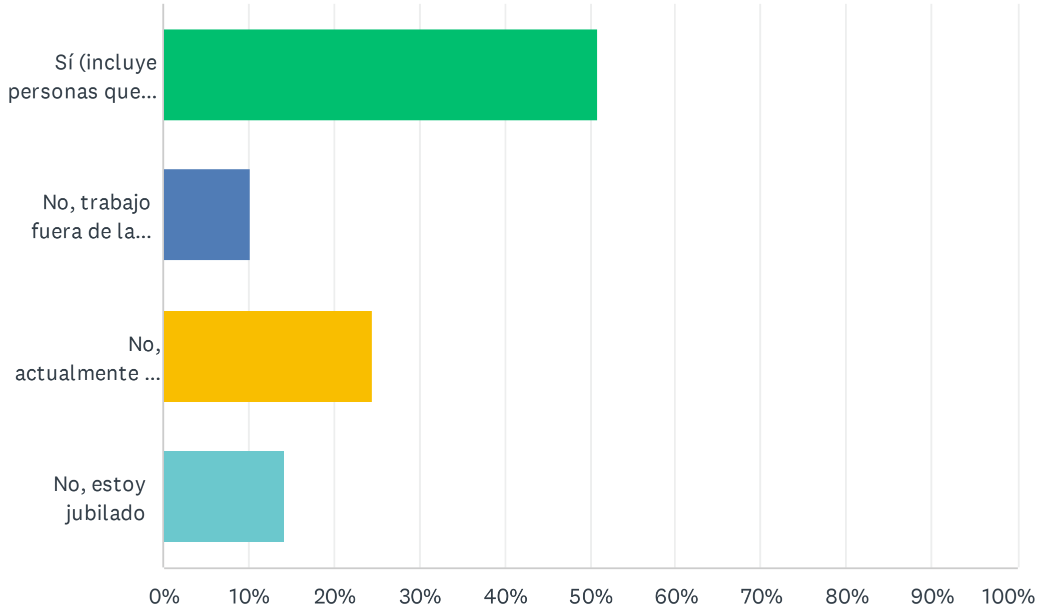
Algunas respuestas no incluyeron códigos postales correctos.

Código postal	Respuestas
90001	2
90004	4
90007	1
90011	2
90017	1
90020	1
90022	1
90023	2
90026	1
90027	1
90032	2
90033	1
90037	1
90039	1
90042	2
90044	1
90047	1
90057	1

Código postal	Respuestas
90065	2
90222	1
90230	1
90260	1
90291	1
90303	1
90504	1
90605	1
91306	1
91324	2
91352	1
91402	2
91411	1
91502	1
91733	1
91754	1
91780	1
92545	1

Q19 ¿Trabajas en la Ciudad de Los Ángeles?

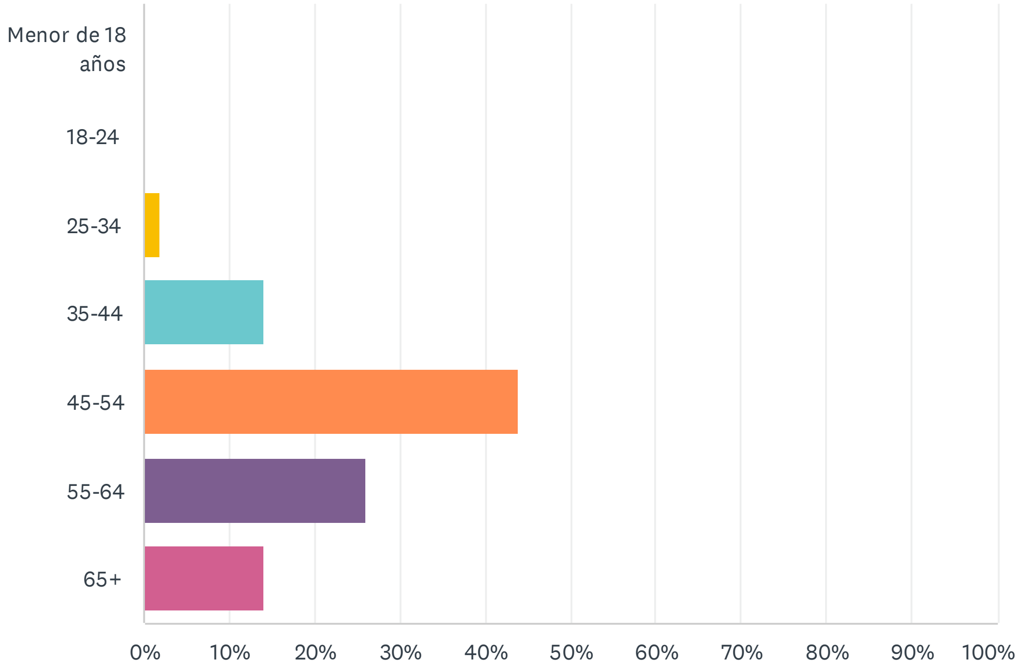
Answered: 49 Skipped: 2



ANSWER CHOICES	RESPONSES	
Sí (incluye personas que trabajan de forma remota desde casa)	51.02%	25
No, trabajo fuera de la ciudad	10.20%	5
No, actualmente no estoy empleado	24.49%	12
No, estoy jubilado	14.29%	7
TOTAL		49

Q20 Por favor, indique su grupo de edad:

Answered: 50 Skipped: 1



ANSWER CHOICES	RESPONSES	
Menor de 18 años	0.00%	0
18-24	0.00%	0
25-34	2.00%	1
35-44	14.00%	7
45-54	44.00%	22
55-64	26.00%	13
65+	14.00%	7
TOTAL		50

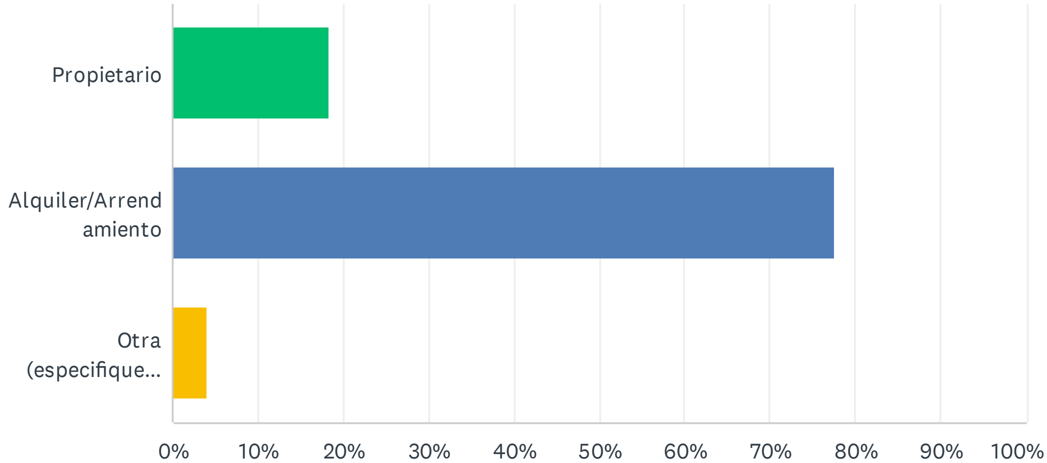
Q21 Por favor, indique el idioma principal que se habla en su hogar.

Answered: 50 Skipped: 1

ANSWER CHOICES	RESPONSES	
Inglés	8.00%	4
Español	88.00%	44
Árabe	0.00%	0
Armenio	0.00%	0
Chino (cantonés)	2.00%	1
Chino (mandarín)	0.00%	0
Farsi	0.00%	0
Francés	0.00%	0
Griego	0.00%	0
Hebreo	0.00%	0
Hindi	0.00%	0
Japonés	0.00%	0
Coreano	0.00%	0
Ruso	0.00%	0
Tagalo	0.00%	0
Vietnamita	0.00%	0
Otra (especifique, por favor)	2.00%	1
TOTAL		50

Q22 ¿Es usted propietario o renta su casa?

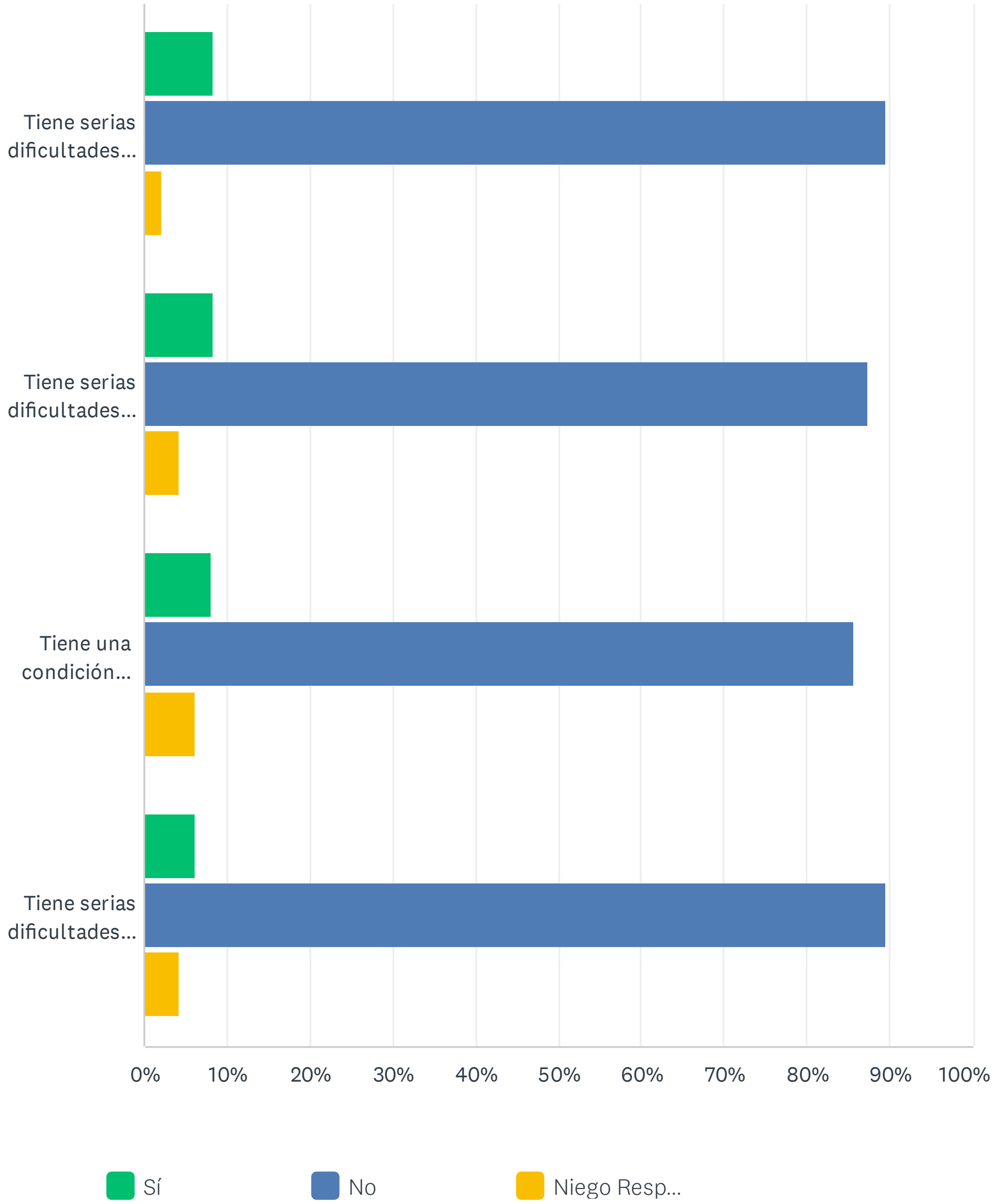
Answered: 49 Skipped: 2



ANSWER CHOICES	RESPONSES	
Propietario	18.37%	9
Alquiler/Arrendamiento	77.55%	38
Otra (especifique, por favor)	4.08%	2
TOTAL		49

Q23 Usted, o alguien en su hogar:

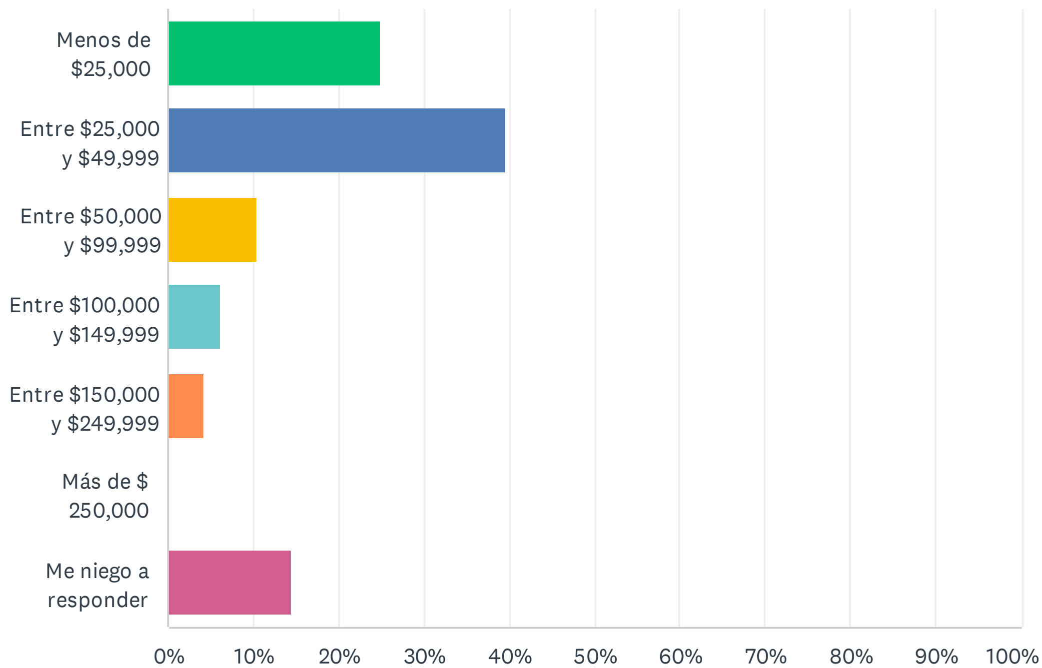
Answered: 49 Skipped: 2



	SÍ	NO	NIEGO RESPONDER	TOTAL
Tiene serias dificultades para oír o se identifica como sordo	8.33% 4	89.58% 43	2.08% 1	48
Tiene serias dificultades para ver, incluso cuando usa anteojos o se identifica como ciego	8.33% 4	87.50% 42	4.17% 2	48
Tiene una condición física, mental o emocional que le dificulta concentrarse, recordar o tomar decisiones	8.16% 4	85.71% 42	6.12% 3	49
Tiene serias dificultades para caminar	6.25% 3	89.58% 43	4.17% 2	48

Q24 ¿Cuál es su ingreso familiar anual (bruto)?

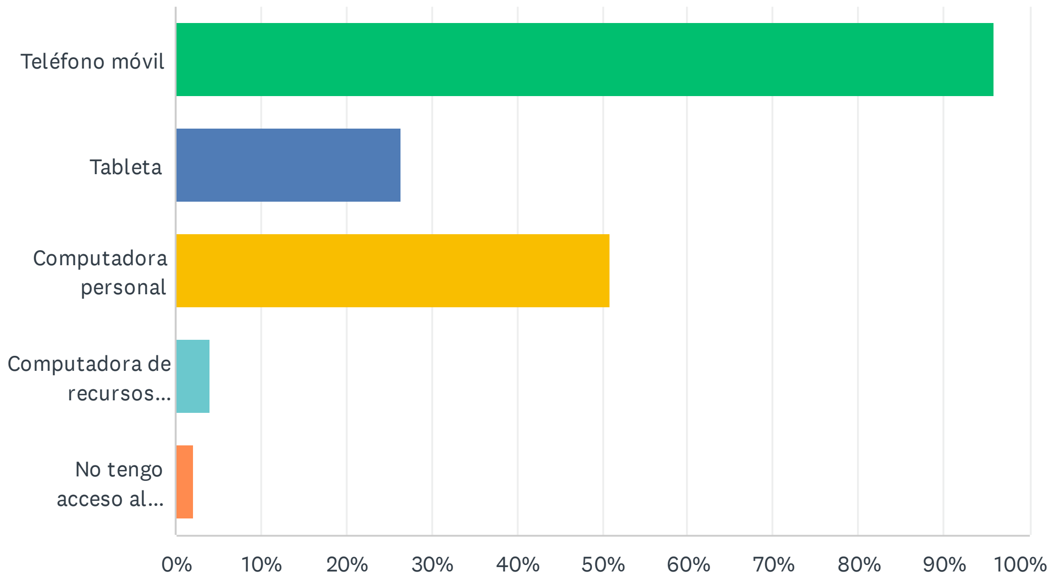
Answered: 48   Skipped: 3



ANSWER CHOICES	RESPONSES	
Menos de $25,000	25.00%	12
Entre $25,000 y $49,999	39.58%	19
Entre $50,000 y $99,999	10.42%	5
Entre $100,000 y $149,999	6.25%	3
Entre $150,000 y $249,999	4.17%	2
Más de $ 250,000	0.00%	0
Me niego a responder	14.58%	7
TOTAL		48

Q25 ¿Cómo acceder normalmente al internet? (Marque todo lo que corresponda)

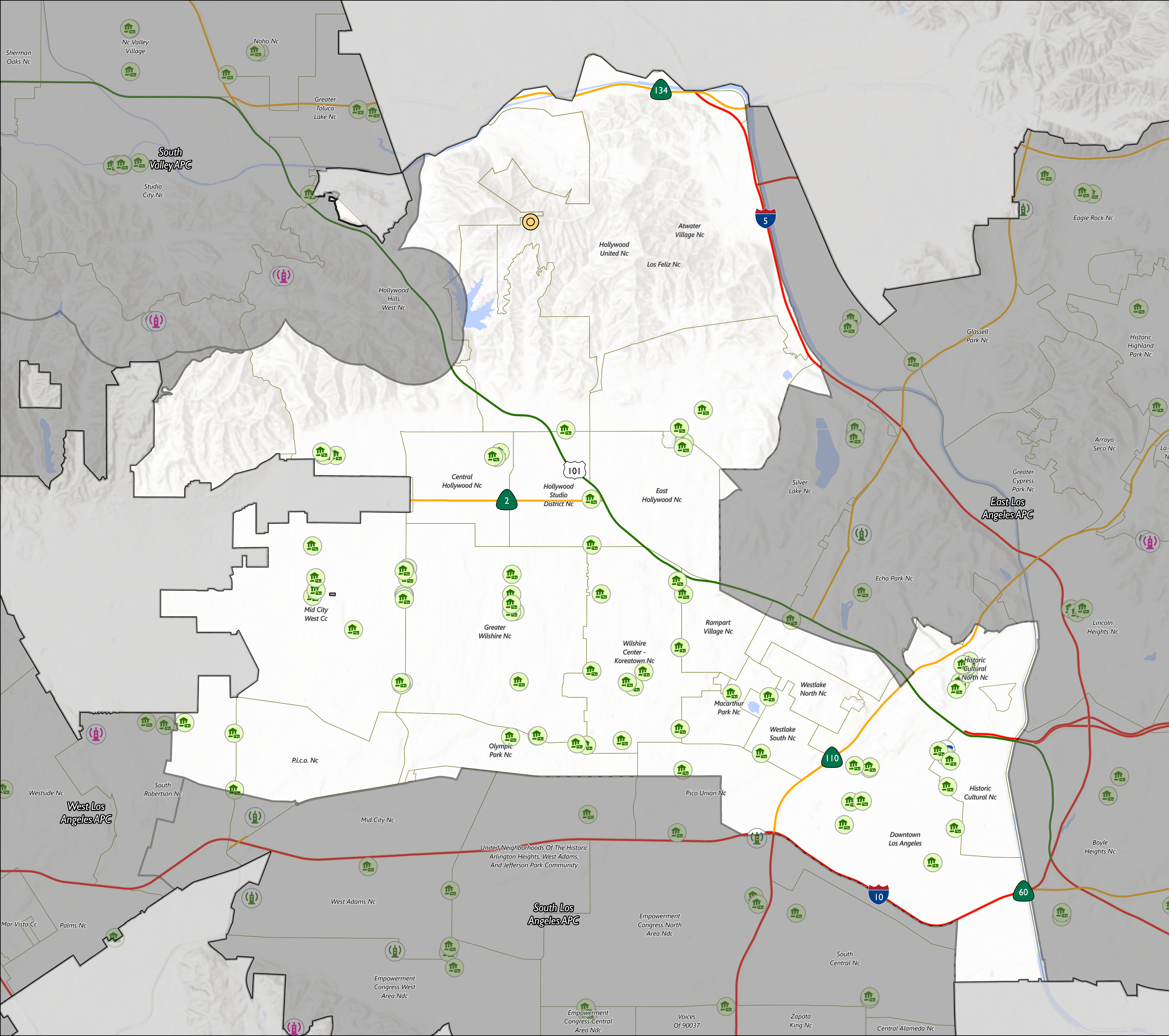
Answered: 49 Skipped: 2



ANSWER CHOICES	RESPONSES	
Teléfono móvil	95.92%	47
Tableta	26.53%	13
Computadora personal	51.02%	25
Computadora de recursos públicos compartidos (por ejemplo, biblioteca)	4.08%	2
No tengo acceso al internet	2.04%	1
Total Respondents: 49		

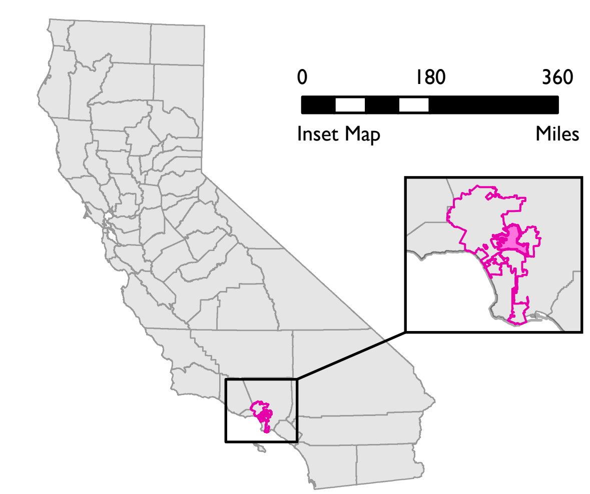
C. Maps of Community Lifelines and Critical Facilities

Central APC



Communication Lifelines

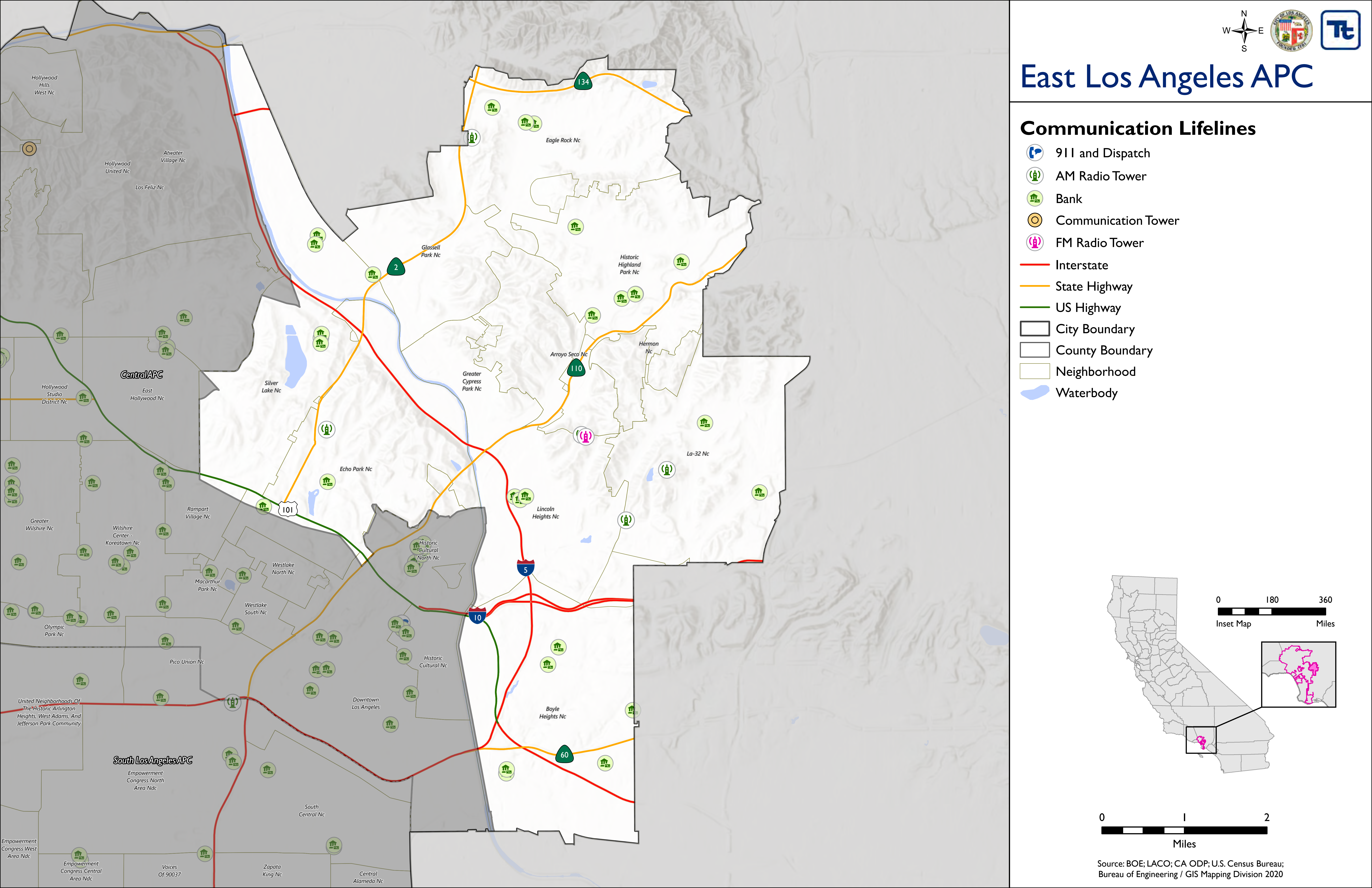
- 911 and Dispatch
- AM Radio Tower
- Bank
- Communication Tower
- FM Radio Tower
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

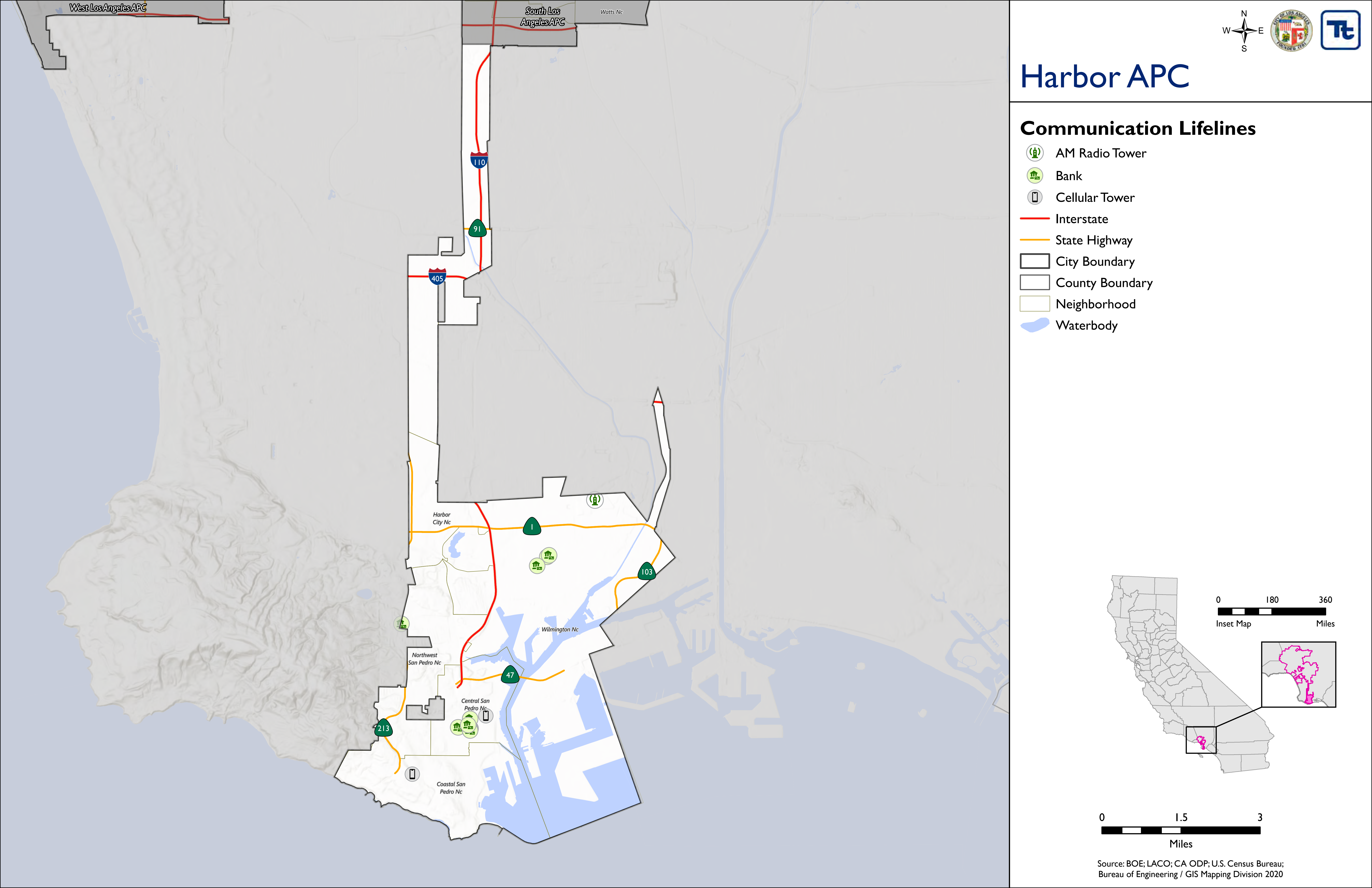


0 1 2

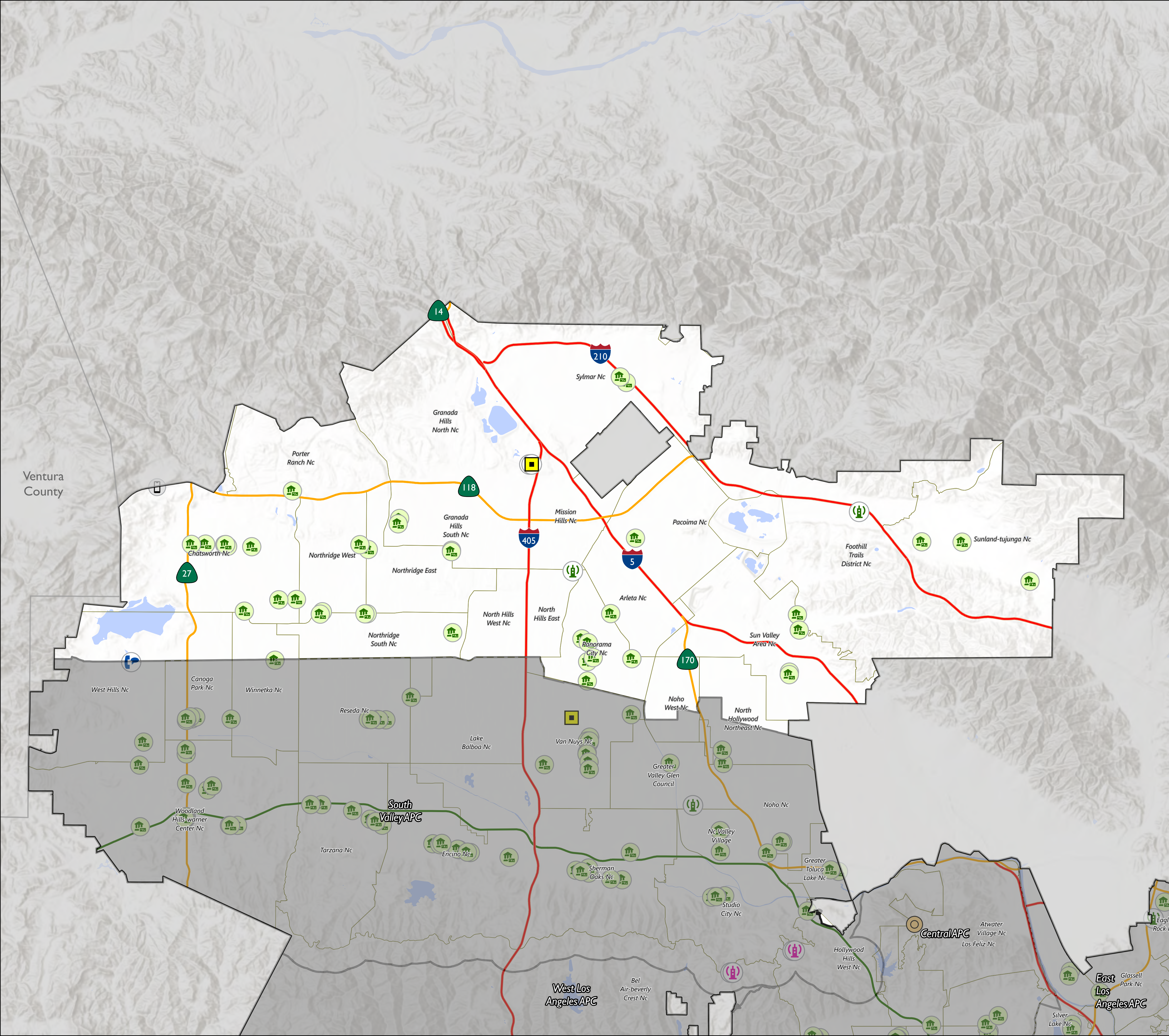
Miles

Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020


East Los Angeles APC
Communication Lifelines
911 and Dispatch
AM Radio Tower
Bank
Communication Tower
FM Radio Tower
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
Central APC
South Los Angeles APC
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
Hermon Nc
Greater Cypress Park Nc
Silver Lake Nc
Echo Park Nc
La-32 Nc
Lincoln Heights Nc
Historic Cultural North Nc
Boyle Heights Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Hollywood Studio District Nc
East Hollywood Nc
Rampart Village Nc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
Olympic Park Nc
Pico Union Nc
Historic Cultural Nc
Downtown Los Angeles
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Empowerment Congress North Area Ndc
South Central Nc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
Central Alameda Nc
134
2
110
101
5
10
60

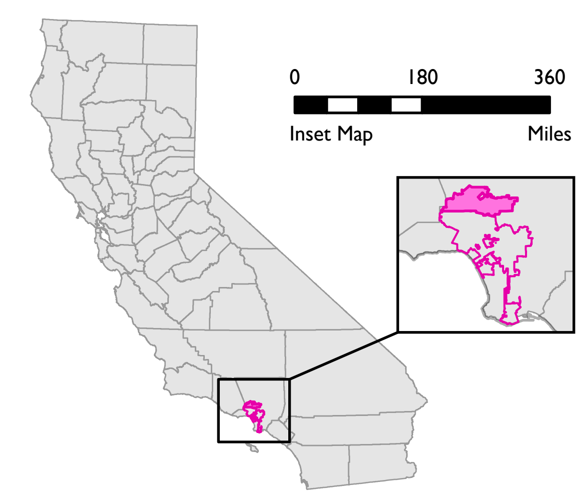

West Los Angeles APC
South Los Angeles APC
Watts Nc
Harbor City Nc
Wilmington Nc
Northwest San Pedro Nc
Central San Pedro Nc
Coastal San Pedro Nc
110
91
405
1
103
47
213
N
W
E
S
Harbor APC
Communication Lifelines
AM Radio Tower
Bank
Cellular Tower
Interstate
State Highway
City Boundary
County Boundary
Neighborhood
Waterbody
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

North Valley APC



Communication Lifelines

- 911 and Dispatch
- AM Radio Tower
- Bank
- Cellular Tower
- Communication Tower
- FM Radio Tower
- NTSC TV
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

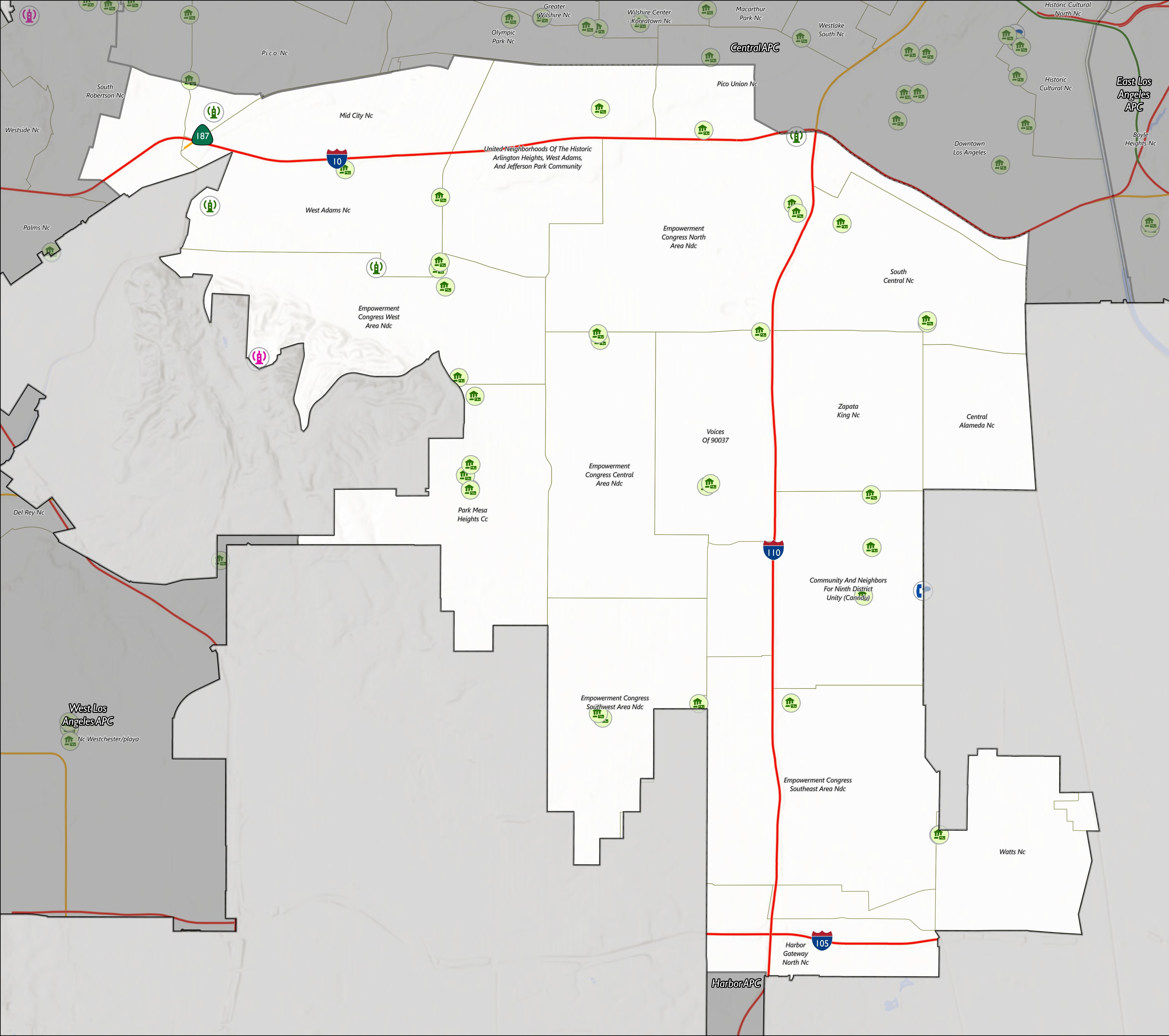


0 2 4

Miles

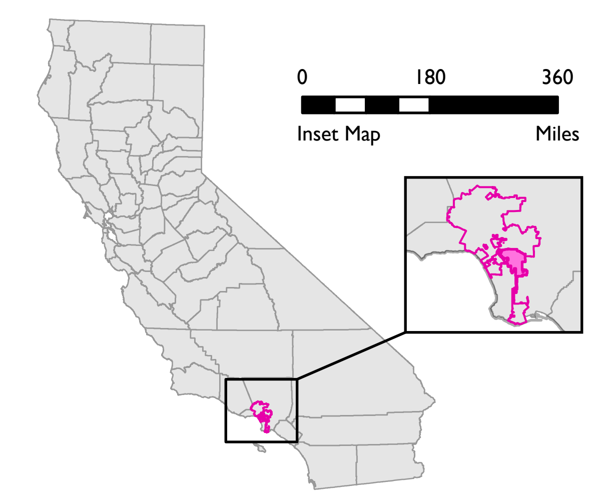
Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

South Los Angeles APC



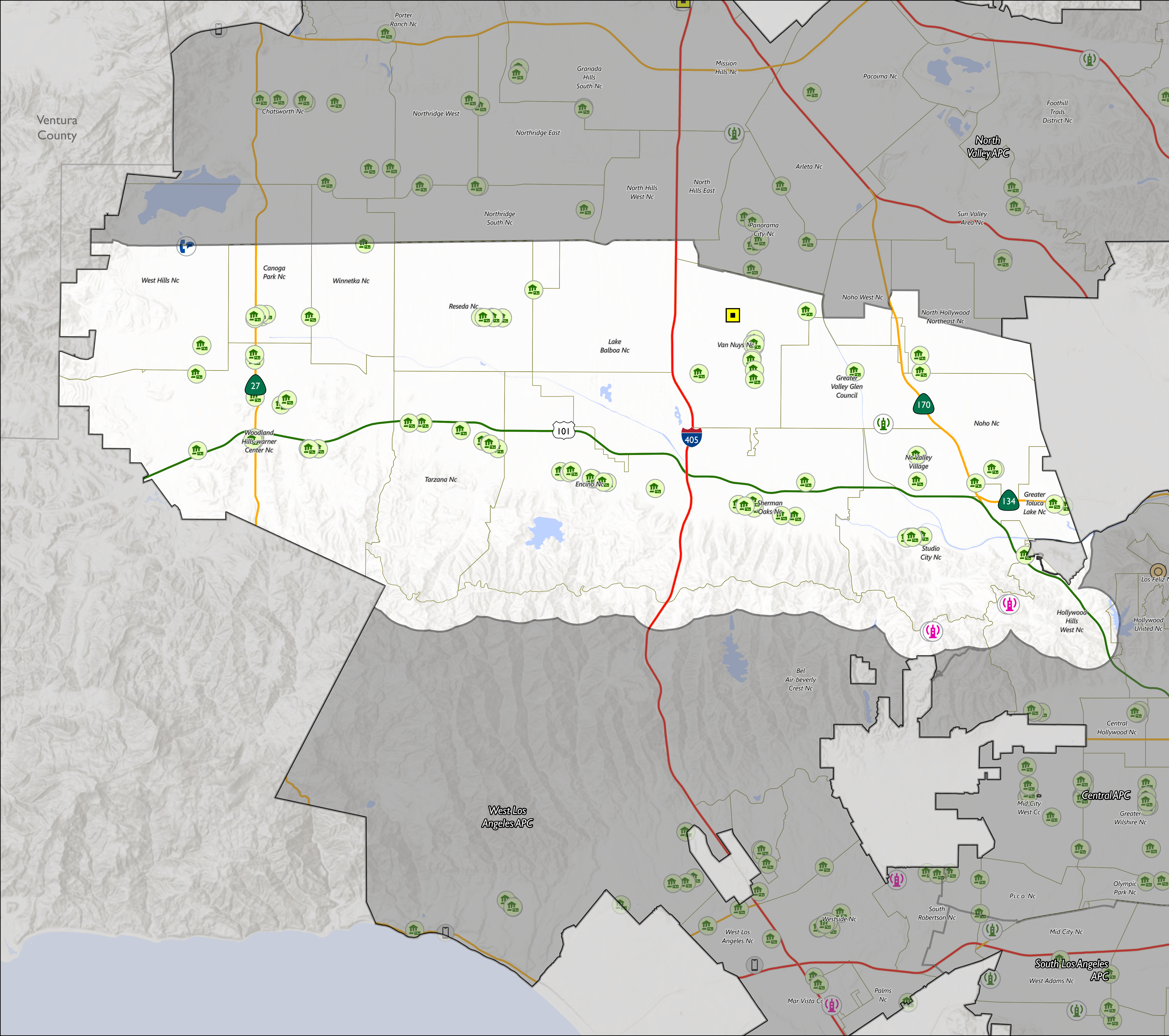
Communication Lifelines

911 and Dispatch
AM Radio Tower
Bank
FM Radio Tower
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody



0 1 2
Miles

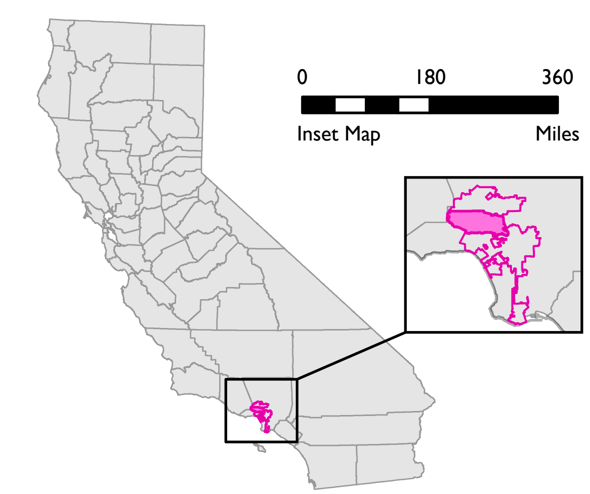
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



South Valley APC

Communication Lifelines

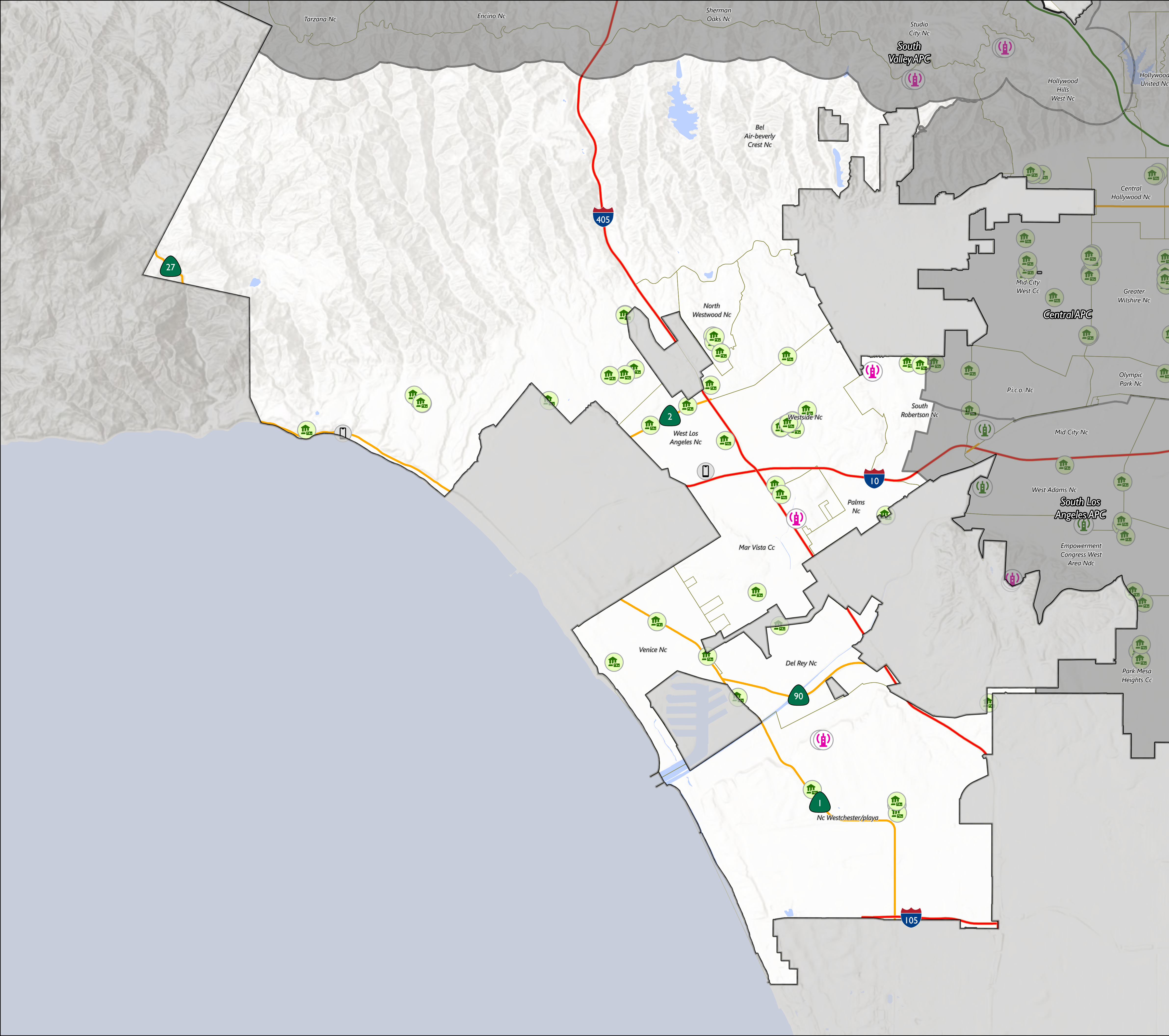
- 911 and Dispatch
- AM Radio Tower
- Bank
- Cellular Tower
- Communication Tower
- FM Radio Tower
- NTSC TV
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1.5 3

Miles

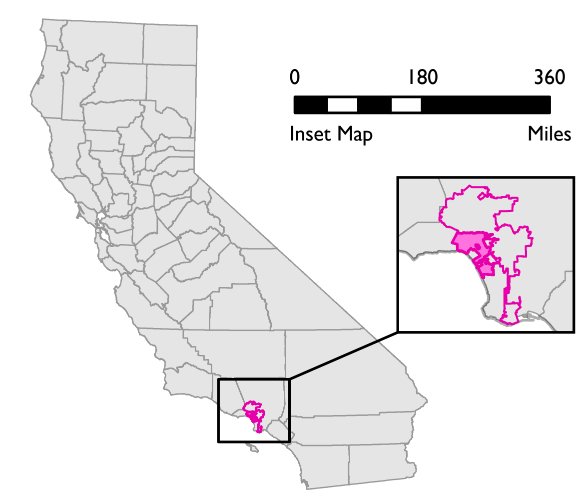
Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020



West Los Angeles APC

Communication Lifelines

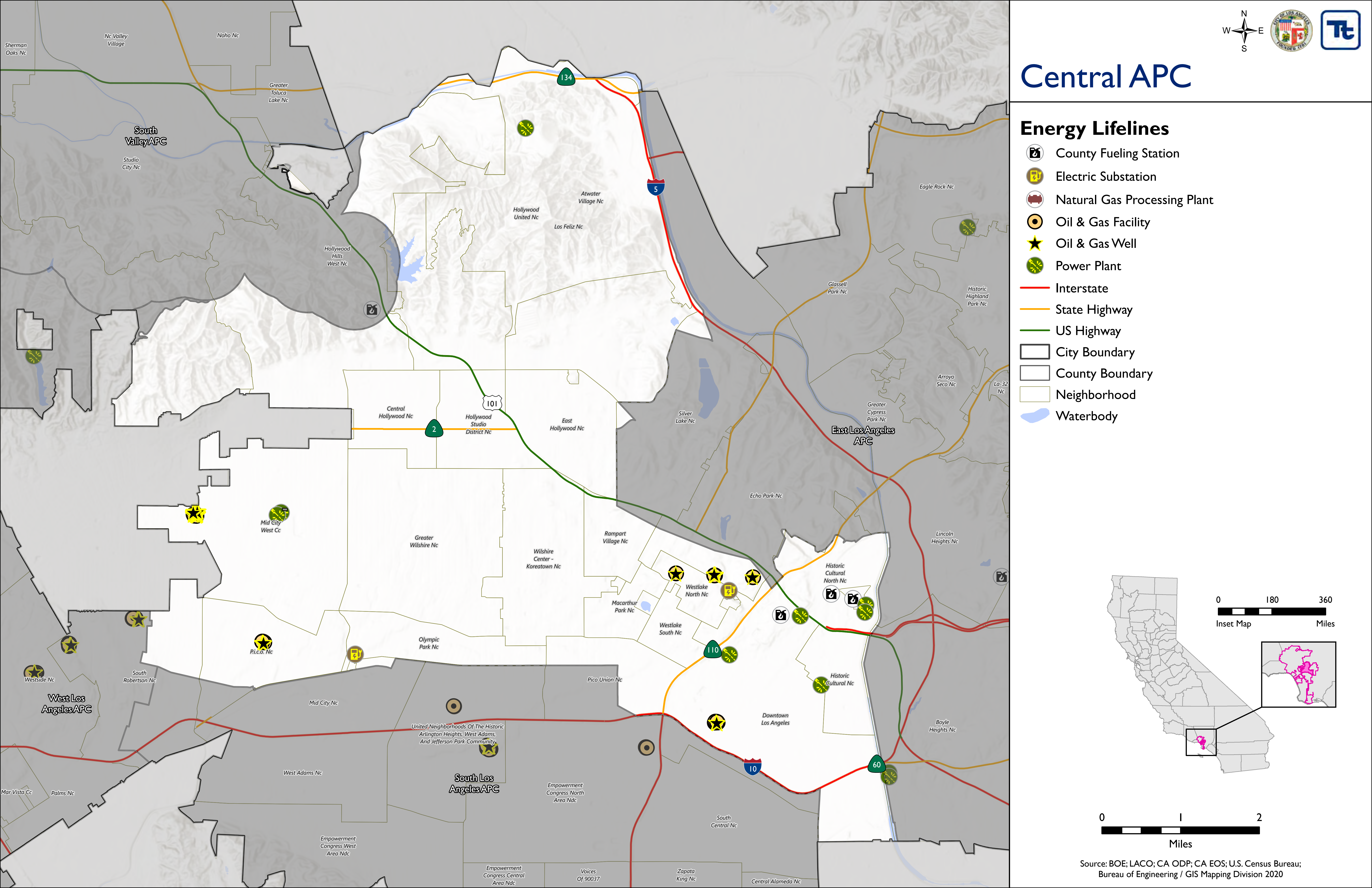
- AM Radio Tower
- Bank
- Cellular Tower
- Communication Tower
- FM Radio Tower
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

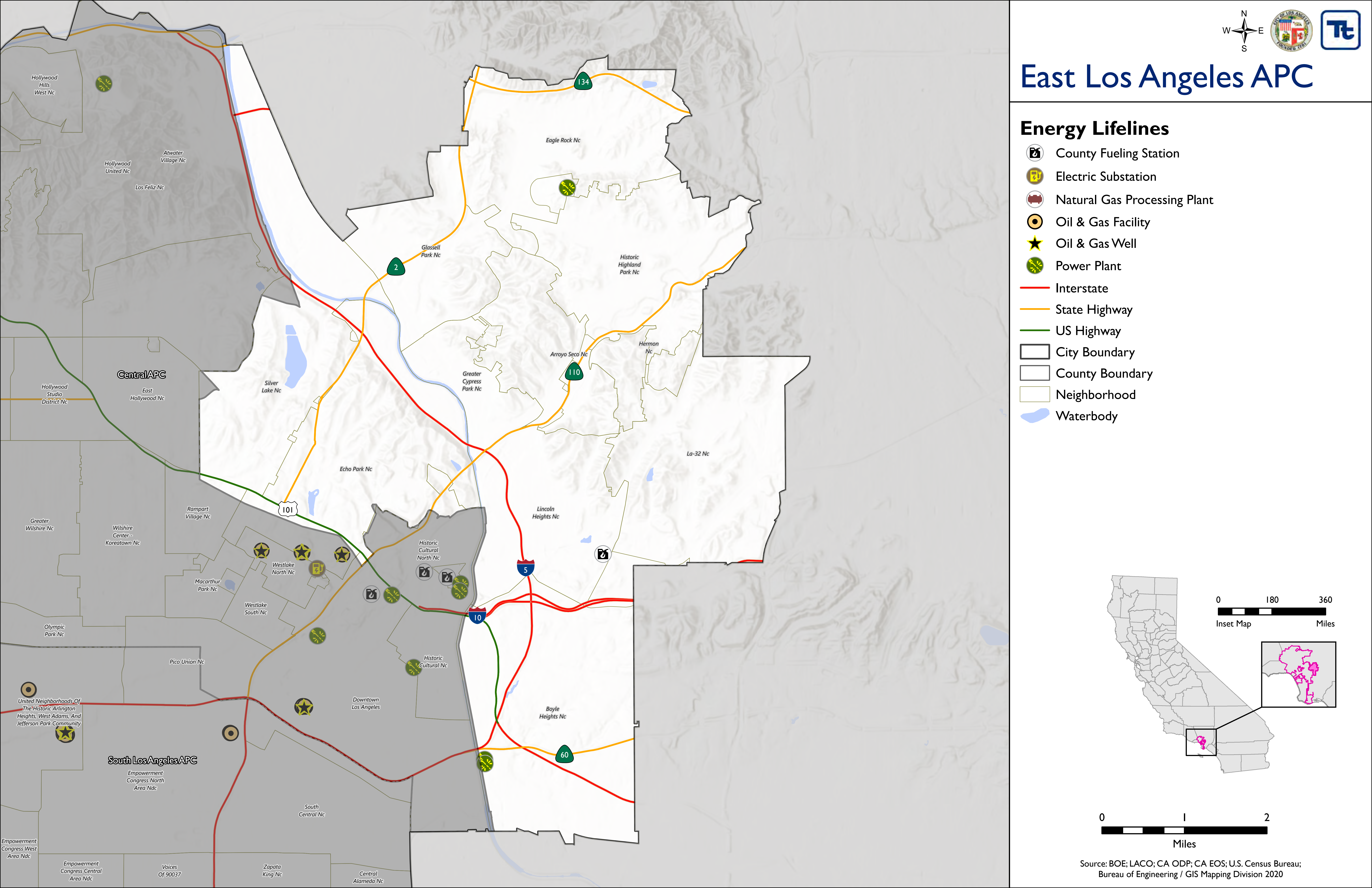


0 1.5 3

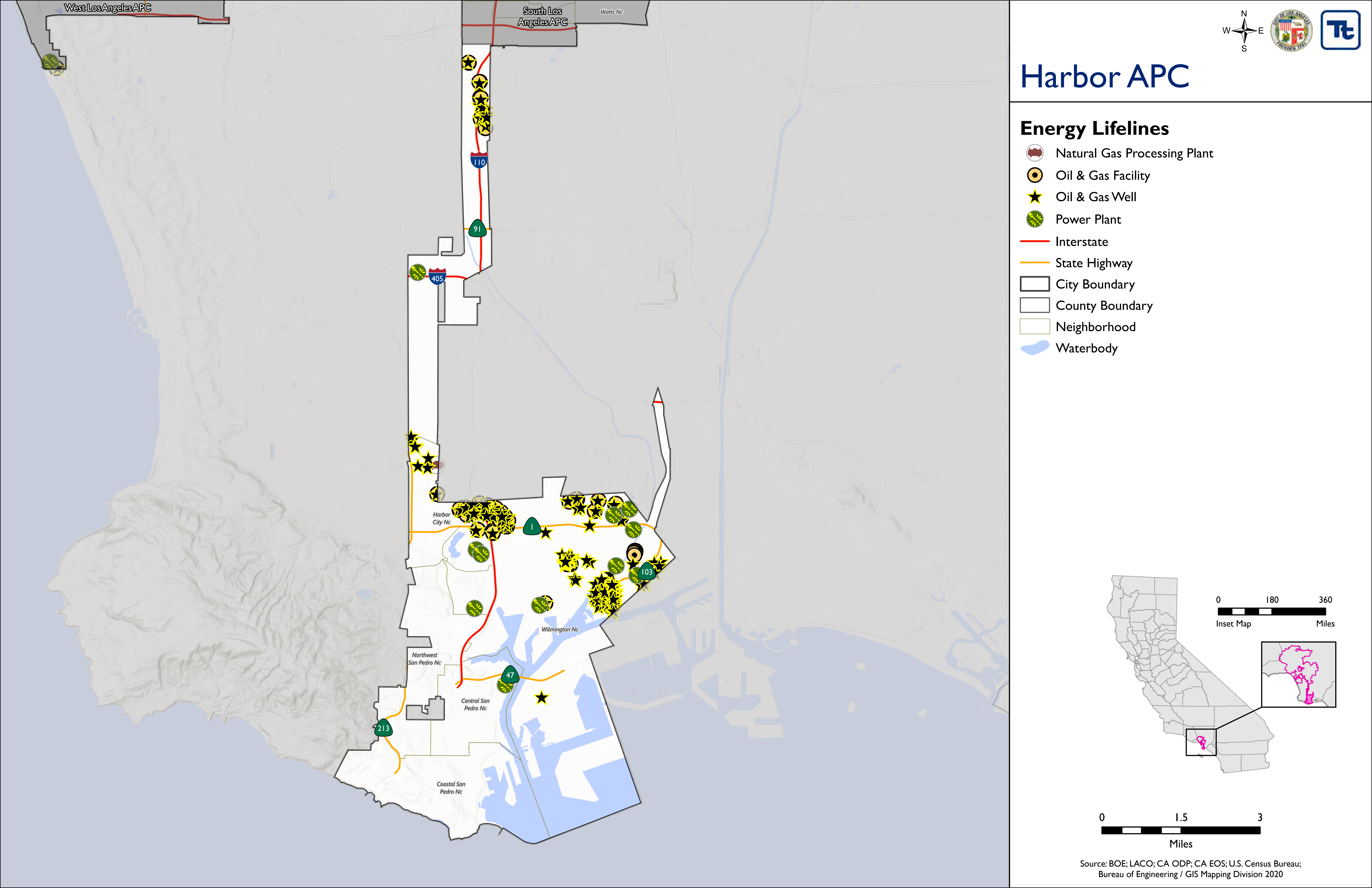
Miles

Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020


Central APC
Energy Lifelines
County Fueling Station
Electric Substation
Natural Gas Processing Plant
Oil & Gas Facility
Oil & Gas Well
Power Plant
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
W
E
S
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
South Valley APC
East Los Angeles APC
West Los Angeles APC
South Los Angeles APC
Sherman Oaks Nc
Nc Valley Village
Noho Nc
Greater Toluca Lake Nc
Studio City Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
La 32 Nc
Greater Cypress Park Nc
Silver Lake Nc
Central Hollywood Nc
Hollywood Studio District Nc
East Hollywood Nc
Echo Park Nc
Lincoln Heights Nc
Mid City West Cc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Rampart Village Nc
Historic Cultural North Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
P.i.c.o. Nc
Olympic Park Nc
Historic Cultural Nc
Downtown Los Angeles
Boyle Heights Nc
Westside Nc
South Robertson Nc
Pico Union Nc
Mid City Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
West Adams Nc
Mar Vista Cc
Palms Nc
Empowerment Congress North Area Ndc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
South Central Nc
Central Alameda Nc
134
5
101
2
110
10
60

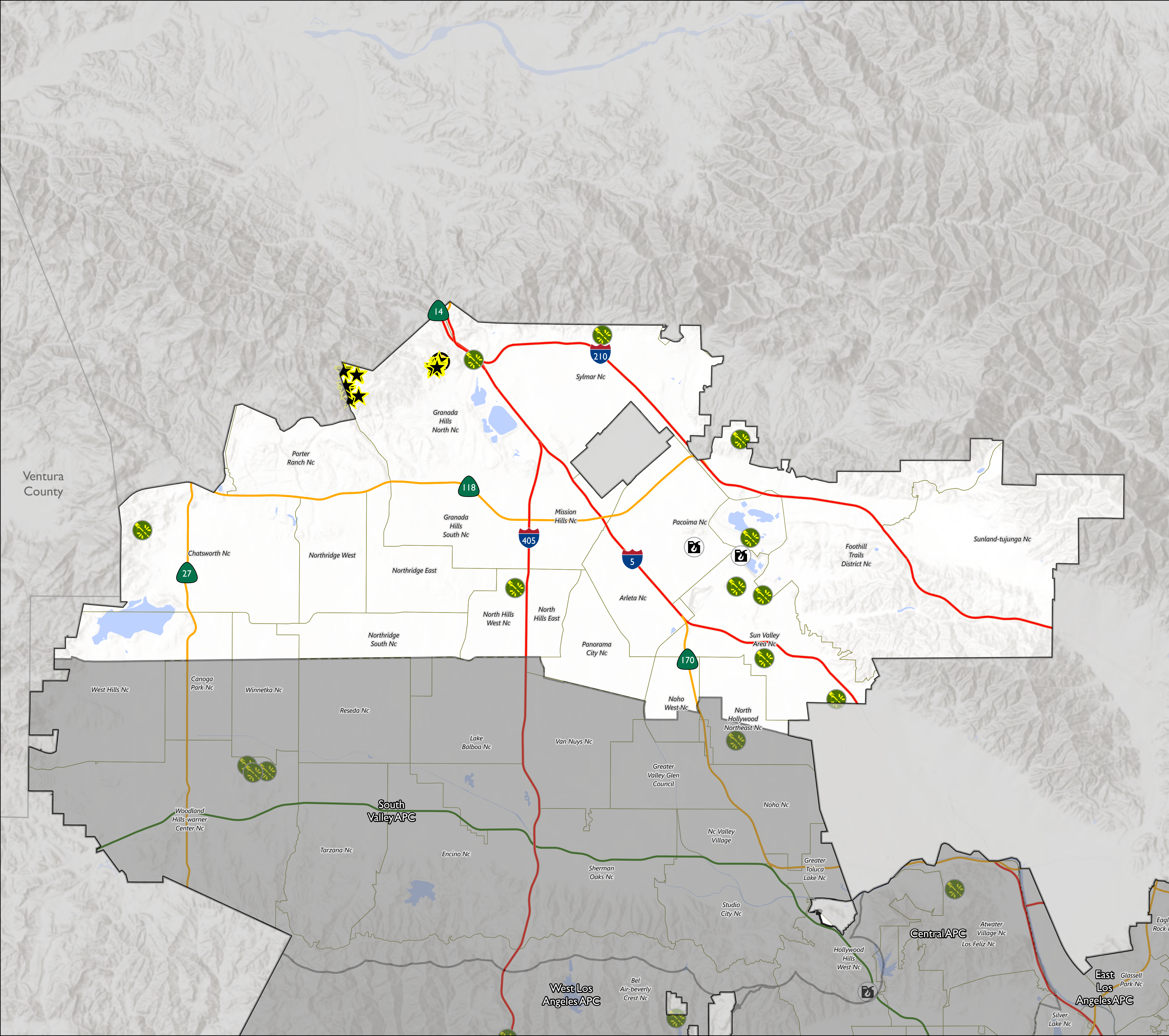


East Los Angeles APC
Energy Lifelines
County Fueling Station
Electric Substation
Natural Gas Processing Plant
Oil & Gas Facility
Oil & Gas Well
Power Plant
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
Hermon Nc
Greater Cypress Park Nc
Silver Lake Nc
Echo Park Nc
La-32 Nc
Lincoln Heights Nc
Historic Cultural North Nc
Boyle Heights Nc
Historic Cultural Nc
Downtown Los Angeles
Westlake North Nc
Westlake South Nc
Macarthur Park Nc
Rampart Village Nc
Central APC
East Hollywood Nc
Hollywood Studio District Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Olympic Park Nc
Pico Union Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
South Los Angeles APC
Empowerment Congress North Area Ndc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
South Central Nc
Central Alameda Nc
134
2
110
101
5
10
60
0 180 360
Inset Map
Miles
0 1 2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



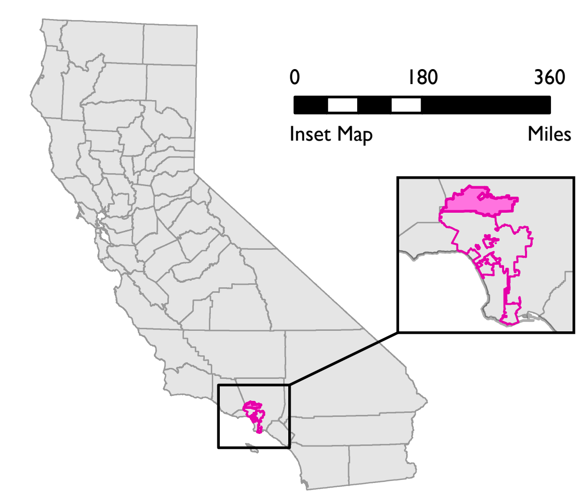
West Los Angeles APC
South Los Angeles APC
Watts Nc
Harbor City Nc
Wilmington Nc
Northwest San Pedro Nc
Central San Pedro Nc
Coastal San Pedro Nc
110
405
91
1
103
47
213
Harbor APC
Energy Lifelines
Natural Gas Processing Plant
Oil & Gas Facility
Oil & Gas Well
Power Plant
Interstate
State Highway
City Boundary
County Boundary
Neighborhood
Waterbody
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

North Valley APC



Energy Lifelines

- County Fueling Station
- Oil & Gas Facility
- Oil & Gas Well
- Power Plant
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

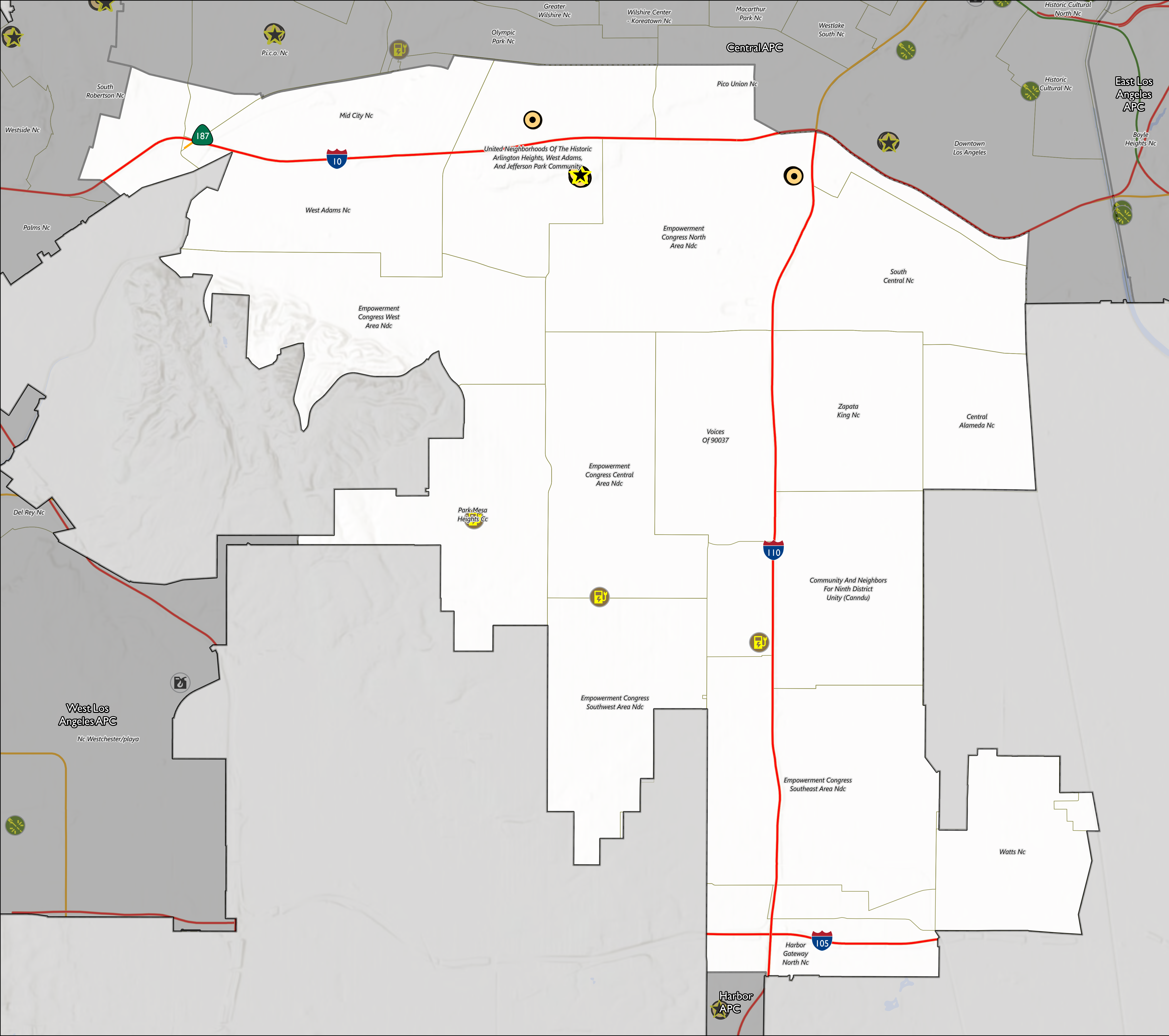


0 2 4

Miles

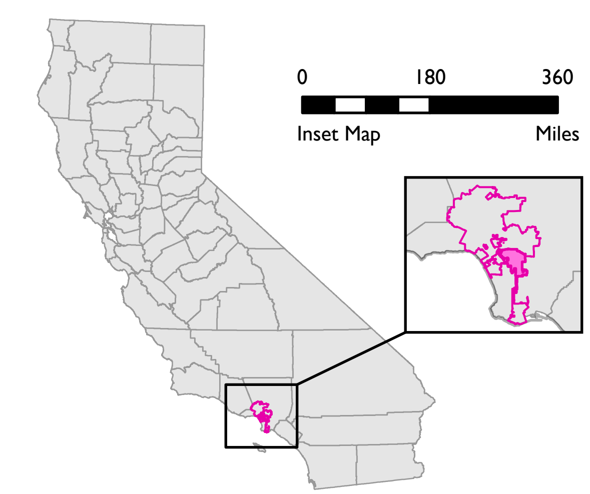
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

South Los Angeles APC



Energy Lifelines

- County Fueling Station
- Electric Substation
- Natural Gas Processing Plant
- Oil & Gas Facility
- Oil & Gas Well
- Power Plant
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

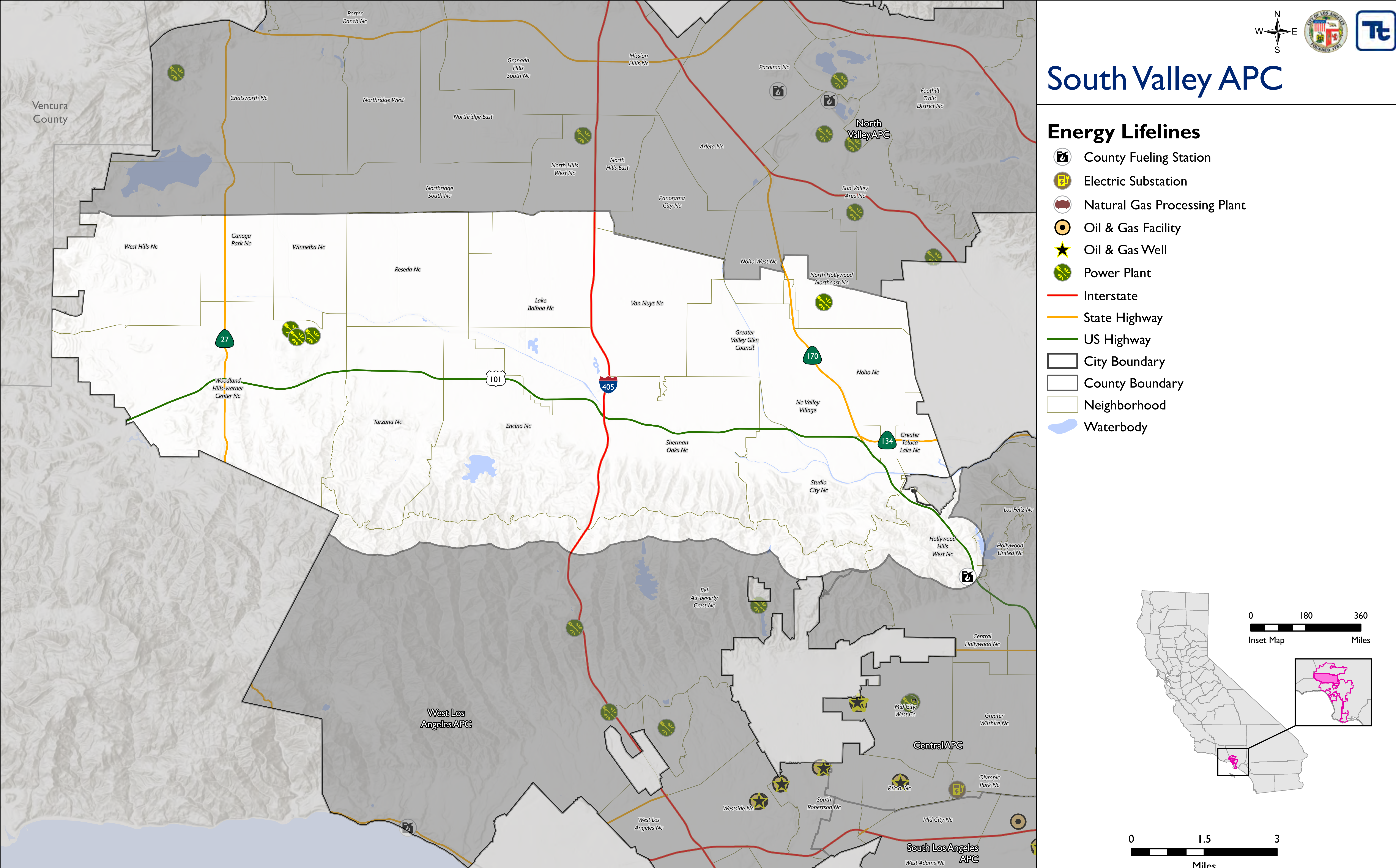


0 1 2

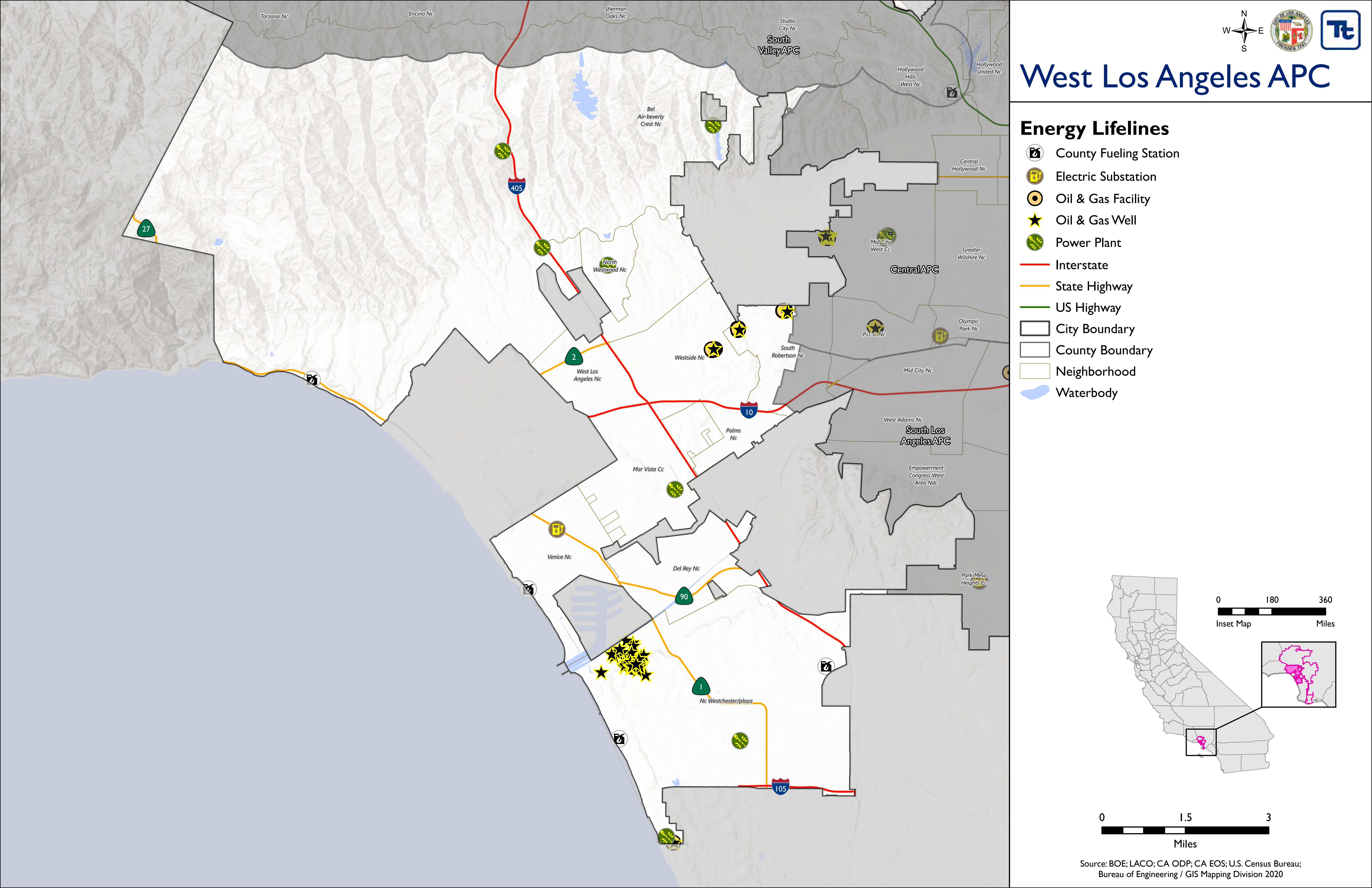
Miles

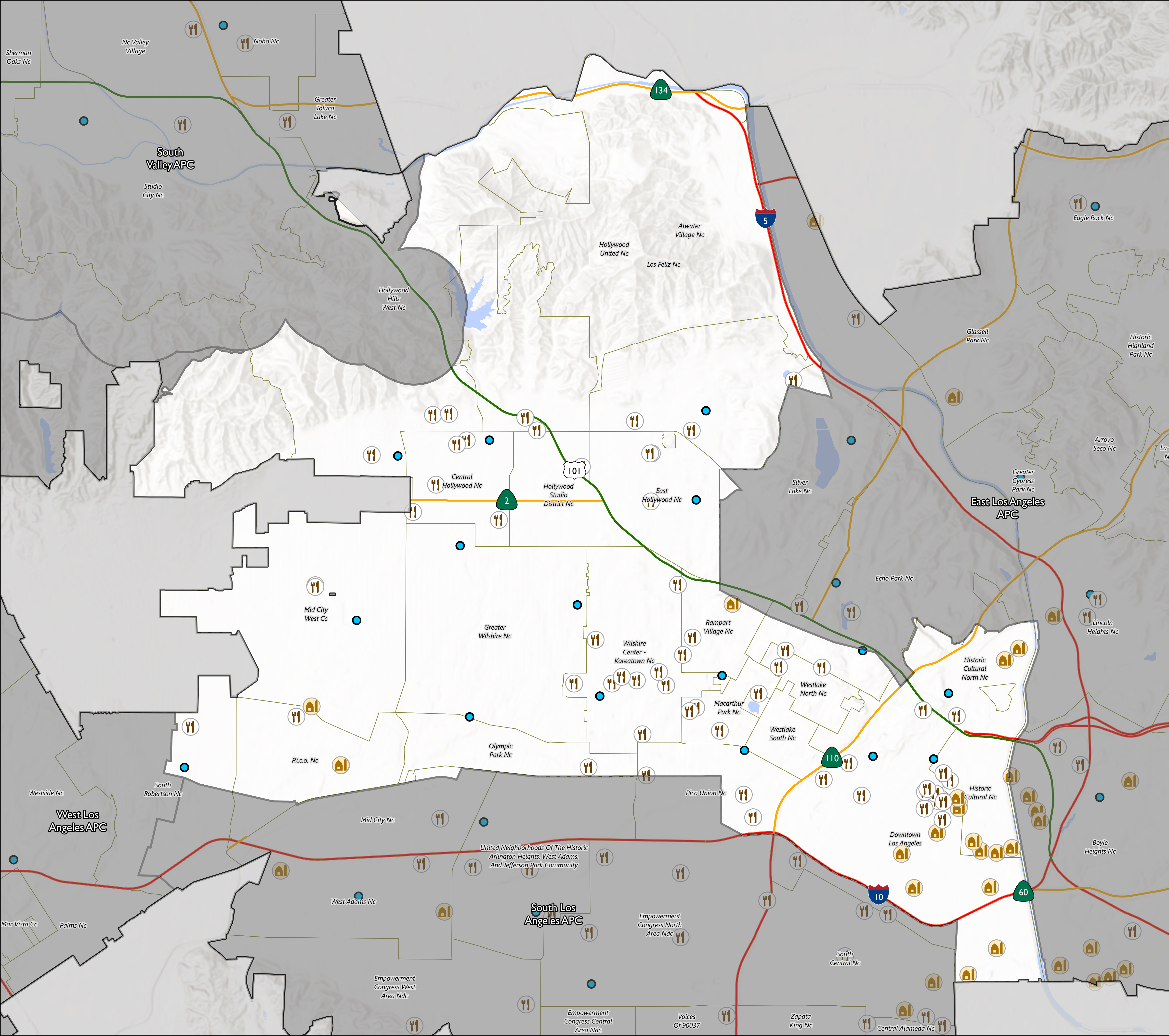
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

South Valley APC



Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

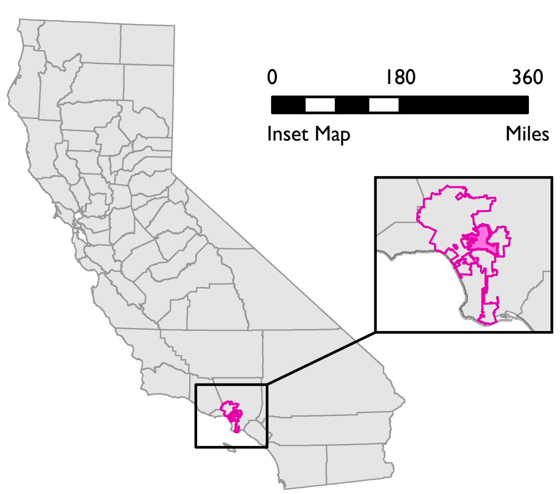

West Los Angeles APC
Energy Lifelines
County Fueling Station
Electric Substation
Oil & Gas Facility
Oil & Gas Well
Power Plant
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
South Valley APC
Central APC
South Los Angeles APC
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
Hollywood Hills West Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
North Westwood Nc
Mid City West Cc
Greater Wilshire Nc
Westside Nc
South Robertson Nc
P.i.c.o. Nc
Olympic Park Nc
Mid City Nc
West Los Angeles Nc
Palms Nc
West Adams Nc
Empowerment Congress West Area Ndc
Mar Vista Cc
Venice Nc
Del Rey Nc
Park Mesa Heights Cc
Nc Westchester/playa
405
27
2
10
90
1
105
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



Central APC

Food, Hydration, Shelter Lifelines

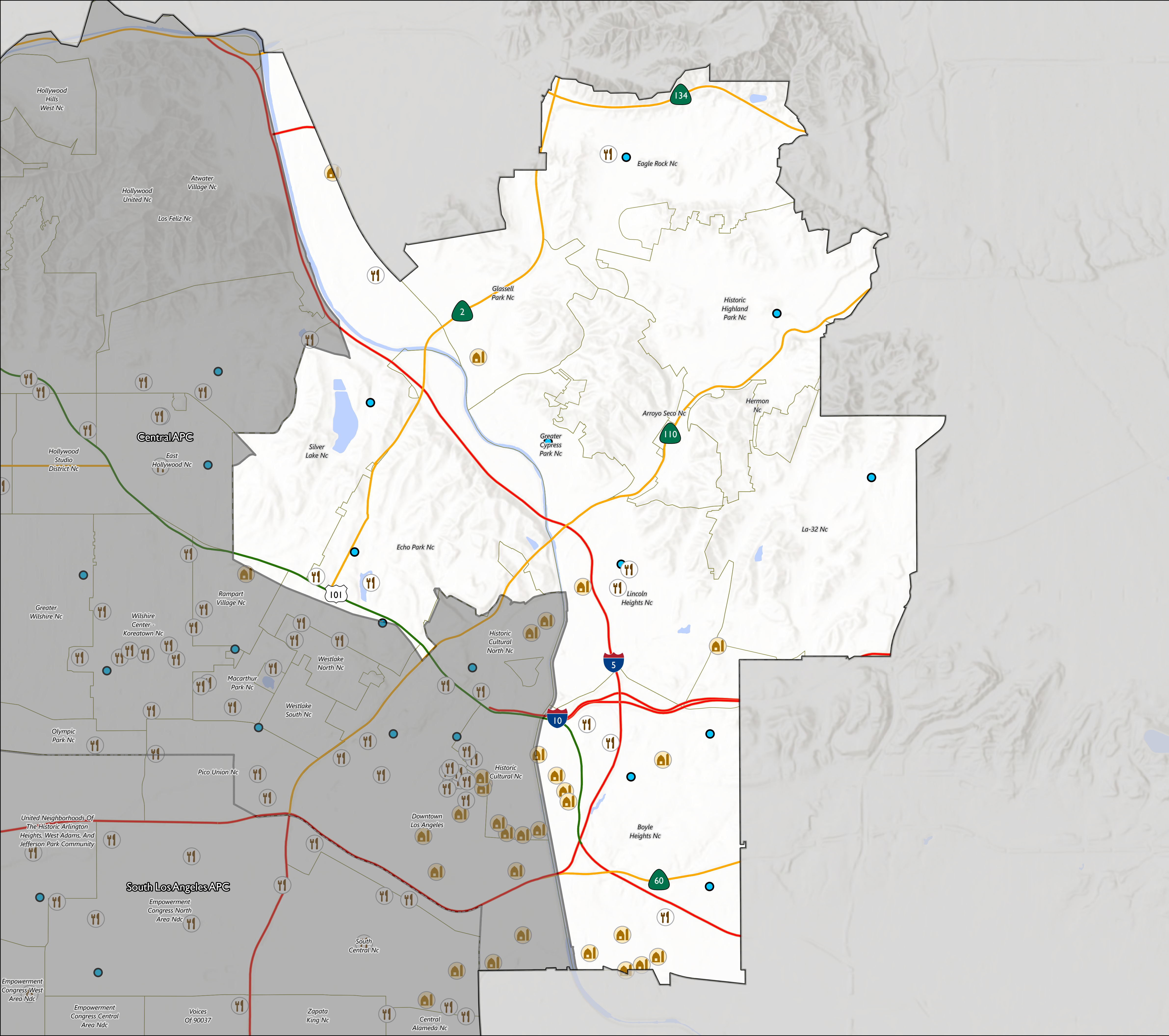
- Agriculture & Food Facility
- Cooling Center
- Food Assistance Services
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1 2
Miles

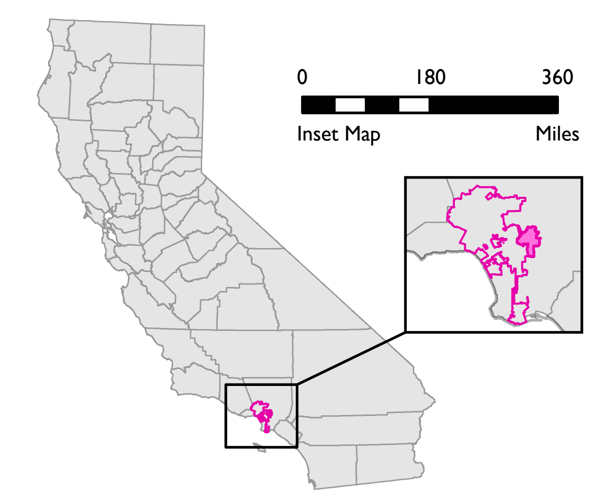
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

East Los Angeles APC



Food, Hydration, Shelter Lifelines

- Agriculture & Food Facility
- Cooling Center
- Food Assistance Services
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



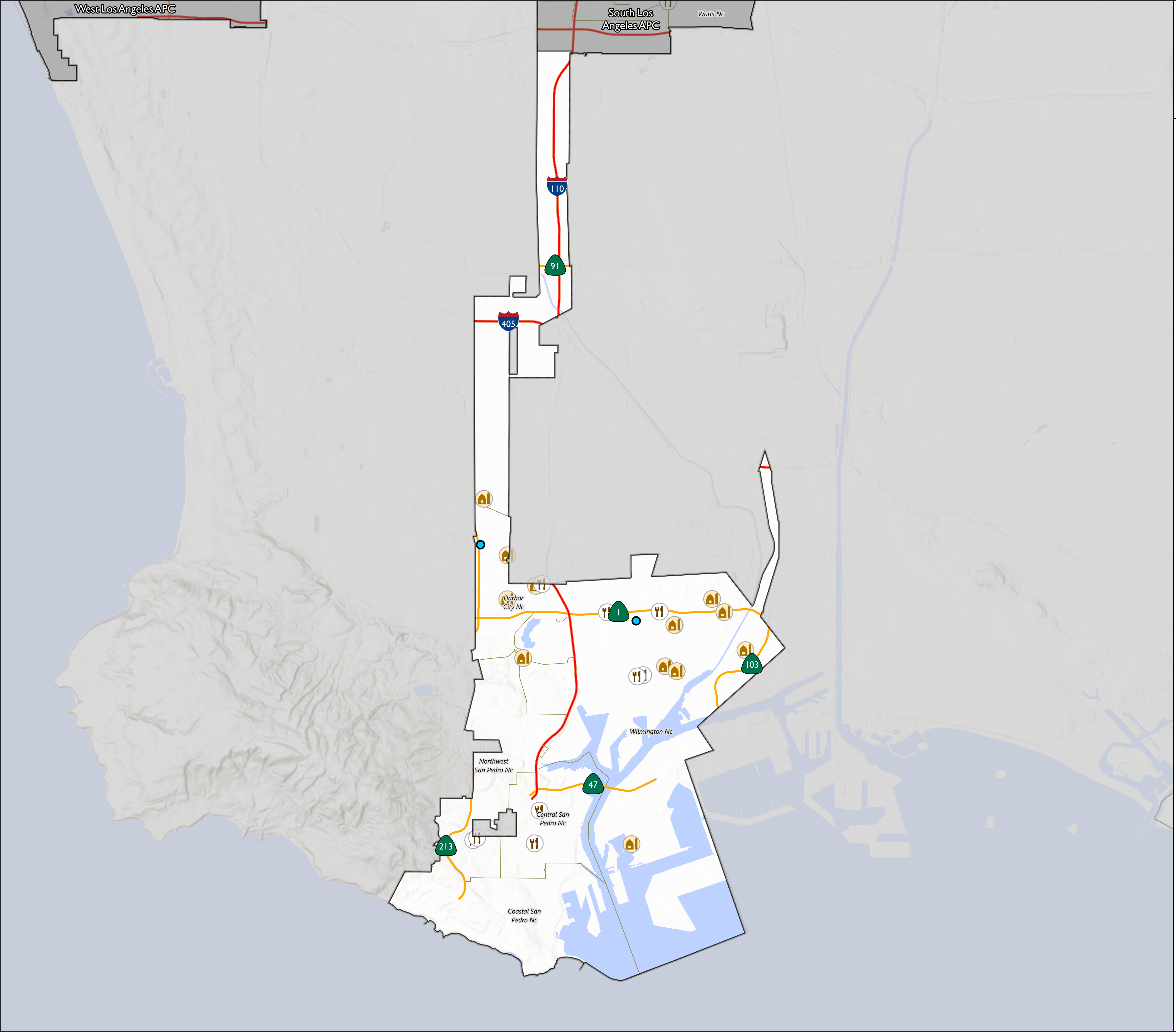
0 1 2
Miles

Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

Harbor APC

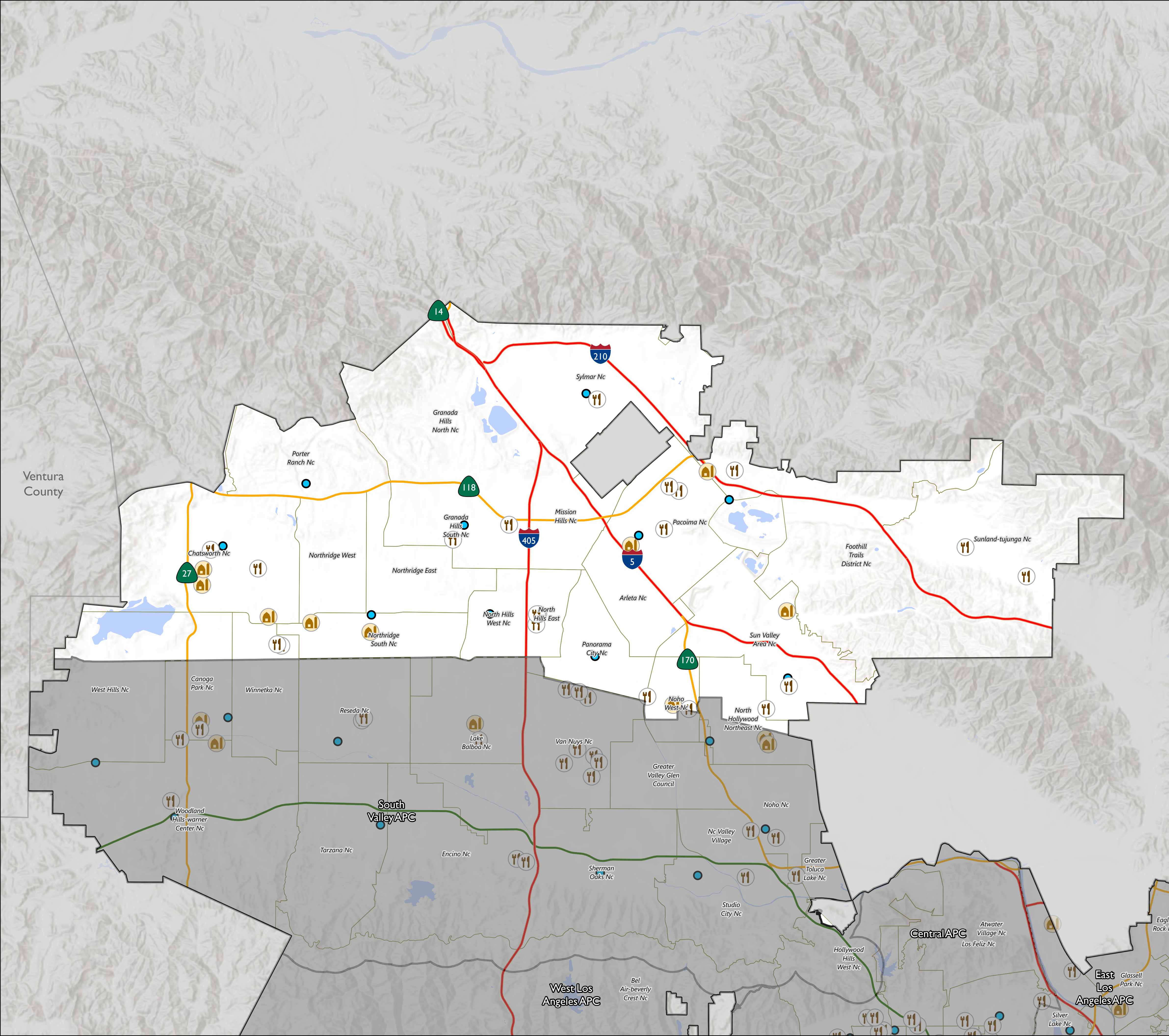
Food, Hydration, Shelter Lifelines

- Agriculture & Food Facility
- Cooling Center
- Food Assistance Services
- Interstate
- State Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



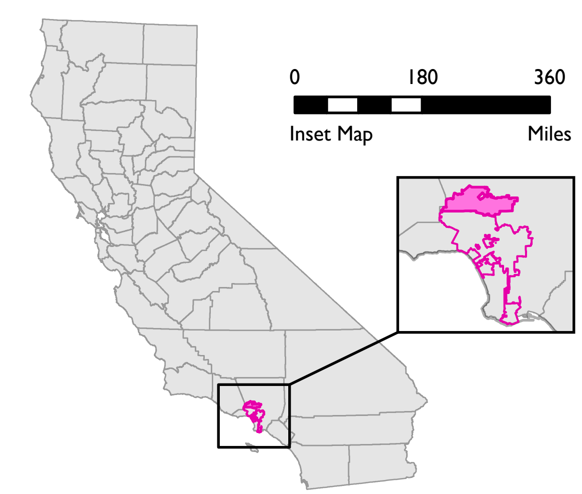
Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

North Valley APC



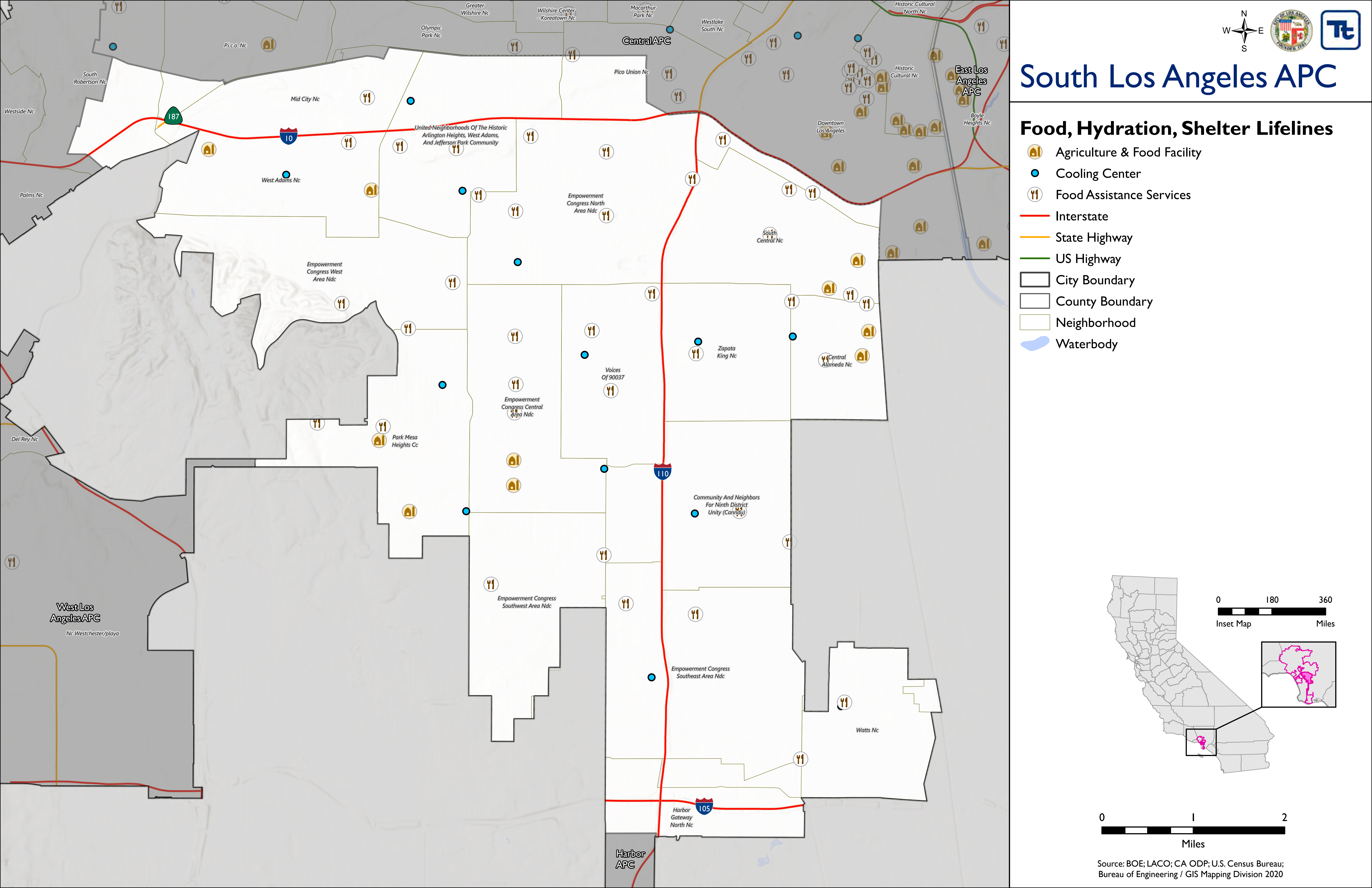
Food, Hydration, Shelter Lifelines

- Agriculture & Food Facility
- Cooling Center
- Food Assistance Services
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



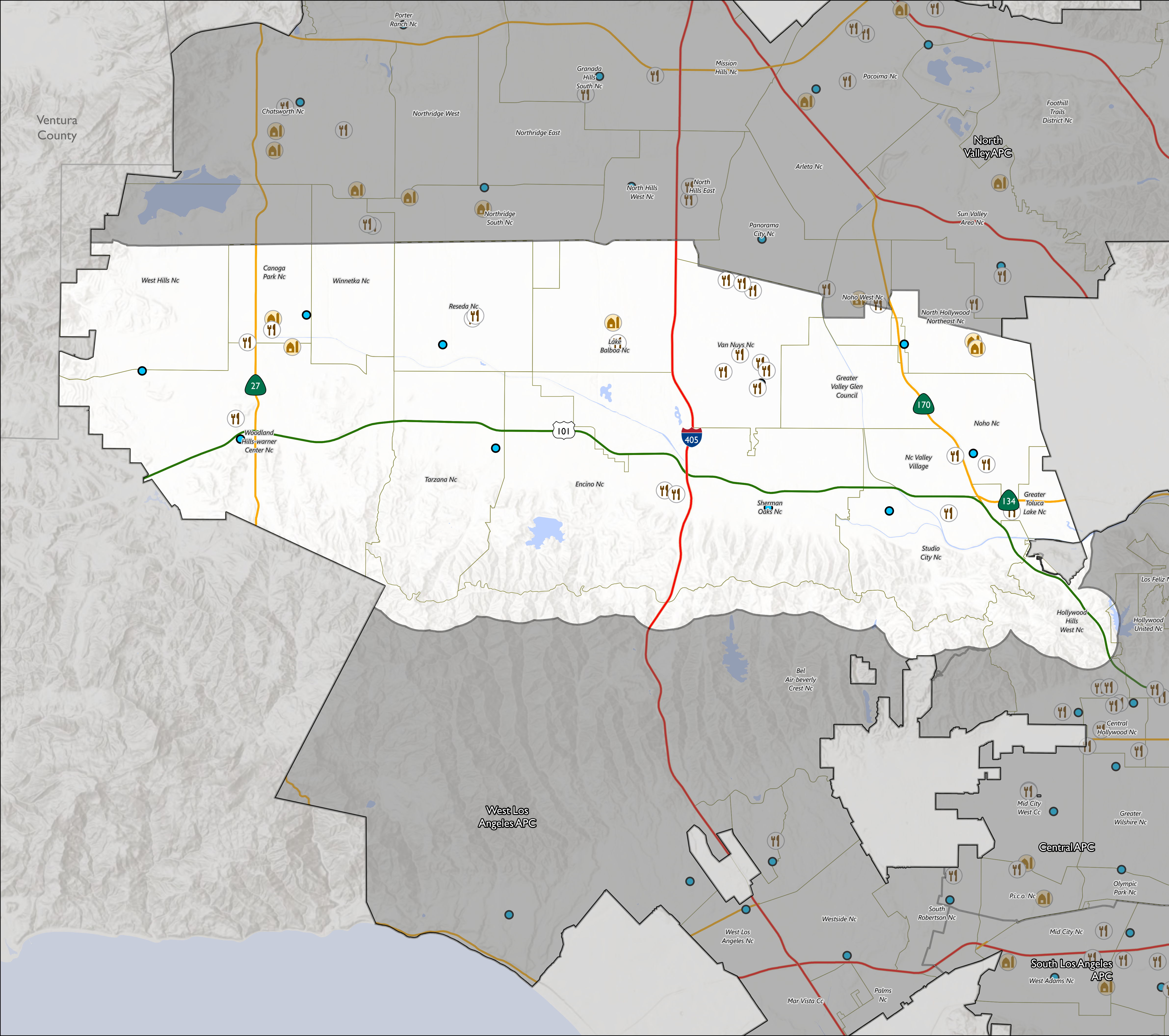
0 2 4
Miles

Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



South Los Angeles APC
Food, Hydration, Shelter Lifelines
Agriculture & Food Facility
Cooling Center
Food Assistance Services
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0 180 360
Inset Map
Miles
0 1 2
Miles
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
Central APC
East Los Angeles APC
West Los Angeles APC
Harbor APC
Mid City Nc
West Adams Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Empowerment Congress North Area Ndc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Empowerment Congress Southwest Area Ndc
Empowerment Congress Southeast Area Ndc
Park Mesa Heights Cc
Voices Of 90037
Zapata King Nc
South Central Nc
Central Alameda Nc
Community And Neighbors For Ninth District Unity (Candu)
Watts Nc
Harbor Gateway North Nc
Pico Union Nc
Downtown Los Angeles
Historic Cultural Nc
Historic Cultural North Nc
Boyle Heights Nc
Westlake South Nc
Macarthur Park Nc
Wilshire Center - Koreatown Nc
Olympic Park Nc
Greater Wilshire Nc
P.i.c.o. Nc
South Robertson Nc
Westside Nc
Palms Nc
Del Rey Nc
Nc Westchester/playa
10
110
105
187

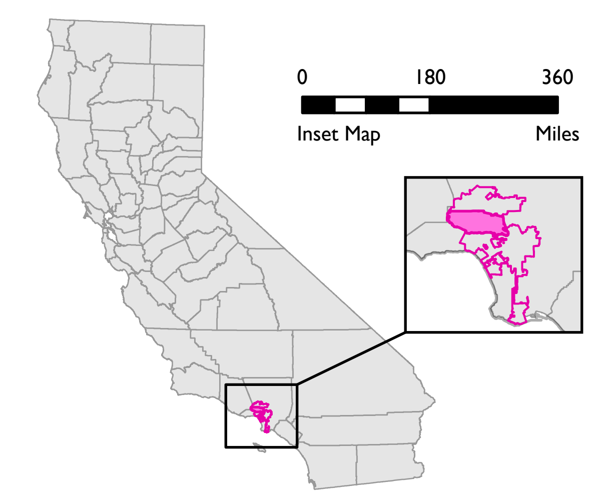
South Valley APC



N
W E
S

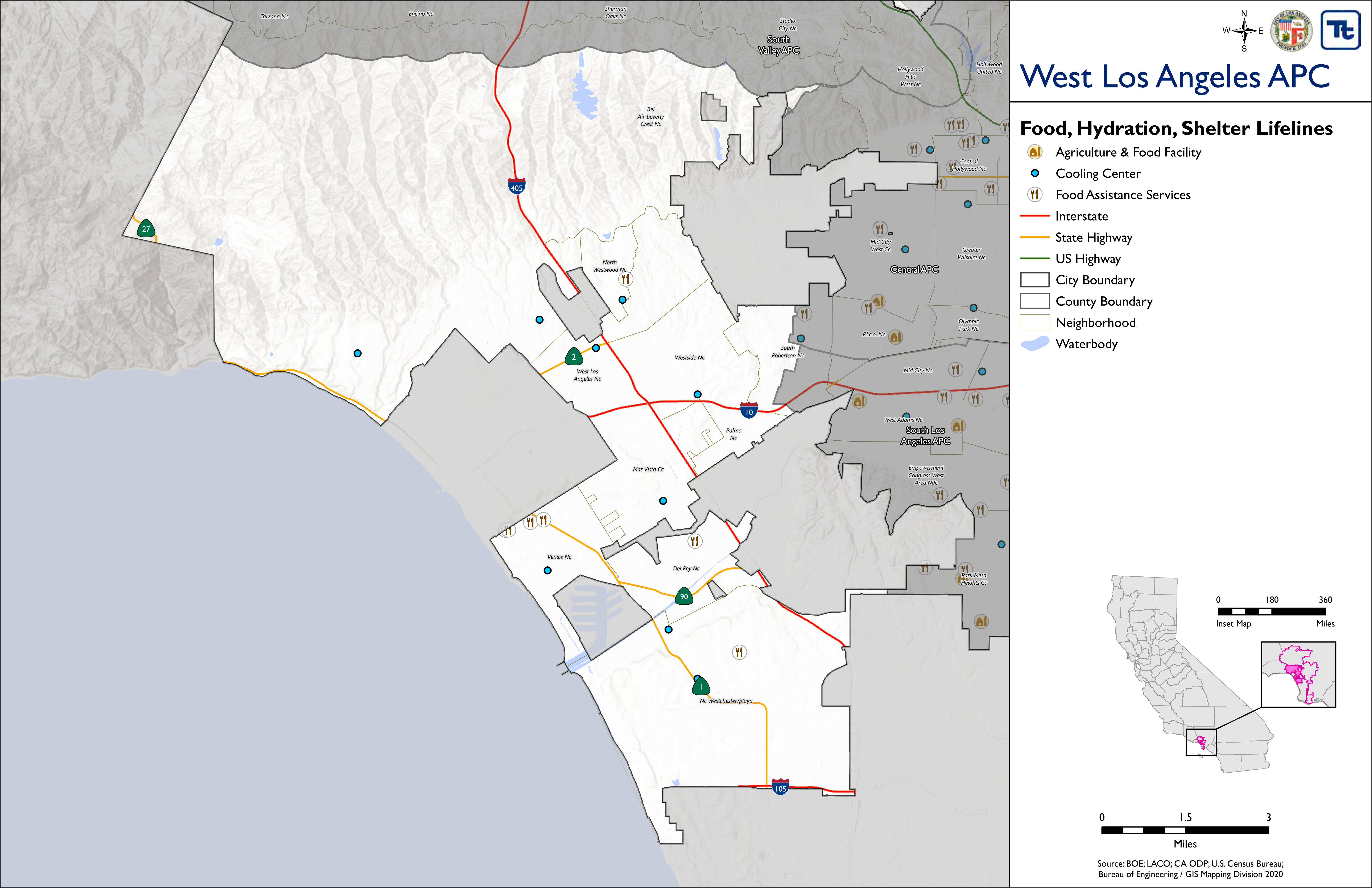
Food, Hydration, Shelter Lifelines

- Agriculture & Food Facility
- Cooling Center
- Food Assistance Services
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1.5 3
Miles

Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020



West Los Angeles APC
Food, Hydration, Shelter Lifelines
Agriculture & Food Facility
Cooling Center
Food Assistance Services
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
W
E
S
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
South Valley APC
Hollywood Hills West Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
North Westwood Nc
Mid City West Cc
Central APC
Greater Wilshire Nc
Westside Nc
South Robertson Nc
Olympic Park Nc
P.i.c.o. Nc
Mid City Nc
West Los Angeles Nc
Palms Nc
West Adams Nc
South Los Angeles APC
Mar Vista Cc
Empowerment Congress West Area Ndc
Venice Nc
Del Rey Nc
Park Mesa Heights Cc
Nc Westchester/playa
405
27
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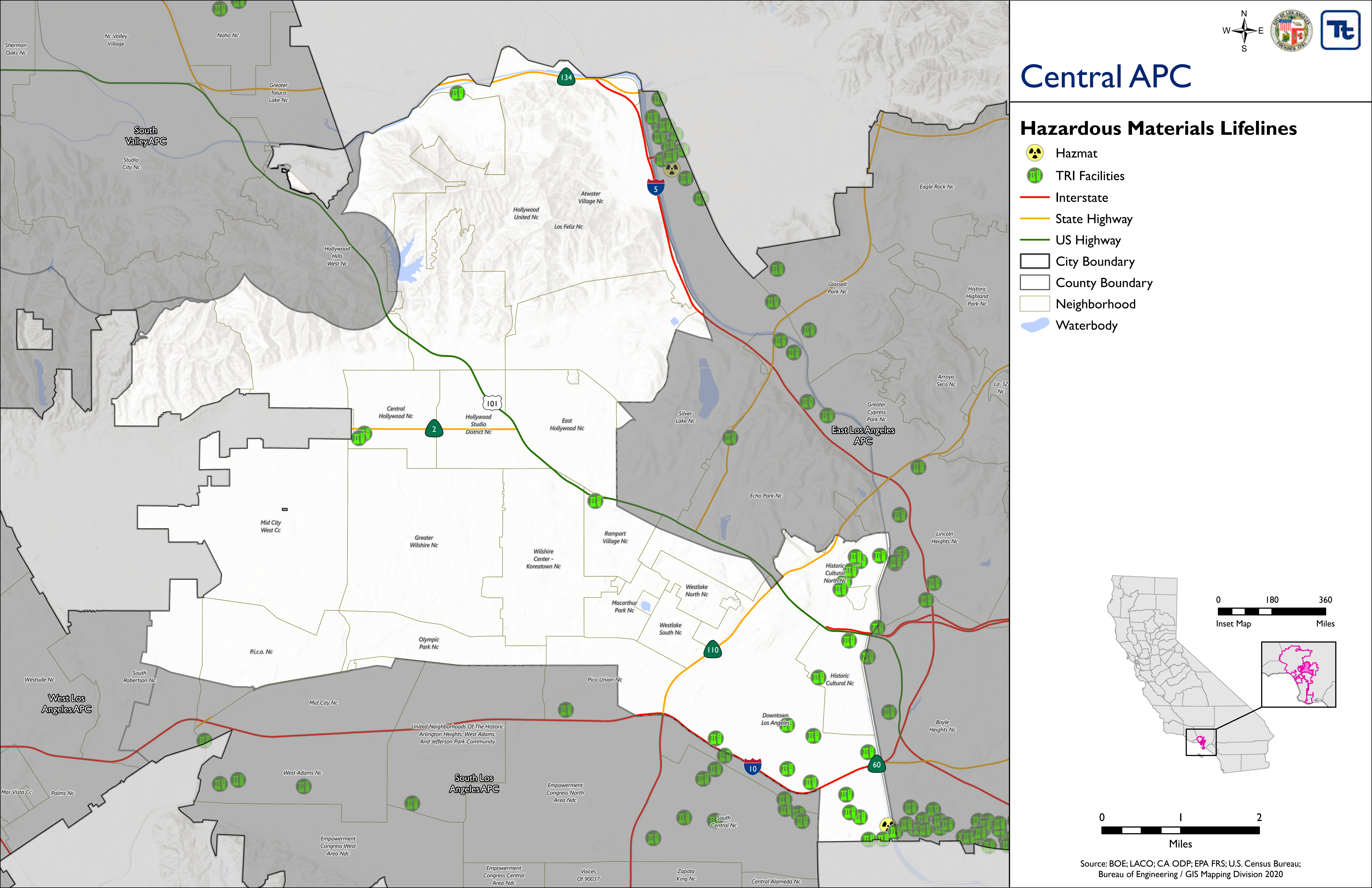
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



Central APC
Hazardous Materials Lifelines
Hazmat
TRI Facilities
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; EPA FRS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
South Valley APC
East Los Angeles APC
West Los Angeles APC
South Los Angeles APC
Sherman Oaks Nc
Nc Valley Village
Noho Nc
Greater Toluca Lake Nc
Studio City Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
La 32 Nc
Greater Cypress Park Nc
Silver Lake Nc
Central Hollywood Nc
Hollywood Studio District Nc
East Hollywood Nc
Echo Park Nc
Lincoln Heights Nc
Mid City West Cc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Rampart Village Nc
Historic Cultural North Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
Olympic Park Nc
P.i.c.o. Nc
Pico Union Nc
Historic Cultural Nc
Downtown Los Angeles
Boyle Heights Nc
Westside Nc
South Robertson Nc
Mid City Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
West Adams Nc
Mar Vista Cc
Palms Nc
Empowerment Congress North Area Ndc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
South Central Nc
Central Alameda Nc
134
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101
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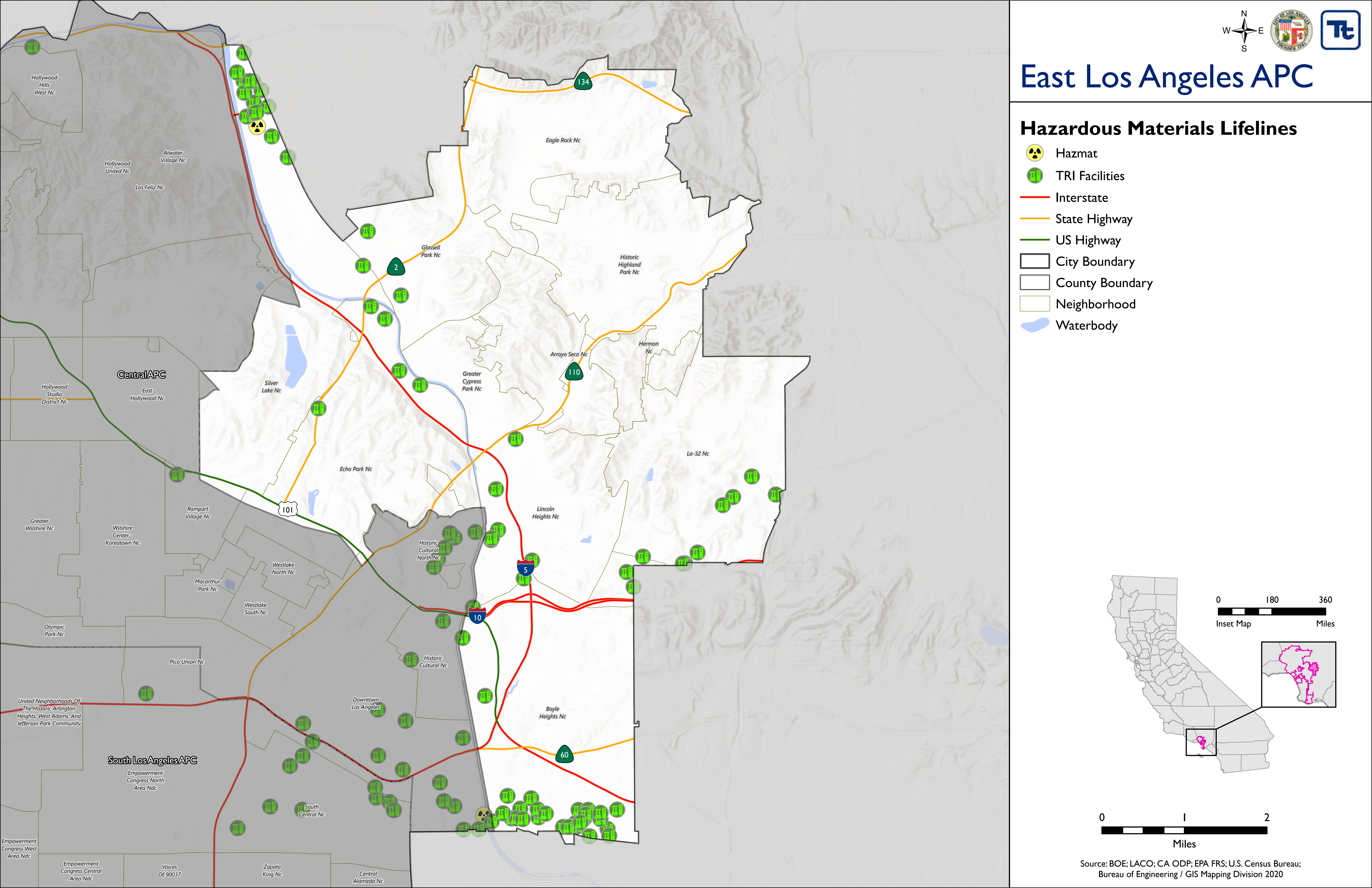
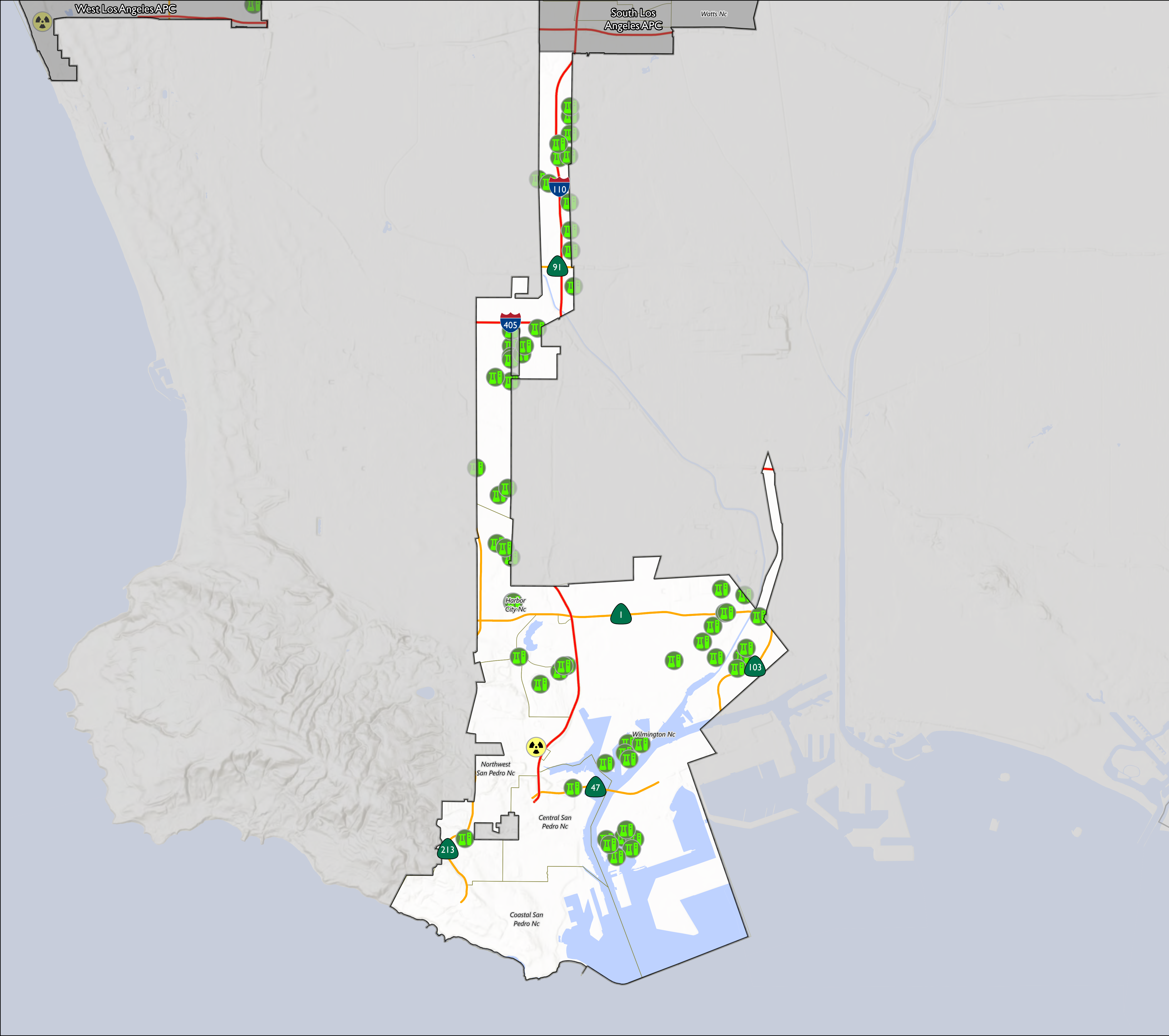
60



East Los Angeles APC
Hazardous Materials Lifelines
Hazmat
TRI Facilities
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Hermon Nc
Arroyo Seco Nc
Greater Cypress Park Nc
Silver Lake Nc
Echo Park Nc
La-32 Nc
Lincoln Heights Nc
Historic Cultural North Nc
Historic Cultural Nc
Boyle Heights Nc
Downtown Los Angeles
Central APC
South Los Angeles APC
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
East Hollywood Nc
Hollywood Studio District Nc
Rampart Village Nc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
Olympic Park Nc
Pico Union Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Empowerment Congress North Area Ndc
South Central Nc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
Central Alameda Nc
134
2
110
101
5
10
60
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; EPA FRS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

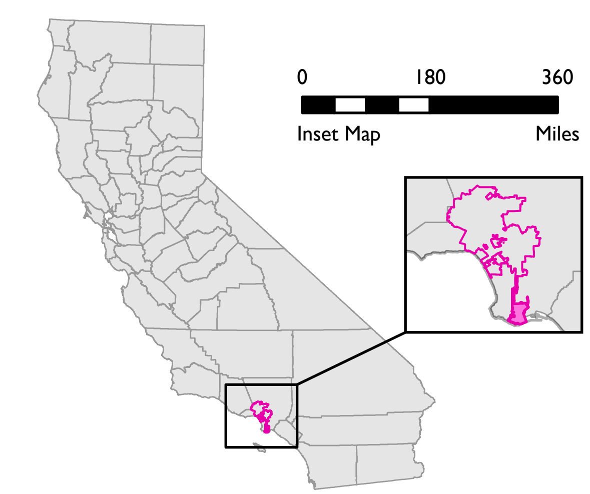


N
W E
S

Harbor APC

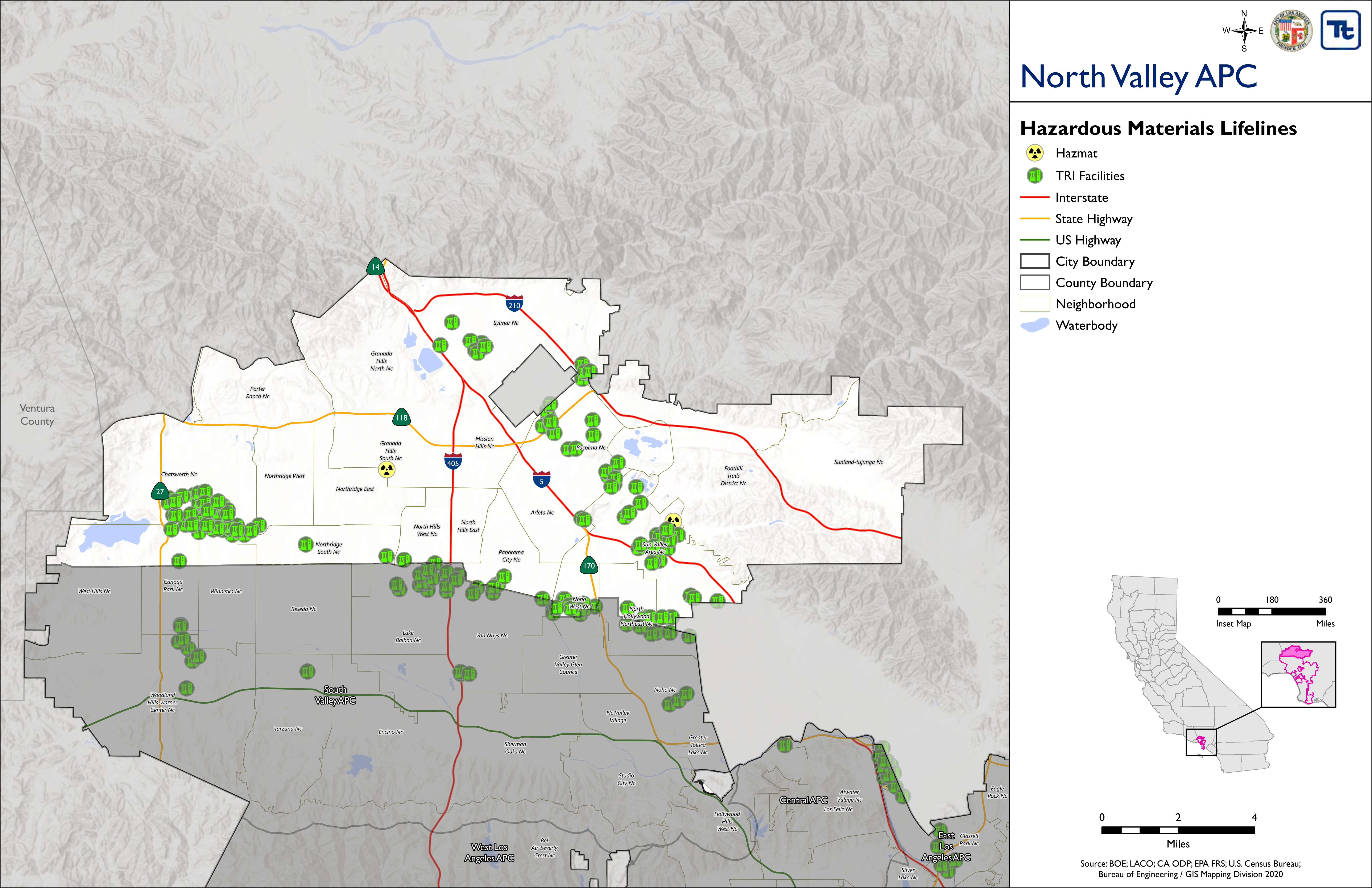
Hazardous Materials Lifelines

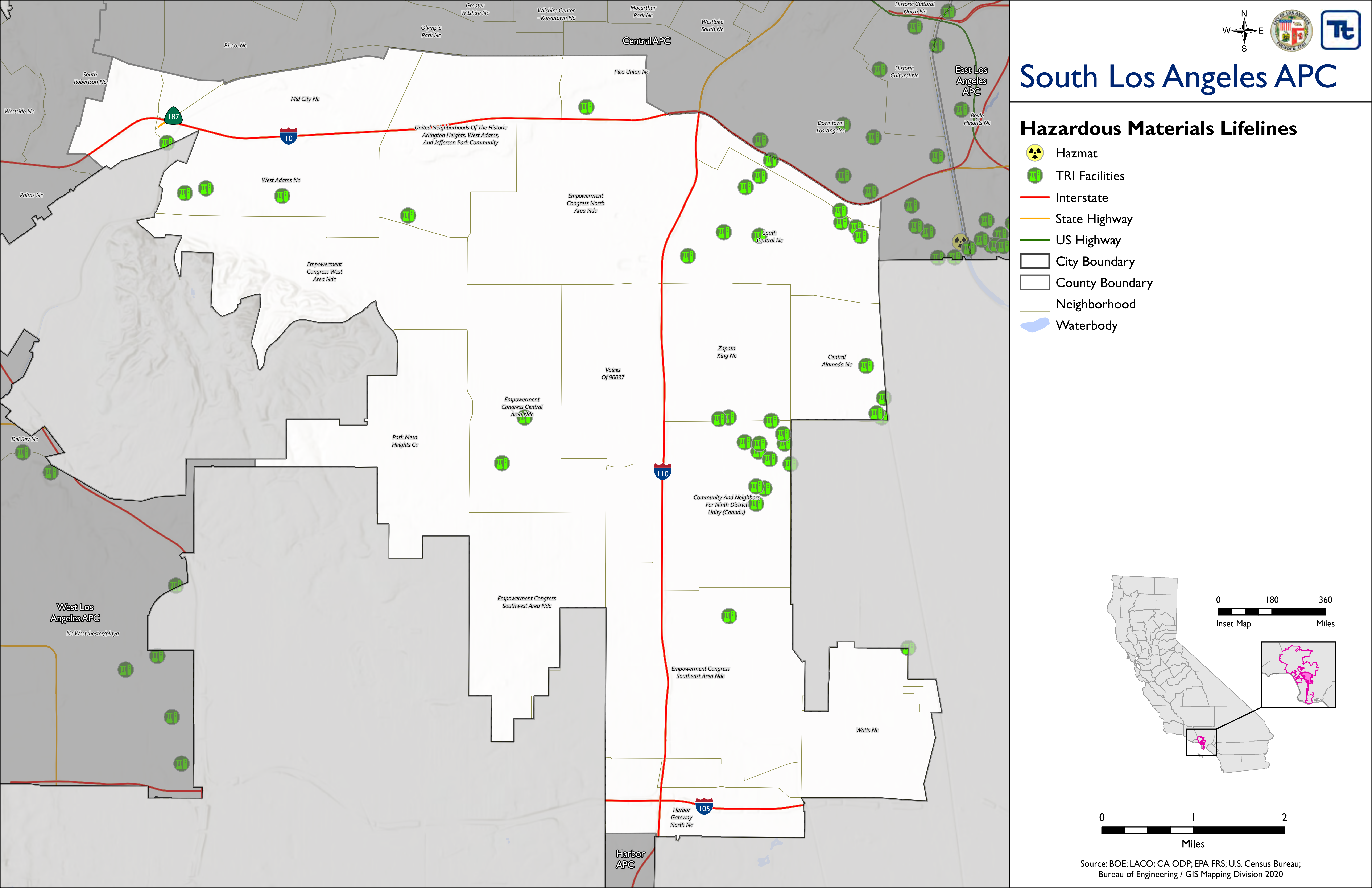
- Hazmat
- TRI Facilities
- Interstate
- State Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1.5 3
Miles

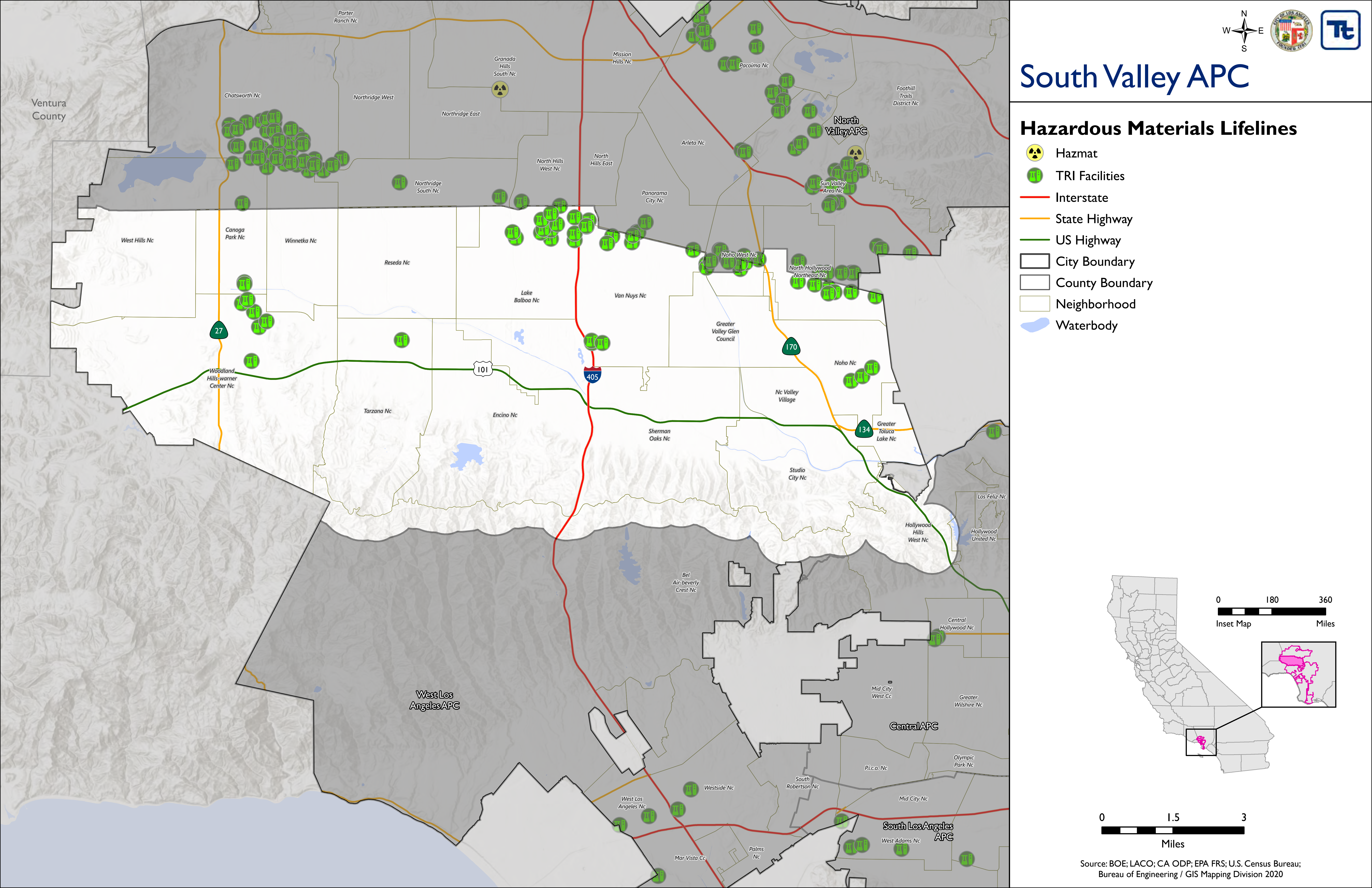
Source: BOE; LACO; CA ODP; EPA FRS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020


North Valley APC
Hazardous Materials Lifelines
Hazmat
TRI Facilities
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
W
E
S
Ventura County
Porter Ranch Nc
Granada Hills North Nc
Sylmar Nc
Granada Hills South Nc
Mission Hills Nc
Pacoima Nc
Chatsworth Nc
Northridge West
Northridge East
Foothill Trails District Nc
Sunland-tujunga Nc
North Hills West Nc
North Hills East
Arleta Nc
Panorama City Nc
Sun Valley Area Nc
Northridge South Nc
West Hills Nc
Canoga Park Nc
Winnetka Nc
Reseda Nc
Lake Balboa Nc
Van Nuys Nc
Noho West Nc
North Hollywood Northeast Nc
Greater Valley Glen Council
Noho Nc
South Valley APC
Woodland Hills-warner Center Nc
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Nc Valley Village
Greater Toluca Lake Nc
Studio City Nc
Central APC
Atwater Village Nc
Los Feliz Nc
Eagle Rock Nc
Hollywood Hills West Nc
West Los Angeles APC
Bel Air-beverly Crest Nc
East Los Angeles APC
Glassell Park Nc
Silver Lake Nc
14
210
118
405
5
27
170
0
180
360
Inset Map
Miles
0
2
4
Miles
Source: BOE; LACO; CA ODP; EPA FRS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020


South Los Angeles APC
Hazardous Materials Lifelines
Hazmat
TRI Facilities
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; EPA FRS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
Central APC
East Los Angeles APC
West Los Angeles APC
Harbor APC
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Macarthur Park Nc
Westlake South Nc
Historic Cultural North Nc
Olympic Park Nc
Pico Nc
South Robertson Nc
Westside Nc
Mid City Nc
Pico Union Nc
Historic Cultural Nc
Downtown Los Angeles
Boyle Heights Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Palms Nc
West Adams Nc
Empowerment Congress North Area Ndc
South Central Nc
Empowerment Congress West Area Ndc
Zapata King Nc
Central Alameda Nc
Voices Of 90037
Empowerment Congress Central Area Ndc
Park Mesa Heights Cc
Del Rey Nc
Community And Neighbors For Ninth District Unity (Candu)
Empowerment Congress Southwest Area Ndc
Nc Westchester/playa
Empowerment Congress Southeast Area Ndc
Watts Nc
Harbor Gateway North Nc
187
10
110
105

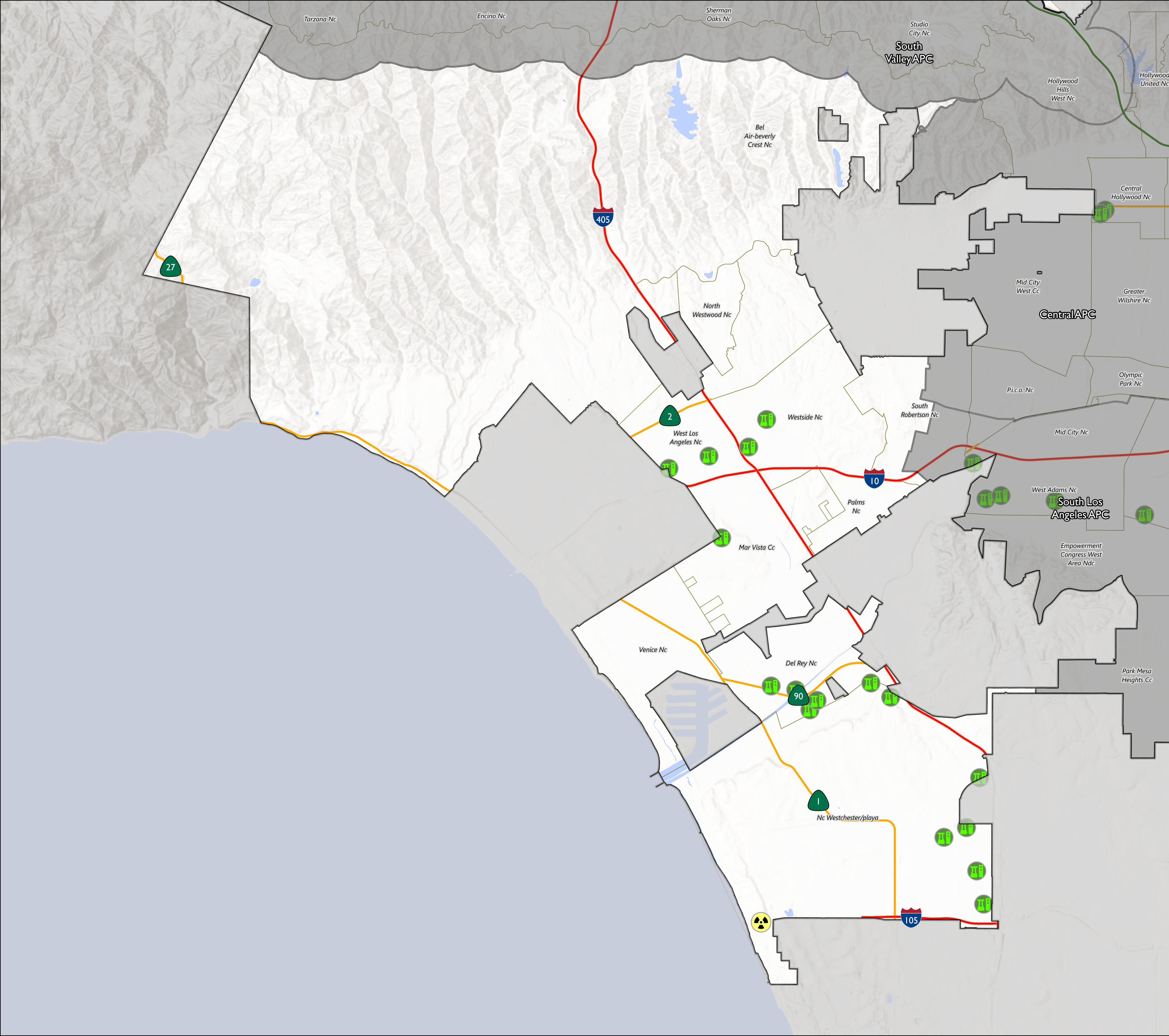
South Valley APC

Hazardous Materials Lifelines



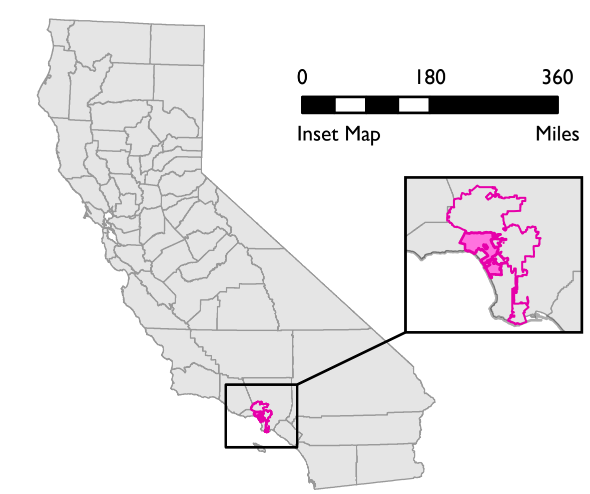
Source: BOE; LACO; CA ODP; EPA FRS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

West Los Angeles APC



Hazardous Materials Lifelines

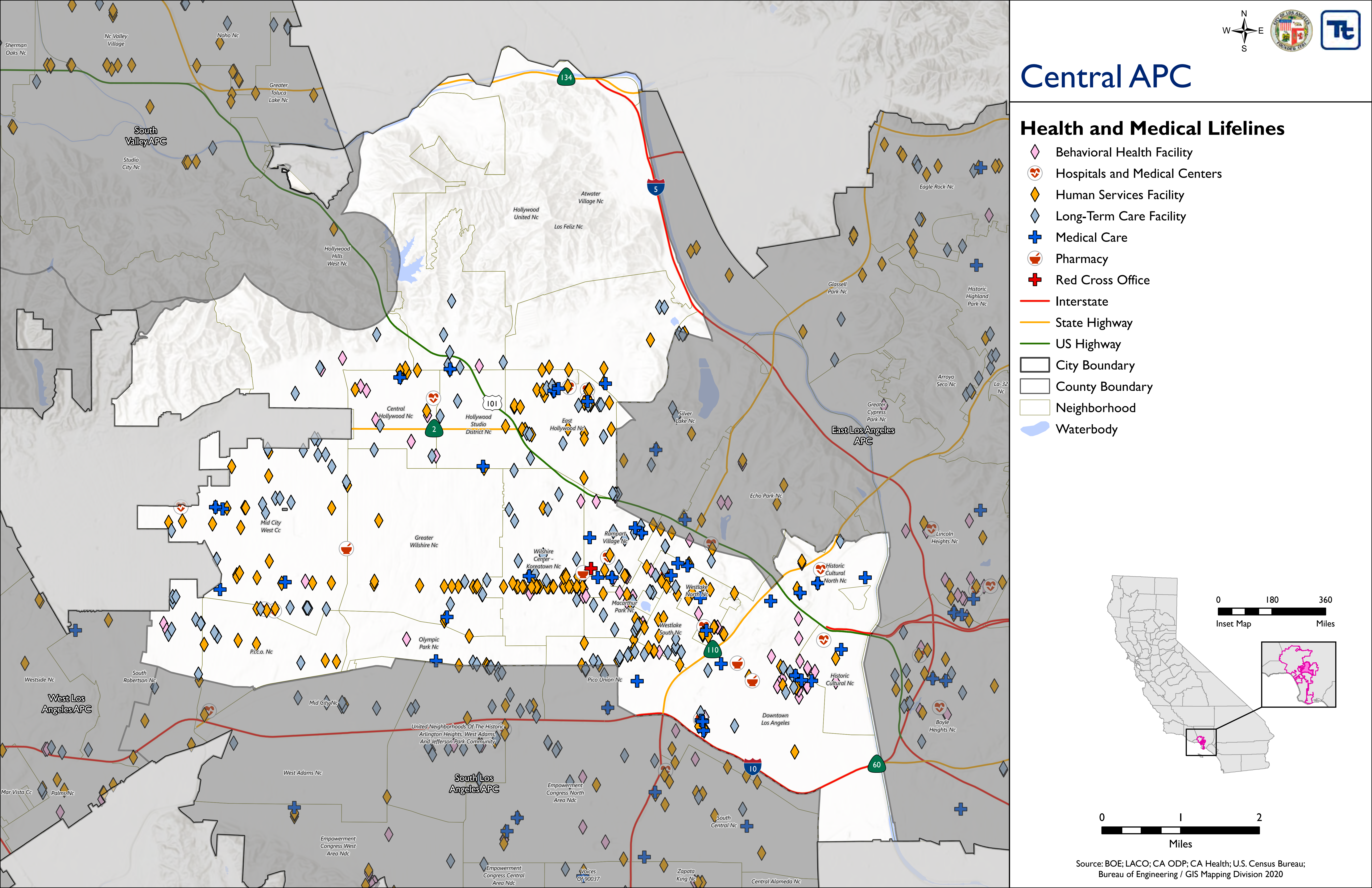
- Hazmat
- TRI Facilities
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

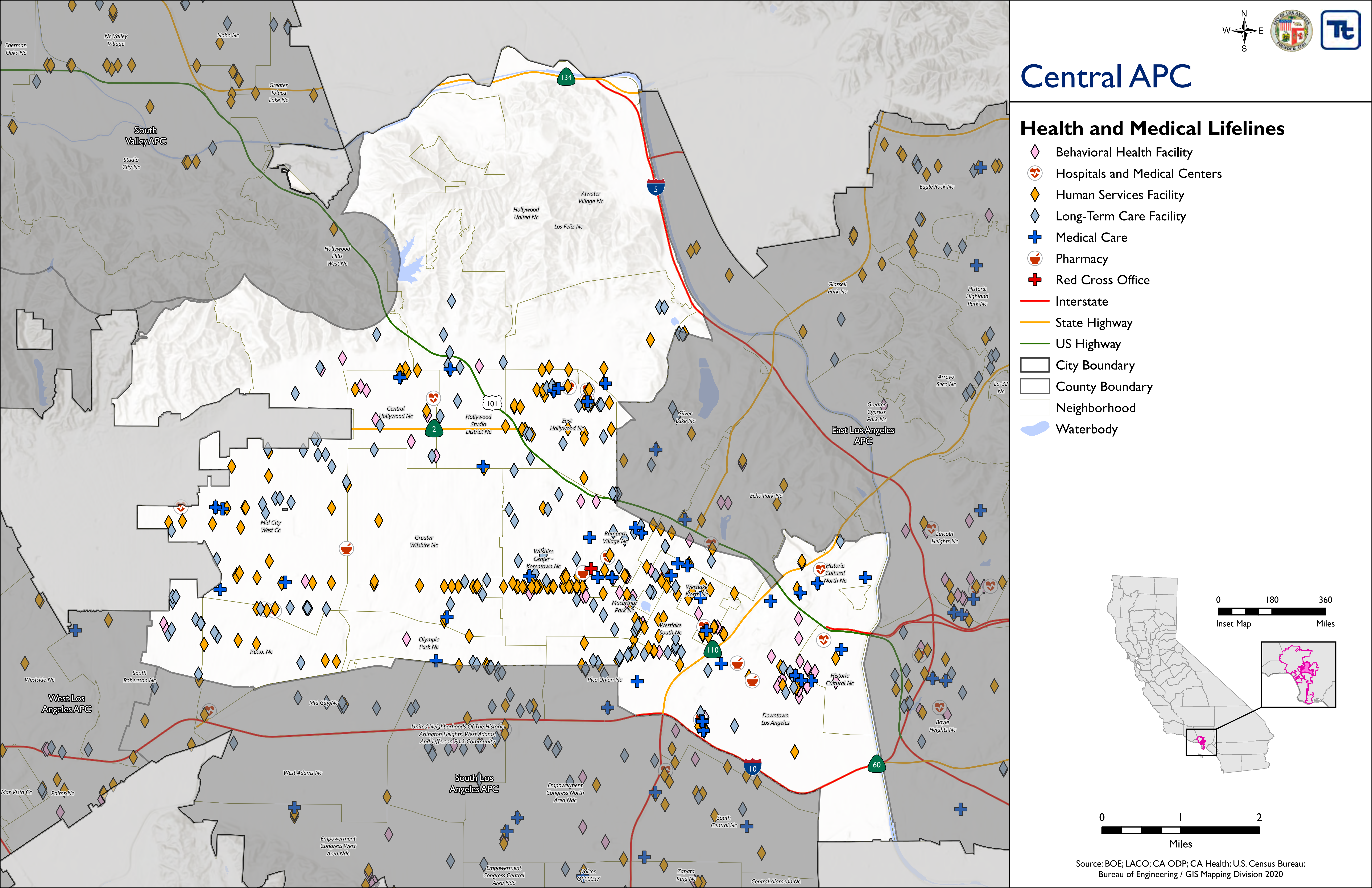


0 1.5 3

Miles

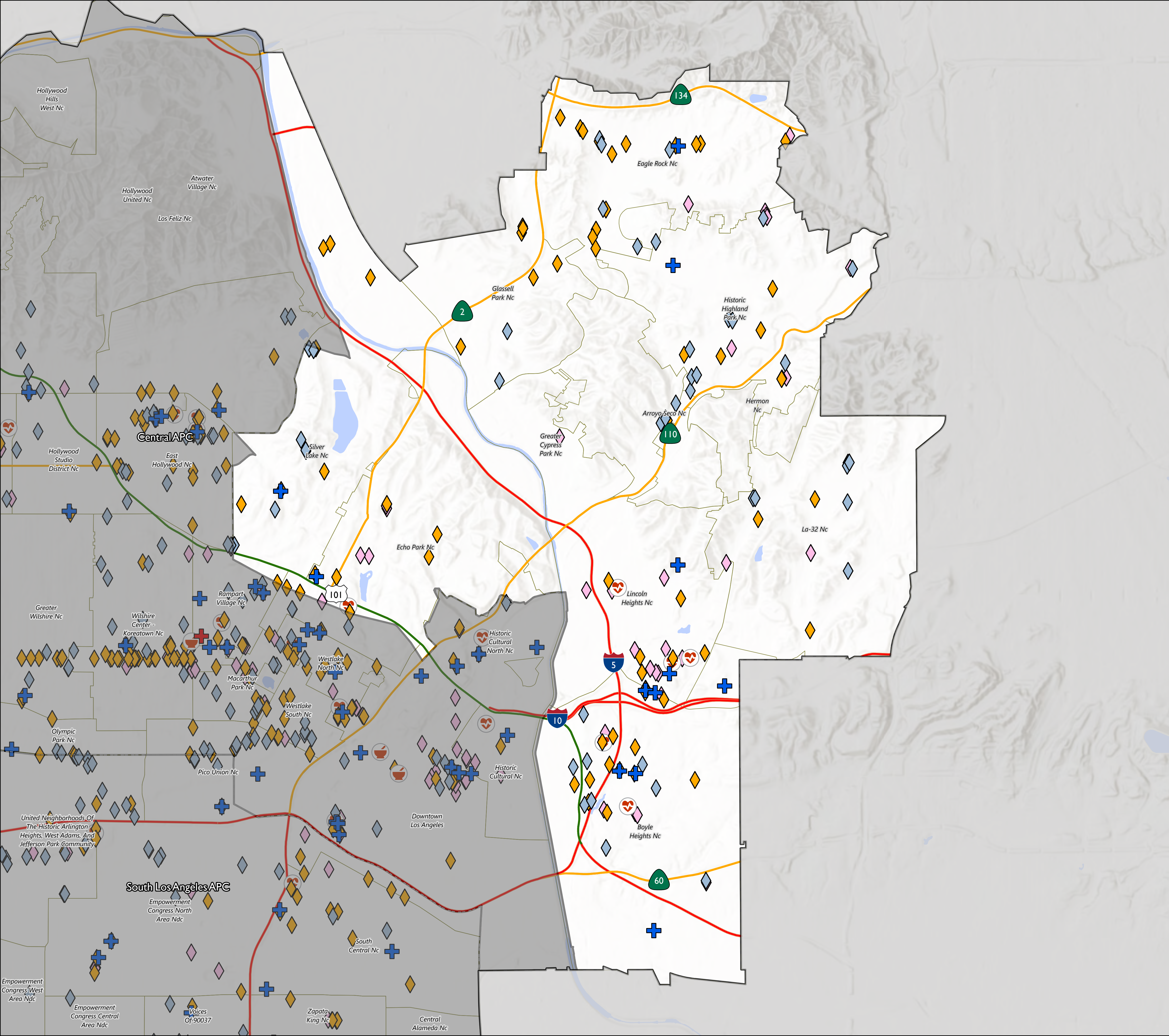
Source: BOE; LACO; CA ODP; EPA FRS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020


Central APC
Health and Medical Lifelines
Behavioral Health Facility
Hospitals and Medical Centers
Human Services Facility
Long-Term Care Facility
Medical Care
Pharmacy
Red Cross Office
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
South Valley APC
West Los Angeles APC
South Los Angeles APC
East Los Angeles APC
Sherman Oaks Nc
Nc Valley Village
Noho Nc
Greater Toluca Lake Nc
Studio City Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Central Hollywood Nc
Hollywood Studio District Nc
East Hollywood Nc
Silver Lake Nc
Glassell Park Nc
Eagle Rock Nc
Historic Highland Park Nc
Arroyo Seco Nc
Greater Cypress Park Nc
Echo Park Nc
Lincoln Heights Nc
Mid City West Cc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Rampart Village Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
Historic Cultural North Nc
Historic Cultural Nc
Olympic Park Nc
P.i.c.o. Nc
Pico Union Nc
Downtown Los Angeles
Boyle Heights Nc
Westside Nc
South Robertson Nc
Mid City Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
West Adams Nc
Mar Vista Cc
Palms Nc
Empowerment Congress North Area Ndc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
South Central Nc
Central Alameda Nc
134
5
101
2
110
10
60



Central APC
Health and Medical Lifelines
Behavioral Health Facility
Hospitals and Medical Centers
Human Services Facility
Long-Term Care Facility
Medical Care
Pharmacy
Red Cross Office
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
W
E
S
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
South Valley APC
East Los Angeles APC
West Los Angeles APC
South Los Angeles APC
Sherman Oaks Nc
Nc Valley Village
Noho Nc
Greater Toluca Lake Nc
Studio City Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Silver Lake Nc
Arroyo Seco Nc
La 32 Nc
Greater Cypress Park Nc
Central Hollywood Nc
Hollywood Studio District Nc
East Hollywood Nc
Echo Park Nc
Lincoln Heights Nc
Mid City West Cc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Rampart Village Nc
Historic Cultural North Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
Olympic Park Nc
P.i.c.o. Nc
Pico Union Nc
Historic Cultural Nc
Downtown Los Angeles
Boyle Heights Nc
Westside Nc
South Robertson Nc
Mid City Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
West Adams Nc
Mar Vista Cc
Palms Nc
Empowerment Congress North Area Ndc
South Central Nc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
Central Alameda Nc
134
5
101
2
110
10
60

East Los Angeles APC



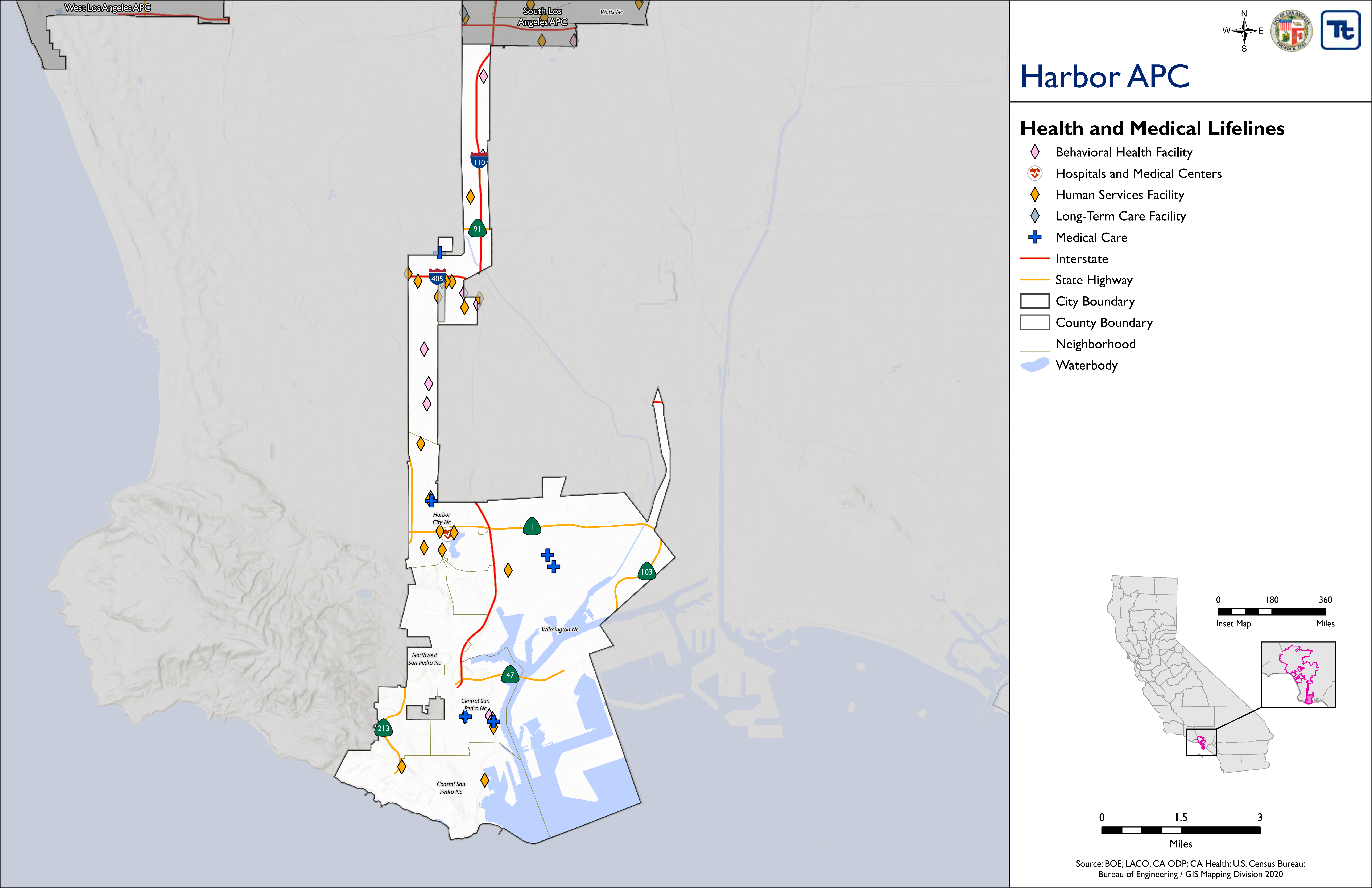
Health and Medical Lifelines

- Behavioral Health Facility
- Hospitals and Medical Centers
- Human Services Facility
- Long-Term Care Facility
- Medical Care
- Pharmacy
- Red Cross Office
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

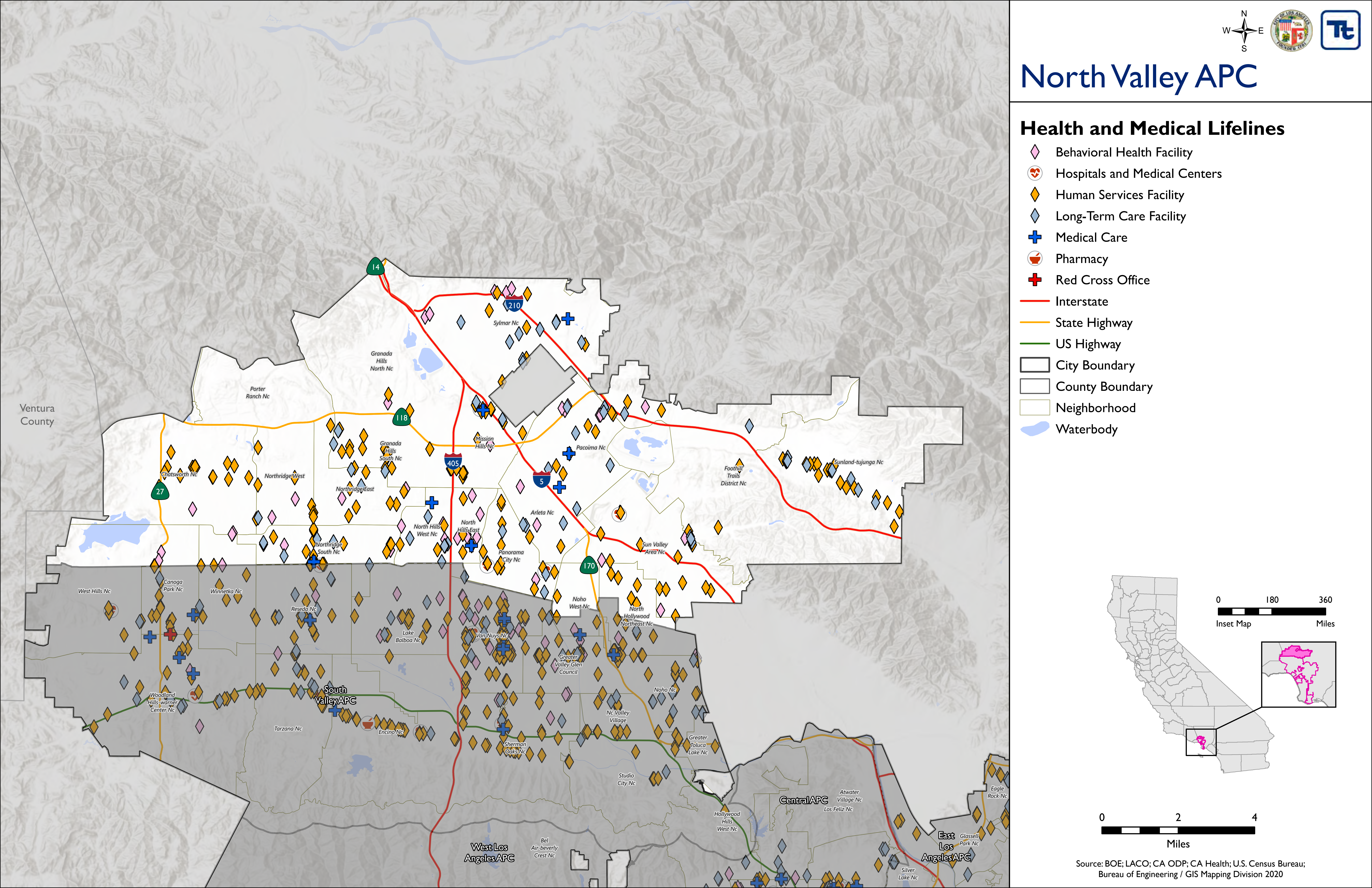
0 180 360
Inset Map Miles

0 1 2
Miles

Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

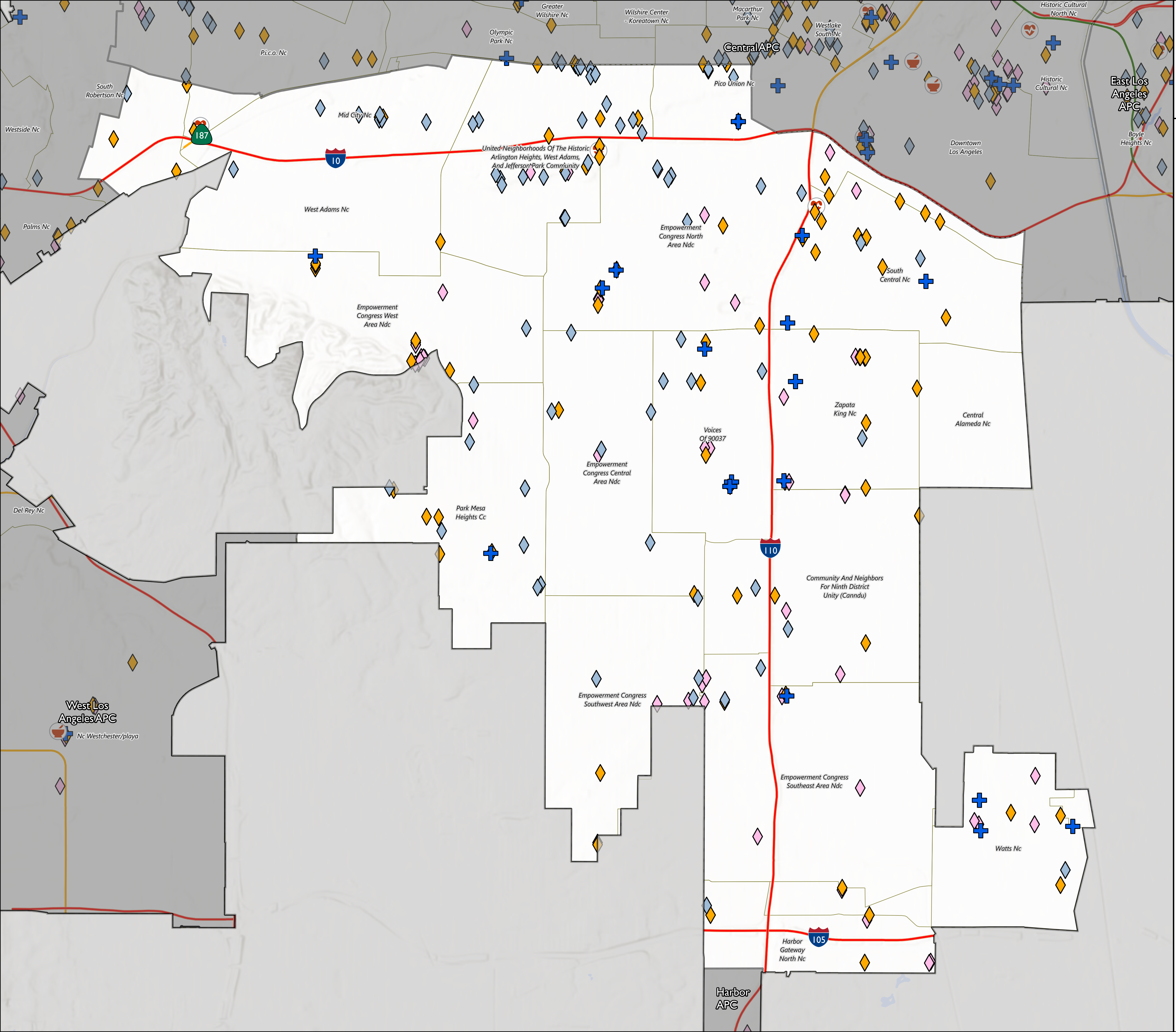


Harbor APC
Health and Medical Lifelines
Behavioral Health Facility
Hospitals and Medical Centers
Human Services Facility
Long-Term Care Facility
Medical Care
Interstate
State Highway
City Boundary
County Boundary
Neighborhood
Waterbody
West Los Angeles APC
South Los Angeles APC
Watts Nc
Harbor City Nc
Wilmington Nc
Northwest San Pedro Nc
Central San Pedro Nc
Coastal San Pedro Nc
110
405
91
1
103
47
213
0 180 360
Inset Map
Miles
0 1.5 3
Miles
Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020



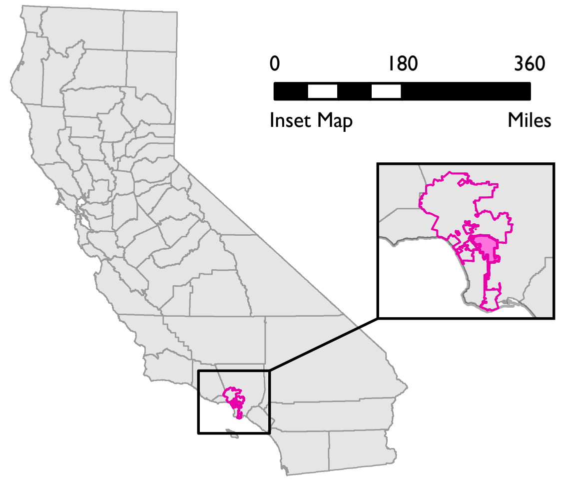
North Valley APC
Health and Medical Lifelines
Behavioral Health Facility
Hospitals and Medical Centers
Human Services Facility
Long-Term Care Facility
Medical Care
Pharmacy
Red Cross Office
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
W
E
S
0
180
360
Inset Map
Miles
0
2
4
Miles
Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020
Ventura County
Porter Ranch Nc
Granada Hills North Nc
Sylmar Nc
Granada Hills South Nc
Mission Hills Nc
Pacoima Nc
Foothill Trails District Nc
Sunland-tujunga Nc
Chatsworth Nc
Northridge West
Northridge East
North Hills West Nc
North Hills East
Arleta Nc
Panorama City Nc
Sun Valley Area Nc
Northridge South Nc
Noho West Nc
North Hollywood Northeast Nc
West Hills Nc
Canoga Park Nc
Winnetka Nc
Reseda Nc
Lake Balboa Nc
Van Nuys Nc
Greater Valley Glen Council
Noho Nc
Woodland Hills-warner Center Nc
South Valley APC
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Nc Valley Village
Greater Toluca Lake Nc
Studio City Nc
Central APC
Atwater Village Nc
Los Feliz Nc
Hollywood Hills West Nc
West Los Angeles APC
Bel Air-beverly Crest Nc
East Los Angeles APC
Eagle Rock Nc
Glassell Park Nc
Silver Lake Nc
14
210
118
405
5
27
170

South Los Angeles APC



Health and Medical Lifelines

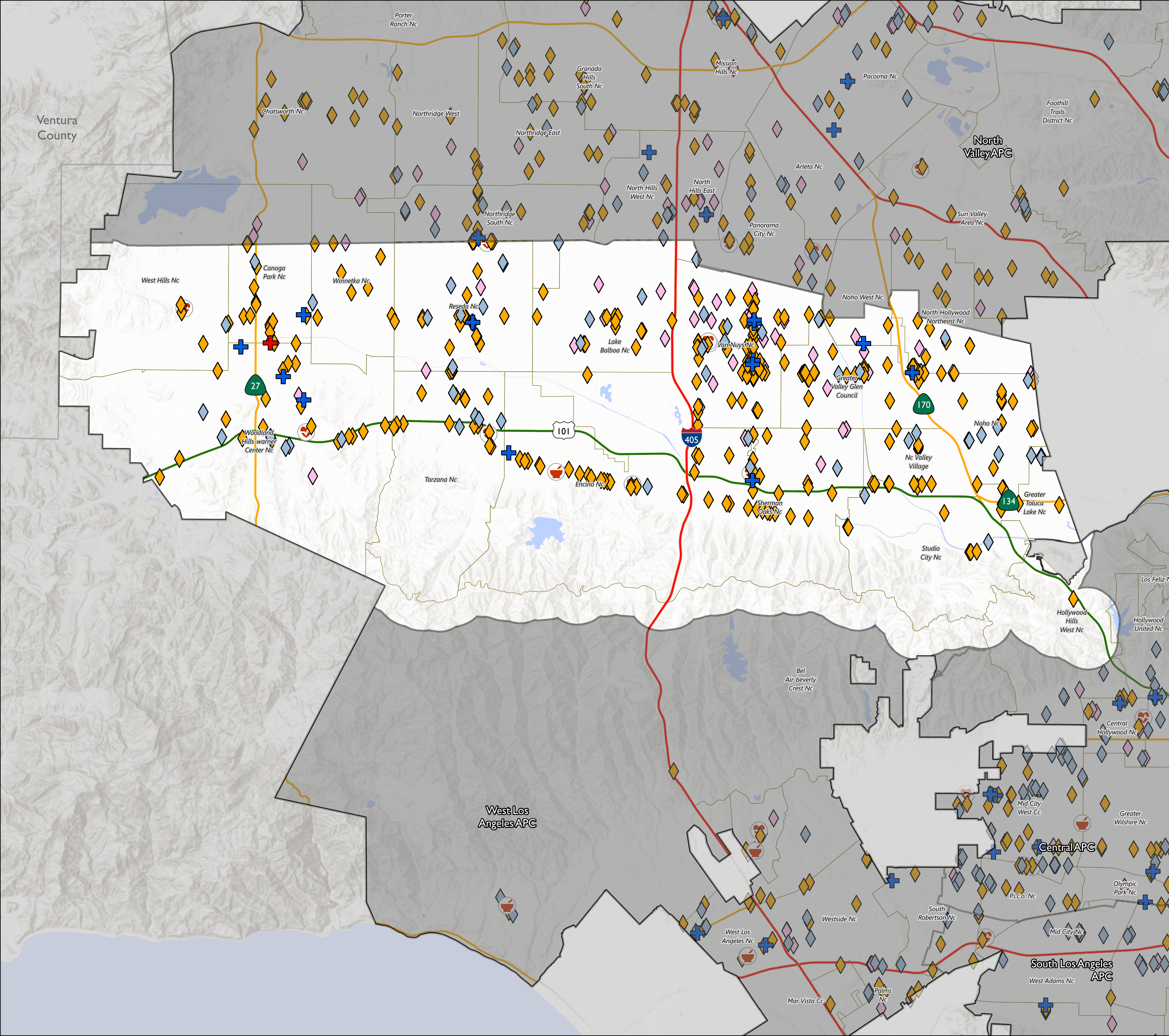
- Behavioral Health Facility
- Hospitals and Medical Centers
- Human Services Facility
- Long-Term Care Facility
- Medical Care
- Pharmacy
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1 2

Miles

Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



South Valley APC

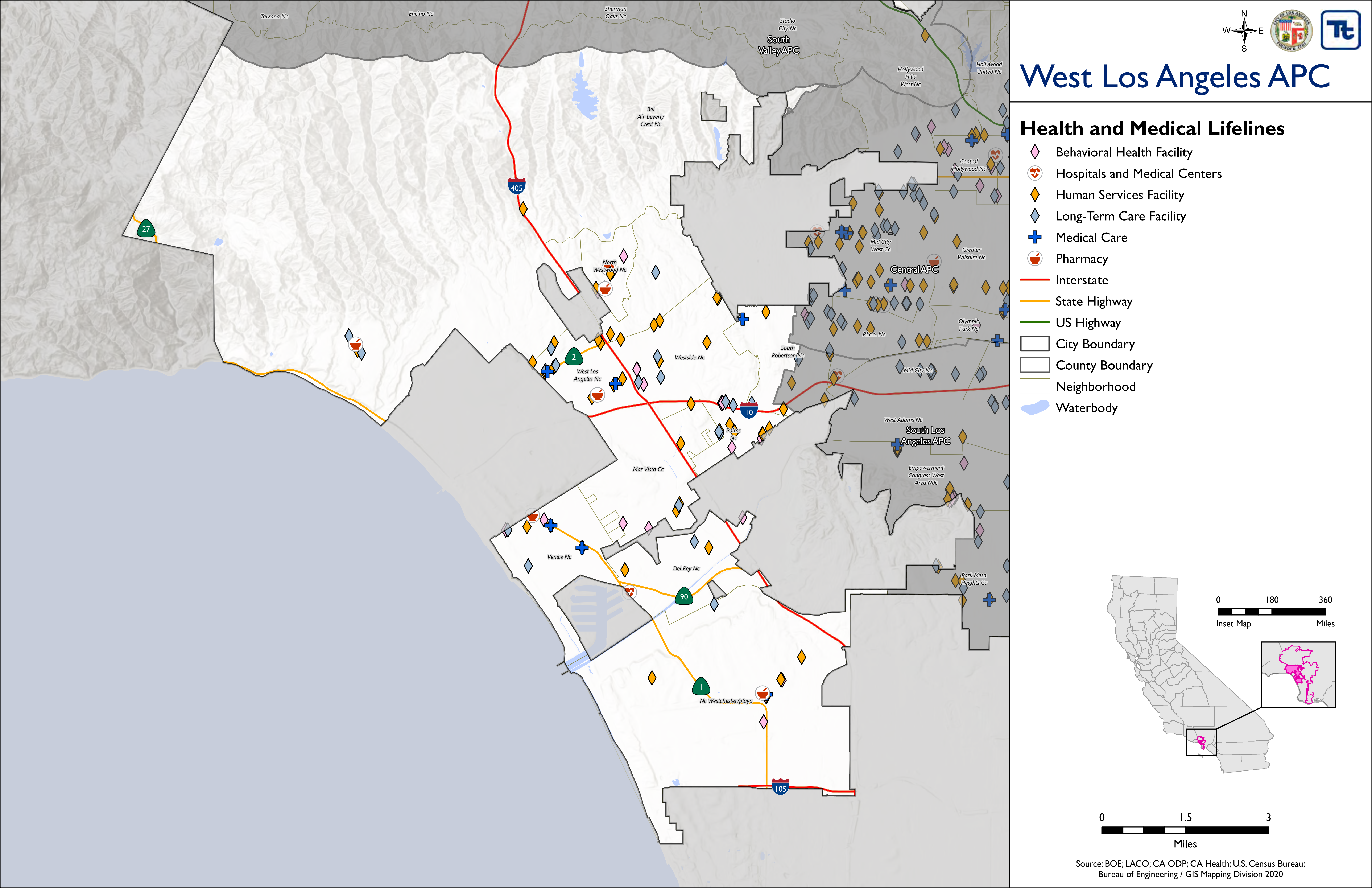
Health and Medical Lifelines

- Behavioral Health Facility
- Hospitals and Medical Centers
- Human Services Facility
- Long-Term Care Facility
- Medical Care
- Pharmacy
- Red Cross Office
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

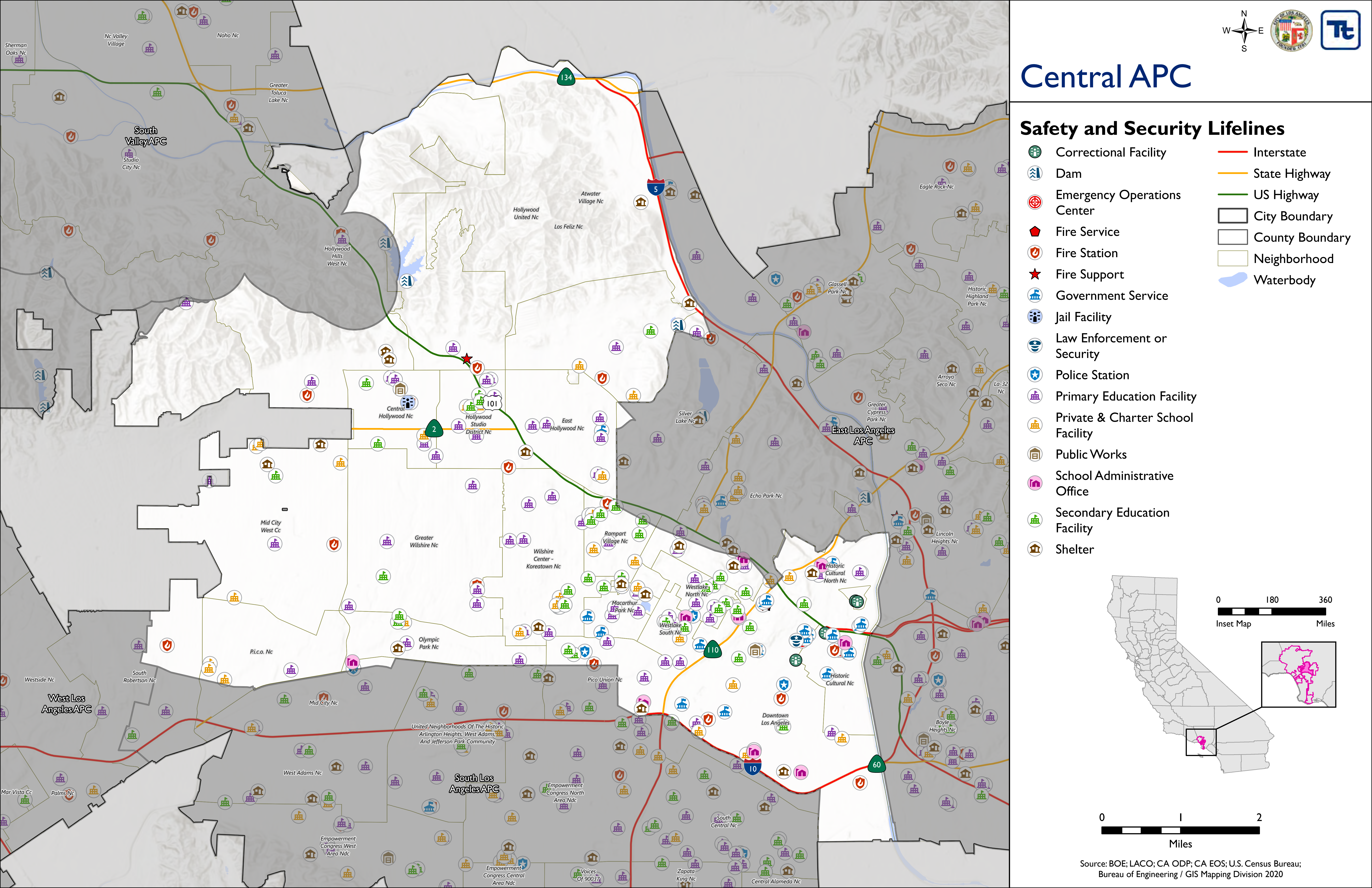
Inset Map: 0 180 360 Miles

0 1.5 3 Miles

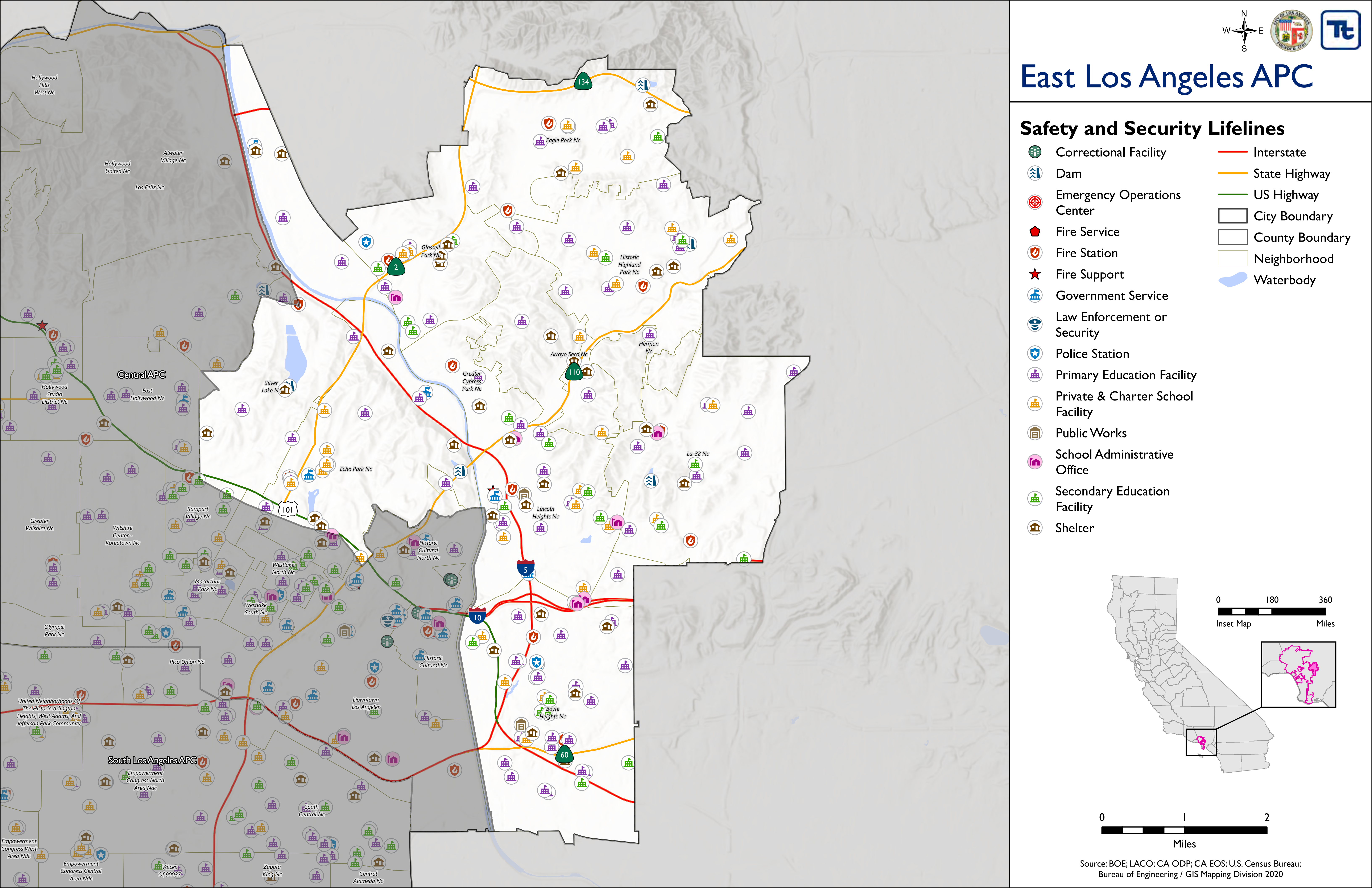
Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



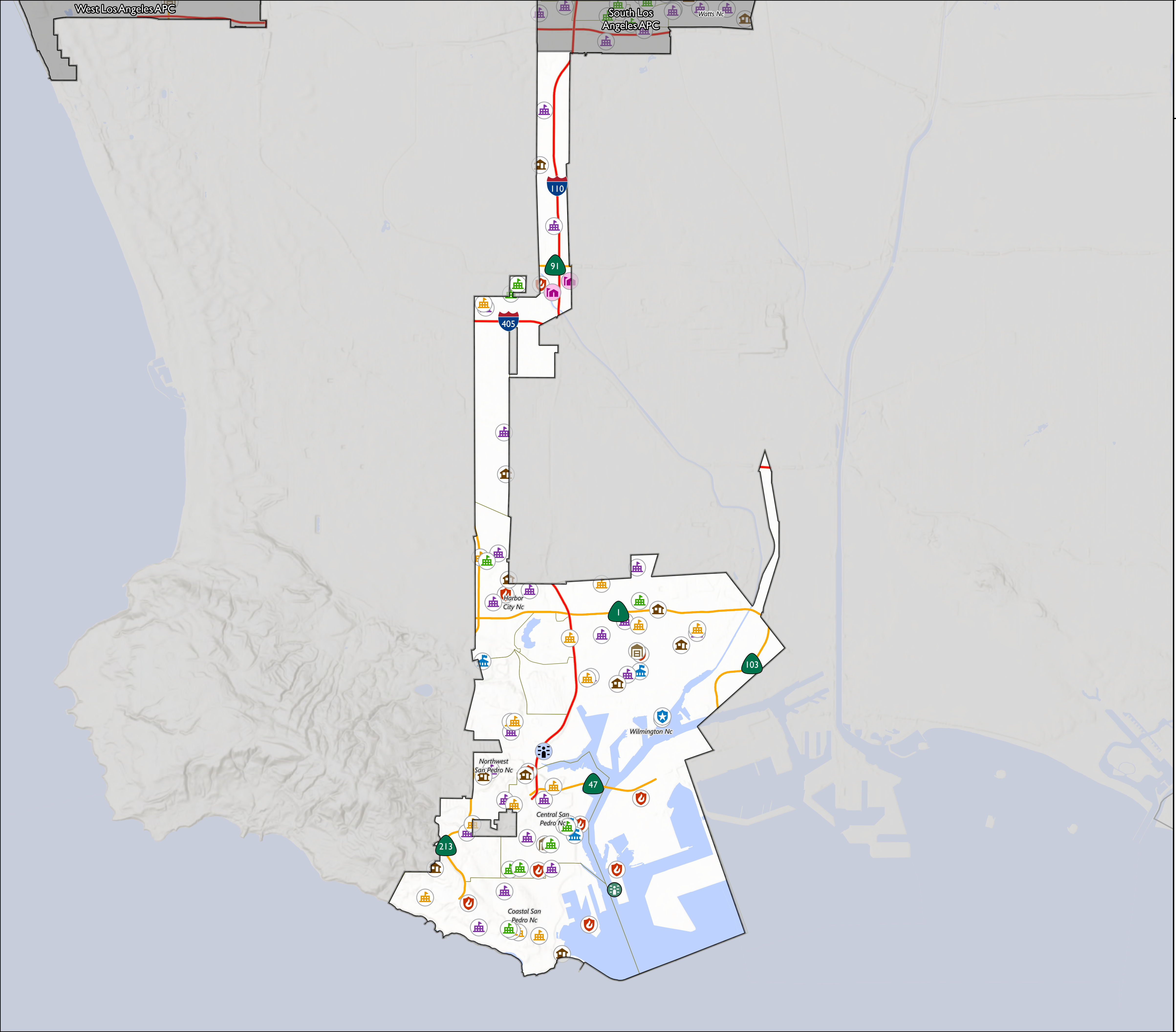
West Los Angeles APC
Health and Medical Lifelines
Behavioral Health Facility
Hospitals and Medical Centers
Human Services Facility
Long-Term Care Facility
Medical Care
Pharmacy
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
South Valley APC
Hollywood Hills West Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
North Westwood Nc
Mid City West Cc
Greater Wilshire Nc
Central APC
Olympic Park Nc
Pico Nc
South Robertson Nc
Westside Nc
West Los Angeles Nc
Mid City Nc
West Adams Nc
South Los Angeles APC
Palms Nc
Mar Vista Cc
Empowerment Congress West Area Ndc
Venice Nc
Del Rey Nc
Park Mesa Heights Cc
Nc Westchester/playa
405
27
2
10
90
1
105
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; CA Health; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



Central APC
Safety and Security Lifelines
Correctional Facility
Dam
Emergency Operations Center
Fire Service
Fire Station
Fire Support
Government Service
Jail Facility
Law Enforcement or Security
Police Station
Primary Education Facility
Private & Charter School Facility
Public Works
School Administrative Office
Secondary Education Facility
Shelter
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
0 180 360
Inset Map
Miles
0 1 2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
South Valley APC
West Los Angeles APC
South Los Angeles APC
East Los Angeles APC
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Central Hollywood Nc
Hollywood Studio District Nc
East Hollywood Nc
Mid City West Cc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Rampart Village Nc
Silver Lake Nc
Echo Park Nc
Westlake North Nc
Westlake South Nc
Macarthur Park Nc
Historic Cultural North Nc
Historic Cultural Nc
Downtown Los Angeles
P.i.c.o. Nc
Olympic Park Nc
Pico Union Nc



East Los Angeles APC
Safety and Security Lifelines
Correctional Facility
Dam
Emergency Operations Center
Fire Service
Fire Station
Fire Support
Government Service
Law Enforcement or Security
Police Station
Primary Education Facility
Private & Charter School Facility
Public Works
School Administrative Office
Secondary Education Facility
Shelter
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
Central APC
South Los Angeles APC
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
Hermon Nc
Greater Cypress Park Nc
Silver Lake Nc
Echo Park Nc
Lincoln Heights Nc
La-32 Nc
Boyle Heights Nc
Historic Cultural North Nc
Historic Cultural Nc
Downtown Los Angeles
Westlake North Nc
Westlake South Nc
Macarthur Park Nc
Pico Union Nc
Rampart Village Nc
Wilshire Center - Koreatown Nc
Greater Wilshire Nc
Olympic Park Nc
East Hollywood Nc
Hollywood Studio District Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Empowerment Congress North Area Ndc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
South Central Nc
Central Alameda Nc
134
2
110
101
5
10
60



Harbor APC

Safety and Security Lifelines

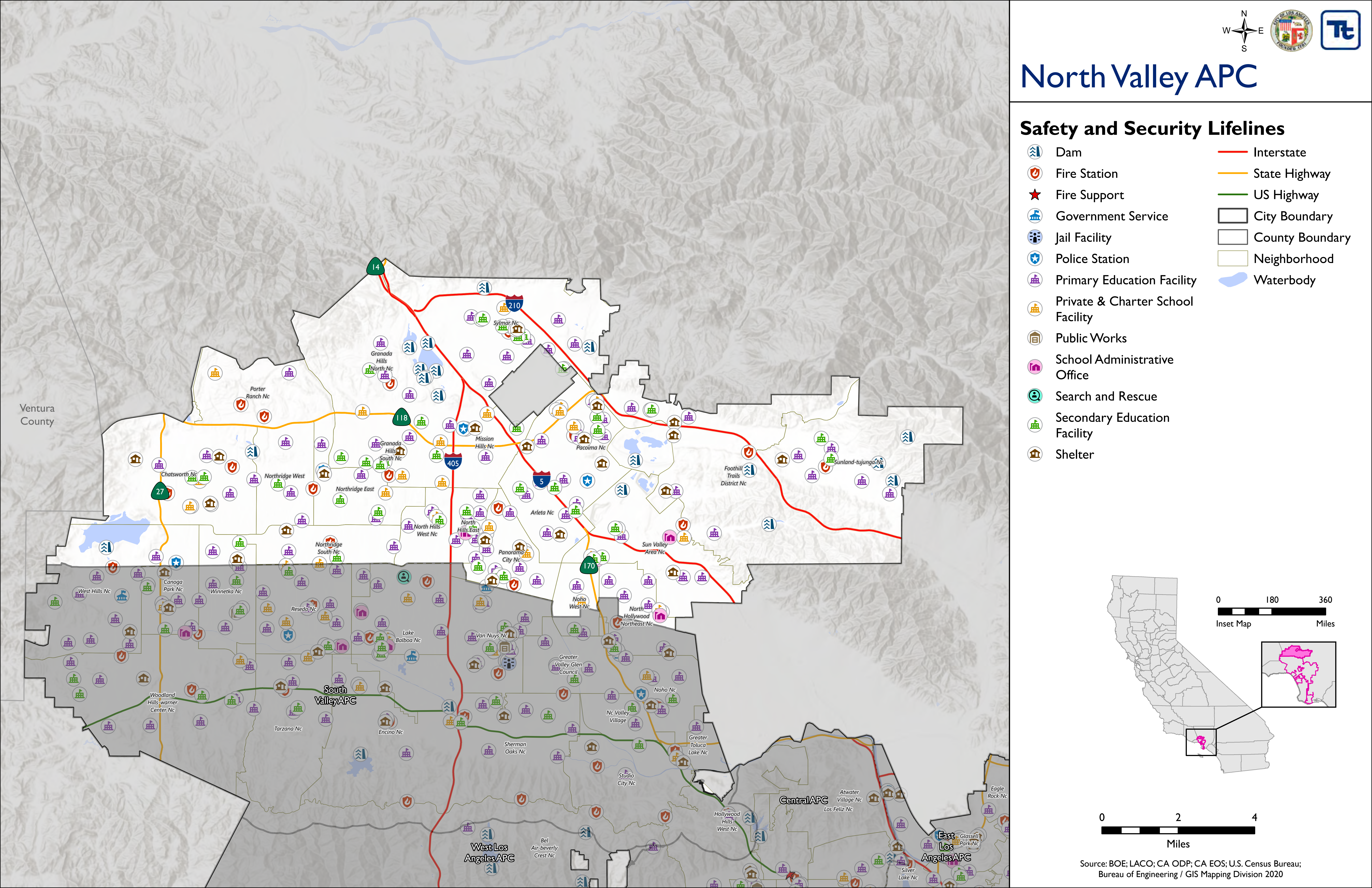
- Correctional Facility
- Fire Station
- Government Service
- Jail Facility
- Police Station
- Primary Education Facility
- Private & Charter School Facility
- Public Works
- School Administrative Office
- Secondary Education Facility
- Shelter
- Interstate
- State Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

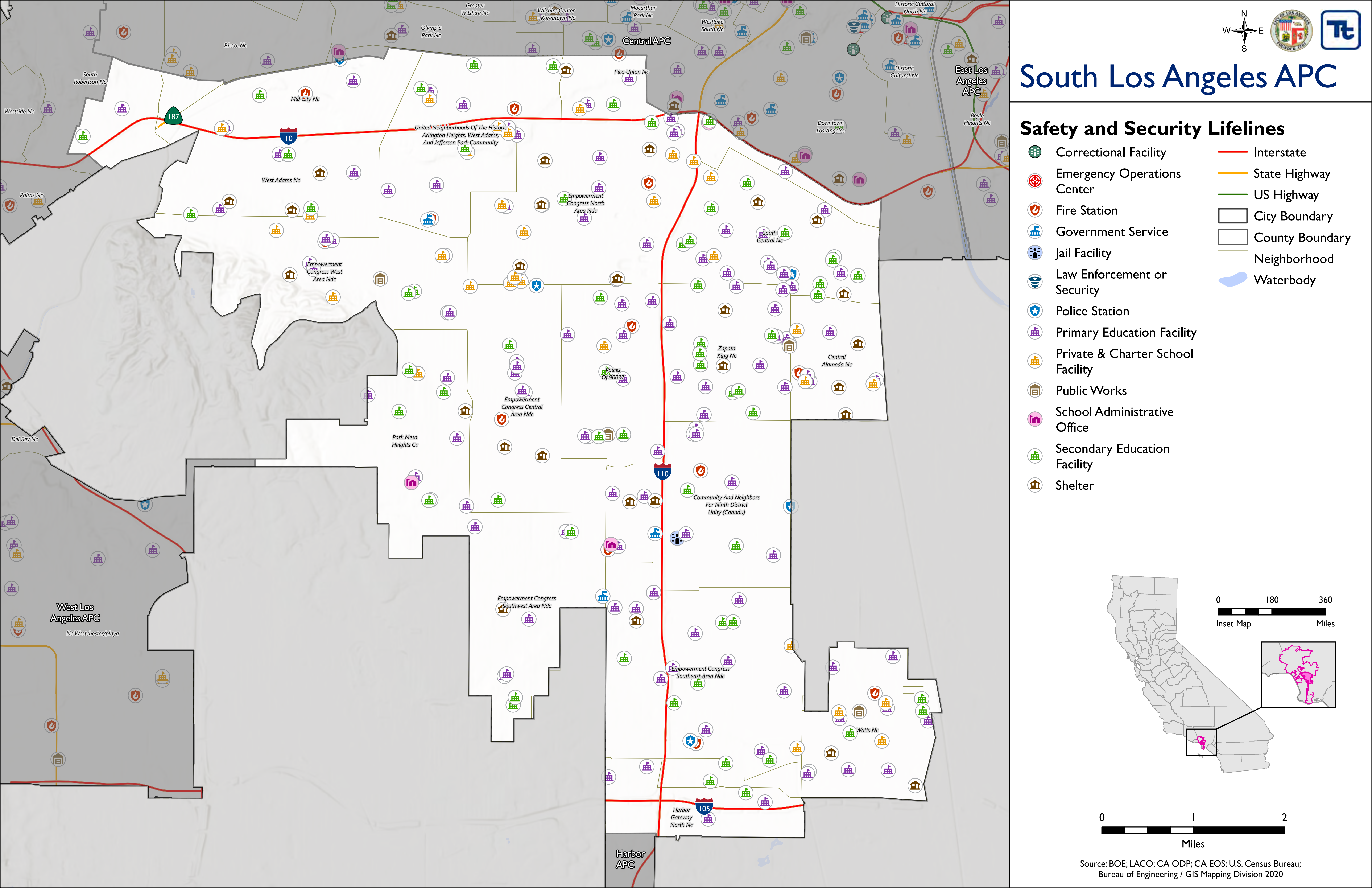
0 180 360
Inset Map Miles

0 1.5 3
Miles

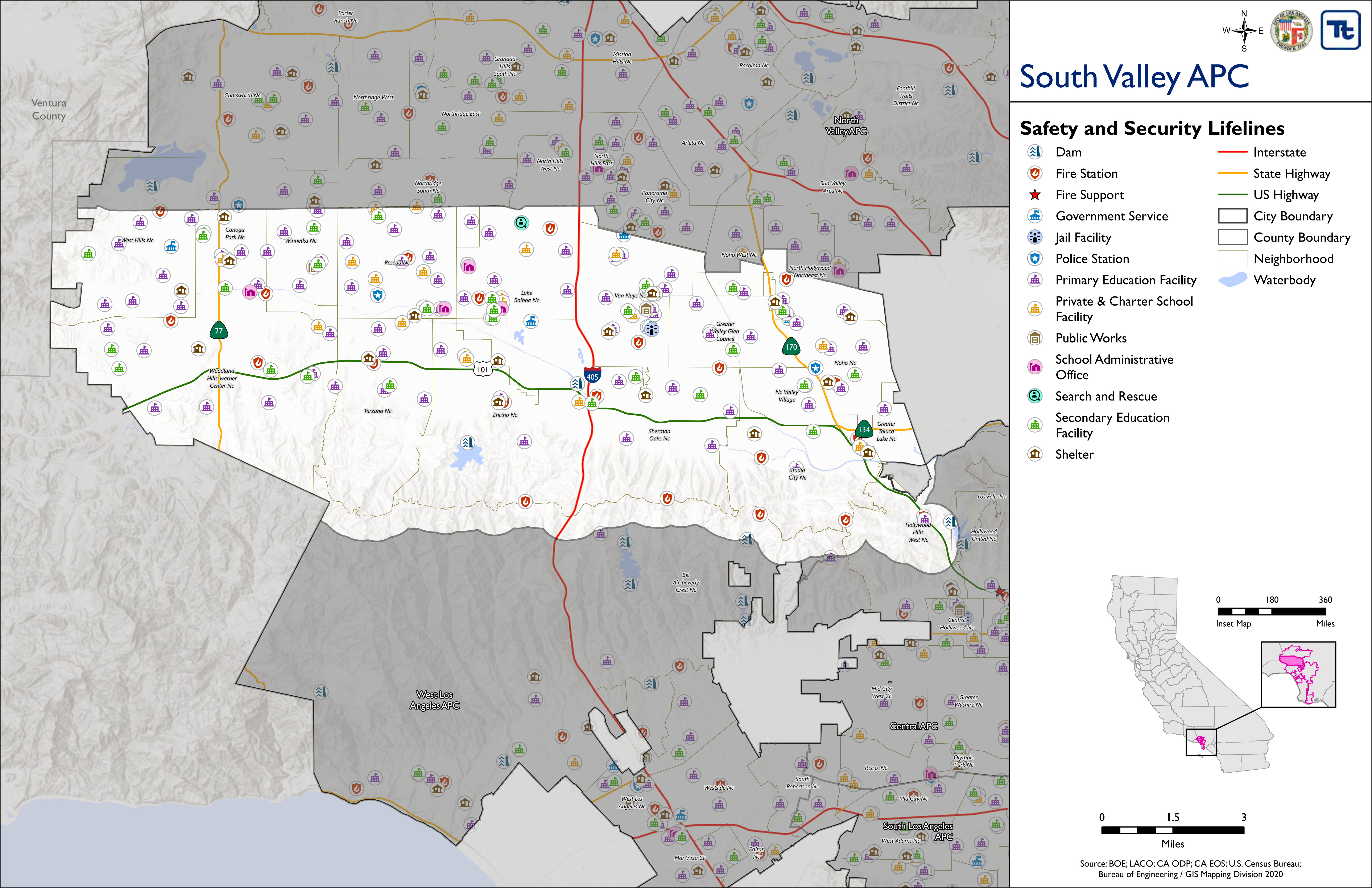
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

North Valley APC

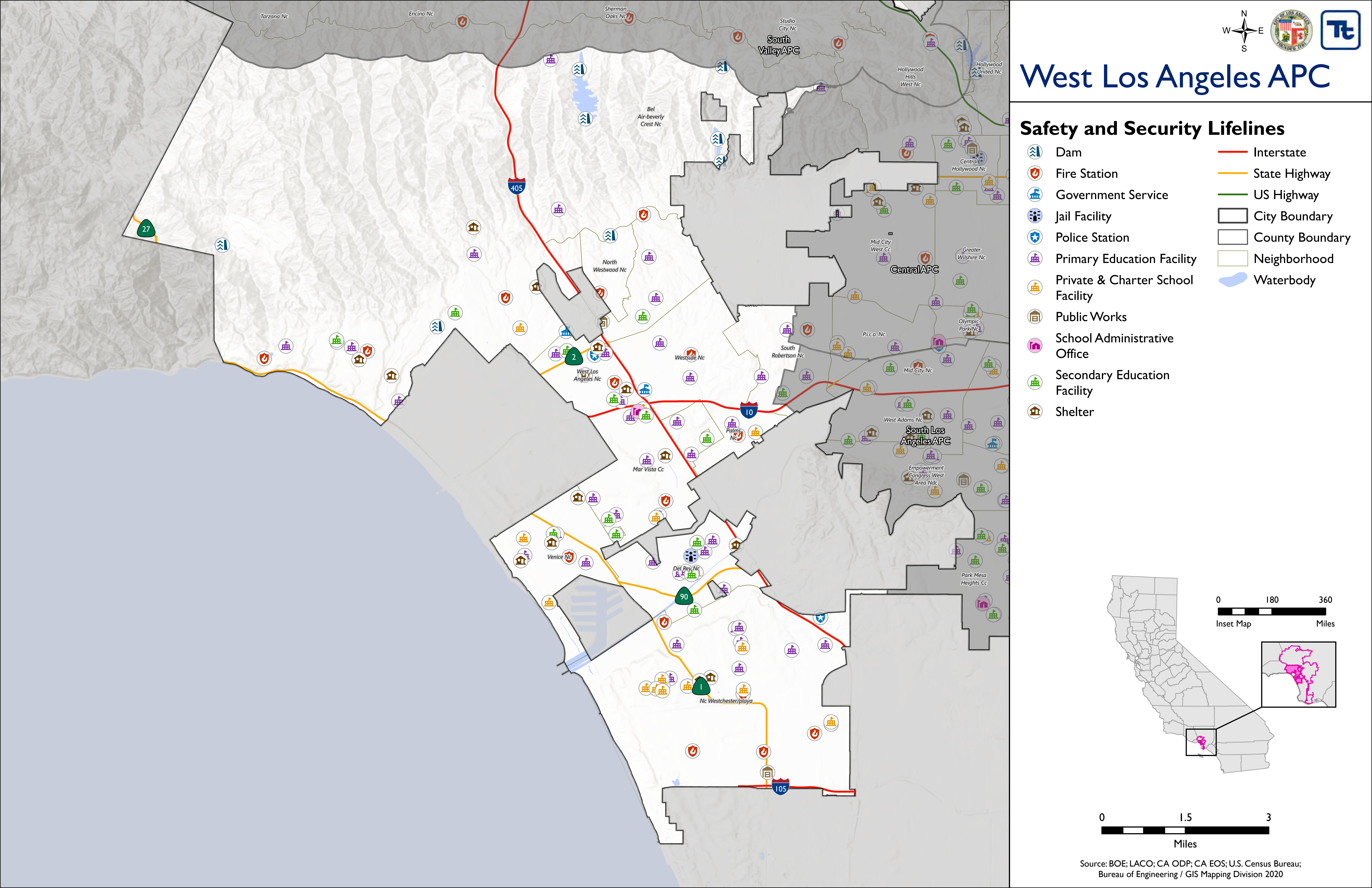


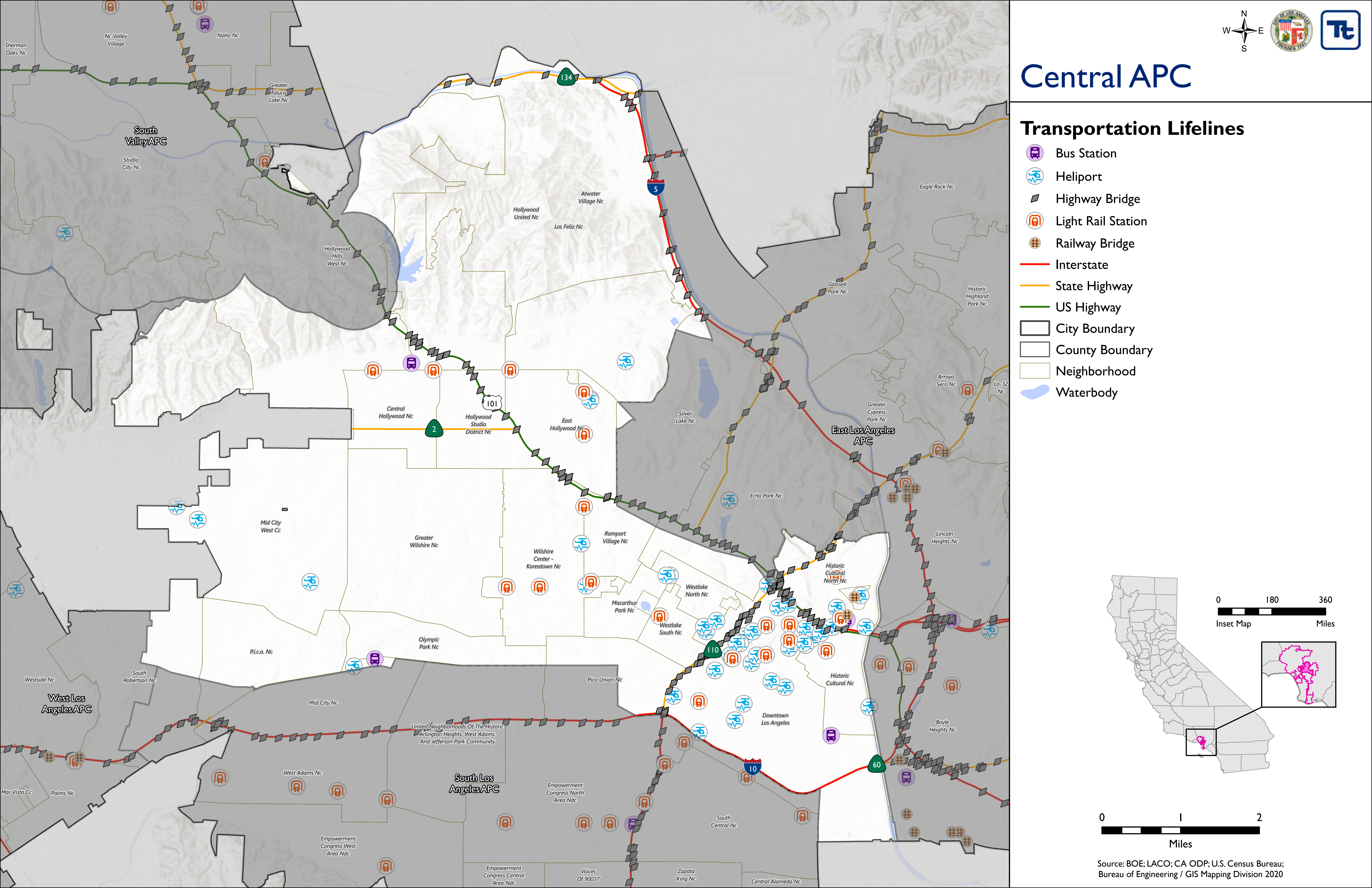


South Los Angeles APC
Safety and Security Lifelines
Correctional Facility
Emergency Operations Center
Fire Station
Government Service
Jail Facility
Law Enforcement or Security
Police Station
Primary Education Facility
Private & Charter School Facility
Public Works
School Administrative Office
Secondary Education Facility
Shelter
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
0 180 360
Inset Map
Miles
0 1 2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020
Central APC
West Los Angeles APC
East Los Angeles APC
Harbor APC
West Adams Nc
Empowerment Congress West Area Ndc
Empowerment Congress North Area Ndc
Empowerment Congress Central Area Ndc
Empowerment Congress Southwest Area Ndc
Empowerment Congress Southeast Area Ndc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Community And Neighbors For Ninth District Unity (Candu)
Park Mesa Heights Cc
Voices Of 90037
Zapata King Nc
South Central Nc
Central Alameda Nc
Watts Nc
Harbor Gateway North Nc
Mid City Nc
Pico Union Nc
Downtown Los Angeles
Historic Cultural Nc
Historic Cultural North Nc
Boyle Heights Nc
Westlake South Nc
Macarthur Park Nc
Wilshire Center Koreatown Nc
Greater Wilshire Nc
Olympic Park Nc
P.i.c.o. Nc
South Robertson Nc
Westside Nc
Palms Nc
Del Rey Nc
Nc Westchester/playa
10
110
105
187



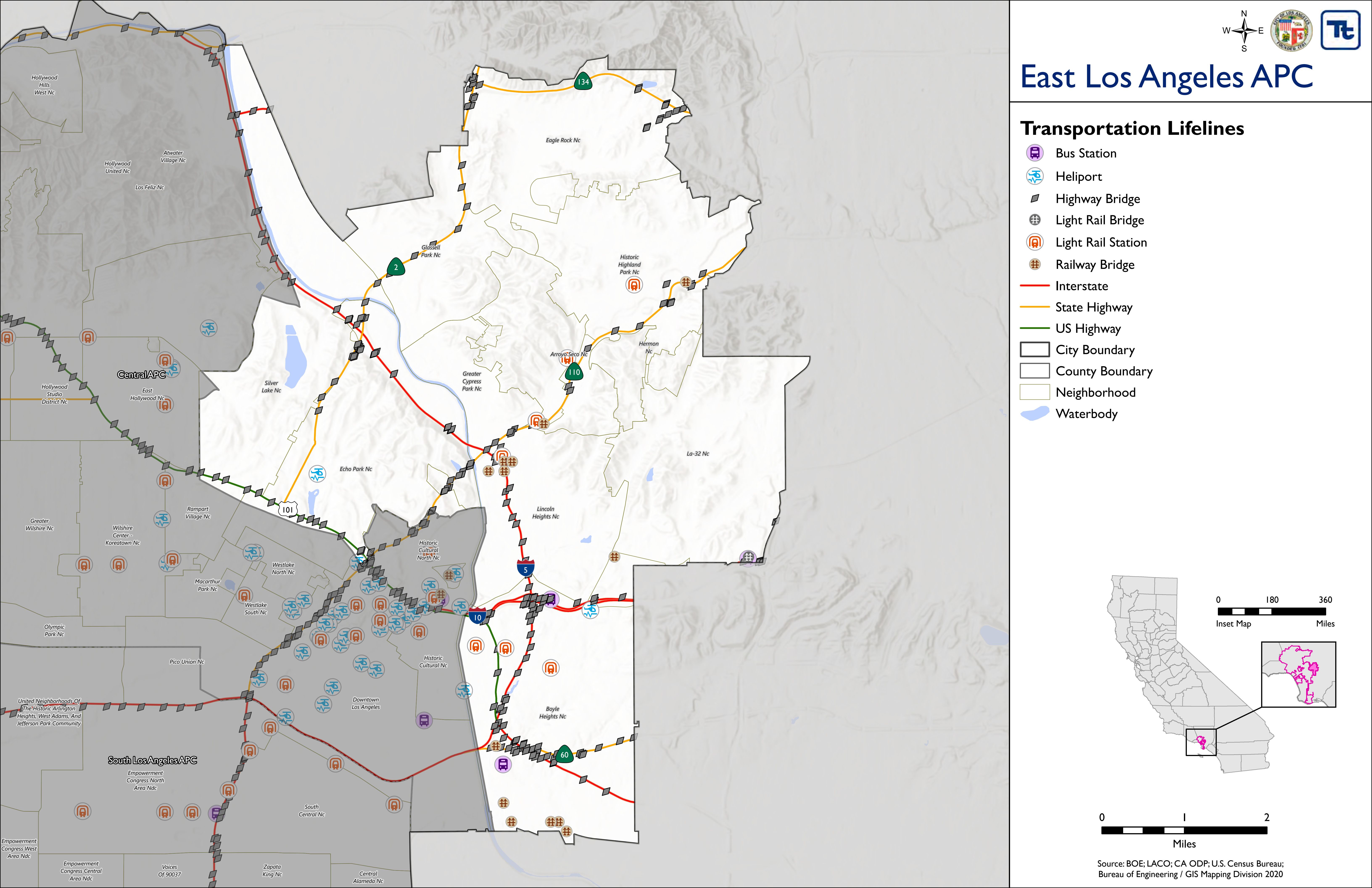
South Valley APC
Safety and Security Lifelines
Dam
Fire Station
Fire Support
Government Service
Jail Facility
Police Station
Primary Education Facility
Private & Charter School Facility
Public Works
School Administrative Office
Search and Rescue
Secondary Education Facility
Shelter
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020
Ventura County
North Valley APC
West Los Angeles APC
Central APC
South Los Angeles APC
Porter Ranch Nc
Chatsworth Nc
Northridge West
Northridge East
Granada Hills South Nc
Mission Hills Nc
Pacoima Nc
Foothill Trails District Nc
Arleta Nc
North Hills West Nc
North Hills East
Northridge South Nc
Panorama City Nc
Sun Valley Area Nc
Noho West Nc
North Hollywood Northeast Nc
West Hills Nc
Canoga Park Nc
Winnetka Nc
Reseda Nc
Lake Balboa Nc
Van Nuys Nc
Greater Valley Glen Council
Noho Nc
Nc Valley Village
Woodland Hills-warner Center Nc
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
Greater Toluca Lake Nc
Hollywood Hills West Nc
Los Feliz Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
Mid City West Cc
Greater Wilshire Nc
Olympic Park Nc
P.i.c.o. Nc
South Robertson Nc
Westside Nc
West Los Angeles Nc
Mid City Nc
Mar Vista Cc
Palms Nc
West Adams Nc
27
101
405
170
134

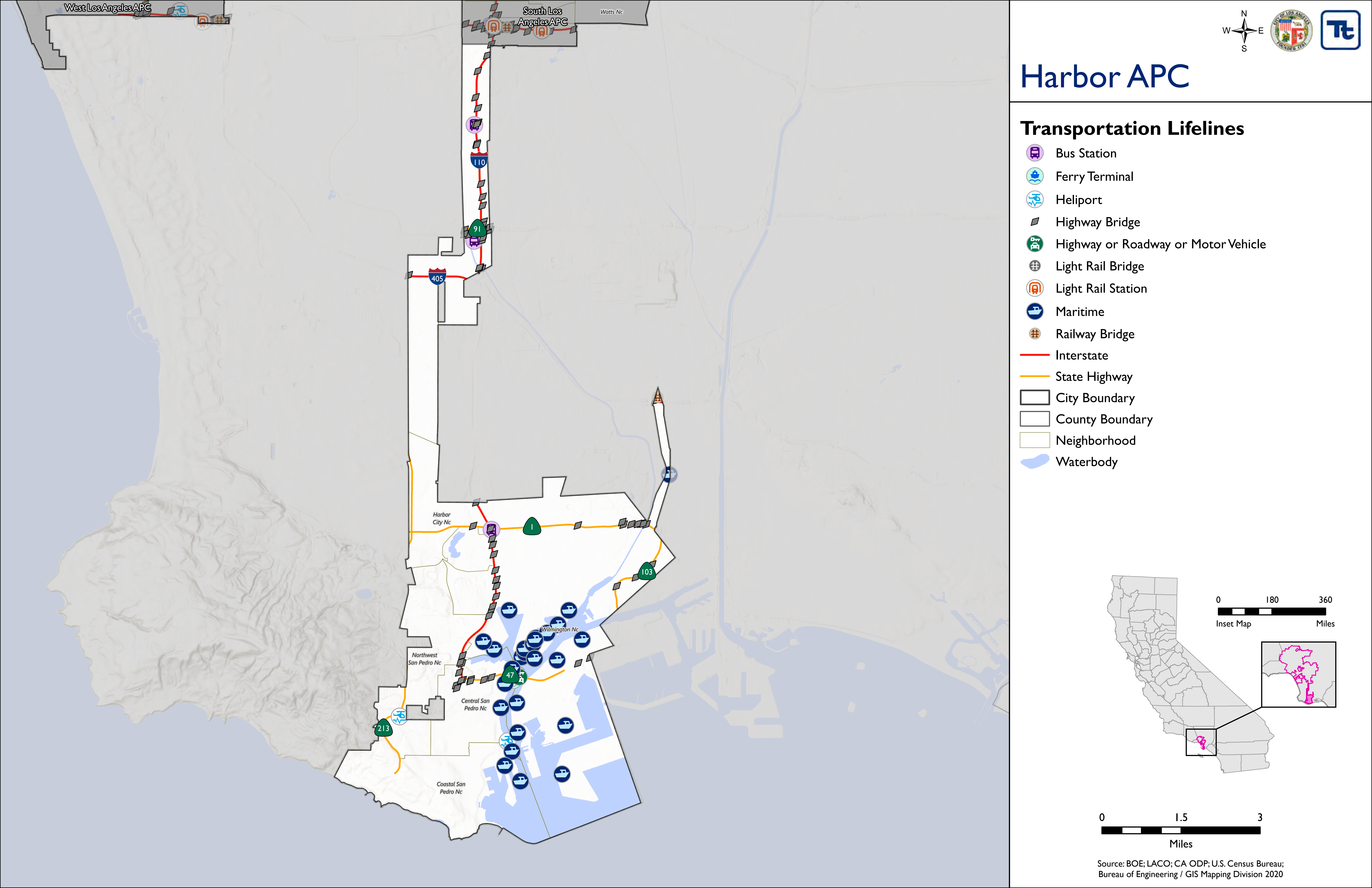

West Los Angeles APC
Safety and Security Lifelines
Dam
Fire Station
Government Service
Jail Facility
Police Station
Primary Education Facility
Private & Charter School Facility
Public Works
School Administrative Office
Secondary Education Facility
Shelter
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020
South Valley APC
Central APC
South Los Angeles APC
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
Hollywood Hills West Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
North Westwood Nc
Mid City West Cc
Greater Wilshire Nc
Westside Nc
West Los Angeles Nc
South Robertson Nc
P.i.c.o. Nc
Olympic Park Nc
Mid City Nc
Palms Nc
West Adams Nc
Mar Vista Cc
Empowerment Congress West Area Ndc
Venice Nc
Del Rey Nc
Park Mesa Heights Cc
Nc Westchester/playa
405
10
105
27
2
90
1



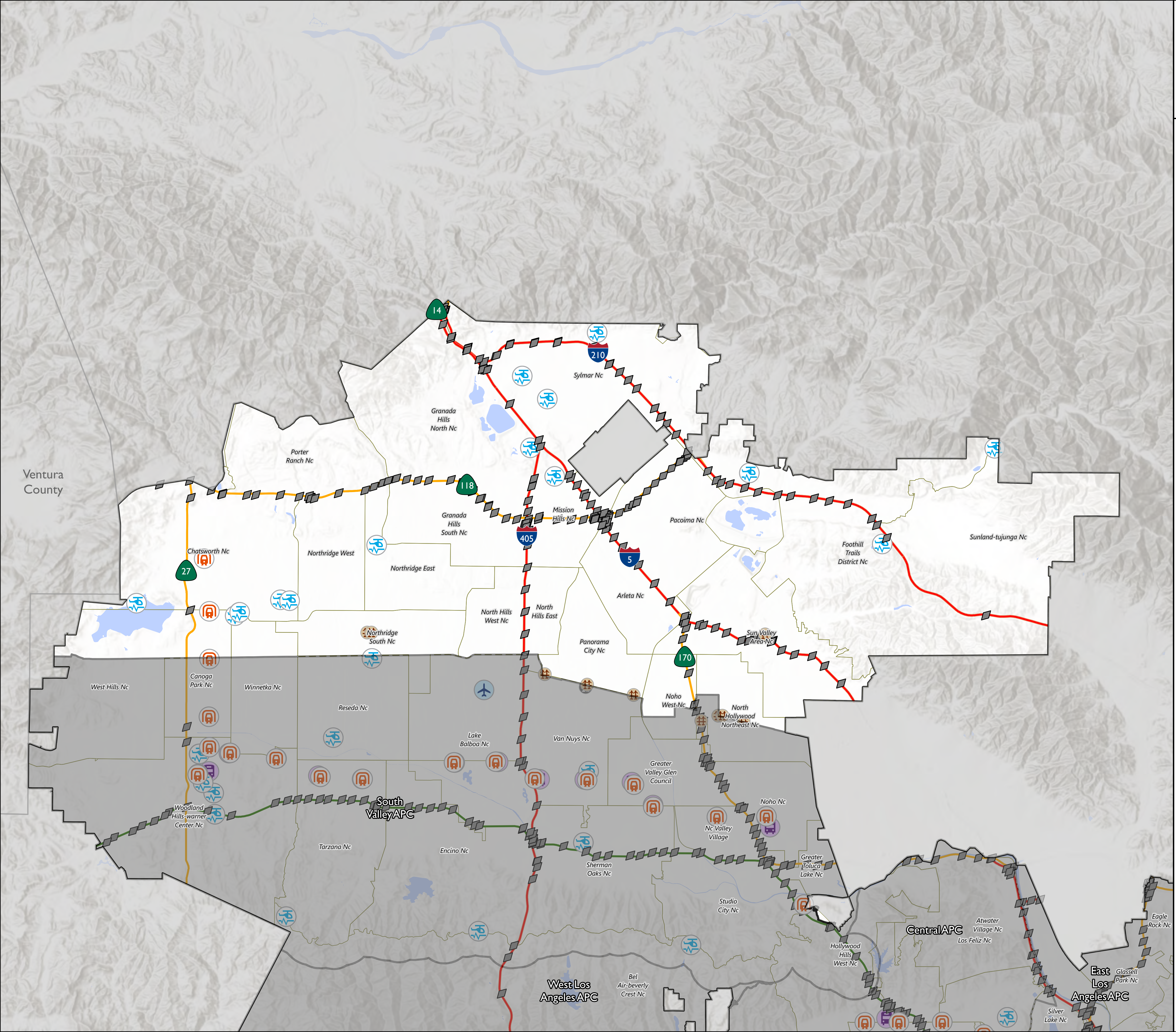
Central APC
Transportation Lifelines
Bus Station
Heliport
Highway Bridge
Light Rail Station
Railway Bridge
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
South Valley APC
East Los Angeles APC
West Los Angeles APC
South Los Angeles APC
Central Hollywood Nc
Hollywood Studio District Nc
East Hollywood Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Silver Lake Nc
Echo Park Nc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Rampart Village Nc
Mid City West Cc
P.i.c.o. Nc
Olympic Park Nc
Macarthur Park Nc
Westlake North Nc
Westlake South Nc
Historic Cultural North Nc
Historic Cultural Nc
Downtown Los Angeles
Pico Union Nc
Mid City Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Inset Map
0 180 360
Miles
0 1 2
Miles
Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

East Los Angeles APC





Harbor APC
Transportation Lifelines
Bus Station
Ferry Terminal
Heliport
Highway Bridge
Highway or Roadway or Motor Vehicle
Light Rail Bridge
Light Rail Station
Maritime
Railway Bridge
Interstate
State Highway
City Boundary
County Boundary
Neighborhood
Waterbody
West Los Angeles APC
South Los Angeles APC
Watts Nc
Harbor City Nc
Wilmington Nc
Northwest San Pedro Nc
Central San Pedro Nc
Coastal San Pedro Nc
110
405
91
1
103
47
213
0 180 360
Inset Map Miles
0 1.5 3
Miles
N
S
E
W
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

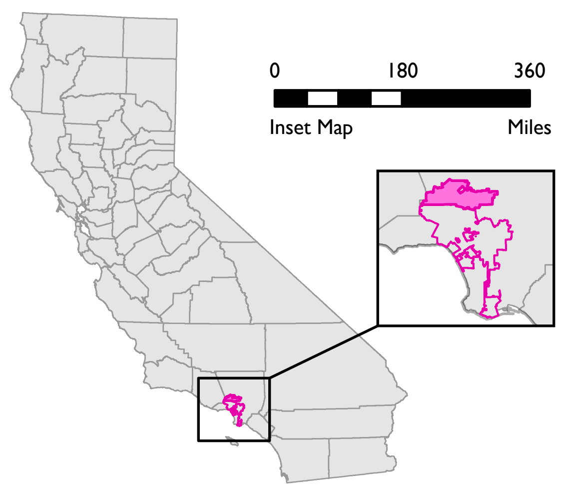


N W E S

North Valley APC

Transportation Lifelines

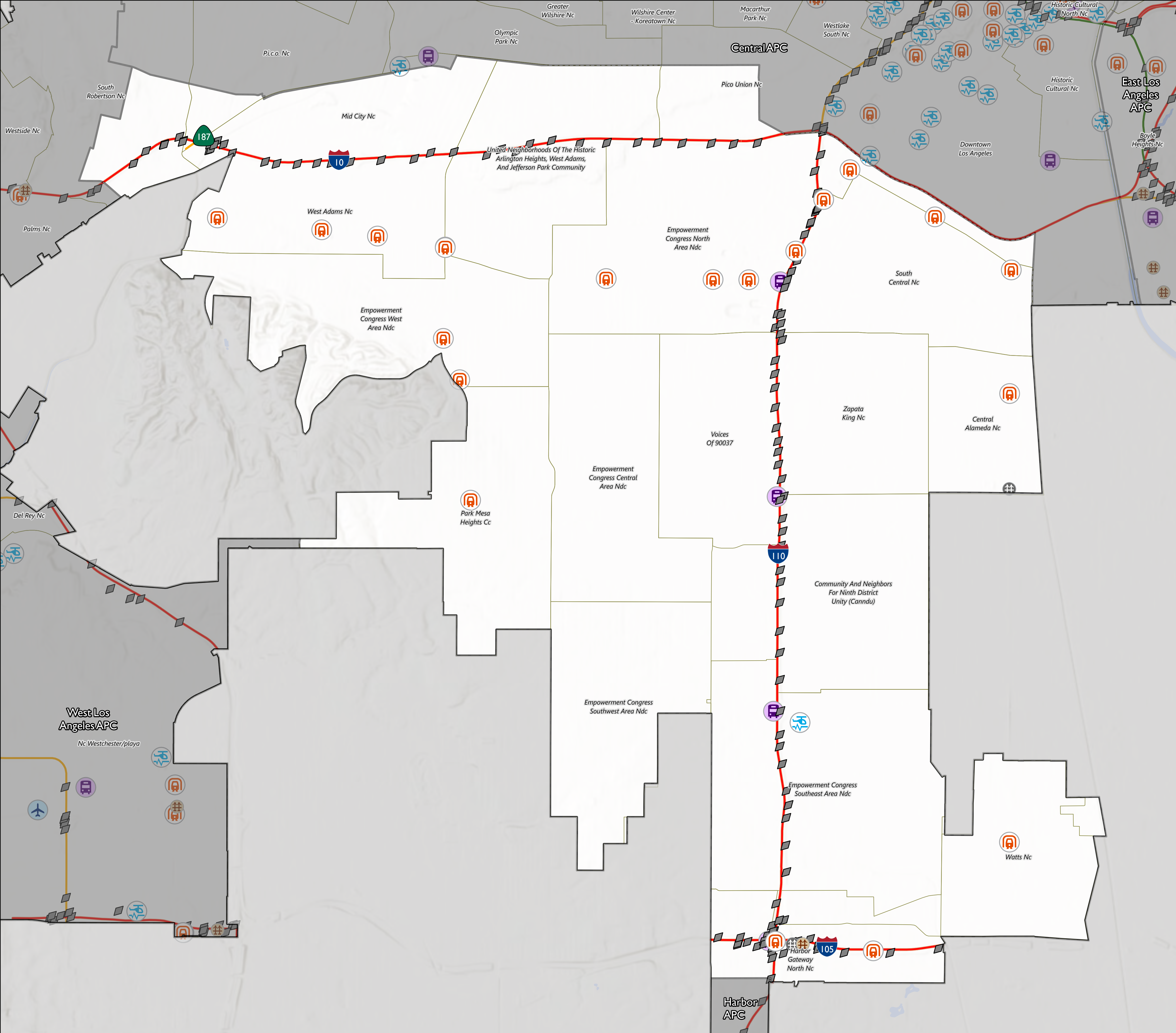
- Airport
- Bus Station
- Heliport
- Highway Bridge
- Light Rail Bridge
- Light Rail Station
- Railway Bridge
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 180 360
Inset Map Miles

0 2 4
Miles

Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

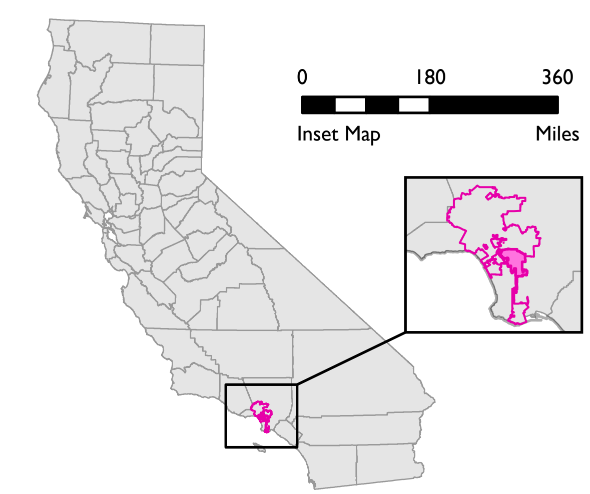


N
W
E
S

South Los Angeles APC

Transportation Lifelines

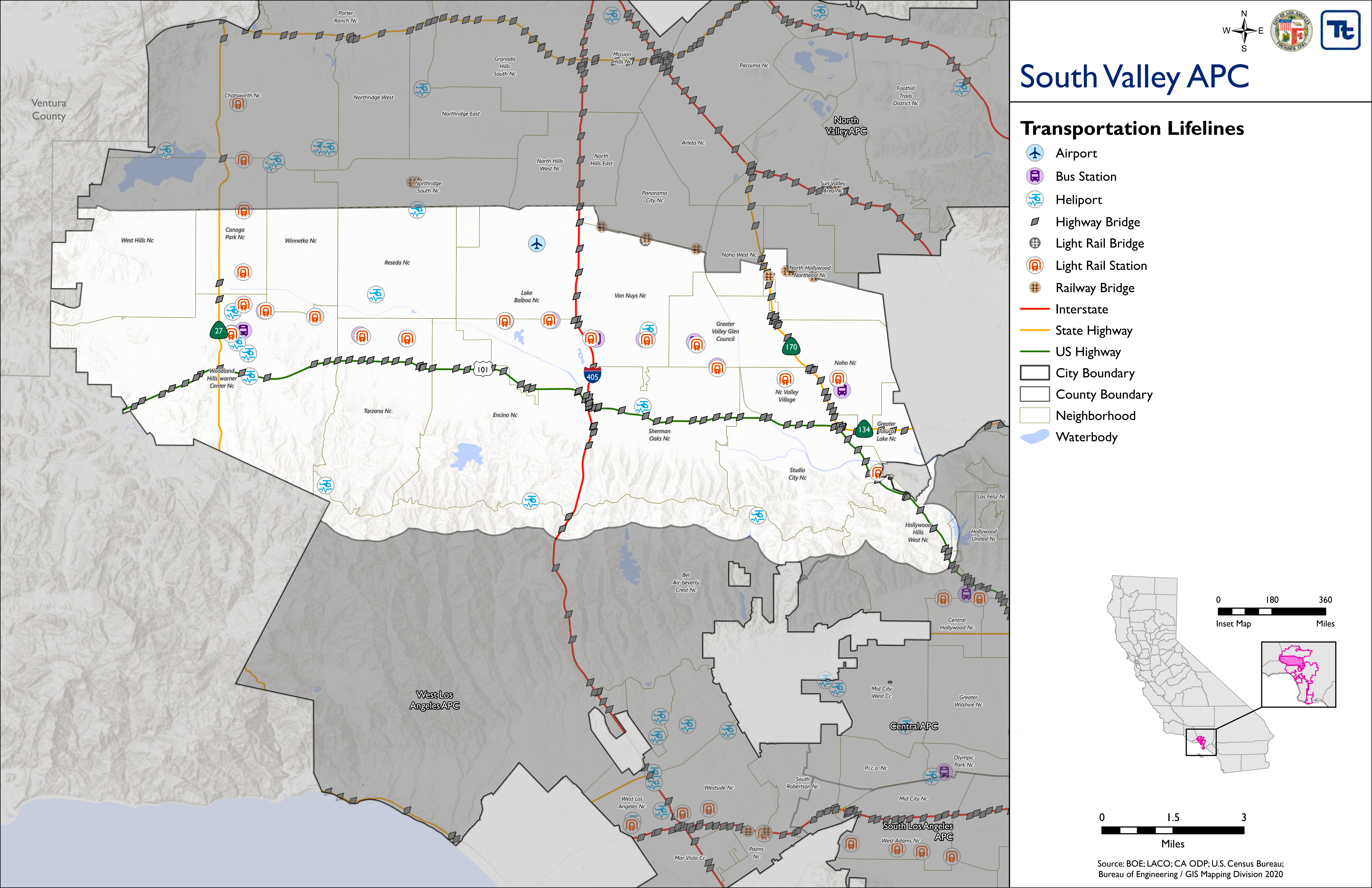
- Airport
- Bus Station
- Heliport
- Highway Bridge
- Light Rail Bridge
- Light Rail Station
- Railway Bridge
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

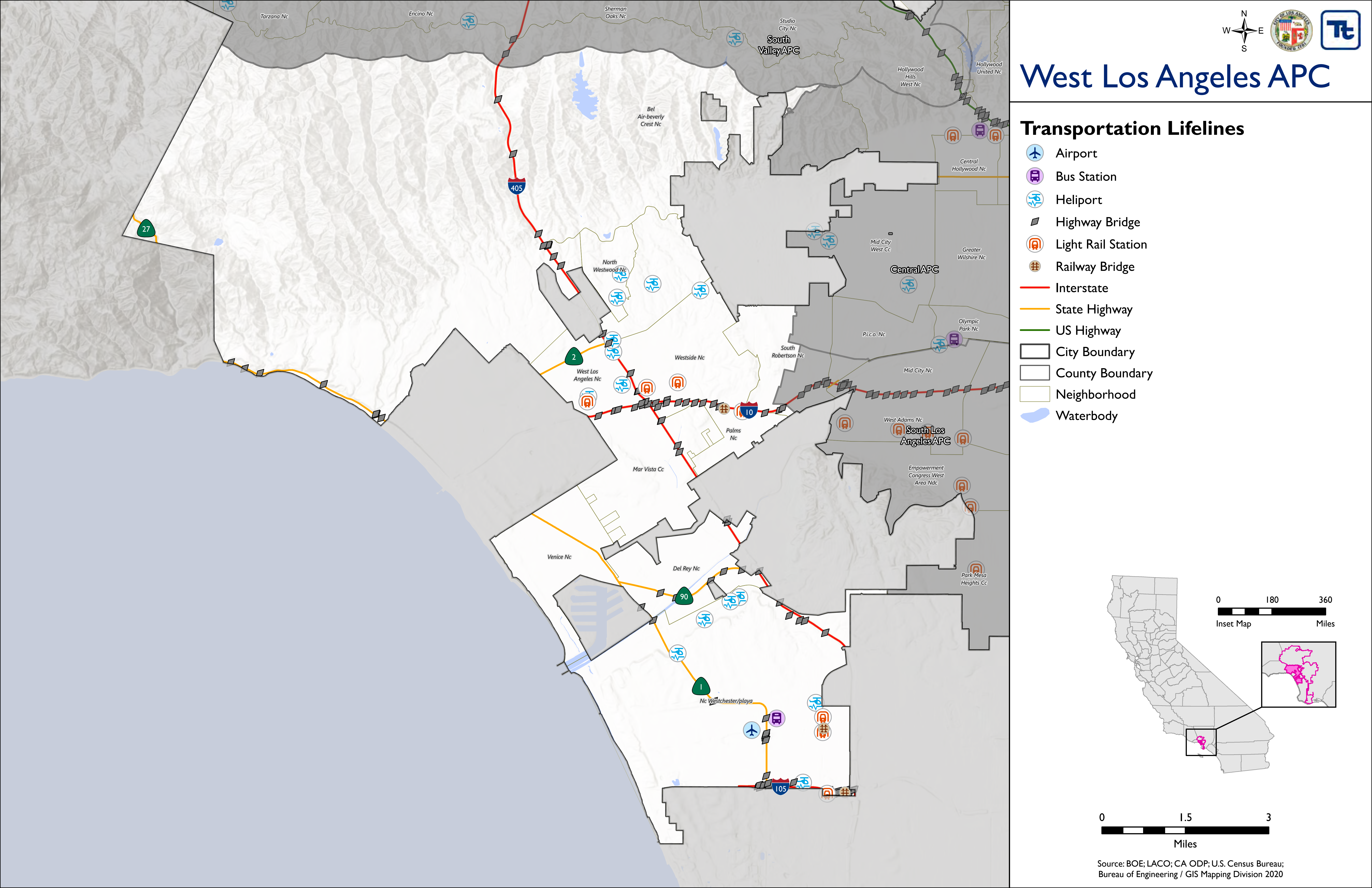


0 1 2

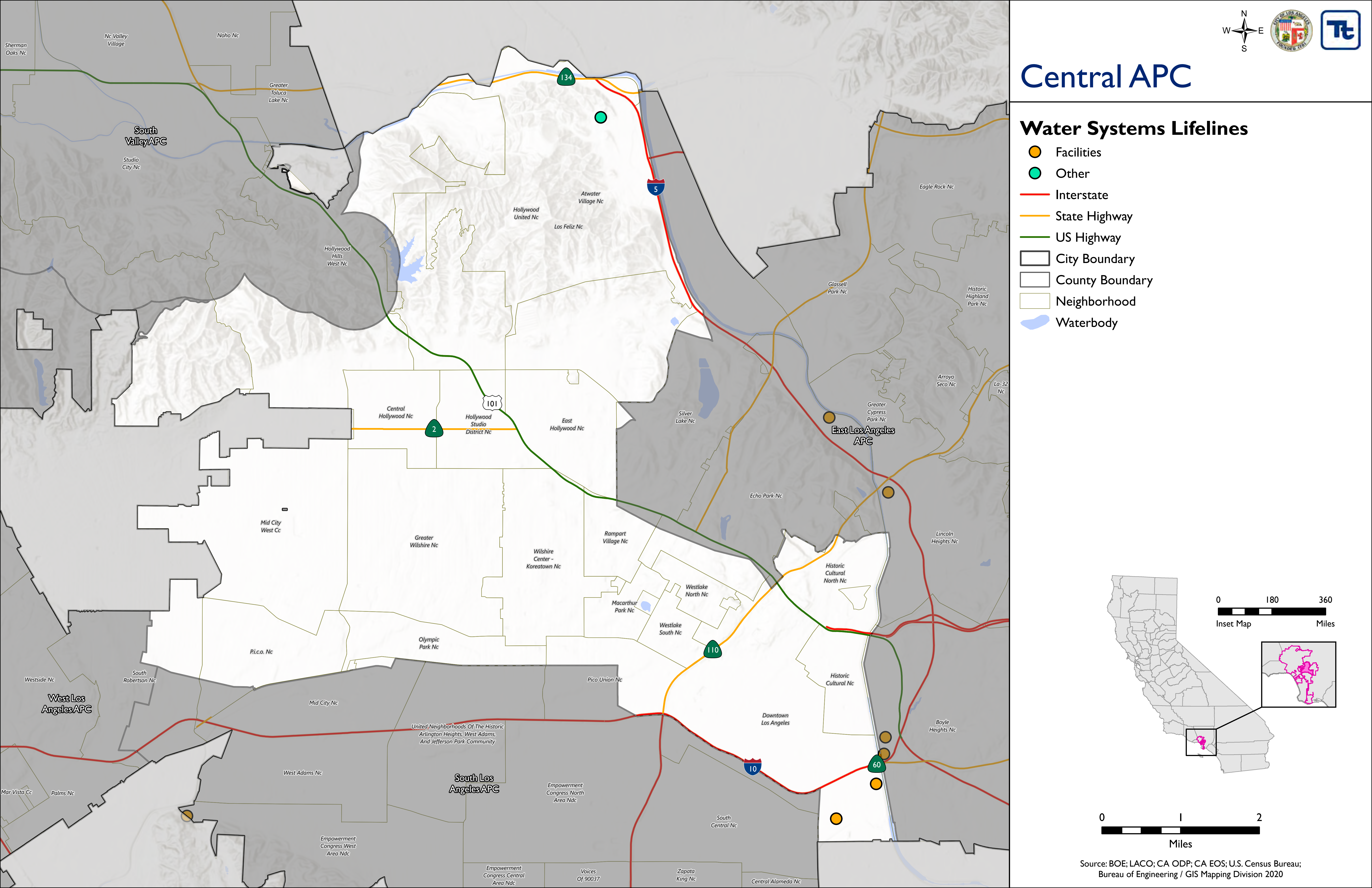
Miles

Source: BOE; LACO; CA ODP; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

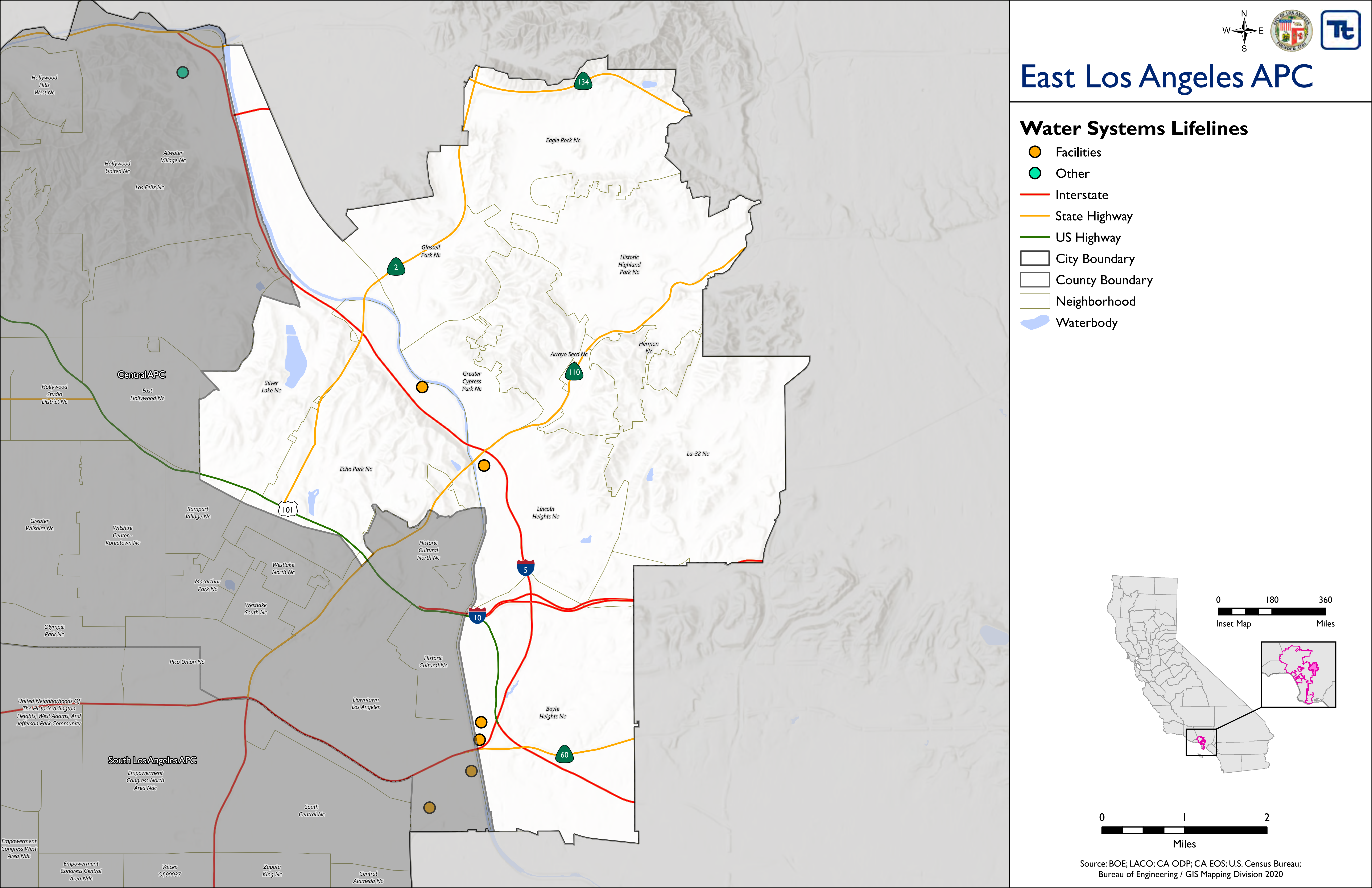

South Valley APC
Transportation Lifelines
Airport
Bus Station
Heliport
Highway Bridge
Light Rail Bridge
Light Rail Station
Railway Bridge
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
Ventura County
North Valley APC
West Los Angeles APC
Central APC
South Los Angeles APC
West Hills Nc
Canoga Park Nc
Winnetka Nc
Reseda Nc
Lake Balboa Nc
Van Nuys Nc
Greater Valley Glen Council
Noho Nc
Nc Valley Village
Woodland Hills-warner Center Nc
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
Greater Toluca Lake Nc
Hollywood Hills West Nc
Noho West Nc
North Hollywood Northeast Nc
Chatsworth Nc
Northridge West
Northridge East
Northridge South Nc
Granada Hills South Nc
Porter Ranch Nc
Mission Hills Nc
North Hills West Nc
North Hills East
Panorama City Nc
Arleta Nc
Pacoima Nc
Sun Valley Area Nc
Foothill Trails District Nc
Bel Air-beverly Crest Nc
Los Feliz Nc
Hollywood United Nc
Central Hollywood Nc
Mid City West Cc
Greater Wilshire Nc
Olympic Park Nc
Pico Nc
Mid City Nc
South Robertson Nc
Westside Nc
West Los Angeles Nc
Palms Nc
Mar Vista Cc
West Adams Nc
27
101
405
170
134
N
S
E
W
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



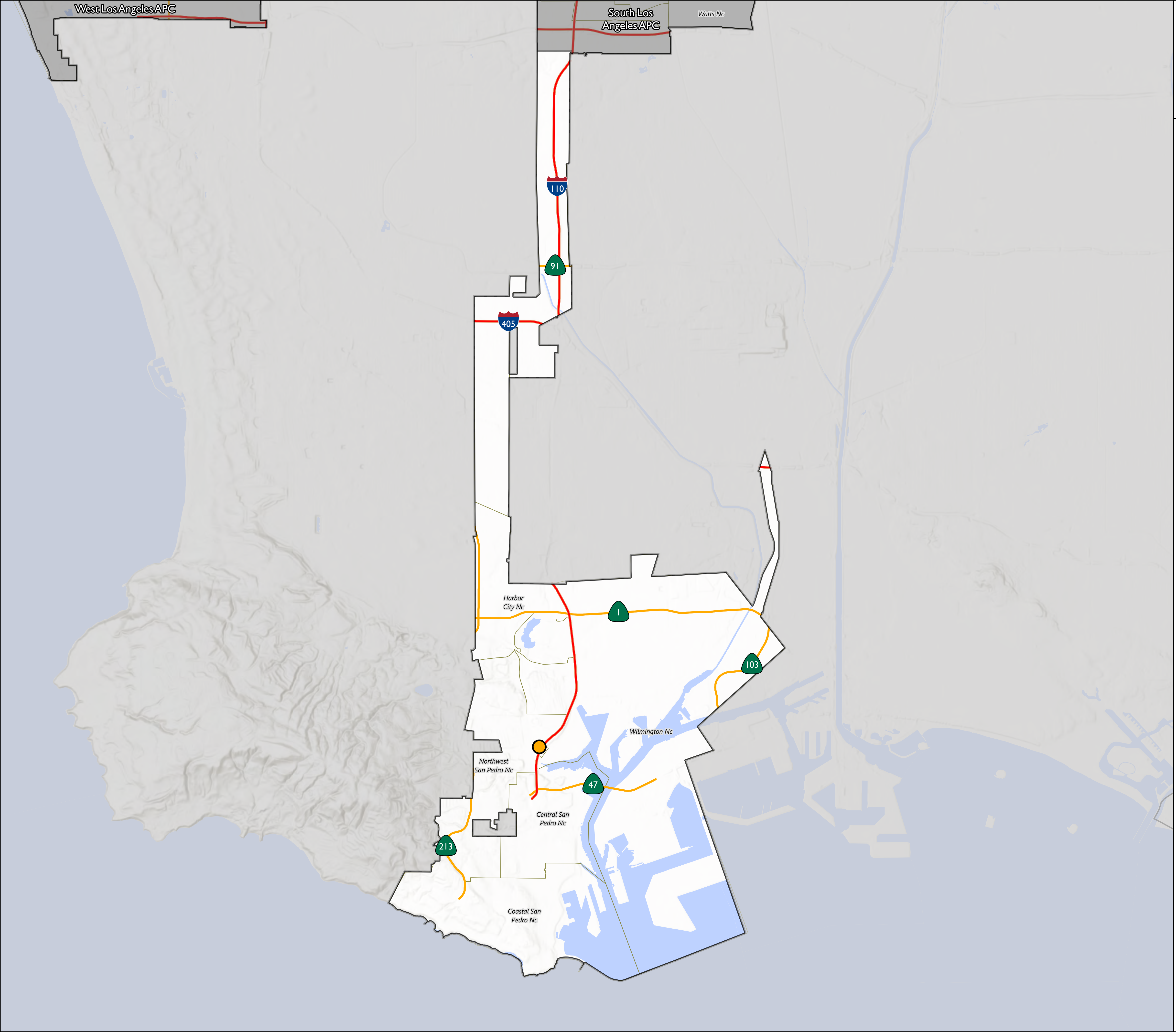
West Los Angeles APC
N
S
E
W
Transportation Lifelines
Airport
Bus Station
Heliport
Highway Bridge
Light Rail Station
Railway Bridge
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
South Valley APC
Hollywood Hills West Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
Mid City West Cc
Greater Wilshire Nc
Central APC
North Westwood Nc
Westside Nc
South Robertson Nc
P.i.c.o. Nc
Olympic Park Nc
Mid City Nc
West Los Angeles Nc
Palms Nc
West Adams Nc
South Los Angeles APC
Empowerment Congress West Area Ndc
Mar Vista Cc
Venice Nc
Del Rey Nc
Park Mesa Heights Cc
Nc Westchester/playa
405
27
2
10
90
1
105



Central APC
Water Systems Lifelines
Facilities
Other
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
South Valley APC
East Los Angeles APC
West Los Angeles APC
South Los Angeles APC
Sherman Oaks Nc
Nc Valley Village
Noho Nc
Greater Toluca Lake Nc
Studio City Nc
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
Greater Cypress Park Nc
Silver Lake Nc
Central Hollywood Nc
Hollywood Studio District Nc
East Hollywood Nc
Mid City West Cc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Rampart Village Nc
Echo Park Nc
Lincoln Heights Nc
Historic Cultural North Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
Historic Cultural Nc
Downtown Los Angeles
Boyle Heights Nc
P.i.c.o. Nc
Olympic Park Nc
Pico Union Nc
Westside Nc
South Robertson Nc
Mid City Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
West Adams Nc
Mar Vista Cc
Palms Nc
Empowerment Congress North Area Ndc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
South Central Nc
Voices Of 90037
Zapata King Nc
Central Alameda Nc
134
5
101
2
110
10
60



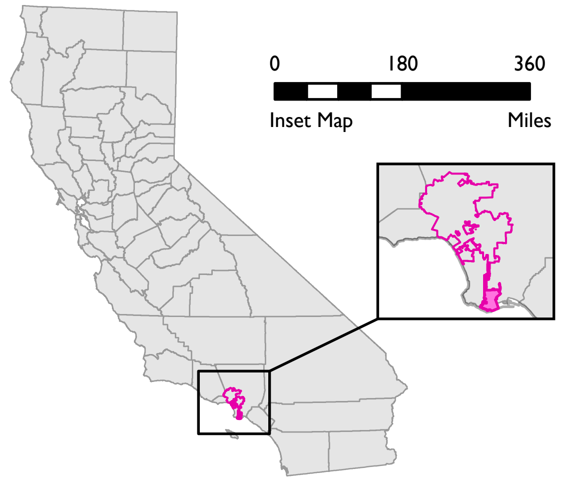
East Los Angeles APC
Water Systems Lifelines
Facilities
Other
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
Hermon Nc
Greater Cypress Park Nc
Silver Lake Nc
Echo Park Nc
La-32 Nc
Lincoln Heights Nc
Historic Cultural North Nc
Historic Cultural Nc
Boyle Heights Nc
Downtown Los Angeles
Central APC
South Los Angeles APC
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Hollywood Studio District Nc
East Hollywood Nc
Rampart Village Nc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Westlake North Nc
Westlake South Nc
Macarthur Park Nc
Olympic Park Nc
Pico Union Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Empowerment Congress North Area Ndc
South Central Nc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
Central Alameda Nc
134
2
110
101
5
10
60
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020



Harbor APC

Water Systems Lifelines

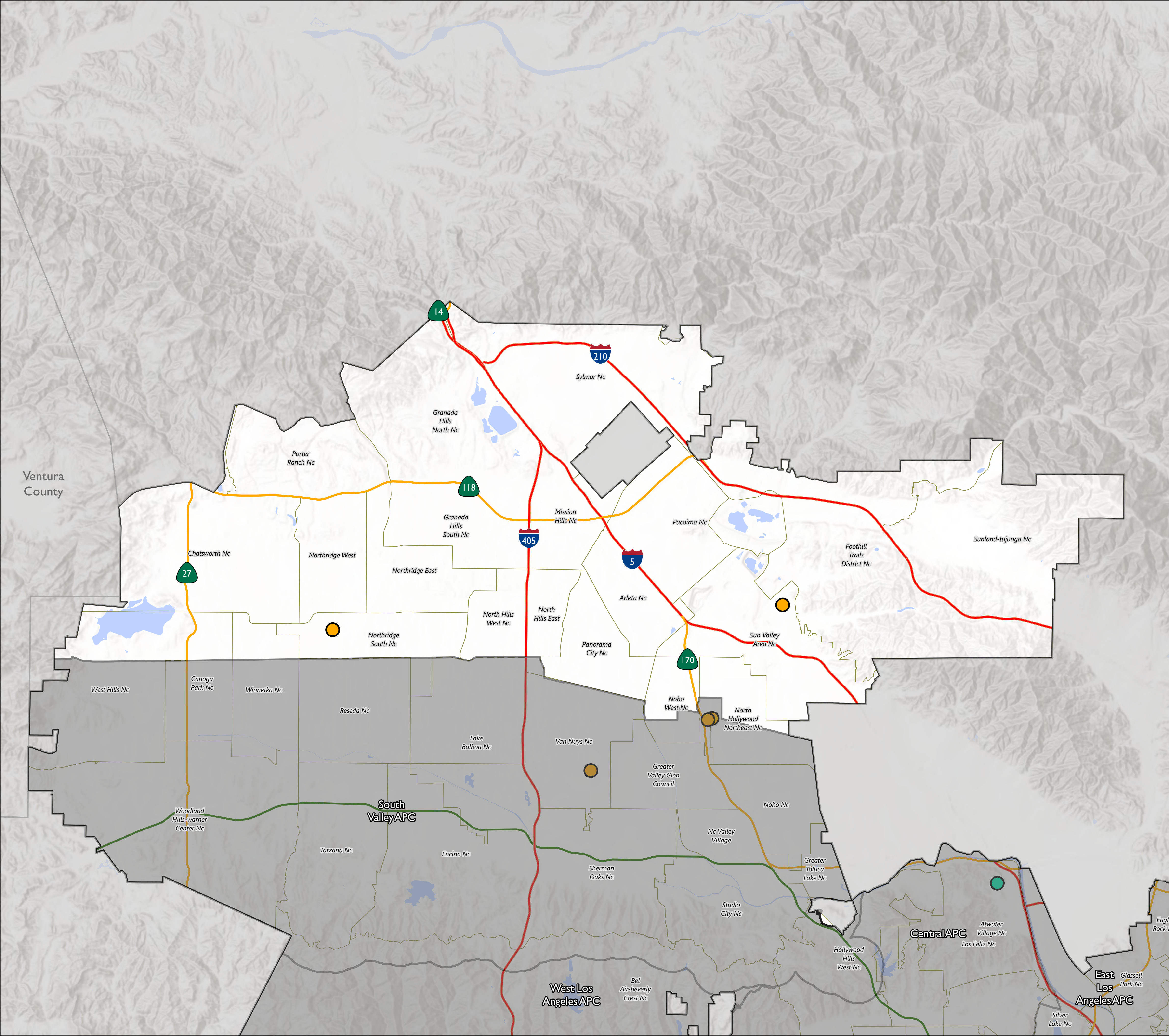
- Facilities
- Interstate
- State Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1.5 3

Miles

Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

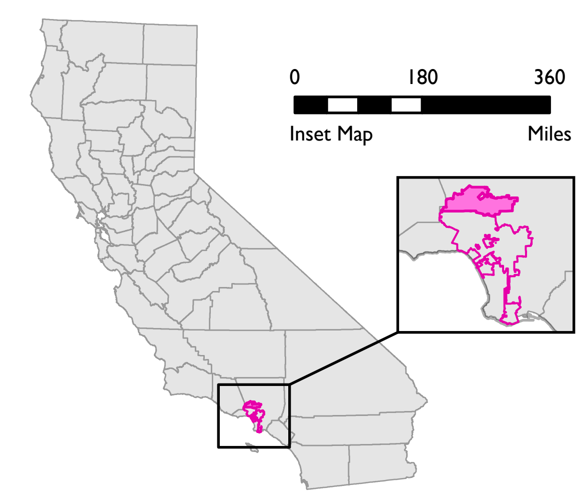


N
W E
S

North Valley APC

Water Systems Lifelines

- Facilities
- Other
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

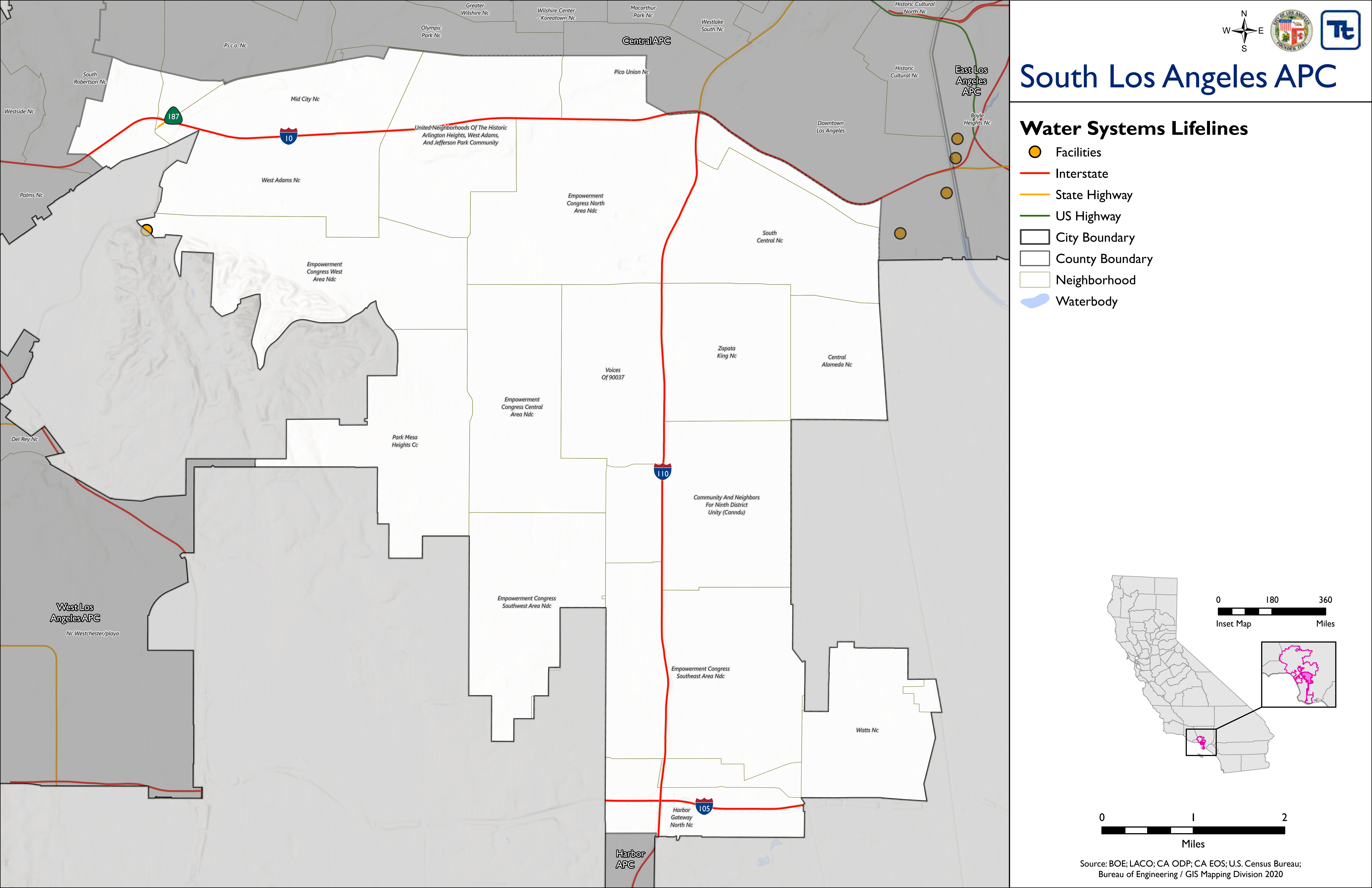


0 2 4
Miles

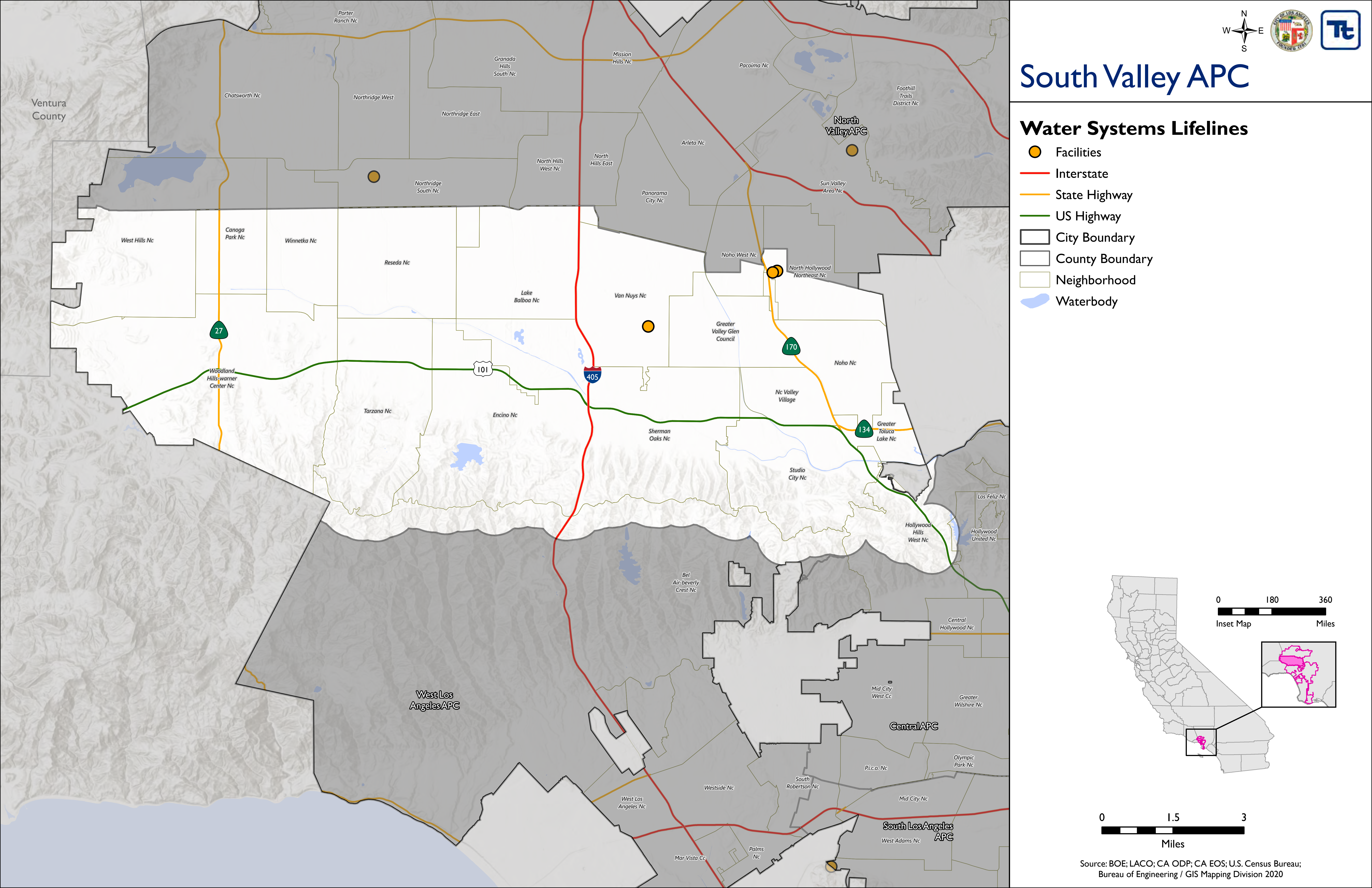
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

South Los Angeles APC

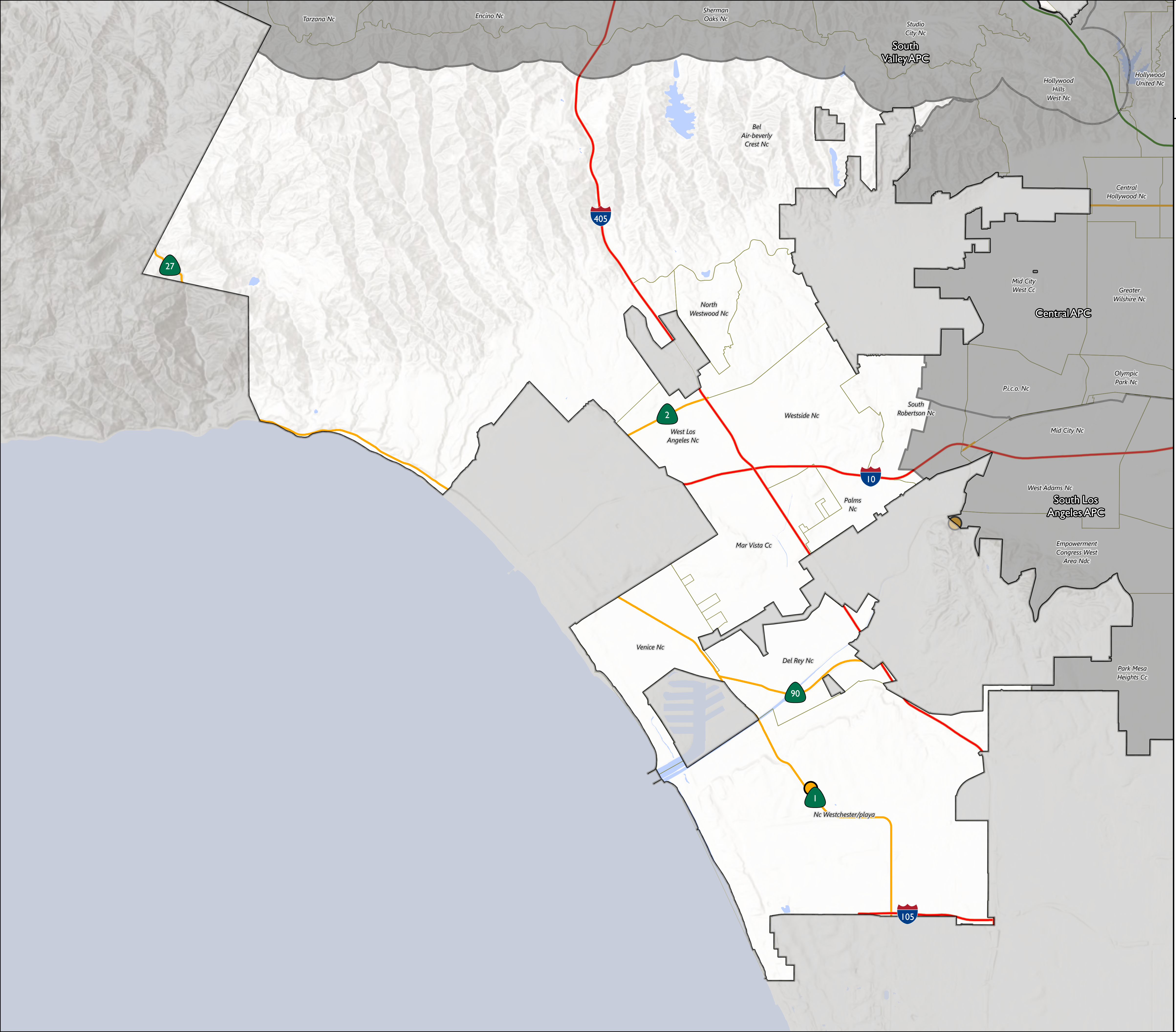
Water Systems Lifelines



Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020


South Valley APC
Water Systems Lifelines
Facilities
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
W
E
Ventura County
North Valley APC
West Los Angeles APC
Central APC
South Los Angeles APC
Porter Ranch Nc
Granada Hills South Nc
Mission Hills Nc
Pacoima Nc
Foothill Trails District Nc
Chatsworth Nc
Northridge West
Northridge East
Arleta Nc
North Hills West Nc
North Hills East
Northridge South Nc
Panorama City Nc
Sun Valley Area Nc
Noho West Nc
North Hollywood Northeast Nc
West Hills Nc
Canoga Park Nc
Winnetka Nc
Reseda Nc
Lake Balboa Nc
Van Nuys Nc
Greater Valley Glen Council
Noho Nc
Woodland Hills-warner Center Nc
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Nc Valley Village
Greater Toluca Lake Nc
Studio City Nc
Hollywood Hills West Nc
Los Feliz Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
Mid City West Cc
Greater Wilshire Nc
Olympic Park Nc
Pico Nc
Westside Nc
South Robertson Nc
Mid City Nc
West Los Angeles Nc
West Adams Nc
Mar Vista Cc
Palms Nc
27
101
405
170
134
0
180
360
Inset Map
Miles
0
1.5
3
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

West Los Angeles APC

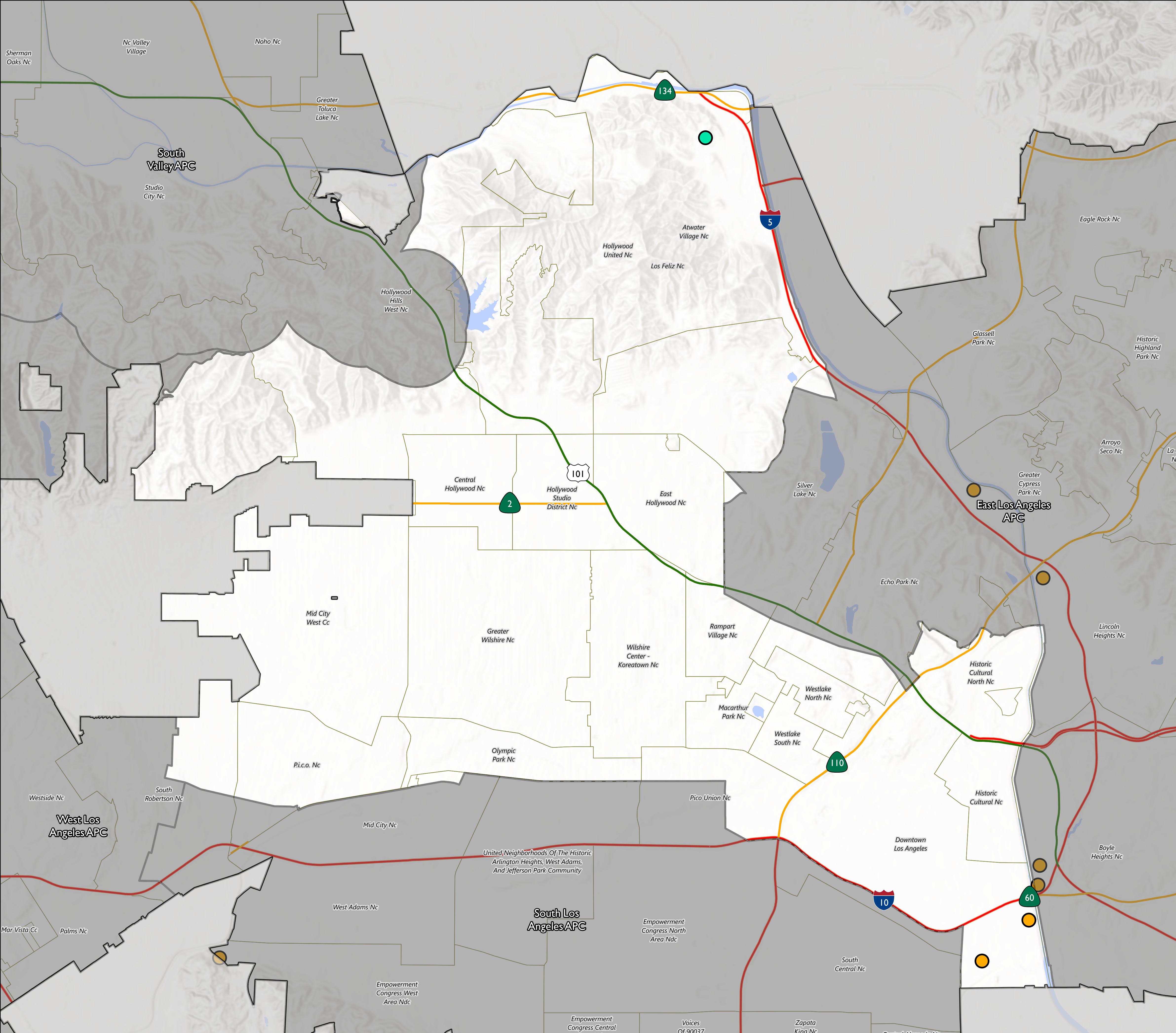


Water Systems Lifelines

- Facilities
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody

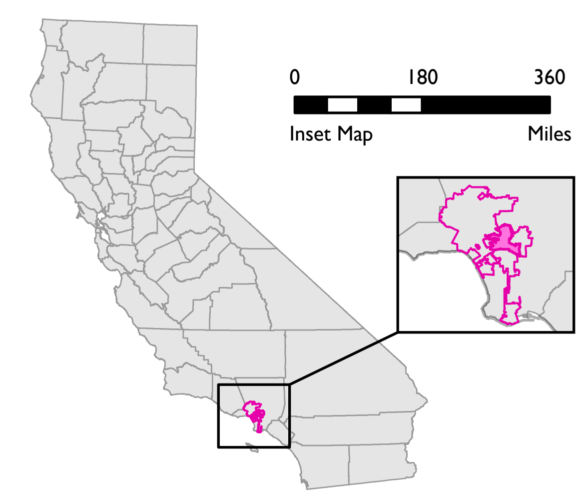
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

Central APC



Additional Critical Facilities

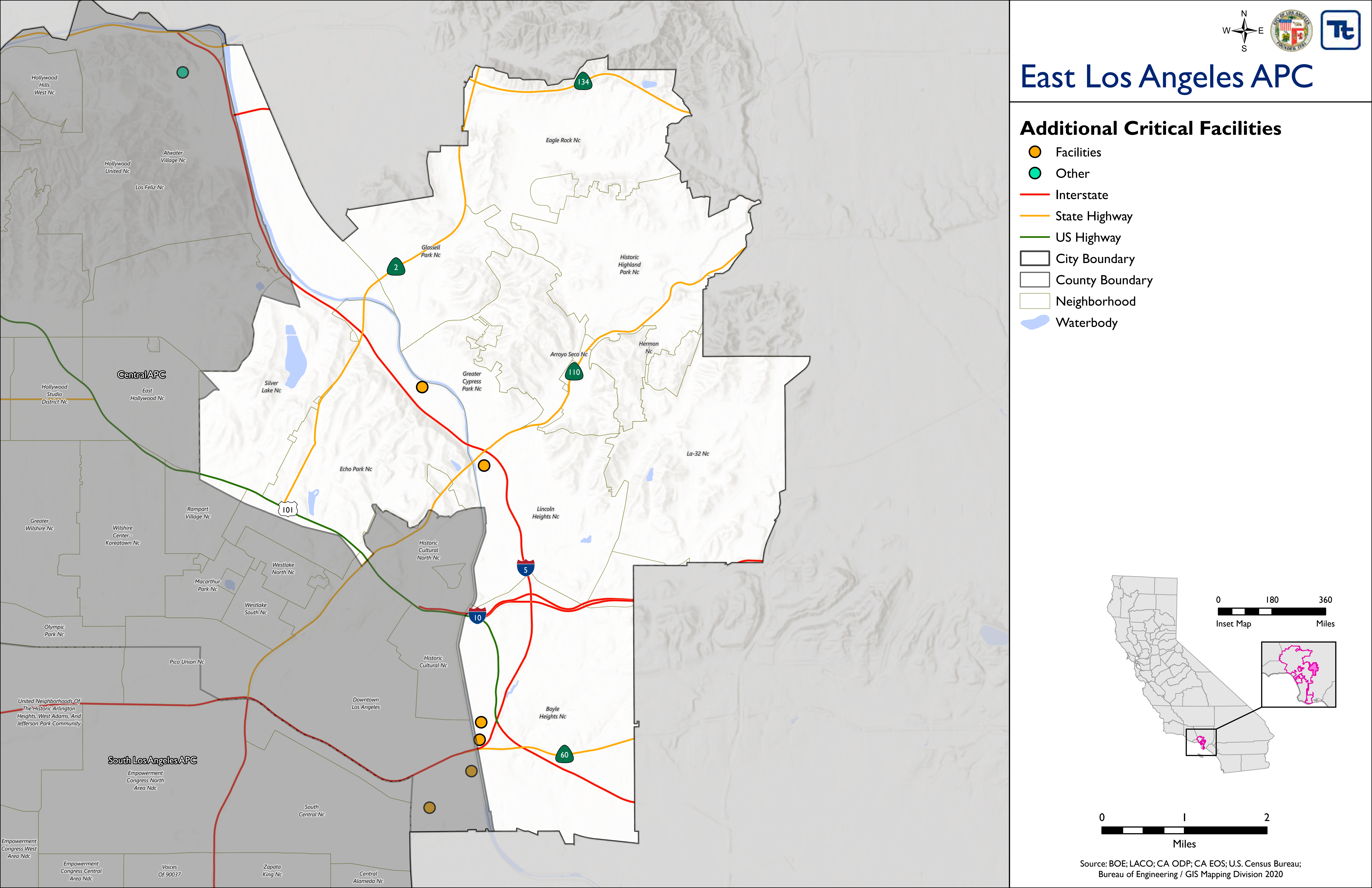
- Facilities
- Other
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



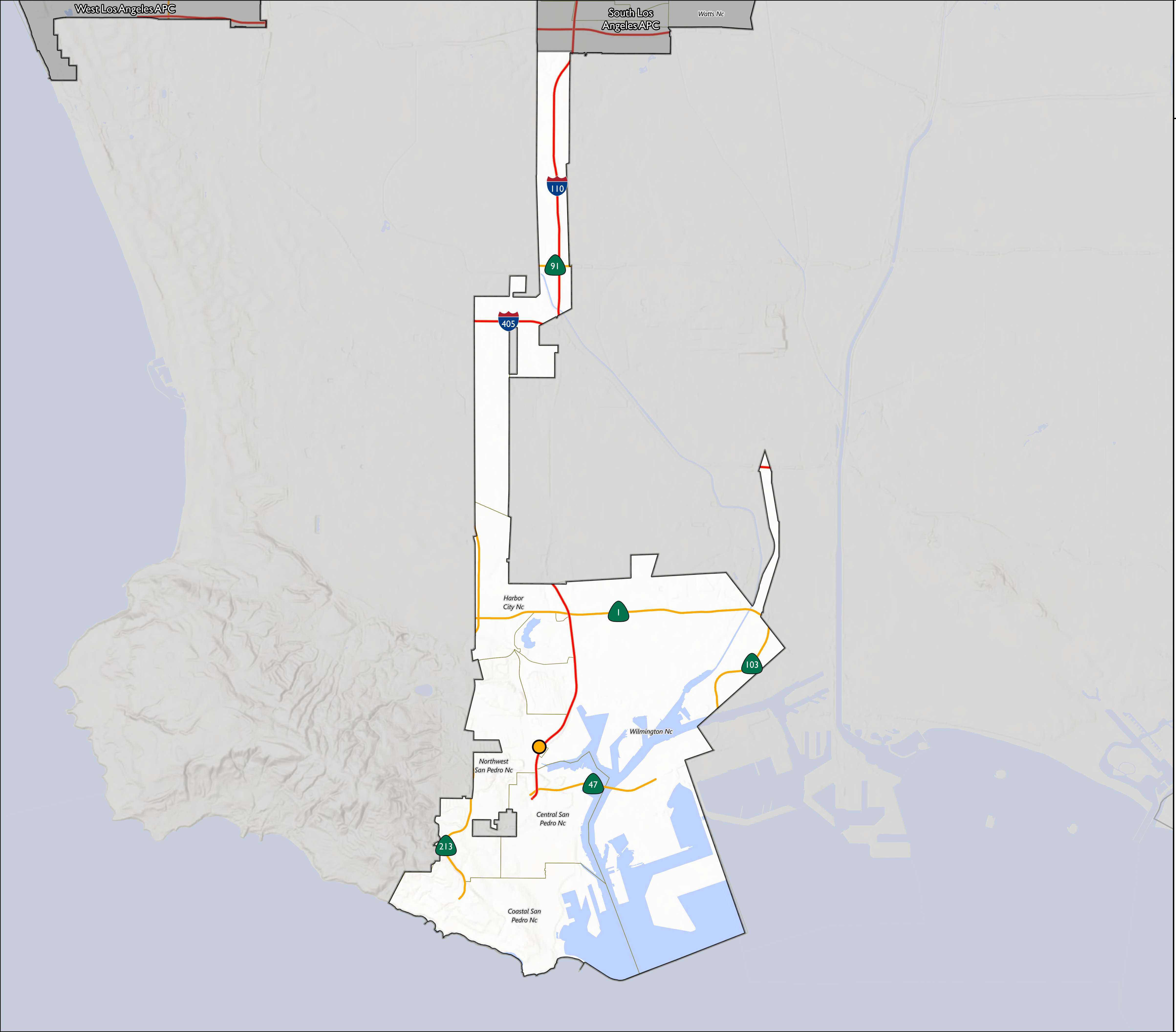
0 1 2

Miles

Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

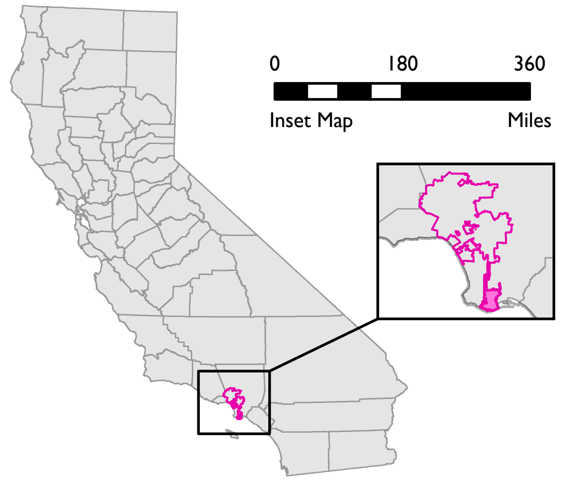

East Los Angeles APC
Additional Critical Facilities
Facilities
Other
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
0
180
360
Inset Map
Miles
0
1
2
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020
Central APC
South Los Angeles APC
Eagle Rock Nc
Glassell Park Nc
Historic Highland Park Nc
Arroyo Seco Nc
Hermon Nc
Greater Cypress Park Nc
Silver Lake Nc
Echo Park Nc
La-32 Nc
Lincoln Heights Nc
Historic Cultural North Nc
Historic Cultural Nc
Boyle Heights Nc
Downtown Los Angeles
Hollywood Hills West Nc
Hollywood United Nc
Atwater Village Nc
Los Feliz Nc
Hollywood Studio District Nc
East Hollywood Nc
Rampart Village Nc
Greater Wilshire Nc
Wilshire Center - Koreatown Nc
Westlake North Nc
Macarthur Park Nc
Westlake South Nc
Olympic Park Nc
Pico Union Nc
United Neighborhoods Of The Historic Arlington Heights, West Adams, And Jefferson Park Community
Empowerment Congress North Area Ndc
South Central Nc
Empowerment Congress West Area Ndc
Empowerment Congress Central Area Ndc
Voices Of 90037
Zapata King Nc
Central Alameda Nc
134
2
110
101
5
10
60

Harbor APC



Additional Critical Facilities

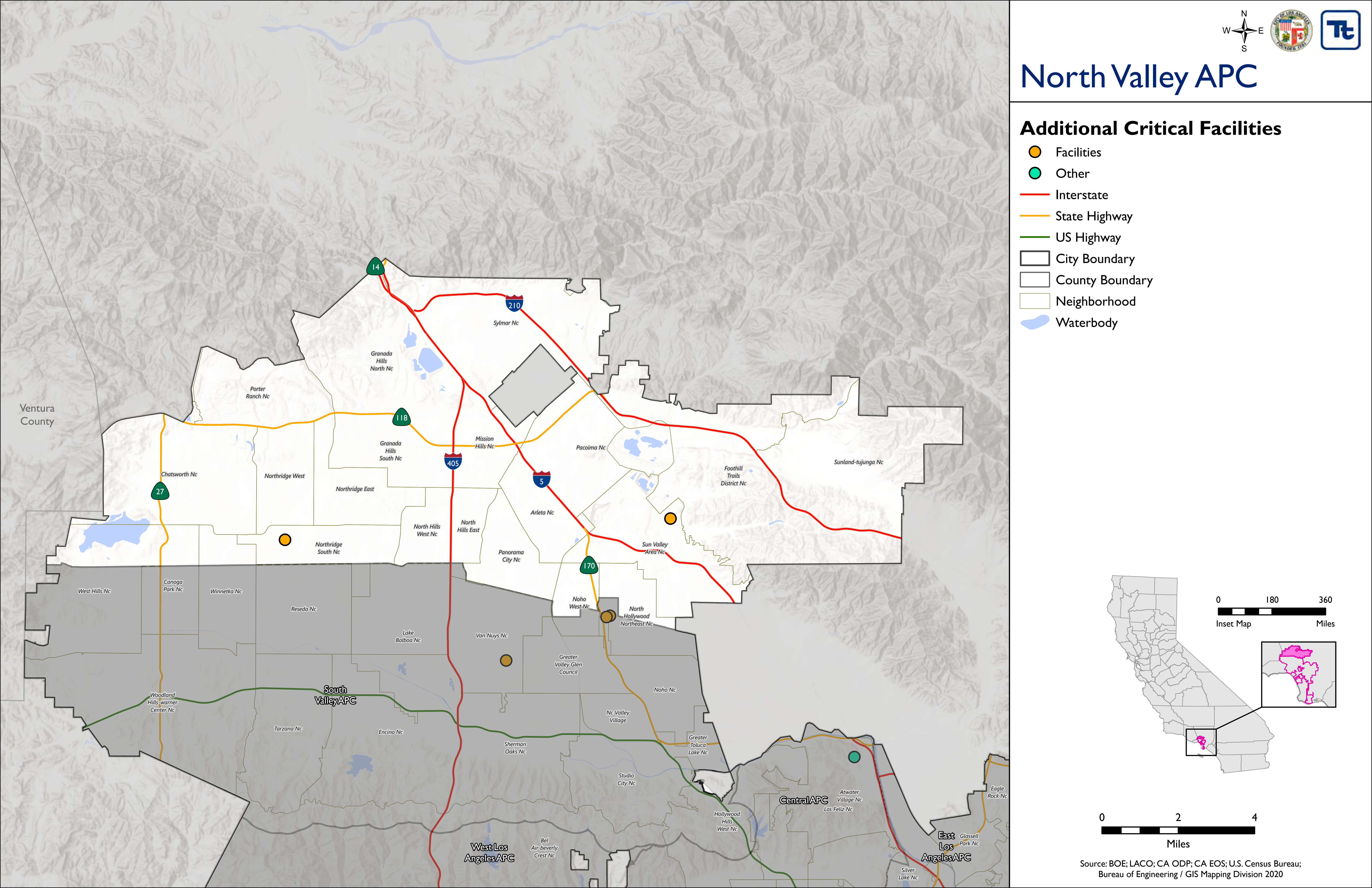
- Facilities
- Interstate
- State Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



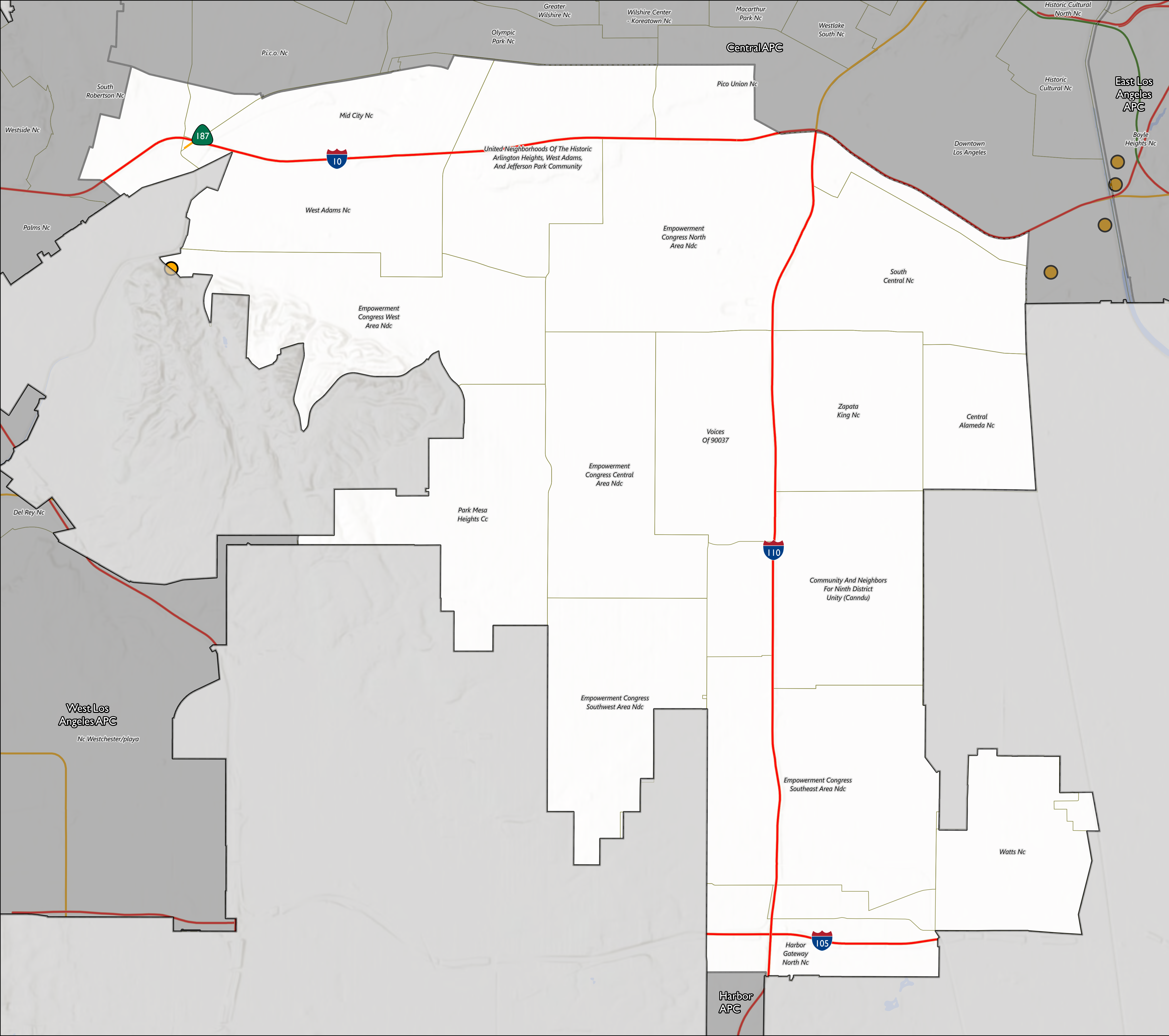
0 1.5 3

Miles

Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

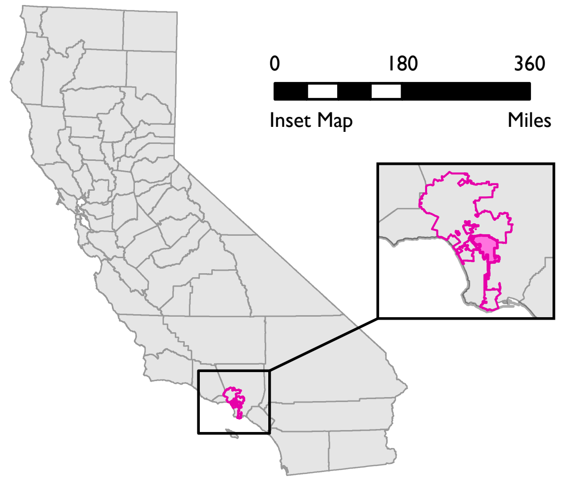

North Valley APC
Additional Critical Facilities
Facilities
Other
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
N
S
E
W
Ventura County
Sylmar Nc
Granada Hills North Nc
Porter Ranch Nc
Granada Hills South Nc
Mission Hills Nc
Pacoima Nc
Foothill Trails District Nc
Sunland-tujunga Nc
Chatsworth Nc
Northridge West
Northridge East
North Hills West Nc
North Hills East
Arleta Nc
Northridge South Nc
Panorama City Nc
Sun Valley Area Nc
Noho West Nc
North Hollywood Northeast Nc
West Hills Nc
Canoga Park Nc
Winnetka Nc
Reseda Nc
Lake Balboa Nc
Van Nuys Nc
Greater Valley Glen Council
Noho Nc
South Valley APC
Woodland Hills-warner Center Nc
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Nc Valley Village
Greater Toluca Lake Nc
Studio City Nc
Central APC
Atwater Village Nc
Los Feliz Nc
Hollywood Hills West Nc
Eagle Rock Nc
Glassell Park Nc
East Los Angeles APC
West Los Angeles APC
Bel Air-beverly Crest Nc
Silver Lake Nc
14
210
118
405
5
27
170
0 180 360
Inset Map Miles
0 2 4
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020

South Los Angeles APC



Additional Critical Facilities

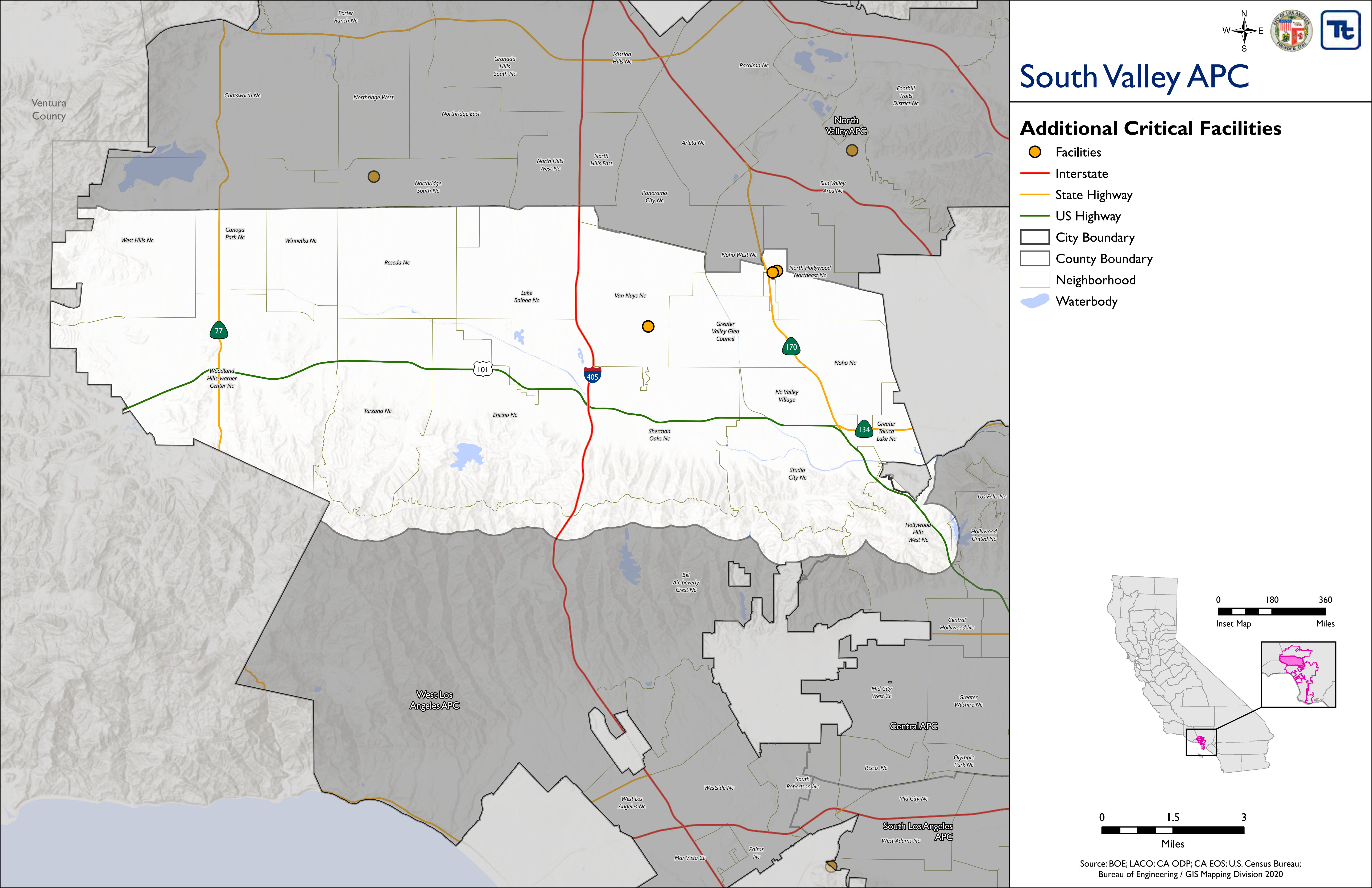
- Facilities
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1 2

Miles

Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau; Bureau of Engineering / GIS Mapping Division 2020



South Valley APC
Additional Critical Facilities
Facilities
Interstate
State Highway
US Highway
City Boundary
County Boundary
Neighborhood
Waterbody
Ventura County
North Valley APC
West Los Angeles APC
Central APC
South Los Angeles APC
Porter Ranch Nc
Mission Hills Nc
Granada Hills South Nc
Pacoima Nc
Foothill Trails District Nc
Chatsworth Nc
Northridge West
Northridge East
Arleta Nc
North Hills West Nc
North Hills East
Northridge South Nc
Panorama City Nc
Sun Valley Area Nc
West Hills Nc
Canoga Park Nc
Winnetka Nc
Reseda Nc
Lake Balboa Nc
Van Nuys Nc
Noho West Nc
North Hollywood Northeast Nc
Greater Valley Glen Council
Noho Nc
Nc Valley Village
Woodland Hills-warner Center Nc
Tarzana Nc
Encino Nc
Sherman Oaks Nc
Studio City Nc
Greater Toluca Lake Nc
Hollywood Hills West Nc
Los Feliz Nc
Hollywood United Nc
Bel Air-beverly Crest Nc
Central Hollywood Nc
Mid City West Cc
Greater Wilshire Nc
Olympic Park Nc
P.i.c.o. Nc
South Robertson Nc
Westside Nc
West Los Angeles Nc
Mid City Nc
West Adams Nc
Mar Vista Cc
Palms Nc
27
101
405
170
134
0 180 360
Inset Map Miles
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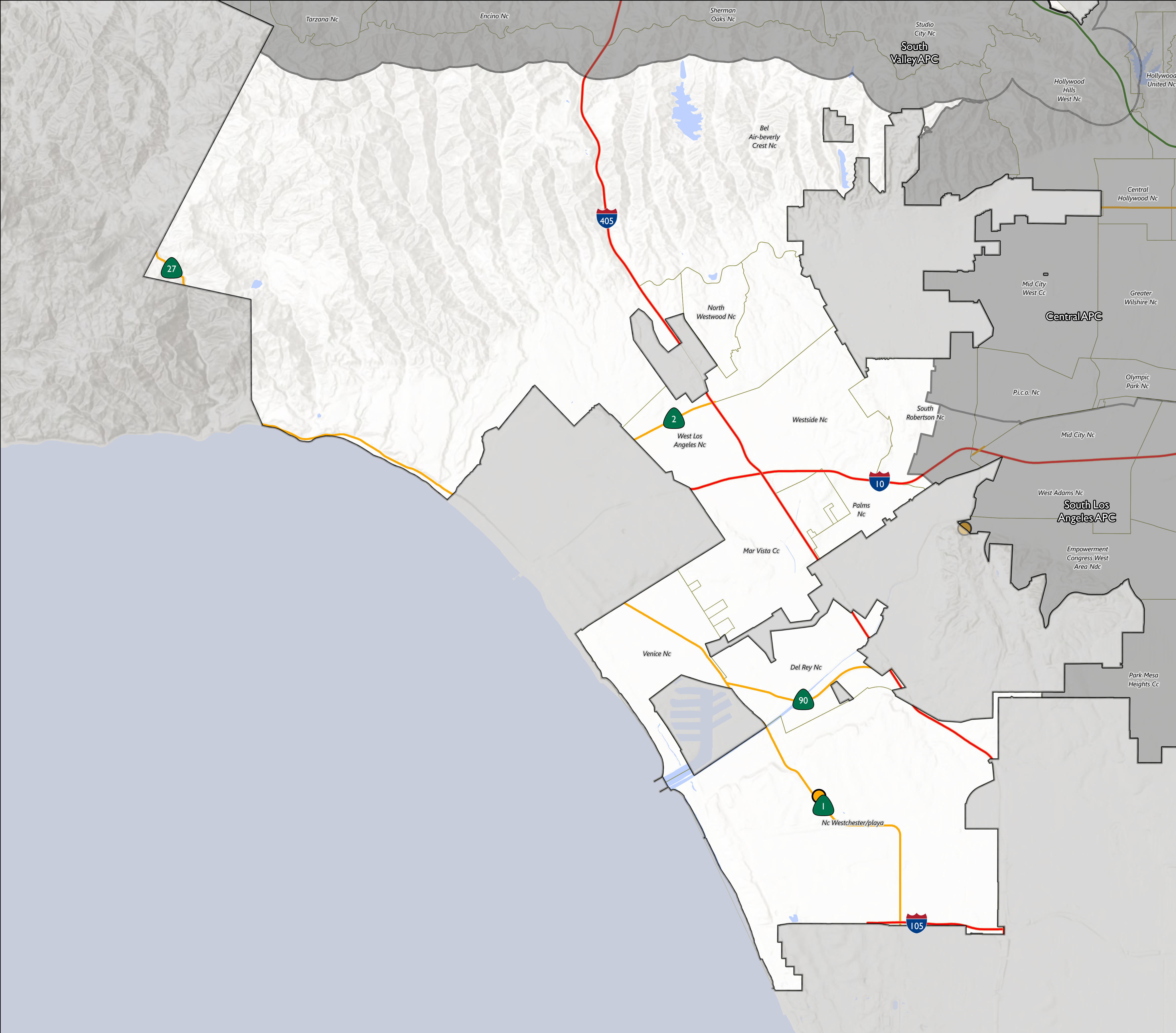
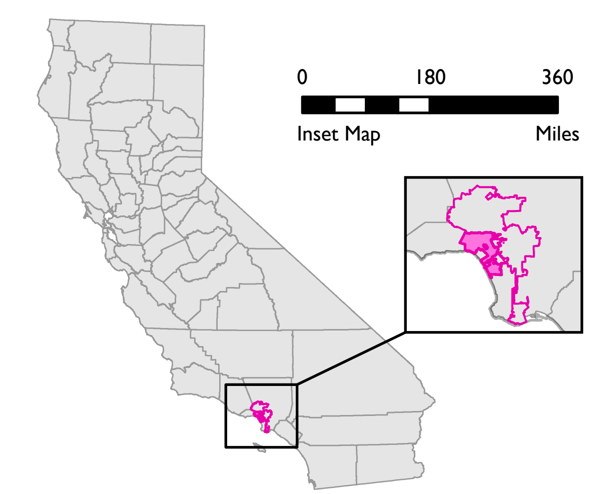
Miles
Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

West Los Angeles APC



Additional Critical Facilities

- Facilities
- Interstate
- State Highway
- US Highway
- City Boundary
- County Boundary
- Neighborhood
- Waterbody



0 1.5 3
Miles

Source: BOE; LACO; CA ODP; CA EOS; U.S. Census Bureau;
Bureau of Engineering / GIS Mapping Division 2020

D. Summary of Federal and State Agencies, Programs and Regulation

Existing laws, ordinances, plans and programs at the federal and state level can support or impair hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). The following federal and state programs have been identified as programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan. Information presented in this section can be used to review local capabilities to implement the action plan presented in this hazard mitigation plan.

Federal

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) seeks to prevent discrimination against people with disabilities in employment, transportation, public accommodation, communications, and government activities. Title II of the ADA deals with compliance with the Act in emergency management and disaster-related programs, services, and activities. It applies to state and local governments as well as third parties, including religious entities and private nonprofit organizations.

The ADA has implications for sheltering requirements and public notifications. During an emergency alert, officials must use a combination of warning methods to ensure that all residents have all necessary information. Those with hearing impairments may not hear radio, television, sirens, or other audible alerts, while those with visual impairments may not see flashing lights or other visual alerts. Two technical documents for shelter operators address physical accessibility needs of people with disabilities, as well as medical needs and service animals.

The ADA intersects with disaster preparedness programs in regard to transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses). Evacuation and other response plans should address the unique needs of residents. Local governments may be interested in implementing a special-needs registry to identify the home addresses, contact information, and needs for residents who may require more assistance.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Civil Rights Act of 1964

The Civil Rights Act of 1964 prohibits discrimination based on race, color, religion, sex or nation origin and requires equal access to public places and employment. The Act is relevant to emergency management and hazard mitigation in that it prohibits local governments from favoring the needs of one population group over another. Local government and emergency response must ensure the continued safety and well-being of all residents equally, to the extent possible. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation’s surface waters so that they can support “the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water.”

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, and pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. Numerous issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

The CWA is important to hazard mitigation in several ways. There are often permitting requirements for any construction within 200 feet of water of the United States, which may have implications for mitigation projects identified by a local jurisdiction. Additionally, CWA requirements apply to wetlands, which serve important functions related to preserving and protecting the natural and beneficial functions of floodplains and are linked with a community's floodplain management program. Finally, the National Pollutant Discharge Elimination System is part of the CWA and addresses local stormwater management programs. Stormwater management plays a critical role in hazard mitigation by addressing urban drainage or localized flooding issues within jurisdictions.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Community Development Block Grant Disaster Resilience Program

In response to disasters, Congress may appropriate additional funding for the U.S. Department of Housing and Urban Development Community Development Block Grant programs to be distributed as Disaster Recovery grants (CDBG-DR). These grants can be used to rebuild affected areas and provide seed money to start the recovery process. CDBG-DR assistance may fund a broad range of recovery activities, helping communities and neighborhoods that otherwise might not recover due to limited resources. CDBG-DR grants often supplement disaster programs of FEMA, the Small Business Administration, and the U.S. Army Corps of Engineers. Housing and Urban Development generally awards noncompetitive, nonrecurring CDBG-DR grants by a formula that considers disaster recovery needs unmet by other federal disaster assistance programs. To be eligible for CDBG-DR funds, projects must meet the following criteria:

- Address a disaster-related impact (direct or indirect) in a presidentially declared county for the covered disaster
- Be a CDBG-eligible activity (according to regulations and waivers)
- Meet a national objective.

Incorporating preparedness and mitigation into these actions is encouraged, as the goal is to rebuild in ways that are safer and stronger. CDBG-DR funding is a potential alternative source of funding for actions identified in this plan.

Community Rating System

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The discount partially depends on location of the property. Properties outside the special flood hazard area receive smaller discounts: a 10 percent discount if the community is at Class 1 to 6 and a 5 percent discount if the community is at Class 7 to 9. The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66 percent of the NFIP's policy base is located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks.

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Assistance grant funds are available to communities. This plan is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds.

Emergency Relief for Federally Owned Roads Program

The U.S. Forest Service's Emergency Relief for Federally Owned Roads Program was established to assist federal agencies with repair or reconstruction of tribal transportation facilities, federal lands transportation facilities, and other federally owned roads that are open to public travel and have suffered serious damage by a natural disaster over a wide area or by a catastrophic failure. The program funds both emergency and permanent repairs (Office of Federal Lands Highway, 2016). Eligible activities under this program meet some of the goals and objectives for this plan and the program is a possible funding source for actions identified in this plan.

Emergency Watershed Program

The U. S. Department of Agriculture Natural Resources Conservation Service administers the Emergency Watershed Protection Program, which responds to emergencies created by natural disasters. Eligibility for assistance is not dependent on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. Emergency Watershed Protection is an emergency recovery program. Financial and technical assistance are available for the following activities (Natural Resources Conservation Service, 2016):

- Remove debris from stream channels, road culverts, and bridges
- Reshape and protect eroded banks
- Correct damaged drainage facilities
- Establish cover on critically eroding lands
- Repair levees and structures
- Repair conservation practices.

This federal program could be a possible funding source for actions identified in this plan.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- Endangered means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- Threatened means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- Critical habitat means "specific geographical areas that are…essential for the conservation and management of a listed species, whether occupied by the species or not."

Five sections of the ESA are of critical importance to understanding it:

- Section 4: Listing of a Species—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or citizens may petition for them. A listing must be made "solely on the basis of the best scientific and commercial data available." After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- Section 7: Consultation—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a "consultation." If the listing agency finds that an action will "take" a species, it must propose mitigations or "reasonable and prudent" alternatives to the action; if the proponent rejects these, the action cannot proceed.
- Section 9: Prohibition of Take—It is unlawful to "take" an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding or sheltering.
- Section 10: Permitted Take—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a "Habitat Conservation Plan."
- Section 11: Citizen Lawsuits—Civil actions initiated by any citizen can require the listing agency to enforce the ESA's prohibition of taking or to meet the requirements of the consultation process.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) cooperates with a large number of federal and state agencies to ensure and promote dam safety. More than 3,000 dams are part of regulated hydroelectric projects in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters

- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent engineer approved by the FERC must inspect and evaluate projects with dams higher than 32.8 feet (10 meters), or with a total storage capacity of more than 2,000 acre-feet.

FERC monitors seismic research and applies it in performing structural analyses of hydroelectric projects. FERC also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication Engineering Guidelines for the Evaluation of Hydropower Projects guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

National Dam Safety Act

Potential for catastrophic flooding due to dam failures led to passage of the National Dam Inspection Act in 1972, creation of the National Dam Safety Program in 1996, and reauthorization of the program through the Dam Safety Act in 2006. National Dam Safety Program, administered by FEMA requires a periodic engineering analysis of the majority of dams in the country; exceptions include the following:

- Dams under jurisdiction of the Bureau of Reclamation, Tennessee Valley Authority, or International Boundary and Water Commission
- Dams constructed pursuant to licenses issued under the Federal Power Act
- Dams that the Secretary of the Army determines do not pose any threat to human life or property.

The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect lives and property of the public. The National Dam Safety Program is a partnership among the states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all participating states to improve their programs through increased inspections, emergency action planning, and purchases of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most of the dams in the United States.

National Environmental Policy Act

The National Environmental Policy Act requires federal agencies to consider the environmental impacts of proposed actions and reasonable alternatives to those actions, alongside technical and economic considerations. The National Environmental Policy Act established the Council on Environmental Quality, whose regulations (40 CFR Parts 1500-1508) set standards for compliance. Consideration and decision-making regarding environmental impacts must be documented in an environmental impact statement or environmental assessment. Environmental impact assessment requires the evaluation of reasonable alternatives to a proposed action, solicitation of input from organizations and individuals that could be affected, and an unbiased presentation of direct, indirect, and cumulative environmental impacts. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities that enact floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act. NFIP participation is limited to local governments that possess permit authority and have the ability to adopt and enforce regulations that govern land use.

For most participating communities, FEMA has prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1 percent-annual-chance flood and the 0.2 percent-annual-chance flood. Base flood elevations and the boundaries of the flood hazard areas are shown on Flood Insurance Rate Maps, which are the principle tool for identifying the extent and location of the flood hazard. Flood Insurance Rate Maps are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under the local floodplain management program. In recent years, Flood Insurance Rate Maps have been digitized as Digital Flood Insurance Rate Maps, which are more accessible to residents, local governments and stakeholders.

NFIP participants must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 1 percent-annual-chance flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.

- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

In California, the Department of Water Resources (DWR) is the coordinating agency for floodplain management. DWR works with FEMA and local governments by providing grants and technical assistance, evaluating community floodplain management programs, reviewing local floodplain ordinances, participating in statewide flood hazard mitigation planning, and facilitating annual statewide workshops. Compliance is monitored by FEMA regional staff and by DWR.

National Incident Management System

The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards. The NIMS provides a flexible but standardized set of incident management practices. Incidents typically begin and end locally, and they are managed at the lowest possible geographical, organizational, and jurisdictional level. In some cases, success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and emergency responder disciplines. These cases necessitate coordination across a spectrum of organizations. Communities using NIMS follow a comprehensive national approach that improves the effectiveness of emergency management and response personnel across the full spectrum of potential hazards (including natural hazards, technological hazards, and human-caused hazards) regardless of size or complexity.

Although participation is voluntary, federal departments and agencies are required to make adoption of NIMS by local and state jurisdictions a condition to receive federal preparedness grants and awards. The content of this plan is considered to be a viable support tool for any phase of emergency management. The NIMS program is considered as a response function, and information in this hazard mitigation plan can support the implementation and update of all NIMS-compliant plans within the planning area.

Presidential Executive Order 11988, Floodplain Management

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values of floodplains. The requirements apply to the following activities (FEMA, 2015a):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements

- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

Presidential Executive Order 11990, Protection of Wetlands

Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The requirements apply to the following activities (National Archives, 2016):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

All actions identified in this plan will seek full compliance with all applicable presidential executive orders.

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers operates and maintains approximately 700 dams nationwide. It is also responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried dams; surveyed each state and federal agency's capabilities, practices and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety. The Corps maintains the National Inventory of Dams, which contains information about a dam's location, size, purpose, type, last inspection and regulatory status (U.S. Army Corps of Engineers, 2017).

U.S. Army Corps of Engineers Flood Hazard Management

The following U.S. Army Corps of Engineers authorities and programs related to flood hazard management:

- The Floodplain Management Services program offers 100 percent federally funded technical services such as development and interpretation of site-specific data related to the extent, duration and frequency of flooding. Special studies may be conducted to help a community understand and respond to flood risk. These may include flood hazard evaluation, flood warning and preparedness, or flood modeling.
- For more extensive studies, the Corps of Engineers offers a cost-shared program called Planning Assistance to States and Tribes. Studies under this program generally range from $25,000 to $100,000 with the local jurisdiction providing 50 percent of the cost.
- The Corps of Engineers has several cost-shared programs (typically 65 percent federal and 35 percent non-federal) aimed at developing, evaluating and implementing

structural and non-structural capital projects to address flood risks at specific locations or within a specific watershed:

- The Continuing Authorities Program for smaller-scale projects includes Section 205 for Flood Control, with a $7 million federal limit and Section 14 for Emergency Streambank Protection with a $1.5 million federal limit. These can be implemented without specific authorization from Congress.
- Larger scale studies, referred to as General Investigations, and projects for flood risk management, for ecosystem restoration or to address other water resource issues, can be pursued through a specific authorization from Congress and are cost-shared, typically at 65 percent federal and 35 percent non-federal.
- Watershed management planning studies can be specifically authorized and are cost-shared at 50 percent federal and 50 percent non-federal.

- The Corps of Engineers provides emergency response assistance during and following natural disasters. Public Law 84-99 enables the Corps to assist state and local authorities in flood fight activities and cost share in the repair of flood protective structures. Assistance is provided in the flowing categories:
    - Preparedness—The Flood Control and Coastal Emergency Act establishes an emergency fund for preparedness for emergency response to natural disasters; for flood fighting and rescue operations; for rehabilitation of flood control and hurricane protection structures. Funding for Corps of Engineers emergency response under this authority is provided by Congress through the annual Energy and Water Development Appropriation Act. Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state and federal agencies.
    - Response Activities—Public Law 84-99 allows the Corps of Engineers to supplement state and local entities in flood fighting urban and other non-agricultural areas under certain conditions (Engineering Regulation 500-1-1 provides specific details). All flood fight efforts require a project cooperation agreement signed by the public sponsor and the sponsor must remove all flood fight material after the flood has receded. Public Law 84-99 also authorizes emergency water support and drought assistance in certain situations and allows for “advance measures” assistance to prevent or reduce flood damage conditions of imminent threat of unusual flooding.
    - Rehabilitation—Under Public Law 84-99, an eligible flood protection system can be rehabilitated if damaged by a flood event. The flood system would be restored to its pre-disaster status at no cost to the federal system owner, and at 20 percent cost to the eligible non-federal system owner. All systems considered eligible for Public Law 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program prior to the flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested federal, state, and local agencies following natural disaster events where flood control works are damaged.

These authorities and programs are all available to support any related mitigation actions.

STATE

AB 32: The California Global Warming Solutions Act

This bill identifies the following potential adverse impacts of global warming:

> "… the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems."

AB 32 establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020 (a reduction of approximately 25 percent from forecast emission levels), with further reductions to follow. The law requires the state Air Resources Board to do the following:

- Establish a program to track and report greenhouse gas emissions.
- Approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions from sources of greenhouse gas emissions.
- Adopt early reduction measures to begin moving forward.
- Adopt, implement and enforce regulations—including market mechanisms such as "cap and-trade" programs—to ensure that the required reductions occur.

The Air Resources Board has adopted a statewide greenhouse gas emissions limit and an emissions inventory, along with requirements to measure, track, and report greenhouse gas emissions by the industries it determined to be significant sources of greenhouse gas emissions.

AB 70: Flood Liability

This bill provides that a city or county may be required to contribute a fair and reasonable share to compensate for property damage caused by a flood to the extent that it has increased the state's exposure to liability for property damage by unreasonably approving new development in a previously undeveloped area that is protected by a state flood control project, unless the city or county meets specified requirements.

AB 162: Flood Planning

This California State Assembly Bill passed in 2007 requires cities and counties to address flood-related matters in the land use, conservation, and safety and housing elements of their general plans. The land use element must identify and annually review the areas covered by the General Plan that are subject to flooding as identified in floodplain mapping by either FEMA or the state Department of Water Resources (DWR). During the next revision of the housing element on or after January 1, 2009, the conservation element of the General Plan must identify rivers, creeks, streams, flood corridors, riparian habitat, and land that may accommodate floodwater for the purpose of groundwater recharge and stormwater management. The Safety Element must identify information regarding flood hazards, including:

- Flood hazard zones
- Maps published by FEMA, DWR, the U.S. Army Corps of Engineers, the Central Valley Flood Protection Board, and the Governor's Office of Emergency Services (Cal OES)
- Historical data on flooding
- Existing and planned development in flood hazard zones.

The General Plan must establish goals, policies and objectives related to flooding risks, including:

- Avoiding or minimizing the risks of flooding new development
- Evaluating whether new development should be located in flood hazard zones
- Identifying construction methods to minimize damage.

AB 162 establishes goals, policies and objectives related to flooding risks. It establishes procedures for the determination of available land suitable for urban development, which may exclude lands where FEMA or DWR has concluded that the flood management infrastructure is not adequate to avoid the risk of flooding.

AB 747: Required Information for General Plan Safety Elements

This bill requires California communities with general plans to address evacuation routes in the Safety Element of the General Plan. Information on the evacuation routes and their capacity, safety and viability under a range of emergency scenarios must be provided. For communities that have not adopted a local hazard mitigation plan, the Safety Element must be updated with this information by January 1, 2022. For those with a local hazard mitigation plan, the requirement applies upon the next revision of the hazard mitigation plan on or after January 1, 2022. Communities that have adopted a local hazard mitigation plan, emergency operations plan, or other document that fulfills the goals and objectives of this law may comply with this requirement by summarizing and incorporating by reference the other plan or document in the Safety Element.

In subsequent revisions to the Safety Element, communities also will be required to identify new information relating to flood and fire hazards and climate adaptation and resiliency strategies applicable to the city or county that was not available during the previous revision of the Safety Element. These subsequent updates must occur upon each revision of the General Plan housing element or local hazard mitigation plan and not less than once every eight years.

AB 2140: General Plans—Safety Element

This bill provides that the state may allow for more than 75 percent of public assistance funding under the California Disaster Assistance Act only if the local agency is in a jurisdiction that has adopted a local hazard mitigation plan as part of the Safety Element of its General Plan. The local hazard mitigation plan needs to include elements specified in this legislation. In addition, this bill requires Cal OES to give preference for federal mitigation funding to cities and counties that have adopted local hazard mitigation plans. The intent of the bill is to encourage cities and counties to create and adopt hazard mitigation plans.

AB 2800: Climate Change—Infrastructure Planning

This California State Assembly bill passed in 2016 and until July 1, 2020, requires state agencies to take into account the current and future impacts of climate change when planning, designing, building, operating, maintaining, and investing in state infrastructure. The bill, by July 1, 2017, and until July 1, 2020, requires an agency to establish a Climate-Safe Infrastructure Working Group to examine how to integrate scientific data concerning projected climate change impacts into state infrastructure engineering.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was enacted in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Earthquake Fault Zoning Act's main purpose is to prevent construction of buildings used for human occupancy on the surface trace of active faults. Before a new project is permitted, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards, such as liquefaction or seismically induced landslides. The law requires the State of California Geologist to establish regulatory zones around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. All seismic hazard mitigation actions identified in this plan will seek full compliance with the Alquist-Priolo Earthquake Fault Zoning Act.

California Department of Water Resources

In California, the DWR is the coordinating agency for floodplain management. The DWR works with FEMA and local governments by providing grants and technical assistance, evaluating community floodplain management programs, reviewing local floodplain ordinances, participating in statewide flood hazard mitigation planning, and facilitating annual statewide workshops. Compliance is monitored by FEMA regional staff and by the DWR.

California Division of Safety of Dams

California's Division of Safety of Dams (a division of the DWR) monitors the dam safety program at the state level and maintains a working list of dams in the state. When a new dam is proposed, Division engineers and geologists inspect the site and the subsurface. Upon submittal of an application, the Division reviews the plans and specifications prepared by the owner to ensure that the dam is designed to meet minimum requirements and that the design is appropriate for the known geologic conditions. After approval of the application, the Division inspects all aspects of the construction to ensure that the work is done in accordance with the approved plans and specifications. After construction, the Division inspects each dam to ensure that it is performing as intended and is not developing problems. The Division periodically reviews the stability of dams and their major appurtenances in light of improved design approaches and requirements, as well as new findings regarding earthquake hazards and hydrologic estimates in California. Over 1,200 dams are inspected by Division engineers on a yearly schedule to ensure performance and maintenance of dams (California Division of Safety of Dams, 2017).

California Environmental Quality Act

The California Environmental Quality Act (CEQA) was passed in 1970, shortly after the federal government enacted the National Environmental Policy Act, to institute a statewide policy of environmental protection. CEQA requires state and local agencies in California to follow a protocol of analysis and public disclosure of the potential environmental impacts of development projects. CEQA makes environmental protection a mandatory part of every California state and local agency's decision-making process.

CEQA establishes a statewide environmental policy and mandates actions all state and local agencies must take to advance the policy. Jurisdictions conduct analysis of the project to determine if there are potentially significant environmental impacts, identify mitigation measures, and possible project alternatives by preparing environmental reports for projects that requires CEQA review. This environmental review is required before an agency takes action on any policy, program, or project. Any project action identified in this plan will seek full CEQA compliance upon implementation.

California General Planning Law

California state law requires that every county and city prepare and adopt a comprehensive long-range plan to serve as a guide for community development. The General Plan expresses the community's goals, visions, and policies relative to future land uses, both public and private. The General Plan is mandated and prescribed by state law (Cal. Gov. Code §65300 et seq.) and forms the basis for most local government land use decision-making.

The plan must consist of an integrated, internally consistent set of goals, policies, and implementation measures. In addition, the plan must focus on issues of the greatest concern to the community and be written in a clear and concise manner. City and county actions, such as those relating to land use allocations, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with the plan.

California Multi-Hazard Mitigation Plan

Under the DMA, California must adopt a federally approved state multi-hazard mitigation plan to be eligible for certain disaster assistance and mitigation funding. The intent of the State of California Multi-Hazard Mitigation Plan is to reduce or prevent injury and damage from hazards in the state through the following:

- Documenting statewide hazard mitigation planning in California
- Describing strategies and priorities for future mitigation activities
- Facilitating the integration of local and tribal hazard mitigation planning activities into statewide efforts
- Meeting state and federal statutory and regulatory requirements

The plan is an annex to the State Emergency Plan, and it identifies past and present mitigation activities, current policies and programs, and mitigation strategies for the future. It also establishes hazard mitigation goals and objectives. The plan will be reviewed and updated annually to reflect changing conditions and new information, especially information on local planning activities.

Under 44 CFR Section 201.6, local hazard mitigation plans must be consistent with their state's hazard mitigation plan. In updating this plan, the Steering Committee reviewed the California State Hazard Mitigation Plan to identify key relevant state plan elements (see Section 3.7).

California Residential Mitigation Program

The California Residential Mitigation Program was established in 2011 to help Californians strengthen their homes against damage from earthquakes. The program is a joint powers authority created by Cal OES and the California Earthquake Authority, which is a not-for-profit, publicly managed, privately funded provider of home earthquake insurance to California homeowners and renters.

Earthquake Brace + Bolt was developed to help homeowners lessen the potential for damage to their houses during an earthquake. A residential seismic retrofit strengthens an existing older house, making it more resistant to earthquake activity such as ground shaking and soil failure. The seismic retrofitting involves bolting the house to its foundation and adding bracing around the perimeter of the crawl space. Most homeowners hire a contractor to do the retrofit work, and owners of houses in ZIP Codes with house characteristics suitable for this type of retrofit are eligible for up to $3,000 toward the cost. A typical retrofit by a contractor may cost between $3,000 and $7,000, depending on the location and size of the house, contractor fees, and the amount of materials and work involved. If the homeowner is an experienced do-it-yourselfer, a retrofit can cost less than $3,000.

California State Building Code

California Code of Regulations Title 24 (CCR Title 24), also known as the California Building Standards Code, is a compilation of building standards from three sources:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions
- Building standards authorized by the California legislature that constitute extensive additions not covered by the model codes adopted to address particular California concerns

The state Building Standards Commission is authorized by California Building Standards Law (Health and Safety Code Sections 18901 through 18949.6) to administer the processes related to the adoption, approval, publication, and implementation of California's building codes. These building codes serve as the basis for the design and construction of buildings in California. The national model code standards adopted into Title 24 apply to all occupancies in California, except for modifications adopted by state agencies and local governing bodies. Since 1989, the Building Standards Commission has published new editions of Title 24 every three years.

On January 1, 2014, California Building Code Accessibility Standards found in Chapter 11B incorporated the 2010 Americans with Disabilities Act (ADA) Standards as the model accessibility code for California. The purpose was to ensure consistency with federal guidelines. As a result of this incorporation, the California standards will fully implement and include 2010 ADA Standards within the California Building Code while maintaining enhanced levels of accessibility already provided by existing California accessibility regulations.

Disadvantaged and Low-income Communities Investments

Senate Bill (SB) 535 directs state and local agencies to make investments that benefit California's disadvantaged communities. It also directs the California Environmental Protection Agency to identify disadvantaged communities for the purposes of these investments based on geographic, socio-economic, public health, and environmental hazard criteria. Assembly Bill (AB) 1550 increased the percent of funds for projects located in disadvantaged communities from 10 to 25 percent and added a focus on investments in low-income communities and households. This program is a potential alternative source of funding for actions identified in this plan.

Division of the State Architect's AB 300 List of Seismically At-Risk Schools

In 2002, California's Division of the State Architect completed an inventory of public school buildings built before 1978 that identifies buildings with characteristics that might make them unsafe in future earthquakes. This inventory provides a list of potentially at-risk schools known as the AB 300 list (the inventory was authorized by Assembly Bill 300 in 1999). Using available information on school buildings' dates of construction, seismic retrofits, and structural systems (wood-frame, concrete shear wall, or steel moment frame, etc.), the inventory categorized California public school buildings into one of two categories: those expected to perform well in future earthquakes; and those that are not expected to perform well and require more detailed seismic evaluation.

The Division of the State Architect recommends that public schools on this list undergo detailed seismic evaluations to determine if they pose life safety risks, but the state has neither required nor funded school districts to do this.

Governor's Executive Order S-13-08

Governor's Executive Order S-13-08 enhances the state's management of climate impacts from sea-level rise, increased temperatures, shifting precipitation and extreme weather events. There are four key actions in the executive order:

- Initiate California's first statewide climate change adaptation strategy to assess expected climate change impacts, identify where California is most vulnerable, and recommend adaptation policies. This effort will improve coordination within state government so that better planning can more effectively address climate impacts on human health, the environment, the state's water supply and the economy.
- Request that the National Academy of Science establish an expert panel to report on sea-level rise impacts in California, to inform state planning and development efforts.
- Issue interim guidance to state agencies for how to plan for sea-level rise in designated coastal and floodplain areas for new projects.
- Initiate a report on critical infrastructure projects vulnerable to sea-level rise.

Senate Bill 92: Public Resources Portion of Biennial Budget Bill

The State of California updated its requirements regarding emergency action plans (EAPs) via Senate Bill 92, which became effective in June 2017 as part of the state Legislature's biennial budget process. The bill required dam owners to submit EAPs to Cal OES and the Department of Water Resources for approval by January 1, 2018 (for extremely high hazard dams), January 1, 2019 (for high-hazard dams), and January 1, 2021 (for significant hazard dams). The EAPs were to include the following (California Government Code Section 8589.5; Cal OES, 2018):

- Emergency notification flow charts
- Information on a four-step response process

- Description of agencies' roles and actions in response to an emergency incident
- Description of actions to be taken in advance of an emergency
- Inundation maps
- Additional information such as revision records and distribution lists

After the EAPs are approved by the state, the law requires dam owners to send the approved EAPs to relevant stakeholders. Local public agencies can then adopt emergency procedures that incorporate the information in the EAP in a manner that conforms to local needs and includes methods and procedures for alerting and warning the public and other response and preparedness related items (State of California, 2018).

SB 92 also requires dams other than low-risk dams to have current inundation mapping, which must be updated every 10 years, or sooner if specific circumstances change. EAPs also must be updated every 10 years. It provides DWR with enforcement tools, including fines and operational restrictions for failure to comply. Cal OES is required by the law to work with state and federal agencies, dam owners, planners, and the public to make dam failure inundation maps available to citizens interested in learning their dam failure inundation risk.

Senate Bill 97: Guidelines for Greenhouse Gas Emissions

Senate Bill 97, enacted in 2007, amends CEQA to clearly establish that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for CEQA analysis. It directs the Governor's Office of Planning and Research to develop draft CEQA guidelines for the mitigation of greenhouse gas emissions or their effects by July 1, 2009, and directs the California Natural Resources Agency to certify and adopt the CEQA Guidelines by January 1, 2010.

Senate Bill 99: Evacuation Route Planning

Senate Bill 99, enacted in 2019, requires that cities' and counties' general plans address evacuation routes from any hazard area identified in the Safety Element. Under this law, the Safety Element must include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes. Each city or county must update its Safety Element with the new information upon the next revision of its housing element on or after January 1, 2020.

Senate Bill 379: General Plans: Safety Element—Climate Adaptation

Senate Bill 379 builds upon the flood planning inclusions into the safety and housing elements and the hazard mitigation planning Safety Element inclusions in general plans outlined in AB 162 and AB 2140, respectively. SB 379 focuses on a new requirement that cities and counties include climate adaptation and resiliency strategies in the Safety Element of their general plans beginning January 1, 2017. In addition, this bill requires general plans to include a set of goals, policies and objectives, and specified implementation measures based on the conclusions drawn from climate adaptation research and recommendations.

Senate Bill 1000: General Plan Amendments—Safety and Environmental Justice Elements

In 2016, Senate Bill 1000 amended California's Planning and Zoning Law in two ways:

- The original law established requirements for initial revisions of General Plan safety elements to address flooding, fire, and climate adaptation and resilience. It also required subsequent review and revision as necessary based on new information. Senate Bill 1000 specifies that the subsequent reviews and revision based on new information are required to address only flooding and fires (not climate adaptation and resilience).
- Senate Bill 1000 adds a requirement that, upon adoption or revision of any two other General Plan elements on or after January 1, 2018, an environmental justice element be adopted for the General Plan or environmental justice goals, policies and objectives be incorporated into other elements of the plan.

Senate Bill 1035: Fire, Flood, and Adaptation Safety Element Updates

Senate Bill 1035 clarifies that revisions to a community's General Plan Safety Element—to address fire hazards, flood hazards, and climate adaptation and resilience strategies—must occur upon each revision to a Housing Element or Local Hazard Mitigation Program.

Standardized Emergency Management System

CCR Title 19 establishes the Standardized Emergency Management System (SEMS) to standardize the response to emergencies involving multiple jurisdictions. SEMS is intended to be flexible and adaptable to the needs of all emergency responders in California. It requires emergency response agencies to use basic principles and components of emergency management. Local governments must use SEMS by December 1, 1996, to be eligible for state funding of response-related personnel costs under CCR Title 19 (Sections 2920, 2925 and 2930). The roles and responsibilities of Individual agencies contained in existing laws or the state emergency plan are not superseded by these regulations. This hazard mitigation plan is considered to be a support document for all phases of emergency management, including those associated with SEMS.

E. Detailed Risk Assessment and Ranking Results

Risk Assessment

General Community Features and Assets

Jurisdiction	2020 Decennial Redistricting Census	
	Total Population	% of County Total
Central APC	396,309	10.2%
East Los Angeles APC	475,968	12.3%
Harbor APC	217,536	5.6%
North Valley APC	760,789	19.7%
South Los Angeles APC	761,718	19.7%
South Valley APC	816,016	21.1%
West Los Angeles APC	442,610	11.4%
City of Los Angeles (Total)	**3,870,946**	**100.0%**

Jurisdiction	Community Health and Equity Index Vulnerable Populations			
	Index 43.56 - 48.57		Index Greater than 48.57	
	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total
Central APC	64,717	16.3%	63,368	16.0%
East Los Angeles APC	99,255	20.9%	149,568	31.4%
Harbor APC	49,927	23.0%	83,519	38.4%
North Valley APC	223,104	29.3%	88,102	11.6%
South Los Angeles APC	242,455	31.8%	411,044	54.0%
South Valley APC	146,384	17.9%	48,808	6.0%
West Los Angeles APC	6,077	1.4%	0	0.0%
City of Los Angeles (Total)	**831,919**	**21.5%**	**844,409**	**21.8%**

Jurisdiction	Number of Buildings	Replacement Cost Value Structure	Contents	Total
Central APC	81,207	$97,846,488,746	$83,659,248,409	$181,505,737,155
East Los Angeles APC	90,628	$36,881,893,529	$30,460,950,764	$67,342,844,294
Harbor APC	41,797	$23,749,610,310	$19,486,685,560	$43,236,295,870
North Valley APC	142,352	$72,266,675,243	$56,348,199,150	$128,614,874,394
South Los Angeles APC	146,328	$60,067,623,226	$47,213,476,995	$107,281,100,221
South Valley APC	154,038	$87,560,040,934	$63,959,866,956	$151,519,907,890
West Los Angeles APC	83,294	$59,504,157,128	$42,598,783,918	$102,102,941,046
City of Los Angeles (Total)	**739,644**	**$437,876,489,117**	**$343,727,211,752**	**$781,603,700,869**

Jurisdiction	Residential		Commercial		Industrial		Government, Religion, Agricultural, and Education	
	Building Count	Total Replacement Cost Value	Building Count	Total Replacement Cost Value	Building Count	Total Replacement Cost Value	Building Count	Total Replacement Cost Value
Central APC	70,821	$54,359,758,545	8,074	$103,702,269,489	1,391	$12,368,025,437	921	$11,075,683,683
East Los Angeles APC	85,056	$26,998,236,285	3,624	$24,172,463,027	1,191	$9,391,230,940	757	$6,780,914,041
Harbor APC	38,874	$17,070,059,043	1,936	$17,072,386,404	601	$6,980,233,643	386	$2,113,616,780
North Valley APC	135,954	$63,439,399,176	3,492	$34,957,505,578	2,065	$21,760,619,780	841	$8,457,349,860
South Los Angeles APC	136,120	$46,607,444,913	6,954	$35,407,361,310	1,678	$11,056,755,100	1,576	$14,209,538,898
South Valley APC	145,823	$79,812,233,544	5,966	$54,540,296,351	1,348	$10,175,528,381	901	$6,991,849,615
West Los Angeles APC	79,095	$53,391,132,901	3,173	$40,695,010,064	511	$3,955,747,589	515	$4,061,050,492
City of Los Angeles (Total)	**691,743**	**$341,678,264,407**	**33,219**	**$310,547,292,223**	**8,785**	**$75,688,140,869**	**5,897**	**$53,690,003,370**

Land Use Category	2021 Data Acreage	% of County
Agriculture	566	0.2%
Barren Land	237	0.1%
Forest	3,106	1.0%
Rangeland	47,562	15.5%
Urban Area	248,815	81.3%
Water	3,801	1.2%

Land Use Category	Acreage	2021 Data % of County
Wetland	1,989	0.6%
City of Los Angeles (Total)	**306,077**	**100.0%**

Jurisdiction	Area Acres	Square Miles
Central APC	29,738.2	46.5
East Los Angeles APC	23,766.7	37.1
Harbor APC	18,235.5	28.5
North Valley APC	79,997.7	125.0
South Los Angeles APC	28,030.3	43.8
South Valley APC	67,586.4	105.6
West Los Angeles APC	52,881.3	82.6
City of Los Angeles (Total)	**300,236.0**	**469.1**

Jurisdiction	Number of Community Lifeline Facilities in Jurisdiction									
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Total
Central APC	82	213	94	25	444	217	223	4	3	1,305
East Los Angeles APC	36	4	36	70	166	190	240	6	4	752
Harbor APC	13	575	26	62	39	81	108	22	1	927
North Valley APC	46	60	40	129	282	215	231	10	2	1,015
South Los Angeles APC	43	101	62	38	223	286	149	7	1	910
South Valley APC	89	5	35	44	419	188	182	10	3	975
West Los Angeles APC	53	237	16	17	96	122	129	19	1	690
City of Los Angeles (Total)	**362**	**1,195**	**309**	**385**	**1,669**	**1,299**	**1,262**	**78**	**15**	**6,574**

Dam Failure

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the High and Very High Combined Dam Inundation Hazard Area Number of Persons	% of Jurisdiction Total
Central APC	396,309	84,140	21.2%
East Los Angeles APC	475,968	50,671	10.6%

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the High and Very High Combined Dam Inundation Hazard Area	
		Number of Persons	% of Jurisdiction Total
Harbor APC	217,536	3,016	1.4%
North Valley APC	760,789	165,640	21.8%
South Los Angeles APC	761,718	460,366	60.4%
South Valley APC	816,016	214,296	26.3%
West Los Angeles APC	442,610	90,397	20.4%
City of Los Angeles (Total)	**3,870,946**	**1,068,526**	**27.6%**

Jurisdiction	Estimated Number of Persons Located within both the Community Health and Equity Index Areas and High and Very High Combined Dam Inundation Hazard Area			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	8,500	2.1%	817	0.2%
East Los Angeles APC	9,737	2.0%	8,500	1.8%
Harbor APC	190	0.1%	341	0.2%
North Valley APC	50,128	6.6%	23,889	3.1%
South Los Angeles APC	104,314	13.7%	319,998	42.0%
South Valley APC	29,418	3.6%	26,519	3.2%
West Los Angeles APC	6,021	1.4%	0	0.0%
City of Los Angeles (Total)	**208,309**	**5.4%**	**380,064**	**9.8%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the High and Very High Combined Dam Inundation Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	19,985	24.6%	$65,113,801,348	35.9%
East Los Angeles APC	90,628	$67,342,844,294	10,277	11.3%	$13,387,363,715	19.9%
Harbor APC	41,797	$43,236,295,870	731	1.7%	$2,457,568,139	5.7%
North Valley APC	142,352	$128,614,874,394	31,179	21.9%	$25,555,306,880	19.9%
South Los Angeles APC	146,328	$107,281,100,221	89,010	60.8%	$68,020,097,024	63.4%
South Valley APC	154,038	$151,519,907,890	41,914	27.2%	$49,338,016,507	32.6%
West Los Angeles APC	83,294	$102,102,941,046	17,716	21.3%	$23,853,254,990	23.4%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**210,812**	**28.5%**	**$247,725,408,602**	**31.7%**

	Buildings in the High and Very High Combined Dam Inundation Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	15,036	3,490	1,169	$290
East Los Angeles APC	9,055	654	430	$138
Harbor APC	539	99	80	$13
North Valley APC	29,600	1,050	307	$222
South Los Angeles APC	82,268	4,251	1,513	$978
South Valley APC	38,295	2,587	754	$278
West Los Angeles APC	16,154	1,218	203	$141
City of Los Angeles (Total)	**190,947**	**13,349**	**4,456**	**2,060**

	Number of Facilities in High and Very High Combined Dam Inundation Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	28	74	40	25	115	65	61	4	2	414	31.7%
East Los Angeles APC	1	2	6	20	16	38	53	4	4	144	19.1%
Harbor APC	0	136	1	6	2	4	16	5	0	170	18.3%
North Valley APC	6	4	14	56	97	58	26	2	0	263	25.9%
South Los Angeles APC	22	7	40	35	104	195	50	7	0	460	50.5%
South Valley APC	45	1	21	33	258	83	63	5	3	512	52.5%
West Los Angeles APC	21	4	3	6	31	38	26	1	0	130	18.8%
City of Los Angeles (Total)	**123**	**228**	**125**	**181**	**623**	**481**	**295**	**28**	**9**	**2,093**	**31.8%**

Jurisdiction	Total Population (2020 Redistricting Decennial)	High and Very High Combined Dam Inundation Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Central APC	396,309	139,138	12,916
East Los Angeles APC	475,968	42,748	4,115
Harbor APC	217,536	241	101
North Valley APC	760,789	210,319	21,808
South Los Angeles APC	761,718	452,694	44,345
South Valley APC	816,016	362,097	28,605
West Los Angeles APC	442,610	105,474	6,809
City of Los Angeles (Total)	**3,870,946**	**1,312,711**	**118,699**

Jurisdiction	High and Very High Combined Dam Inundation Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Central APC	$181,505,737,155	$14,632,799,507	8.1%	$1,886,170,362	$9,132,297,646	$3,614,331,499
East Los Angeles APC	$67,342,844,294	$4,649,327,015	6.9%	$710,057,667	$2,283,280,963	$1,655,988,385
Harbor APC	$43,236,295,870	$335,521,712	0.8%	$19,336	$170,831,737	$164,670,639
North Valley APC	$128,614,874,394	$5,650,799,898	4.4%	$2,015,230,207	$1,669,658,000	$1,965,911,691
South Los Angeles APC	$107,281,100,221	$7,853,957,859	7.3%	$1,957,931,852	$3,241,187,810	$2,654,838,197
South Valley APC	$151,519,907,890	$14,020,691,737	9.3%	$5,357,721,952	$6,713,421,678	$1,949,548,107
West Los Angeles APC	$102,102,941,046	$8,383,568,035	8.2%	$2,061,094,074	$5,759,502,736	$562,971,225
City of Los Angeles (Total)	**$781,603,700,869**	**$55,526,665,763**	**7.1%**	**$13,988,225,450**	**$28,970,180,570**	**$12,568,259,743**

Jurisdiction	Debris Generated by High and Very High Combined Dam Inundation (tons)			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Central APC	288,750.4	150,000.1	79,817.6	58,932.6
East Los Angeles APC	158,435.7	44,592.5	61,340.9	52,502.3
Harbor APC	220.7	148.3	51.2	21.1
North Valley APC	241,660.2	146,924.6	47,257.4	47,478.2
South Los Angeles APC	217,430.1	204,885.1	7,383.7	5,161.3
South Valley APC	586,235.2	247,784.5	176,513.7	161,937.0
West Los Angeles APC	222,966.5	97,850.1	67,579.4	57,537.0
City of Los Angeles (Total)	**1,715,698.9**	**892,185.4**	**439,944.0**	**383,569.5**

Earthquake Risk Assessment

M7.2 Newport-Inglewood Fault Scenario

Jurisdiction	Newport-Inglewood M7.2 ShakeMap Scenario	
	Displaced Households	Persons Seeking Short-Term Sheltering
Central APC	38,987	20,298
East Los Angeles APC	2,024	1,302
Harbor APC	2,468	1,811
North Valley APC	32	26

Jurisdiction	Newport-Inglewood M7.2 ShakeMap Scenario Displaced Households	Persons Seeking Short-Term Sheltering
South Los Angeles APC	21,827	17,927
South Valley APC	1,261	564
West Los Angeles APC	9,920	4,638
City of Los Angeles (Total)	**76,519**	**46,566**

Jurisdiction	Total Replacement Cost Value (RCV)	Newport-Inglewood M7.2 ShakeMap Scenario - Estimated Losses				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
Central APC	$181,505,737,155	$13,097,490,720	7.2%	$3,551,440,361	$7,757,121,480	$1,788,928,879
East Los Angeles APC	$67,342,844,294	$1,734,288,163	2.6%	$513,002,456	$757,743,721	$463,541,986
Harbor APC	$43,236,295,870	$2,414,938,686	5.6%	$716,976,583	$1,200,359,071	$497,603,032
North Valley APC	$128,614,874,394	$1,144,508,239	0.9%	$446,982,085	$340,150,067	$357,376,086
South Los Angeles APC	$107,281,100,221	$13,303,617,204	12.4%	$4,100,980,189	$6,480,822,144	$2,721,814,871
South Valley APC	$151,519,907,890	$2,613,351,444	1.7%	$1,242,880,632	$1,050,536,183	$319,934,629
West Los Angeles APC	$102,102,941,046	$6,116,703,227	6.0%	$2,304,697,531	$3,316,349,158	$495,656,538
City of Los Angeles (Total)	**$781,603,700,869**	**$40,424,897,683**	**5.2%**	**$12,876,959,838**	**$20,903,081,825**	**$6,644,856,021**

Jurisdiction	Debris Generated by the Newport-Inglewood M7.2 ShakeMap Scenario (tons)	
	Brick/Wood (tons)	Concrete/Steel (tons
Central APC	1,652,623	2,561,498
East Los Angeles APC	240,201	269,991
Harbor APC	268,955	378,629
North Valley APC	52,397	58,247
South Los Angeles APC	1,723,416	2,616,602
South Valley APC	205,812	160,340
West Los Angeles APC	518,340	774,308
City of Los Angeles (Total)	**4,661,744**	**6,819,615**

Level of Severity	Time of Day - Newport-Inglewood M7.2 ShakeMap Scenario 2:00 AM	2:00 PM	5:00 PM
Injuries (non-hospitalized)	7,471	16,475	11,887
Hospitalization	2,150	5,006	3,742
Fatalities	595	1,266	942

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Newport-Inglewood M7.2 ShakeMap Scenario Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	691,743	NONE	340,268	49.2%
		MINOR	266,852	38.6%
		MODERATE	69,241	10.0%
		SEVERE	10,410	1.5%
		DESTRUCTION	4,972	0.7%
Commercial Buildings	33,219	NONE	9,333	28.1%
		MINOR	9,225	27.8%
		MODERATE	7,744	23.3%
		SEVERE	4,075	12.3%
		DESTRUCTION	2,843	8.6%
Industrial Buildings	8,785	NONE	2,527	28.8%
		MINOR	2,238	25.5%
		MODERATE	2,367	26.9%
		SEVERE	1,065	12.1%
		DESTRUCTION	588	6.7%
Government, Religion, Agricultural, and Education Buildings	5,897	NONE	2,655	45.0%
		MINOR	1,768	30.0%
		MODERATE	1,155	19.6%
		SEVERE	248	4.2%
		DESTRUCTION	71	1.2%

Name	Average Percent Probability of Sustaining Damage Newport-Inglewood M7.2 ShakeMap Scenario					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Lifelines									
Communications	26.7%	35.0%	33.3%	4.9%	0.1%	79.0%	97.4%	99.9%	99.9%
Energy	17.0%	43.1%	38.2%	1.7%	<0.1%	49.6%	79.7%	99.1%	99.9%

Name	Average Percent Probability of Sustaining Damage Newport-Inglewood M7.2 ShakeMap Scenario					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Food, Hydration, Shelter	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hazardous Materials	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Health and Medical	57.2%	39.7%	3.1%	<0.1%	0.0%	57.1%	95.9%	99.9%	99.9%
Safety and Security	56.7%	32.1%	10.9%	0.2%	<0.1%	56.7%	88.1%	99.7%	99.8%
Transportation	76.9%	14.2%	4.1%	3.1%	1.6%	91.6%	95.3%	95.8%	97.4%
Water Systems	35.6%	38.9%	23.0%	2.2%	0.3%	55.3%	97.1%	98.8%	99.7%

M7.3 Palos Verdes Fault Scenario

Jurisdiction	Palos Verde M7.3 ShakeMap Scenario	
	Displaced Households	Persons Seeking Short-Term Sheltering
Central APC	2,389	1,246
East Los Angeles APC	165	112
Harbor APC	4,482	3,086
North Valley APC	10	8
South Los Angeles APC	2,831	2,457
South Valley APC	205	104
West Los Angeles APC	2,920	1,330
City of Los Angeles (Total)	**13,003**	**8,343**

Jurisdiction	Total Replacement Cost Value (RCV)	Palos Verde M7.3 ShakeMap Scenario - Estimated Losses				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
Central APC	$181,505,737,155	$2,539,114,942	1.4%	$622,227,270	$1,523,984,448	$392,903,224
East Los Angeles APC	$67,342,844,294	$574,247,940	0.9%	$161,476,753	$242,390,984	$170,380,203
Harbor APC	$43,236,295,870	$4,283,045,013	9.9%	$1,610,530,458	$1,901,683,698	$770,830,857
North Valley APC	$128,614,874,394	$827,490,065	0.6%	$316,567,984	$238,408,953	$272,513,128
South Los Angeles APC	$107,281,100,221	$2,502,467,216	2.3%	$880,615,958	$1,015,715,539	$606,135,719
South Valley APC	$151,519,907,890	$1,723,684,148	1.1%	$836,174,421	$665,932,835	$221,576,892
West Los Angeles APC	$102,102,941,046	$3,231,564,013	3.2%	$1,415,305,313	$1,518,886,749	$297,371,951
City of Los Angeles (Total)	**$781,603,700,869**	**$15,681,613,336**	**2.0%**	**$5,842,898,157**	**$7,107,003,206**	**$2,731,711,974**

Jurisdiction	Debris Generated by the Palos Verde M7.3 ShakeMap Scenario (tons) Brick/Wood (tons)	Concrete/Steel (tons)
Central APC	354,752	325,047
East Los Angeles APC	70,634	60,139
Harbor APC	528,582	751,826
North Valley APC	34,277	38,123
South Los Angeles APC	420,431	374,086
South Valley APC	103,664	71,126
West Los Angeles APC	279,762	324,716
City of Los Angeles (Total)	**1,792,102**	**1,945,063**

Level of Severity	Time of Day - Palos Verde M7.3 ShakeMap Scenario 2:00 AM	2:00 PM	5:00 PM
Injuries (non-hospitalized)	2,231	3,716	2,944
Hospitalization	456	863	732
Fatalities	104	193	164

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Palos Verde M7.3 ShakeMap Scenario Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	691,743	NONE	471,578	68.2%
		MINOR	186,244	26.9%
		MODERATE	29,961	4.3%
		SEVERE	2,844	0.4%
		DESTRUCTION	1,116	0.2%
Commercial Buildings	33,219	NONE	17,279	52.0%
		MINOR	9,168	27.6%
		MODERATE	5,082	15.3%
		SEVERE	1,216	3.7%
		DESTRUCTION	474	1.4%
Industrial Buildings	8,785	NONE	4,147	47.2%
		MINOR	2,181	24.8%
		MODERATE	1,738	19.8%
		SEVERE	630	7.2%
		DESTRUCTION	89	1.0%
	5,897	NONE	4,153	70.4%

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Palos Verde M7.3 ShakeMap Scenario	
			Building Count	Percent Buildings in Occupancy Class
Government, Religion, Agricultural, and Education Buildings		MINOR	1,175	19.9%
		MODERATE	479	8.1%
		SEVERE	81	1.4%
		DESTRUCTION	9	0.2%

Name	Average Percent Probability of Sustaining Damage Palos Verde M7.3 ShakeMap Scenario					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Lifelines									
Communications	49.1%	33.4%	16.5%	1.0%	<0.1%	90.7%	99.4%	99.9%	99.9%
Energy	29.2%	40.6%	29.0%	1.2%	<01%	58.5%	84.6%	99.4%	99.9%
Food, Hydration, Shelter	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hazardous Materials	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Health and Medical	79.6%	19.8%	0.6%	<0.1%	0.0%	79.6%	98.9%	99.9%	99.9%
Safety and Security	76.2%	19.3%	4.3%	0.1%	<0.1%	76.2%	95.1%	99.8%	99.9%
Transportation	87.3%	8.8%	2.1%	1.2%	0.6%	96.4%	98.2%	98.4%	99.0%
Water Systems	38.9%	33.4%	25.6%	2.0%	<0.1%	56.3%	97.4%	99.2%	99.8%

M7.0 Puente Hills Fault Scenario

Jurisdiction	Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario	
	Displaced Households	Persons Seeking Short-Term Sheltering
Central APC	76,401	42,094
East Los Angeles APC	16,017	10,284
Harbor APC	216	159
North Valley APC	342	241
South Los Angeles APC	20,614	18,021
South Valley APC	2,196	1,001
West Los Angeles APC	2,407	1,151
City of Los Angeles (Total)	**118,192**	**72,950**

Jurisdiction	Total Replacement Cost Value (RCV)	Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario - Estimated Losses				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
Central APC	$181,505,737,155	$31,341,046,320	17.3%	$7,438,127,829	$19,079,908,711	$4,823,009,780
East Los Angeles APC	$67,342,844,294	$11,384,331,232	16.9%	$3,788,778,488	$4,935,355,125	$2,660,197,619
Harbor APC	$43,236,295,870	$639,295,212	1.5%	$193,296,557	$292,445,808	$153,552,846
North Valley APC	$128,614,874,394	$1,981,048,807	1.5%	$817,851,931	$632,720,489	$530,476,387
South Los Angeles APC	$107,281,100,221	$14,946,778,527	13.9%	$4,297,807,461	$7,107,599,753	$3,541,371,313
South Valley APC	$151,519,907,890	$2,912,831,638	1.9%	$1,323,923,782	$1,209,535,958	$379,371,898
West Los Angeles APC	$102,102,941,046	$2,924,034,958	2.9%	$1,238,747,241	$1,435,442,708	$249,845,009
City of Los Angeles (Total)	**$781,603,700,869**	**$66,129,366,694**	**8.5%**	**$19,098,533,289**	**$34,693,008,553**	**$12,337,824,853**

Jurisdiction	Debris Generated by the Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario (tons)	
	Brick/Wood (tons)	Concrete/Steel (tons)
Central APC	2,989,942	6,027,997
East Los Angeles APC	1,115,546	2,096,599
Harbor APC	55,327	56,582
North Valley APC	125,587	134,116
South Los Angeles APC	1,818,014	2,929,018
South Valley APC	253,181	226,535
West Los Angeles APC	252,995	270,035
City of Los Angeles (Total)	**6,610,592**	**11,740,883**

Level of Severity	Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario		
	2:00 AM	2:00 PM	5:00 PM
Injuries (non-hospitalized)	17,015	29,303	21,722
Hospitalization	6,094	9,754	7,555
Fatalities	1,821	2,582	2,010

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario	
			Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	691,743	NONE	290,604	42.0%
		MINOR	273,573	39.5%

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario Building Count	Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario Percent Buildings in Occupancy Class
		MODERATE	103,772	15.0%
		SEVERE	12,139	1.8%
		DESTRUCTION	11,656	1.7%
Commercial Buildings	33,219	NONE	7,541	22.7%
		MINOR	7,916	23.8%
		MODERATE	7,941	23.9%
		SEVERE	5,036	15.2%
		DESTRUCTION	4,785	14.4%
Industrial Buildings	8,785	NONE	1,956	22.3%
		MINOR	1,654	18.8%
		MODERATE	2,210	25.2%
		SEVERE	1,644	18.7%
		DESTRUCTION	1,322	15.0%
Government, Religion, Agricultural, and Education Buildings	5,897	NONE	1,986	33.7%
		MINOR	1,568	26.6%
		MODERATE	1,560	26.5%
		SEVERE	654	11.1%
		DESTRUCTION	129	2.2%

Name	Average Percent Probability of Sustaining Damage Puente Hills (DTLA direct hit) M7.0 ShakeMap Scenario					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Lifelines									
Communications	20.5%	34.6%	37.8%	6.9%	0.1%	75.1%	96.4%	99.8%	99.9%
Energy	35.9%	38.4%	24.5%	1.2%	<0.1%	63.0%	86.9%	99.3%	99.9%
Food, Hydration, Shelter	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hazardous Materials	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Health and Medical	41.3%	48.1%	10.5%	0.1%	0.0%	41.3%	88.3%	99.8%	99.9%
Safety and Security	44.4%	34.4%	20.3%	0.9%	<0.1%	44.4%	78.0%	99.0%	99.5%
Transportation	68.2%	16.8%	7.1%	5.0%	2.8%	86.2%	92.3%	93.0%	95.7%
Water Systems	41.7%	33.9%	20.8%	3.1%	0.6%	59.7%	96.0%	98.0%	99.5%

M7.8 San Andreas Fault Scenario

Jurisdiction	San Andreas (ShakeOut scenario) ShakeMap Scenario	
	Displaced Households	Persons Seeking Short-Term Sheltering
Central APC	560	306
East Los Angeles APC	117	73
Harbor APC	8	6
North Valley APC	37	30
South Los Angeles APC	189	169
South Valley APC	107	58
West Los Angeles APC	30	12
City of Los Angeles (Total)	**1,047**	**653**

Jurisdiction	Total Replacement Cost Value (RCV)	San Andreas (ShakeOut scenario) ShakeMap Scenario - Estimated Losses				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
Central APC	$181,505,737,155	$964,931,506	0.5%	$210,677,735	$577,868,444	$176,385,328
East Los Angeles APC	$67,342,844,294	$342,607,926	0.5%	$101,628,864	$137,553,649	$103,425,413
Harbor APC	$43,236,295,870	$85,643,352	0.2%	$25,241,228	$36,361,285	$24,040,839
North Valley APC	$128,614,874,394	$790,679,438	0.6%	$320,105,873	$226,033,224	$244,540,341
South Los Angeles APC	$107,281,100,221	$516,509,922	0.5%	$164,884,916	$201,873,921	$149,751,085
South Valley APC	$151,519,907,890	$683,960,881	0.5%	$280,556,600	$282,805,284	$120,598,998
West Los Angeles APC	$102,102,941,046	$278,670,882	0.3%	$109,833,776	$140,599,337	$28,237,770
City of Los Angeles (Total)	**$781,603,700,869**	**$3,663,003,908**	**0.5%**	**$1,212,928,991**	**$1,603,095,143**	**$846,979,774**

Jurisdiction	Debris Generated by the San Andreas (ShakeOut scenario) ShakeMap Scenario (tons)	
	Brick/Wood (tons)	Concrete/Steel (tons)
Central APC	122,476	139,816
East Los Angeles APC	43,453	41,926
Harbor APC	7,896	5,406
North Valley APC	41,205	37,379
South Los Angeles APC	74,477	71,197
South Valley APC	40,406	32,291
West Los Angeles APC	16,234	12,024

Jurisdiction	Debris Generated by the San Andreas (ShakeOut scenario) ShakeMap Scenario (tons)	
	Brick/Wood (tons)	Concrete/Steel (tons)
City of Los Angeles (Total)	**346,146**	**340,039**

Level of Severity	Time of Day - San Andreas (ShakeOut scenario) ShakeMap Scenario		
	2:00 AM	2:00 PM	5:00 PM
Injuries (non-hospitalized)	365	407	317
Hospitalization	21	29	22
Fatalities	0	1	0

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	San Andreas (ShakeOut scenario) ShakeMap Scenario	
			Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	691,743	NONE	628,813	90.9%
		MINOR	56,401	8.2%
		MODERATE	6,277	0.9%
		SEVERE	250	<0.1%
		DESTRUCTION	2	0.0%
Commercial Buildings	33,219	NONE	27,379	82.4%
		MINOR	4,583	13.8%
		MODERATE	1,186	3.6%
		SEVERE	71	0.2%
		DESTRUCTION	1	<0.1%
Industrial Buildings	8,785	NONE	6,278	71.5%
		MINOR	1,400	15.9%
		MODERATE	857	9.8%
		SEVERE	246	2.8%
		DESTRUCTION	5	0.1%
Government, Religion, Agricultural, and Education Buildings	5,897	NONE	5,539	93.9%
		MINOR	313	5.3%
		MODERATE	44	0.8%
		SEVERE	2	0.0%
		DESTRUCTION	0	<0.1%

Lifelines	Average Percent Probability of Sustaining Damage San Andreas (ShakeOut scenario) ShakeMap Scenario					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Communications	80.3%	17.7%	2.0%	<0.1%	0.0%	98.8%	99.9%	99.9%	99.9%
Energy	90.5%	8.8%	0.7%	<0.1%	0.0%	95.6%	99.6%	99.9%	99.9%
Food, Hydration, Shelter	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hazardous Materials	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Health and Medical	95.0%	5.0%	<0.1%	0.0%	0.0%	94.9%	99.8%	99.9%	99.9%
Safety and Security	95.5%	4.3%	0.2%	0.0%	0.0%	95.4%	99.6%	99.9%	99.9%
Transportation	97.2%	2.3%	0.5%	<0.1%	<0.1%	99.5%	99.9%	99.9%	99.9%
Water Systems	88.7%	10.0%	1.3%	<0.1%	0.0%	93.6%	99.9%	99.9%	99.9%

M6.8 Santa Monica Fault Scenario

Jurisdiction	Santa Monica M6.8 ShakeMap Scenario	
	Displaced Households	Persons Seeking Short-Term Sheltering
Central APC	55,292	28,300
East Los Angeles APC	5,459	3,016
Harbor APC	11	9
North Valley APC	353	285
South Los Angeles APC	7,326	5,923
South Valley APC	9,215	4,316
West Los Angeles APC	10,511	5,330
City of Los Angeles (Total)	**88,167**	**47,180**

Jurisdiction	Total Replacement Cost Value (RCV)	Santa Monica M6.8 ShakeMap Scenario - Estimated Losses				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
Central APC	$181,505,737,155	$16,735,927,377	9.2%	$5,163,049,380	$9,664,312,876	$1,908,565,121
East Los Angeles APC	$67,342,844,294	$3,531,687,910	5.2%	$1,119,711,202	$1,562,720,937	$849,255,771
Harbor APC	$43,236,295,870	$225,306,011	0.5%	$62,369,142	$103,867,812	$59,069,058
North Valley APC	$128,614,874,394	$2,709,611,523	2.1%	$1,064,385,255	$862,508,774	$782,717,494
South Los Angeles APC	$107,281,100,221	$4,502,263,277	4.2%	$1,395,714,588	$2,109,632,435	$996,916,254
South Valley APC	$151,519,907,890	$7,728,870,665	5.1%	$3,430,758,008	$3,390,974,469	$907,138,188
West Los Angeles APC	$102,102,941,046	$6,778,781,570	6.6%	$2,805,411,714	$3,464,447,370	$508,922,486

Jurisdiction	Total Replacement Cost Value (RCV)	Santa Monica M6.8 ShakeMap Scenario - Estimated Losses				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
City of Los Angeles (Total)	**$781,603,700,869**	**$42,212,448,333**	**5.4%**	**$15,041,399,289**	**$21,158,464,673**	**$6,012,584,372**

Jurisdiction	Debris Generated by the Santa Monica M6.8 ShakeMap Scenario (tons)	
	Brick/Wood (tons)	Concrete/Steel (tons)
Central APC	1,971,253	3,152,658
East Los Angeles APC	439,617	588,545
Harbor APC	15,719	13,342
North Valley APC	159,666	202,696
South Los Angeles APC	724,276	790,002
South Valley APC	640,605	747,552
West Los Angeles APC	574,462	775,934
City of Los Angeles (Total)	**4,525,598**	**6,270,728**

Level of Severity	Time of Day - Santa Monica M6.8 ShakeMap Scenario		
	2:00 AM	2:00 PM	5:00 PM
Injuries (non-hospitalized)	8,179	15,942	11,276
Hospitalization	2,366	4,643	3,393
Fatalities	657	1,159	845

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Santa Monica M6.8 ShakeMap Scenario	
			Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	691,743	NONE	291,534	42.1%
		MINOR	300,165	43.4%
		MODERATE	84,958	12.3%
		SEVERE	10,791	1.6%
		DESTRUCTION	4,296	0.6%
Commercial Buildings	33,219	NONE	8,009	24.1%
		MINOR	9,951	30.0%
		MODERATE	9,002	27.1%

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Santa Monica M6.8 ShakeMap Scenario	
			Building Count	Percent Buildings in Occupancy Class
		SEVERE	4,180	12.6%
		DESTRUCTION	2,077	6.3%
Industrial Buildings	8,785	NONE	2,008	22.9%
		MINOR	2,305	26.2%
		MODERATE	2,904	33.1%
		SEVERE	1,225	13.9%
		DESTRUCTION	343	3.9%
Government, Religion, Agricultural, and Education Buildings	5,897	NONE	2,534	43.0%
		MINOR	1,766	30.0%
		MODERATE	1,230	20.9%
		SEVERE	312	5.3%
		DESTRUCTION	55	0.9%

Lifelines	Average Percent Probability of Sustaining Damage Santa Monica M6.8 ShakeMap Scenario					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Communications	20.5%	34.4%	40.3%	4.7%	<0.1%	75.7%	97.5%	99.9%	99.9%
Energy	51.9%	28.5%	18.8%	0.8%	<0.1%	72.1%	90.0%	99.5%	99.9%
Food, Hydration, Shelter	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hazardous Materials	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Health and Medical	45.5%	49.5%	4.9%	<0.1%	0.0%	45.5%	93.9%	99.9%	99.9%
Safety and Security	54.7%	33.4%	11.7%	0.3%	<0.1%	54.6%	87.2%	99.6%	99.8%
Transportation	76.9%	14.4%	4.5%	2.9%	1.2%	91.9%	95.9%	96.3%	97.8%
Water Systems	41.9%	31.3%	24.2%	2.5%	0.1%	59.6%	96.8%	99.2%	99.7%

Flood

10% Annual Chance Flood Event

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the 10% Annual Chance Flood Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	0	0.0%
East Los Angeles APC	475,968	0	0.0%
Harbor APC	217,536	0	0.0%

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the 10% Annual Chance Flood Hazard Area	
		Number of Persons	% of Jurisdiction Total
North Valley APC	760,789	0	0.0%
South Los Angeles APC	761,718	0	0.0%
South Valley APC	816,016	0	0.0%
West Los Angeles APC	442,610	50	<0.1%
City of Los Angeles (Total)	**3,870,946**	**50**	**<0.1%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas and 10% Annual Chance Flood Hazard Area			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	0	0.0%	0	0.0%
East Los Angeles APC	0	0.0%	0	0.0%
Harbor APC	0	0.0%	0	0.0%
North Valley APC	0	0.0%	0	0.0%
South Los Angeles APC	0	0.0%	0	0.0%
South Valley APC	0	0.0%	0	0.0%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**0**	**0.0%**	**0**	**0.0%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the 10% Annual Chance Flood Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	0	0.0%	$0	0.0%
East Los Angeles APC	90,628	$67,342,844,294	0	0.0%	$0	0.0%
Harbor APC	41,747	$43,236,295,870	0	0.0%	$0	0.0%
North Valley APC	142,352	$128,614,874,394	4	<0.1%	$13,961,805	<0.1%
South Los Angeles APC	146,328	$107,281,100,221	0	0.0%	$0	0.0%
South Valley APC	154,038	$151,519,907,890	0	0.0%	$0	0.0%
West Los Angeles APC	83,294	$102,102,941,046	9	<0.1%	$7,923,132	<0.1%
City of Los Angeles (Total)	**739,594**	**$781,603,700,869**	**13**	**<0.1%**	**$21,884,937**	**<0.1%**

	Buildings in the 10% Annual Chance Flood Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	0	0	0	0
East Los Angeles APC	0	0	0	0
Harbor APC	0	0	0	0
North Valley APC	0	3	1	0
South Los Angeles APC	0	0	0	0
South Valley APC	0	0	0	0
West Los Angeles APC	9	0	0	0
City of Los Angeles (Total)	**9**	**3**	**1**	**0**

	Total Land Area (Excluding Waterbodies) (acres)	Land Area (Excluding Waterbodies) in the 10% Annual Chance Flood Hazard Area	
Jurisdiction		Total Area (acres)	% of Jurisdiction Total
Central APC	29,738	0.0	0.0%
East Los Angeles APC	23,767	0.0	0.0%
Harbor APC	18,235	0.0	0.0%
North Valley APC	79,998	22.6	<0.1%
South Los Angeles APC	28,030	0.0	0.0%
South Valley APC	67,586	0.0	0.0%
West Los Angeles APC	52,881	8.8	<0.1%
City of Los +AA3:AD12Angeles (Total)	**300,236**	**31.4**	**<0.1%**

	Number of Facilities in 10% Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	0	0	0	0	0	0	0	0	0	0	0.0%
East Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
Harbor APC	0	0	0	0	0	0	0	0	0	0	0.0%
North Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
West Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%

Jurisdiction	Number of Facilities in 10% Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
City of Los Angeles (Total)	0	0	0	0	0	0	0	0	0	0	0.0%

Jurisdiction	Total Population (2020 Decennial Redistricting)	10% Annual Chance Flood Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Central APC	396,309	0	0
East Los Angeles APC	475,968	0	0
Harbor APC	217,536	0	0
North Valley APC	760,789	0	0
South Los Angeles APC	761,718	0	0
South Valley APC	816,016	0	0
West Los Angeles APC	442,610	28	13
City of Los Angeles (Total)	**3,870,946**	**28**	**13**

Jurisdiction	10% Annual Chance Flood Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Central APC	$181,505,737,155	$0	0.0%	$0	$0	$0
East Los Angeles APC	$67,342,844,294	$0	0.0%	$0	$0	$0
Harbor APC	$43,236,295,870	$0	0.0%	$0	$0	$0
North Valley APC	$128,614,874,394	$732,918	<0.1%	$0	$732,918	$0
South Los Angeles APC	$107,281,100,221	$0	0.0%	$0	$0	$0
South Valley APC	$151,519,907,890	$0	0.0%	$0	$0	$0
West Los Angeles APC	$102,102,941,046	$24,718	<0.1%	$24,718	$0	$0
City of Los Angeles (Total)	**$781,603,700,869**	**$757,636**	**0.0%**	**$24,718**	**$732,918**	**$0**

Jurisdiction	Debris Generated by 10% Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Central APC	0.0	0.0	0.0	0.0
East Los Angeles APC	0.0	0.0	0.0	0.0
Harbor APC	0.0	0.0	0.0	0.0

Jurisdiction	Debris Generated by 10% Annual Chance Flood Event Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
North Valley APC	0.4	0.3	0.0	0.0
South Los Angeles APC	0.0	0.0	0.0	0.0
South Valley APC	0.0	0.0	0.0	0.0
West Los Angeles APC	144.1	93.7	30.8	19.5
City of Los Angeles (Total)	**144.4**	**94.1**	**30.9**	**19.5**

2% Annual Chance Flood Event

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the 2% Annual Chance Flood Hazard Area Number of Persons	% of Jurisdiction Total
Central APC	396,309	0	0.0%
East Los Angeles APC	475,968	0	0.0%
Harbor APC	217,536	0	0.0%
North Valley APC	760,789	0	0.0%
South Los Angeles APC	761,718	0	0.0%
South Valley APC	816,016	0	0.0%
West Los Angeles APC	442,610	112	<0.1%
City of Los Angeles (Total)	**3,870,946**	**112**	**<0.1%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas and 2% Annual Chance Flood Hazard Area			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	0	0.0%	0	0.0%
East Los Angeles APC	0	0.0%	0	0.0%
Harbor APC	0	0.0%	0	0.0%
North Valley APC	0	0.0%	0	0.0%
South Los Angeles APC	0	0.0%	0	0.0%
South Valley APC	0	0.0%	0	0.0%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**0**	**0.0%**	**0**	**0.0%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the 2% Annual Chance Flood Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	0	0.0%	$0	0.0%
East Los Angeles APC	90,628	$67,342,844,294	0	0.0%	$0	0.0%
Harbor APC	41,747	$43,236,295,870	0	0.0%	$0	0.0%
North Valley APC	142,352	$128,614,874,394	4	<0.1%	$13,961,805	<0.1%
South Los Angeles APC	146,328	$107,281,100,221	0	0.0%	$0	0.0%
South Valley APC	154,038	$151,519,907,890	0	0.0%	$0	0.0%
West Los Angeles APC	83,294	$102,102,941,046	20	<0.1%	$15,635,032	<0.1%
City of Los Angeles (Total)	**739,594**	**$781,603,700,869**	**24**	**<0.1%**	**$29,596,837**	**<0.1%**

	Buildings in the 2% Annual Chance Flood Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	0	0	0	0
East Los Angeles APC	0	0	0	0
Harbor APC	0	0	0	0
North Valley APC	0	3	1	0
South Los Angeles APC	0	0	0	0
South Valley APC	0	0	0	0
West Los Angeles APC	20	0	0	0
City of Los Angeles (Total)	**20**	**3**	**1**	**0**

Jurisdiction	Total Land Area (Excluding Waterbodies) (acres)	Land Area (Excluding Waterbodies) in the 2% Annual Chance Flood Hazard Area	
		Total Area (acres)	% of Jurisdiction Total
Central APC	29,738	0.0	0.0%
East Los Angeles APC	23,767	0.0	0.0%
Harbor APC	18,235	0.0	0.0%
North Valley APC	79,998	34.0	<0.1%
South Los Angeles APC	28,030	0.0	0.0%
South Valley APC	67,586	0.0	0.0%
West Los Angeles APC	52,881	13.7	<0.1%
City of Los Angeles (Total)	**300,236**	**47.7**	**<0.1%**

Jurisdiction	Number of Facilities in 2% Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	0	0	0	0	0	0	0	0	0	0	0.0%
East Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
Harbor APC	0	0	0	0	0	0	0	0	0	0	0.0%
North Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
West Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
City of Los Angeles (Total)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**

Jurisdiction	Total Population (2020 Decennial Redistricting)	2% Annual Chance Flood Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Central APC	396,309	0	0
East Los Angeles APC	475,968	0	0
Harbor APC	217,536	0	0
North Valley APC	760,789	2	2
South Los Angeles APC	761,718	0	0
South Valley APC	816,016	0	0
West Los Angeles APC	442,610	44	14
City of Los Angeles (Total)	**3,870,946**	**46**	**16**

Jurisdiction	2% Annual Chance Flood Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Central APC	$181,505,737,155	$0	0.0%	$0	$0	$0
East Los Angeles APC	$67,342,844,294	$0	0.0%	$0	$0	$0
Harbor APC	$43,236,295,870	$0	0.0%	$0	$0	$0
North Valley APC	$128,614,874,394	$1,665,972	<0.1%	$0	$1,665,972	$0
South Los Angeles APC	$107,281,100,221	$0	0.0%	$0	$0	$0
South Valley APC	$151,519,907,890	$0	0.0%	$0	$0	$0
West Los Angeles APC	$102,102,941,046	$404,442	<0.1%	$404,442	$0	$0

Jurisdiction	2% Annual Chance Flood Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
City of Los Angeles (Total)	**$781,603,700,869**	**$2,070,415**	**<0.1%**	**$404,442**	**$1,665,972**	**$0**

Jurisdiction	Debris Generated by 2% Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Central APC	0.0	0.0	0.0	0.0
East Los Angeles APC	0.0	0.0	0.0	0.0
Harbor APC	0.0	0.0	0.0	0.0
North Valley APC	1.1	0.8	0.1	0.2
South Los Angeles APC	0.0	0.0	0.0	0.0
South Valley APC	0.0	0.0	0.0	0.0
West Los Angeles APC	287.5	164.8	73.6	49.0
City of Los Angeles (Total)	**288.6**	**165.6**	**73.7**	**49.3**

1% Annual Chance Flood Event

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the 1% Annual Chance Flood Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	8,674	2.2%
East Los Angeles APC	475,968	10,817	2.3%
Harbor APC	217,536	257	0.1%
North Valley APC	760,789	2,166	0.3%
South Los Angeles APC	761,718	9,826	1.3%
South Valley APC	816,016	442	0.1%
West Los Angeles APC	442,610	13,850	3.1%
City of Los Angeles (Total)	**3,870,946**	**46,032**	**1.2%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas and 1% Annual Chance Flood Hazard Area			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	2,378	0.6%	2,238	0.6%
East Los Angeles APC	4,214	0.9%	112	0.0%
Harbor APC	0	0.0%	145	0.1%
North Valley APC	476	0.1%	213	0.0%

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas and 1% Annual Chance Flood Hazard Area			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
South Los Angeles APC	5,249	0.7%	3,145	0.4%
South Valley APC	101	<0.1%	22	<0.1%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**12,417**	**0.3%**	**5,876**	**0.2%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the 1% Annual Chance Flood Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	1,754	2.2%	$4,068,964,998	2.2%
East Los Angeles APC	90,628	$67,342,844,294	2,223	2.5%	$3,439,925,410	5.1%
Harbor APC	41,797	$43,236,295,870	51	0.1%	$81,487,395	0.2%
North Valley APC	142,352	$128,614,874,394	569	0.4%	$2,194,062,102	1.7%
South Los Angeles APC	146,328	$107,281,100,221	2,027	1.4%	$3,262,640,397	3.0%
South Valley APC	154,038	$151,519,907,890	92	0.1%	$168,393,299	0.1%
West Los Angeles APC	83,294	$102,102,941,046	2,609	3.1%	$2,059,943,782	2.0%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**9,325**	**1.3%**	**$15,275,417,383**	**2.0%**

	Buildings in the 1% Annual Chance Flood Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	1,550	172	6	26
East Los Angeles APC	1,933	131	131	28
Harbor APC	46	1	4	0
North Valley APC	387	84	81	17
South Los Angeles APC	1,756	158	97	16
South Valley APC	79	5	2	6
West Los Angeles APC	2,475	109	7	18
City of Los Angeles (Total)	**8,226**	**660**	**328**	**111**

Jurisdiction	Total Land Area (Excluding Waterbodies) (acres)	Land Area (Excluding Waterbodies) in the 1% Annual Chance Flood Hazard Area	
		Total Area (acres)	% of Jurisdiction Total
Central APC	29,738	1,968.2	6.6%
East Los Angeles APC	23,767	1,356.7	5.7%
Harbor APC	18,235	729.2	4.0%
North Valley APC	79,998	7,193.0	9.0%
South Los Angeles APC	28,030	1,160.5	4.1%
South Valley APC	67,586	592.0	0.9%
West Los Angeles APC	52,881	2,678.2	5.1%
City of Los Angeles (Total)	**300,236**	**15,677.8**	**5.2%**

Jurisdiction	Number of Facilities in 1% Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	3	0	0	0	4	7	20	0	0	34	2.6%
East Los Angeles APC	0	0	0	11	2	6	2	3	1	25	3.3%
Harbor APC	0	0	0	0	0	0	5	1	0	6	0.6%
North Valley APC	1	1	1	7	4	7	3	0	0	24	2.4%
South Los Angeles APC	1	7	2	1	3	1	11	1	0	27	3.0%
South Valley APC	0	0	0	1	0	1	1	0	0	3	0.3%
West Los Angeles APC	7	2	0	0	0	2	1	2	0	14	2.0%
City of Los Angeles (Total)	**12**	**10**	**3**	**20**	**13**	**24**	**43**	**7**	**1**	**133**	**2.0%**

Jurisdiction	Total Population (2020 Decennial Redistricting)	1% Annual Chance Flood Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Central APC	396,309	13,099	3,221
East Los Angeles APC	475,968	1,277	200
Harbor APC	217,536	190	115
North Valley APC	760,789	2,950	1,645
South Los Angeles APC	761,718	8,101	2,327
South Valley APC	816,016	1,415	931
West Los Angeles APC	442,610	6,727	611
City of Los Angeles (Total)	**3,870,946**	**33,759**	**9,050**

Jurisdiction	1% Annual Chance Flood Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Central APC	$181,505,737,155	$151,588,526	0.1%	$8,659,533	$131,673,220	$11,255,773
East Los Angeles APC	$67,342,844,294	$42,490,356	0.1%	$2,774,848	$19,075,613	$20,639,895
Harbor APC	$43,236,295,870	$13,801,098	0.0%	$5,524	$260,031	$13,535,542
North Valley APC	$128,614,874,394	$144,440,512	0.1%	$2,576,913	$98,052,526	$43,811,073
South Los Angeles APC	$107,281,100,221	$79,688,084	0.1%	$20,477,153	$44,120,339	$15,090,592
South Valley APC	$151,519,907,890	$9,003,598	0.0%	$2,109	$378,365	$8,623,124
West Los Angeles APC	$102,102,941,046	$88,028,258	0.1%	$39,092,219	$35,097,170	$13,838,868
City of Los Angeles (Total)	**$781,603,700,869**	**$529,040,432**	**0.1%**	**$73,588,300**	**$328,657,264**	**$126,794,868**

Jurisdiction	Debris Generated by 1% Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Central APC	4,681.4	4,581.9	52.1	47.4
East Los Angeles APC	2,908.1	697.8	1,192.0	1,018.3
Harbor APC	1,131.8	1,066.5	35.5	29.8
North Valley APC	4,112.2	1,252.4	1,411.5	1,448.3
South Los Angeles APC	6,782.4	5,906.9	469.9	405.7
South Valley APC	4,678.5	1,357.8	1,696.4	1,624.2
West Los Angeles APC	5,999.6	5,518.8	248.2	232.6
City of Los Angeles (Total)	**30,294.0**	**20,382.1**	**5,105.5**	**4,806.3**

0.2% Annual Chance Flood Event

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the 0.2% Annual Chance Flood Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	35,534	9.0%
East Los Angeles APC	475,968	11,964	2.5%
Harbor APC	217,536	1,746	0.8%
North Valley APC	760,789	5,915	0.8%
South Los Angeles APC	761,718	149,831	19.7%
South Valley APC	816,016	4,141	0.5%
West Los Angeles APC	442,610	23,458	5.3%

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the 0.2% Annual Chance Flood Hazard Area Number of Persons	% of Jurisdiction Total
City of Los Angeles (Total)	**3,870,946**	**232,589**	**6.0%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas and 0.2% Annual Chance Flood Hazard Area			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	9,474	2.4%	4,835	1.2%
East Los Angeles APC	4,415	0.9%	140	<0.1%
Harbor APC	6	<0.1%	1,578	0.7%
North Valley APC	851	0.1%	325	<0.1%
South Los Angeles APC	73,626	9.7%	51,326	6.7%
South Valley APC	627	0.1%	50	<0.1%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**88,998**	**2.3%**	**58,254**	**1.5%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the 0.2% Annual Chance Flood Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	8,679	10.7%	$40,124,732,421	22.1%
East Los Angeles APC	90,628	$67,342,844,294	2,450	2.7%	$3,609,257,657	5.4%
Harbor APC	41,797	$43,236,295,870	367	0.9%	$702,643,635	1.6%
North Valley APC	142,352	$128,614,874,394	1,285	0.9%	$3,420,343,294	2.7%
South Los Angeles APC	146,328	$107,281,100,221	30,549	20.9%	$33,581,272,076	31.3%
South Valley APC	154,038	$151,519,907,890	870	0.6%	$819,669,862	0.5%
West Los Angeles APC	83,294	$102,102,941,046	4,530	5.4%	$5,033,277,318	4.9%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**48,730**	**6.6%**	**$87,291,196,262**	**11.2%**

	Buildings in the 0.2% Annual Chance Flood Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	6,350	1,724	448	157
East Los Angeles APC	2,138	145	136	31
Harbor APC	312	32	19	4
North Valley APC	1,057	107	98	23

	Buildings in the 0.2% Annual Chance Flood Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
South Los Angeles APC	26,775	2,705	610	459
South Valley APC	740	111	6	13
West Los Angeles APC	4,192	280	21	37
City of Los Angeles (Total)	**41,564**	**5,104**	**1,338**	**724**

Jurisdiction	Total Land Area (Excluding Waterbodies) (acres)	Land Area (Excluding Waterbodies) in the 0.2% Annual Chance Flood Hazard Area: Total Area (acres)	Land Area (Excluding Waterbodies) in the 0.2% Annual Chance Flood Hazard Area: % of Jurisdiction Total
Central APC	29,738	6,750.7	22.7%
East Los Angeles APC	23,767	1,406.7	5.9%
Harbor APC	18,235	1,202.1	6.6%
North Valley APC	79,998	7,762.6	9.7%
South Los Angeles APC	28,030	13,293.5	47.4%
South Valley APC	67,586	1,126.3	1.7%
West Los Angeles APC	52,881	5,201.1	9.8%
City of Los Angeles (Total)	**300,236**	**36,742.9**	**12.2%**

	Number of Facilities in 0.2% Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	11	82	8	1	69	26	41	0	0	238	18.2%
East Los Angeles APC	0	0	0	11	2	6	1	3	1	24	3.2%
Harbor APC	0	10	0	4	1	0	12	1	0	28	3.0%
North Valley APC	1	1	1	7	5	8	3	0	0	26	2.6%
South Los Angeles APC	12	9	22	11	52	50	23	3	0	182	20.0%
South Valley APC	0	0	0	1	1	1	2	0	0	5	0.5%
West Los Angeles APC	8	33	2	0	2	3	9	5	0	62	9.0%
City of Los Angeles (Total)	**32**	**135**	**33**	**35**	**132**	**94**	**91**	**12**	**1**	**565**	**8.6%**

Jurisdiction	Total Population (2020 Decennial Redistricting)	0.2% Annual Chance Flood Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Central APC	396,309	68,505	12,067
East Los Angeles APC	475,968	7,480	683
Harbor APC	217,536	1,171	222
North Valley APC	760,789	4,780	2,134
South Los Angeles APC	761,718	146,709	33,060
South Valley APC	816,016	4,397	1,817
West Los Angeles APC	442,610	19,961	1,041
City of Los Angeles (Total)	**3,870,946**	**253,003**	**51,023**

Jurisdiction	0.2% Annual Chance Flood Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Central APC	$181,505,737,155	$778,800,577	0.4%	$116,346,508	$611,566,095	$50,887,974
East Los Angeles APC	$67,342,844,294	$582,517,263	0.9%	$58,768,639	$263,905,707	$259,842,917
Harbor APC	$43,236,295,870	$39,343,224	0.1%	$4,761,578	$31,491,862	$3,089,784
North Valley APC	$128,614,874,394	$148,086,347	0.1%	$4,907,270	$98,673,607	$44,505,470
South Los Angeles APC	$107,281,100,221	$120,712,943	0.1%	$30,112,327	$73,195,911	$17,404,705
South Valley APC	$151,519,907,890	$11,175,908	<0.1%	$770,598	$622,386	$9,782,924
West Los Angeles APC	$102,102,941,046	$552,796,687	0.5%	$380,770,372	$131,736,734	$40,289,582
City of Los Angeles (Total)	**$781,603,700,869**	**$2,233,432,949**	**0.3%**	**$596,437,292**	**$1,211,192,301**	**$425,803,356**

Jurisdiction	Debris Generated by 0.2% Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Central APC	21,881.3	18,818.7	1,553.2	1,509.4
East Los Angeles APC	10,439.3	6,847.1	1,917.3	1,675.0
Harbor APC	2,540.6	1,959.2	350.4	231.0
North Valley APC	4,650.6	1,644.8	1,494.4	1,511.4
South Los Angeles APC	15,573.3	14,239.6	697.8	635.8
South Valley APC	5,805.2	1,900.1	1,971.5	1,933.7
West Los Angeles APC	50,959.0	29,282.2	12,590.8	9,085.9
City of Los Angeles (Total)	**111,849.2**	**74,691.7**	**20,575.4**	**16,582.1**

Landslide

Very High Landslide Susceptibility Zone

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the Very High Susceptibility to Deep-Seated Landslides Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	1,209	0.3%
East Los Angeles APC	475,968	2,770	0.6%
Harbor APC	217,536	4,163	1.9%
North Valley APC	760,789	8,041	1.1%
South Los Angeles APC	761,718	1,511	0.2%
South Valley APC	816,016	5,031	0.6%
West Los Angeles APC	442,610	8,657	2.0%
City of Los Angeles (Total)	**3,870,946**	**31,382**	**0.8%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	0	0.0%	17	<0.1%
East Los Angeles APC	1,170	0.2%	481	0.1%
Harbor APC	196	0.1%	0	0.0%
North Valley APC	90	<0.1%	28	<0.1%
South Los Angeles APC	34	<0.1%	22	<0.1%
South Valley APC	0	0.0%	0	0.0%
West Los Angeles APC	73	<0.1%	0	0.0%
City of Los Angeles (Total)	**1,561**	**<0.1%**	**548**	**<0.1%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Very High Susceptibility to Deep-Seated Landslides Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	226	0.3%	$251,146,936	0.1%
East Los Angeles APC	90,628	$67,342,844,294	502	0.6%	$200,453,826	0.3%
Harbor APC	41,797	$43,236,295,870	752	1.8%	$804,738,030	1.9%
North Valley APC	142,352	$128,614,874,394	1,446	1.0%	$962,820,307	0.7%
South Los Angeles APC	146,328	$107,281,100,221	274	0.2%	$149,299,658	0.1%

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Very High Susceptibility to Deep-Seated Landslides Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
South Valley APC	154,038	$151,519,907,890	909	0.6%	$702,463,735	0.5%
West Los Angeles APC	83,294	$102,102,941,046	1,574	1.9%	$1,451,098,706	1.4%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**5,683**	**0.8%**	**$4,522,021,198**	**0.6%**

	Buildings in the Very High Susceptibility to Deep-Seated Landslides Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	216	9	0	1
East Los Angeles APC	495	5	0	2
Harbor APC	744	2	4	2
North Valley APC	1,437	3	4	2
South Los Angeles APC	270	2	1	1
South Valley APC	899	8	0	2
West Los Angeles APC	1,547	10	2	15
City of Los Angeles (Total)	**5,608**	**39**	**11**	**25**

Jurisdiction	Number of Facilities in Very High Susceptibility to Deep-Seated Landslides Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	0	0	0	1	0	0	6	0	0	7	0.5%
East Los Angeles APC	0	0	0	0	0	0	25	0	0	25	3.3%
Harbor APC	0	0	0	0	0	1	3	1	0	5	0.5%
North Valley APC	0	9	0	0	0	3	4	0	0	16	1.6%
South Los Angeles APC	0	3	0	0	0	0	3	0	0	6	0.7%
South Valley APC	0	0	0	0	0	0	5	1	0	6	0.6%
West Los Angeles APC	1	4	0	0	0	1	5	3	0	14	2.0%
City of Los Angeles (Total)	**1**	**16**	**0**	**1**	**0**	**5**	**51**	**5**	**0**	**79**	**1.2%**

High Landslide Susceptibility Zone

Total Population (2020 Decennial Redistricting Census)	Total Population (2020 Decennial)	Population in the High Susceptibility to Deep-Seated Landslides Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	63,525	16.0%
East Los Angeles APC	475,968	175,852	36.9%
Harbor APC	217,536	33,100	15.2%
North Valley APC	760,789	121,801	16.0%
South Los Angeles APC	761,718	22,143	2.9%
South Valley APC	816,016	108,337	13.3%
West Los Angeles APC	442,610	86,244	19.5%
City of Los Angeles (Total)	**3,870,946**	**611,003**	**15.8%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	5,887	1.5%	5,518	1.4%
East Los Angeles APC	42,417	8.9%	44,851	9.4%
Harbor APC	4,689	2.2%	2,233	1.0%
North Valley APC	13,704	1.8%	4,303	0.6%
South Los Angeles APC	9,362	1.2%	4,410	0.6%
South Valley APC	409	0.1%	39	<0.1%
West Los Angeles APC	196	<0.1%	0	0.0%
City of Los Angeles (Total)	**76,664**	**2.0%**	**61,354**	**1.6%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the High Susceptibility to Deep-Seated Landslides Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	11,835	14.6%	$16,784,687,429	9.2%
East Los Angeles APC	90,628	$67,342,844,294	32,276	35.6%	$15,965,007,560	23.7%
Harbor APC	41,797	$43,236,295,870	6,071	14.5%	$4,237,576,419	9.8%
North Valley APC	142,352	$128,614,874,394	22,256	15.6%	$14,574,118,770	11.3%
South Los Angeles APC	146,328	$107,281,100,221	4,077	2.8%	$3,102,320,025	2.9%
South Valley APC	154,038	$151,519,907,890	19,738	12.8%	$17,557,393,479	11.6%
West Los Angeles APC	83,294	$102,102,941,046	15,708	18.9%	$16,023,283,262	15.7%

Jurisdiction	Jurisdiction Total Buildings		Buildings in the High Susceptibility to Deep-Seated Landslides Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**111,961**	**15.1%**	**$88,244,386,945**	**11.3%**

	Buildings in the High Susceptibility to Deep-Seated Landslides Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	11,352	363	18	102
East Los Angeles APC	31,425	574	104	173
Harbor APC	5,915	74	41	41
North Valley APC	21,766	311	52	127
South Los Angeles APC	3,957	68	12	40
South Valley APC	19,360	290	15	73
West Los Angeles APC	15,412	196	12	88
City of Los Angeles (Total)	**109,187**	**1,876**	**254**	**644**

Jurisdiction	Number of Facilities in High Susceptibility to Deep-Seated Landslides Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	2	2	3	1	31	23	43	0	0	105	8.0%
East Los Angeles APC	8	1	5	6	34	41	93	1	0	189	25.1%
Harbor APC	1	44	1	4	4	6	22	0	0	82	8.8%
North Valley APC	7	36	4	1	31	23	58	6	1	167	16.5%
South Los Angeles APC	3	53	3	0	8	6	30	0	1	104	11.4%
South Valley APC	3	2	1	0	12	8	43	3	0	72	7.4%
West Los Angeles APC	3	27	2	1	9	8	23	4	0	77	11.2%
City of Los Angeles (Total)	**27**	**165**	**19**	**13**	**129**	**115**	**312**	**14**	**2**	**796**	**12.1%**

Moderate Landslide Susceptibility Zone

Total Population (2020 Decennial Redistricting Census)	Total Population (2020 Decennial)	Population in the Moderate Susceptibility to Deep-Seated Landslides Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	29,216	7.4%

Total Population (2020 Decennial Redistricting Census)	Total Population (2020 Decennial)	Population in the Moderate Susceptibility to Deep-Seated Landslides Hazard Area	
		Number of Persons	% of Jurisdiction Total
East Los Angeles APC	475,968	87,890	18.5%
Harbor APC	217,536	15,131	7.0%
North Valley APC	760,789	37,045	4.9%
South Los Angeles APC	761,718	436	0.1%
South Valley APC	816,016	52,820	6.5%
West Los Angeles APC	442,610	40,000	9.0%
City of Los Angeles (Total)	**3,870,946**	**262,539**	**6.8%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	4,113	1.0%	10,386	2.6%
East Los Angeles APC	14,986	3.1%	13,380	2.8%
Harbor APC	4,091	1.9%	2,115	1.0%
North Valley APC	5,786	0.8%	1,942	0.3%
South Los Angeles APC	0	0.0%	0	0.0%
South Valley APC	112	<0.1%	0	0.0%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**29,088**	**0.8%**	**27,823**	**0.7%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Moderate Susceptibility to Deep-Seated Landslides Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	5,481	6.7%	$8,530,939,382	4.7%
East Los Angeles APC	90,628	$67,342,844,294	16,016	17.7%	$8,258,628,582	12.3%
Harbor APC	41,797	$43,236,295,870	2,771	6.6%	$1,447,576,744	3.3%
North Valley APC	142,352	$128,614,874,394	6,699	4.7%	$4,989,421,164	3.9%
South Los Angeles APC	146,328	$107,281,100,221	81	0.1%	$39,669,668	<0.1%
South Valley APC	154,038	$151,519,907,890	9,566	6.2%	$8,242,068,105	5.4%
West Los Angeles APC	83,294	$102,102,941,046	7,242	8.7%	$5,672,143,653	5.6%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**47,856**	**6.5%**	**$37,180,447,298**	**4.8%**

	Buildings in the Moderate Susceptibility to Deep-Seated Landslides Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	5,221	200	18	42
East Los Angeles APC	15,706	214	15	81
Harbor APC	2,704	45	7	15
North Valley APC	6,620	48	6	25
South Los Angeles APC	78	3	0	0
South Valley APC	9,439	90	0	37
West Los Angeles APC	7,148	74	0	20
City of Los Angeles (Total)	**46,916**	**674**	**46**	**220**

Sea-Level Rise

25-Centimeter Sea-Level Rise + 100-Year Storm

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the Sea-Level Rise Hazard Area - 25 cm with a 100-year storm	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	0	0.0%
East Los Angeles APC	475,968	0	0.0%
Harbor APC	217,536	6	<0.1%
North Valley APC	760,789	0	0.0%
South Los Angeles APC	761,718	0	0.0%
South Valley APC	816,016	0	0.0%
West Los Angeles APC	442,610	90	<0.1%
City of Los Angeles (Total)	**3,870,946**	**95**	**<0.1%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	0	0.00%	0	0.00%
East Los Angeles APC	0	0.00%	0	0.00%
Harbor APC	0	0.00%	0	0.00%
North Valley APC	0	0.00%	0	0.00%
South Los Angeles APC	0	0.00%	0	0.00%
South Valley APC	0	0.00%	0	0.00%
West Los Angeles APC	0	0.00%	0	0.00%

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
City of Los Angeles (Total)	**0**	**0.00%**	**0**	**0.00%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Sea-Level Rise Hazard Area - 25 cm with a 100-year storm			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	0	0.0%	$0	0.0%
East Los Angeles APC	90,628	$67,342,844,294	0	0.0%	$0	0.0%
Harbor APC	41,797	$43,236,295,870	10	<0.1%	$371,317,923	0.9%
North Valley APC	142,352	$128,614,874,394	0	0.0%	$0	0.0%
South Los Angeles APC	146,328	$107,281,100,221	0	0.0%	$0	0.0%
South Valley APC	154,038	$151,519,907,890	0	0.0%	$0	0.0%
West Los Angeles APC	83,294	$102,102,941,046	43	0.1%	$169,588,940	0.2%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**53**	**<0.1%**	**$540,906,862**	**0.1%**

	Buildings in the Sea-Level Rise Hazard Area - 25 cm with a 100-year storm by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	0	0	0	0
East Los Angeles APC	0	0	0	0
Harbor APC	1	0	9	0
North Valley APC	0	0	0	0
South Los Angeles APC	0	0	0	0
South Valley APC	0	0	0	0
West Los Angeles APC	16	27	0	0
City of Los Angeles (Total)	**17**	**27**	**9**	**0**

Jurisdiction	Number of Facilities in Sea-Level Rise Hazard Area - 25cm with a 100-year storm Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	0	0	0	0	0	0	0	0	0	0	0.0%
East Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
Harbor APC	0	106	0	1	0	1	7	1	0	116	12.5%

Jurisdiction	Number of Facilities in Sea-Level Rise Hazard Area - 25cm with a 100-year storm Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
North Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
West Los Angeles APC	0	67	0	0	0	0	0	1	0	68	9.9%
City of Los Angeles (Total)	**0**	**173**	**0**	**1**	**0**	**1**	**7**	**2**	**0**	**184**	**2.8%**

Jurisdiction	Total Population (2020 Redistricting Decennial)	Sea-Level Rise Hazard Area - 25cm with a 100-year storm Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Central APC	396,309	0	0
East Los Angeles APC	475,968	0	0
Harbor APC	217,536	6	4
North Valley APC	760,789	0	0
South Los Angeles APC	761,718	0	0
South Valley APC	816,016	0	0
West Los Angeles APC	442,610	319	60
City of Los Angeles (Total)	**3,870,946**	**325**	**64**

Jurisdiction	Sea-Level Rise Hazard Area - 25cm with a 100-year storm Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Central APC	$181,505,737,155	$0	0.0%	$0	$0	$0
East Los Angeles APC	$67,342,844,294	$0	0.0%	$0	$0	$0
Harbor APC	$43,236,295,870	$20,784,509	<0.1%	$0	$0	$20,784,509
North Valley APC	$128,614,874,394	$0	0.0%	$0	$0	$0
South Los Angeles APC	$107,281,100,221	$0	0.0%	$0	$0	$0
South Valley APC	$151,519,907,890	$0	0.0%	$0	$0	$0
West Los Angeles APC	$102,102,941,046	$22,717,727	<0.1%	$4,415,236	$18,302,491	$0
City of Los Angeles (Total)	**$781,603,700,869**	**$43,502,236**	**<0.1%**	**$4,415,236**	**$18,302,491**	**$20,784,509**

Jurisdiction	Debris Generated by Sea-Level Rise Hazard Area - 25cm with a 100-year storm Event (tons) Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Central APC	0.0	0.0	0.0	0.0
East Los Angeles APC	0.0	0.0	0.0	0.0
Harbor APC	727.1	217.9	359.9	149.3
North Valley APC	0.0	0.0	0.0	0.0
South Los Angeles APC	0.0	0.0	0.0	0.0
South Valley APC	0.0	0.0	0.0	0.0
West Los Angeles APC	979.1	864.6	57.8	56.7
City of Los Angeles (Total)	**1,706.2**	**1,082.4**	**417.8**	**206.0**

200-Centimeter Sea-Level Rise + 100-Year Storm

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the Sea-Level Rise Hazard Area - 200 cm with a 100-year storm	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	0	0.0%
East Los Angeles APC	475,968	0	0.0%
Harbor APC	217,536	716	0.3%
North Valley APC	760,789	0	0.0%
South Los Angeles APC	761,718	0	0.0%
South Valley APC	816,016	0	0.0%
West Los Angeles APC	442,610	25,758	5.8%
City of Los Angeles (Total)	**3,870,946**	**26,474**	**0.7%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	0	0.0%	0	0.0%
East Los Angeles APC	0	0.0%	0	0.0%
Harbor APC	0	0.0%	627	0.3%
North Valley APC	0	0.0%	0	0.0%
South Los Angeles APC	0	0.0%	0	0.0%
South Valley APC	0	0.0%	0	0.0%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**0**	**0.0%**	**627**	**<0.1%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Sea-Level Rise Hazard Area - 200 cm with a 100-year storm			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	0	0.0%	$0	0.0%
East Los Angeles APC	90,628	$67,342,844,294	0	0.0%	$0	0.0%
Harbor APC	41,797	$43,236,295,870	525	1.3%	$4,604,463,722	10.6%
North Valley APC	142,352	$128,614,874,394	0	0.0%	$0	0.0%
South Los Angeles APC	146,328	$107,281,100,221	0	0.0%	$0	0.0%
South Valley APC	154,038	$151,519,907,890	0	0.0%	$0	0.0%
West Los Angeles APC	83,294	$102,102,941,046	5,021	6.0%	$4,114,171,395	4.0%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**5,546**	**0.7%**	**$8,718,635,116**	**1.1%**

	Buildings in the Sea-Level Rise Hazard Area - 200 cm with a 100-year storm by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	0	0	0	0
East Los Angeles APC	0	0	0	0
Harbor APC	128	200	186	11
North Valley APC	0	0	0	0
South Los Angeles APC	0	0	0	0
South Valley APC	0	0	0	0
West Los Angeles APC	4,603	330	49	39
City of Los Angeles (Total)	**4,731**	**530**	**235**	**50**

Jurisdiction	Number of Facilities in Sea-Level Rise Hazard Area - 200 cm with a 100-year storm Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	0	0	0	0	0	0	0	0	0	0	0.0%
East Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
Harbor APC	0	145	2	18	0	3	31	13	0	212	22.9%
North Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
West Los Angeles APC	2	64	1	0	1	3	1	7	0	79	11.4%

Jurisdiction	Number of Facilities in Sea-Level Rise Hazard Area - 200 cm with a 100-year storm Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
City of Los Angeles (Total)	**2**	**209**	**3**	**18**	**1**	**6**	**32**	**20**	**0**	**291**	**4.4%**

Jurisdiction	Total Population (2020 Redistricting Decennial)	Seal Level Rise Hazard Area - 200 cm with a 100-year storm Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Central APC	396,309	0	0
East Los Angeles APC	475,968	0	0
Harbor APC	217,536	646	84
North Valley APC	760,789	0	0
South Los Angeles APC	761,718	0	0
South Valley APC	816,016	0	0
West Los Angeles APC	442,610	15,775	1,001
City of Los Angeles (Total)	**3,870,946**	**16,421**	**1,085**

Jurisdiction	Seal Level Rise Hazard Area - 200 cm with a 100-year storm Impacts on Buildings					
	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Central APC	$181,505,737,155	$0	0.0%	$0	$0	$0
East Los Angeles APC	$67,342,844,294	$0	0.0%	$0	$0	$0
Harbor APC	$43,236,295,870	$850,014,285	2.0%	$1,442,864	$357,792,039	$490,779,382
North Valley APC	$128,614,874,394	$0	0.0%	$0	$0	$0
South Los Angeles APC	$107,281,100,221	$0	0.0%	$0	$0	$0
South Valley APC	$151,519,907,890	$0	0.0%	$0	$0	$0
West Los Angeles APC	$102,102,941,046	$1,124,442,733	1.1%	$714,301,007	$326,526,097	$83,615,630
City of Los Angeles (Total)	**$781,603,700,869**	**$1,974,457,018**	**0.3%**	**$715,743,870**	**$684,318,136**	**$574,395,012**

Jurisdiction	Debris Generated by Sea-Level Rise Hazard Area - 200cm with a 100-year storm Event (tons)			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Central APC	0.0	0.0	0.0	0.0
East Los Angeles APC	0.0	0.0	0.0	0.0
Harbor APC	5,021.8	4,073.3	616.0	332.4

Jurisdiction	Debris Generated by Sea-Level Rise Hazard Area - 200cm with a 100-year storm Event (tons)			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
North Valley APC	0.0	0.0	0.0	0.0
South Los Angeles APC	0.0	0.0	0.0	0.0
South Valley APC	0.0	0.0	0.0	0.0
West Los Angeles APC	55,691.3	33,529.6	13,533.1	8,628.6
City of Los Angeles (Total)	**60,713.1**	**37,603.0**	**14,149.1**	**8,961.1**

Tsunami

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the Maximum Tsunami Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	0	0.0%
East Los Angeles APC	475,968	0	0.0%
Harbor APC	217,536	571	0.3%
North Valley APC	760,789	0	0.0%
South Los Angeles APC	761,718	0	0.0%
South Valley APC	816,016	0	0.0%
West Los Angeles APC	442,610	22,132	5.0%
City of Los Angeles (Total)	**3,870,946**	**22,703**	**0.6%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	0	0.0%	0	0.0%
East Los Angeles APC	0	0.0%	0	0.0%
Harbor APC	0	0.0%	285	0.1%
North Valley APC	0	0.0%	0	0.0%
South Los Angeles APC	0	0.0%	0	0.0%
South Valley APC	0	0.0%	0	0.0%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**0**	**0.0%**	**285**	**<0.1%**

Jurisdiction	Jurisdiction Total Buildings: Count	Jurisdiction Total Buildings: Replacement Cost Value	Buildings in the Maximum Tsunami Hazard Area: Number of Buildings: Count	Buildings in the Maximum Tsunami Hazard Area: Number of Buildings: % of Jurisdiction Total	Buildings in the Maximum Tsunami Hazard Area: Replacement Cost Value: Value	Buildings in the Maximum Tsunami Hazard Area: Replacement Cost Value: % of Jurisdiction Total
Central APC	81,207	$181,505,737,155	0	0.0%	$0	0.0%
East Los Angeles APC	90,628	$67,342,844,294	0	0.0%	$0	0.0%
Harbor APC	41,797	$43,236,295,870	434	1.0%	$4,654,975,440	10.8%
North Valley APC	142,352	$128,614,874,394	0	0.0%	$0	0.0%
South Los Angeles APC	146,328	$107,281,100,221	0	0.0%	$0	0.0%
South Valley APC	154,038	$151,519,907,890	0	0.0%	$0	0.0%
West Los Angeles APC	83,294	$102,102,941,046	4,235	5.1%	$3,216,750,567	3.2%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**4,669**	**0.6%**	**$7,871,726,007**	**1.0%**

	Buildings in the Maximum Tsunami Hazard Area: Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	0	0	0	0
East Los Angeles APC	0	0	0	0
Harbor APC	102	154	165	13
North Valley APC	0	0	0	0
South Los Angeles APC	0	0	0	0
South Valley APC	0	0	0	0
West Los Angeles APC	3,955	241	8	31
City of Los Angeles (Total)	**4,057**	**395**	**173**	**44**

Jurisdiction	Number of Facilities in Maximum Tsunami Hazard Area, by Lifeline Category: Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Total Facilities in Hazard Area: Number	Total Facilities in Hazard Area: % of Jurisdiction Total
Central APC	0	0	0	0	0	0	0	0	0	0	0.0%
East Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
Harbor APC	0	141	4	18	1	9	39	16	0	228	24.6%
North Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Los Angeles APC	0	0	0	0	0	0	0	0	0	0	0.0%
South Valley APC	0	0	0	0	0	0	0	0	0	0	0.0%
West Los Angeles APC	2	3	1	0	1	3	3	5	0	18	2.6%

Jurisdiction	Number of Facilities in Maximum Tsunami Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
City of Los Angeles (Total)	2	144	5	18	2	12	42	21	0	246	3.7%

Wildfire

Jurisdiction	Total Population (2020 Decennial Redistricting Census)	Population in the Very High Fire Severity Zone Hazard Area	
		Number of Persons	% of Jurisdiction Total
Central APC	396,309	75,691	19.1%
East Los Angeles APC	475,968	193,116	40.6%
Harbor APC	217,536	1,125	0.5%
North Valley APC	760,789	116,949	15.4%
South Los Angeles APC	761,718	9,787	1.3%
South Valley APC	816,016	117,431	14.4%
West Los Angeles APC	442,610	102,366	23.1%
City of Los Angeles (Total)	**3,870,946**	**616,465**	**15.9%**

Jurisdiction	Estimated Number of Persons Located within the Community Health and Equity Index Areas			
	Community Health and Equity Index 43.56 to 48.57	Percent of Total	Community Health and Equity Index Greater than 48.57	Percent of Total
Central APC	257	0.1%	140	<0.1%
East Los Angeles APC	51,309	10.8%	21,835	4.6%
Harbor APC	6	<0.1%	157	0.1%
North Valley APC	11,835	1.6%	504	0.1%
South Los Angeles APC	62	<0.1%	291	<0.1%
South Valley APC	0	0.0%	0	0.0%
West Los Angeles APC	0	0.0%	0	0.0%
City of Los Angeles (Total)	**63,469**	**1.6%**	**22,927**	**0.6%**

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Very High Fire Severity Zone Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Central APC	81,207	$181,505,737,155	13,731	16.9%	$10,303,170,606	5.7%

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Very High Fire Severity Zone Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
East Los Angeles APC	90,628	$67,342,844,294	35,207	38.8%	$15,403,268,721	22.9%
Harbor APC	41,797	$43,236,295,870	205	0.5%	$134,978,121	0.3%
North Valley APC	142,352	$128,614,874,394	21,357	15.0%	$15,583,324,723	12.1%
South Los Angeles APC	146,328	$107,281,100,221	1,770	1.2%	$1,049,133,334	1.0%
South Valley APC	154,038	$151,519,907,890	21,419	13.9%	$17,692,455,504	11.7%
West Los Angeles APC	83,294	$102,102,941,046	18,566	22.3%	$16,509,401,836	16.2%
City of Los Angeles (Total)	**739,644**	**$781,603,700,869**	**112,255**	**15.2%**	**$76,675,732,846**	**9.8%**

	Buildings in the Very High Fire Severity Zone Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Central APC	13,526	125	5	75
East Los Angeles APC	34,510	501	38	158
Harbor APC	201	1	0	3
North Valley APC	20,899	280	39	139
South Los Angeles APC	1,749	3	9	9
South Valley APC	20,985	351	4	79
West Los Angeles APC	18,293	166	4	103
City of Los Angeles (Total)	**110,163**	**1,427**	**99**	**566**

Jurisdiction	Number of Facilities in Very High Fire Severity Zone, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Central APC	1	1	2	0	9	10	31	1	1	56	4.3%
East Los Angeles APC	11	1	1	1	47	48	66	0	0	175	23.3%
Harbor APC	0	0	0	0	0	1	0	0	0	1	0.1%
North Valley APC	3	52	1	1	17	18	51	8	0	151	14.9%
South Los Angeles APC	6	0	0	0	0	1	0	0	1	8	0.9%
South Valley APC	12	1	0	0	5	11	17	2	0	48	4.9%
West Los Angeles APC	6	87	1	0	5	23	11	8	0	141	20.4%

Jurisdiction	Number of Facilities in Very High Fire Severity Zone, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
City of Los Angeles (Total)	**39**	**142**	**5**	**2**	**83**	**112**	**176**	**19**	**2**	**580**	**8.8%**

Risk Ranking

All Hazards

Jurisdictions	Probability										
	Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Sea-Level Rise, Coastal Flood, Erosion	High Winds	Tsunami and Seiche	Wildfire
Central APC	Occasional	Frequent	Occasional	Rare	Occasional	Occasional	Occasional	Rare	Frequent	Rare	Frequent
East Los Angeles APC	Occasional	Frequent	Occasional	Rare	Occasional	Occasional	Occasional	Rare	Frequent	Rare	Frequent
Harbor APC	Occasional	Frequent	Occasional	Rare	Occasional	Occasional	Occasional	Occasional	Frequent	Rare	Frequent
North Valley APC	Occasional	Frequent	Occasional	Rare	Occasional	Occasional	Occasional	Rare	Frequent	Rare	Frequent
South Los Angeles APC	Occasional	Frequent	Occasional	Rare	Occasional	Occasional	Occasional	Rare	Frequent	Rare	Frequent
South Valley APC	Occasional	Frequent	Occasional	Rare	Occasional	Occasional	Occasional	Rare	Frequent	Rare	Frequent
West Los Angeles APC	Occasional	Frequent	Occasional	Rare	Occasional	Occasional	Occasional	Occasional	Frequent	Rare	Frequent
City of Los Angeles (Total)	**Occasional**	**Frequent**	**Occasional**	**Rare**	**Occasional**	**Occasional**	**Occasional**	**Occasional**	**Frequent**	**Rare**	**Frequent**

Jurisdictions	Impact on Population										
	Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Sea-Level Rise, Coastal Flood, Erosion	High Winds	Tsunami and Seiche	Wildfire
Central APC	M	M	M	M	M	L	L	L	M	L	M
East Los Angeles APC	L	M	M	M	M	L	H	L	M	L	H
Harbor APC	L	M	M	M	M	L	L	L	M	L	L
North Valley APC	M	L	M	M	M	L	M	L	M	L	M
South Los Angeles APC	H	H	H	H	H	L	L	L	M	L	L
South Valley APC	M	M	M	M	M	L	L	L	M	L	L
West Los Angeles APC	M	L	L	L	L	L	M	L	L	L	M

Jurisdictions	Impact on Population										
	Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Sea-Level Rise, Coastal Flood, Erosion	High Winds	Tsunami and Seiche	Wildfire
City of Los Angeles (Total)	**M**	**M**	**M**	**M**	**M**	**L**	**M**	**L**	**M**	**L**	**M**

Jurisdictions	Adaptive Capacity										
	Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Sea-Level Rise, Coastal Flood, Erosion	High Winds	Tsunami and Seiche	Wildfire
Central APC	H	M	M	M	M	M	M	M	M	M	H
East Los Angeles APC	H	M	M	M	M	M	M	M	M	M	H
Harbor APC	H	M	M	M	M	M	M	M	M	M	H
North Valley APC	H	M	M	M	M	M	M	M	M	M	H
South Los Angeles APC	H	M	M	M	M	M	M	M	M	M	H
South Valley APC	H	M	M	M	M	M	M	M	M	M	H
West Los Angeles APC	H	M	M	M	M	M	M	M	M	M	H
City of Los Angeles (Total)	**H**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**H**

Jurisdictions	Hazard Ranking (Numerical)										
	Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Sea-Level Rise, Coastal Flood, Erosion	High Winds	Tsunami and Seiche	Wildfire
Central APC	4.4	4.8	5.2	4.1	3.9	2.7	3.6	2.4	4.7	2.2	4.1
East Los Angeles APC	2.6	4.8	5.2	4.1	3.9	2.7	6.3	2.4	4.7	2.2	6.2
Harbor APC	2.3	4.8	5.2	4.1	3.9	2.7	3.6	3.0	4.7	2.5	2.6
North Valley APC	4.1	3.9	5.2	4.1	3.9	2.7	4.5	2.4	4.7	2.2	4.4
South Los Angeles APC	5.9	5.7	6.1	5.0	4.8	2.7	2.7	2.4	4.7	2.2	2.6
South Valley APC	4.4	4.8	5.2	4.1	3.9	2.7	3.0	2.4	4.7	2.2	2.9
West Los Angeles APC	4.4	3.9	4.3	3.2	3.0	2.7	4.5	2.7	3.8	2.2	4.4

Jurisdictions	Hazard Ranking (Numerical) Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Sea-Level Rise, Coastal Flood, Erosion	High Winds	Tsunami and Seiche	Wildfire
City of Los Angeles (Total)	**4.4**	**4.8**	**5.2**	**4.1**	**3.9**	**2.7**	**4.5**	**2.7**	**4.7**	**2.2**	**4.1**

Jurisdictions	Hazard Ranking										
	Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Sea-Level Rise, Coastal Flood, Erosion	High WInds	Tsunami and Seiche	Wildfire
Central APC	Medium	Medium	High	Medium	Medium	Low	Low	Low	Medium	Low	Medium
East Los Angeles APC	Low	Medium	High	Medium	Medium	Low	High	Low	Medium	Low	High
Harbor APC	Low	Medium	High	Medium	Medium	Low	Low	Low	Medium	Low	Low
North Valley APC	Medium	Medium	High	Medium	Medium	Low	Medium	Low	Medium	Low	Medium
South Los Angeles APC	High	High	High	High	Medium	Low	Low	Low	Medium	Low	Low
South Valley APC	Medium	Medium	High	Medium	Medium	Low	Low	Low	Medium	Low	Low
West Los Angeles APC	Medium	Medium	Medium	Low	Low	Low	Medium	Low	Low	Low	Medium
City of Los Angeles (Total)	**Medium**	**Medium**	**High**	**Medium**	**Medium**	**Low**	**Medium**	**Low**	**Medium**	**Low**	**Medium**

Dam Failure

Jurisdictions	PROBABILITY		IMPACT ON POPULATION					IMPACT ON PROPERTY				
	Frequency	Numeric Value	2020 Decennial Redistricting Census	Pop in Inundation Area	% Pop in Hazard Area	Impact	Numeric Value X3	Total # Bldgs	Bldgs in Inundation Area	% Bldgs in Inundation Area	Impact	Numeric Value X2
Central APC	Occasional	2	396,309	84,140	21.2%	M	6	81,207	19,985	24.6%	M	4
East Los Angeles APC	Occasional	2	475,968	50,671	10.6%	L	3	90,628	10,277	11.3%	L	2
Harbor APC	Occasional	2	217,536	3,016	1.4%	L	3	41,797	731	1.7%	L	2
North Valley APC	Occasional	2	760,789	165,640	21.8%	M	6	142,352	31,179	21.9%	M	4
South Los Angeles APC	Occasional	2	761,718	460,366	60.4%	H	9	146,328	89,010	60.8%	H	6
South Valley APC	Occasional	2	816,016	214,296	26.3%	M	6	154,038	41,914	27.2%	M	4

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	Pop in Inundation Area	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs in Inundation Area	% Bldgs in Inundation Area	Impact	Numeric Value X2
West Los Angeles APC	Occasional	2	442,610	90,397	20.4%	M	6	83,294	17,716	21.3%	M	4
City of Los Angeles (Total)	**Occasional**	**2**	**3,870,946**	**1,068,526**	**27.6%**	**M**	**6**	**739,644**	**210,812**	**28.5%**	**M**	**4**

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed to Inundation Area	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
Central APC	$181,505,737,155.00	$65,113,801,348	35.9%	H	3	H	-1	M	2	4.4	Medium
East Los Angeles APC	$67,342,844,294.00	$13,387,363,715	19.9%	M	2	H	-1	M	2	2.6	Low
Harbor APC	$43,236,295,870.00	$2,457,568,139	5.7%	L	1	H	-1	M	2	2.3	Low
North Valley APC	$128,614,874,394.00	$25,555,306,880	19.9%	M	2	H	-1	M	2	4.1	Medium
South Los Angeles APC	$107,281,100,221.00	$68,020,097,024	63.4%	H	3	H	-1	M	2	5.9	High
South Valley APC	$151,519,907,890.00	$49,338,016,507	32.6%	H	3	H	-1	M	2	4.4	Medium
West Los Angeles APC	$102,102,941,046.00	$23,853,254,990	23.4%	H	3	H	-1	M	2	4.4	Medium
City of Los Angeles (Total)	**$781,603,700,869.00**	**$247,725,408,602**	**31.7%**	**H**	**3**	H	-1	**M**	**2**	**4.4**	**Medium**

Drought

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	CHEI Index 43.56 - 48.57	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Frequent	3	396,309	64,717	16.3%	M	6	81,207	81,207	100.0%	M	4
East Los Angeles APC	Frequent	3	475,968	99,255	20.9%	M	6	90,628	90,628	100.0%	M	4
Harbor APC	Frequent	3	217,536	49,927	23.0%	M	6	41,797	41,797	100.0%	M	4
North Valley APC	Frequent	3	760,789	223,104	29.3%	L	3	142,352	142,352	100.0%	M	4
South Los Angeles APC	Frequent	3	761,718	242,455	31.8%	H	9	146,328	146,328	100.0%	M	4
South Valley APC	Frequent	3	816,016	146,384	17.9%	M	6	154,038	154,038	100.0%	M	4

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	CHEI Index 43.56 - 48.57	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
West Los Angeles APC	Frequent	3	442,610	6,077	1.4%	L	3	83,294	83,294	100.0%	M	4
City of Los Angeles (Total)	**Frequent**	**3**	**3,870,946**	**831,919**	**21.5%**	**M**	**6**	**739,644**	**739,644**	**100.0%**	**M**	**4**

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
Central APC	$181,505,737,155.00	$181,505,737,155.00	100.0%	M	2	M	0	H	3	4.8	Medium
East Los Angeles APC	$67,342,844,294.00	$67,342,844,294.00	100.0%	M	2	M	0	H	3	4.8	Medium
Harbor APC	$43,236,295,870.00	$43,236,295,870.00	100.0%	M	2	M	0	H	3	4.8	Medium
North Valley APC	$128,614,874,394.00	$128,614,874,394.00	100.0%	M	2	M	0	H	3	3.9	Medium
South Los Angeles APC	$107,281,100,221.00	$107,281,100,221.00	100.0%	M	2	M	0	H	3	5.7	High
South Valley APC	$151,519,907,890.00	$151,519,907,890.00	100.0%	M	2	M	0	H	3	4.8	Medium
West Los Angeles APC	$102,102,941,046.00	$102,102,941,046.00	100.0%	M	2	M	0	H	3	3.9	Medium
City of Los Angeles (Total)	**$781,603,700,869.00**	**$781,603,700,869.00**	**100.0%**	**M**	**2**	**M**	0	H	**3**	**4.8**	**Medium**

Earthquake

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	CHEI Index 43.56 - 48.57	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Occasional	2	396,309	64,717	16.3%	M	6	81,207	81,207	100.0%	H	6
East Los Angeles APC	Occasional	2	475,968	99,255	20.9%	M	6	90,628	90,628	100.0%	H	6
Harbor APC	Occasional	2	217,536	49,927	23.0%	M	6	41,797	41,797	100.0%	H	6
North Valley APC	Occasional	2	760,789	223,104	29.3%	M	6	142,352	142,352	100.0%	H	6
South Los Angeles APC	Occasional	2	761,718	242,455	31.8%	H	9	146,328	146,328	100.0%	H	6
South Valley APC	Occasional	2	816,016	146,384	17.9%	M	6	154,038	154,038	100.0%	H	6
West Los Angeles APC	Occasional	2	442,610	6,077	1.4%	L	3	83,294	83,294	100.0%	H	6

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	CHEI Index 43.56 - 48.57	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
City of Los Angeles (Total)	**Occasional**	**2**	**3,870,946**	**831,919**	**21.5%**	**M**	**6**	**739,644**	**739,644**	**100.0%**	**H**	**6**

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
Central APC	$181,505,737,155.00	$181,505,737,155	100.0%	H	3	M	0	L	1	5.2	High
East Los Angeles APC	$67,342,844,294.00	$67,342,844,294	100.0%	H	3	M	0	L	1	5.2	High
Harbor APC	$43,236,295,870.00	$43,236,295,870	100.0%	H	3	M	0	L	1	5.2	High
North Valley APC	$128,614,874,394.00	$128,614,874,394	100.0%	H	3	M	0	L	1	5.2	High
South Los Angeles APC	$107,281,100,221.00	$107,281,100,221	100.0%	H	3	M	0	L	1	6.1	High
South Valley APC	$151,519,907,890.00	$151,519,907,890	100.0%	H	3	M	0	L	1	5.2	High
West Los Angeles APC	$102,102,941,046.00	$102,102,941,046	100.0%	H	3	M	0	L	1	4.3	Medium
City of Los Angeles (Total)	**$781,603,700,869.00**	**$781,603,700,869**	**100.0%**	**H**	**3**	M	0	L	**1**	**5.2**	**High**

Extreme Cold

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	CHEI Index 43.56 - 48.57	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Rare	1	396,309	64,717	16.3%	M	6	81,207	81,207	100.0%	M	4
East Los Angeles APC	Rare	1	475,968	99,255	20.9%	M	6	90,628	90,628	100.0%	M	4
Harbor APC	Rare	1	217,536	49,927	23.0%	M	6	41,797	41,797	100.0%	M	4
North Valley APC	Rare	1	760,789	223,104	29.3%	M	6	142,352	142,352	100.0%	M	4
South Los Angeles APC	Rare	1	761,718	242,455	31.8%	H	9	146,328	146,328	100.0%	M	4
South Valley APC	Rare	1	816,016	146,384	17.9%	M	6	154,038	154,038	100.0%	M	4
West Los Angeles APC	Rare	1	442,610	6,077	1.4%	L	3	83,294	83,294	100.0%	M	4
City of Los Angeles (Total)	**Rare**	**1**	**3,870,946**	**831,919**	**21.5%**	**M**	**6**	**739,644**	**739,644**	**100.0%**	**M**	**4**

Jurisdictions	IMPACT ON ECONOMY					Adaptive Capacity		Climate Change		RISK RANKING SCORE	Hazard Ranking
	Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Capability Impact	Capability Impact Numerical	Climate Impact	Climate Impact Numerical		
Central APC	$181,505,737,155.00	$181,505,737,155	100.0%	M	2	M	0	M	2	4.1	Medium
East Los Angeles APC	$67,342,844,294.00	$67,342,844,294	100.0%	M	2	M	0	M	2	4.1	Medium
Harbor APC	$43,236,295,870.00	$43,236,295,870	100.0%	M	2	M	0	M	2	4.1	Medium
North Valley APC	$128,614,874,394.00	$128,614,874,394	100.0%	M	2	M	0	M	2	4.1	Medium
South Los Angeles APC	$107,281,100,221.00	$107,281,100,221	100.0%	M	2	M	0	M	2	5.0	High
South Valley APC	$151,519,907,890.00	$151,519,907,890	100.0%	M	2	M	0	M	2	4.1	Medium
West Los Angeles APC	$102,102,941,046.00	$102,102,941,046	100.0%	M	2	M	0	M	2	3.2	Low
City of Los Angeles (Total)	**$781,603,700,869.00**	**$781,603,700,869**	**100.0%**	**M**	**2**	M	0	M	**2**	**4.1**	**Medium**

Extreme Heat

Jurisdictions	PROBABILITY		IMPACT ON POPULATION					IMPACT ON PROPERTY				
	Frequency	Numeric Value	2020 Decennial Redistricting Census	CHEI Index 43.56 - 48.57	% Pop in Hazard Area	Impact	Numeric Value X3	Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Occasional	2	396,309	64,717	16.3%	M	6	81,207	81,207	100.0%	L	2
East Los Angeles APC	Occasional	2	475,968	99,255	20.9%	M	6	90,628	90,628	100.0%	L	2
Harbor APC	Occasional	2	217,536	49,927	23.0%	M	6	41,797	41,797	100.0%	L	2
North Valley APC	Occasional	2	760,789	223,104	29.3%	M	6	142,352	142,352	100.0%	L	2
South Los Angeles APC	Occasional	2	761,718	242,455	31.8%	H	9	146,328	146,328	100.0%	L	2
South Valley APC	Occasional	2	816,016	146,384	17.9%	M	6	154,038	154,038	100.0%	L	2
West Los Angeles APC	Occasional	2	442,610	6,077	1.4%	L	3	83,294	83,294	100.0%	L	2
City of Los Angeles (Total)	**Occasional**	**2**	**3,870,946**	**831,919**	**21.5%**	**M**	**6**	**739,644**	**739,644**	**100.0%**	**L**	**2**

Jurisdictions	IMPACT ON ECONOMY					Adaptive Capacity		Climate Change		RISK RANKING SCORE	Hazard Ranking
	Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Capability Impact	Capability Impact Numerical	Climate Impact	Climate Impact Numerical		
Central APC	$181,505,737,155.00	$181,505,737,155	100.0%	M	2	M	0	H	3	3.9	Medium
East Los Angeles APC	$67,342,844,294.00	$67,342,844,294	100.0%	M	2	M	0	H	3	3.9	Medium
Harbor APC	$43,236,295,870.00	$43,236,295,870	100.0%	M	2	M	0	H	3	3.9	Medium
North Valley APC	$128,614,874,394.00	$128,614,874,394	100.0%	M	2	M	0	H	3	3.9	Medium
South Los Angeles APC	$107,281,100,221.00	$107,281,100,221	100.0%	M	2	M	0	H	3	4.8	Medium
South Valley APC	$151,519,907,890.00	$151,519,907,890	100.0%	M	2	M	0	H	3	3.9	Medium
West Los Angeles APC	$102,102,941,046.00	$102,102,941,046	100.0%	M	2	M	0	H	3	3.0	Low
City of Los Angeles (Total)	**$781,603,700,869.00**	**$781,603,700,869**	**100.0%**	**M**	**2**	M	0	H	**3**	**3.9**	**Medium**

Flood

Jurisdictions	PROBABILITY		IMPACT ON POPULATION						IMPACT ON PROPERTY				
	Frequency	Numeric Value	2020 Decennial Redistricting Census	Pop in 1% SFHA	Total Vul Pop	% Pop in Hazard Area	Impact	Numeric Value X3	Total # Bldgs	Bldgs in 1% SFHA	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Occasional	2	396,309	8,674	8,674	2.2%	L	3	81,207	1,754	2.2%	L	2
East Los Angeles APC	Occasional	2	475,968	10,817	10,817	2.3%	L	3	90,628	2,223	2.5%	L	2
Harbor APC	Occasional	2	217,536	257	257	0.1%	L	3	41,797	51	0.1%	L	2
North Valley APC	Occasional	2	760,789	2,166	2,166	0.3%	L	3	142,352	569	0.4%	L	2
South Los Angeles APC	Occasional	2	761,718	9,826	9,826	1.3%	L	3	146,328	2,027	1.4%	L	2
South Valley APC	Occasional	2	816,016	442	442	0.1%	L	3	154,038	92	0.1%	L	2
West Los Angeles APC	Occasional	2	442,610	13,850	13,850	3.1%	L	3	83,294	2,609	3.1%	L	2
City of Los Angeles (Total)	**Occasional**	**2**	**3,870,946**	**46,032**	**46,032**	**1.2%**	**L**	**3**	**739,644**	**9,325**	**1.3%**	**L**	**2**

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
Central APC	$181,505,737,155.00	$4,068,964,998	2.2%	L	1	M	0	H	3	2.7	Low
East Los Angeles APC	$67,342,844,294.00	$3,439,925,410	5.1%	L	1	M	0	H	3	2.7	Low
Harbor APC	$43,236,295,870.00	$81,487,395	0.2%	L	1	M	0	H	3	2.7	Low
North Valley APC	$128,614,874,394.00	$2,194,062,102	1.7%	L	1	M	0	H	3	2.7	Low
South Los Angeles APC	$107,281,100,221.00	$3,262,640,397	3.0%	L	1	M	0	H	3	2.7	Low
South Valley APC	$151,519,907,890.00	$168,393,299	0.1%	L	1	M	0	H	3	2.7	Low
West Los Angeles APC	$102,102,941,046.00	$2,059,943,782	2.0%	L	1	M	0	H	3	2.7	Low
City of Los Angeles (Total)	**$781,603,700,869.00**	**$15,275,417,383**	**2.0%**	**L**	**1**	M	0	H	**3**	**2.7**	**Low**

Landslide

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	Pop Located in High to Deep-Seated Landslides Hazard Area	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Located in High to Deep-Seated Landslides Hazard Area	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Occasional	2	396,309	63,525	16.0%	M	6	81,207	11,835	14.6%	L	2
East Los Angeles APC	Occasional	2	475,968	175,852	36.9%	H	9	90,628	32,276	35.6%	H	6
Harbor APC	Occasional	2	217,536	33,100	15.2%	M	6	41,797	6,071	14.5%	L	2
North Valley APC	Occasional	2	760,789	121,801	16.0%	M	6	142,352	22,256	15.6%	M	4
South Los Angeles APC	Occasional	2	761,718	22,143	2.9%	L	3	146,328	4,077	2.8%	L	2
South Valley APC	Occasional	2	816,016	108,337	13.3%	L	3	154,038	19,738	12.8%	L	2
West Los Angeles APC	Occasional	2	442,610	86,244	19.5%	M	6	83,294	15,708	18.9%	M	4
City of Los Angeles (Total)	**Occasional**	**2**	**3,870,946**	**611,003**	15.8%	**M**	**6**	**739,644**	**111,961**	**15.1%**	**M**	**4**

Jurisdictions	IMPACT ON ECONOMY					Adaptive Capacity		Climate Change		RISK RANKING SCORE	Hazard Ranking
	Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Capability Impact	Capability Impact Numerical	Climate Impact	Climate Impact Numerical		
Central APC	$181,505,737,155.00	$16,784,687,429	9.2%	L	1	M	0	H	3	3.6	Low
East Los Angeles APC	$67,342,844,294.00	$15,965,007,560	23.7%	H	3	M	0	H	3	6.3	High
Harbor APC	$43,236,295,870.00	$4,237,576,419	9.8%	L	1	M	0	H	3	3.6	Low
North Valley APC	$128,614,874,394.00	$14,574,118,770	11.3%	M	2	M	0	H	3	4.5	Medium
South Los Angeles APC	$107,281,100,221.00	$3,102,320,025	2.9%	L	1	M	0	H	3	2.7	Low
South Valley APC	$151,519,907,890.00	$17,557,393,479	11.6%	M	2	M	0	H	3	3.0	Low
West Los Angeles APC	$102,102,941,046.00	$16,023,283,262	15.7%	M	2	M	0	H	3	4.5	Medium
City of Los Angeles (Total)	**$781,603,700,869.00**	**$88,244,386,945**	**11.3%**	**M**	**2**	**M**	0	H	**3**	**4.5**	**Medium**

Sea-Level Rise, Coastal Flood and Erosion

Jurisdictions	PROBABILITY		IMPACT ON POPULATION						IMPACT ON PROPERTY				
	Frequency	Numeric Value	2020 Decennial Redistricting Census	Pop Located in 200 cm with a 100-year storm	Total Vul Pop	% Pop in Hazard Area	Impact	Numeric Value X3	Total # Bldgs	Bldgs Located in 200 cm with a 100-year storm	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Rare	1	396,309	0	0	0.0%	L	3	81,207	0	0.0%	L	2
East Los Angeles APC	Rare	1	475,968	0	0	0.0%	L	3	90,628	0	0.0%	L	2
Harbor APC	Occasional	2	217,536	716	716	0.3%	L	3	41,797	525	1.3%	L	2
North Valley APC	Rare	1	760,789	0	0	0.0%	L	3	142,352	0	0.0%	L	2
South Los Angeles APC	Rare	1	761,718	0	0	0.0%	L	3	146,328	0	0.0%	L	2
South Valley APC	Rare	1	816,016	0	0	0.0%	L	3	154,038	0	0.0%	L	2
West Los Angeles APC	Occasional	2	442,610	25,758	25758	5.8%	L	3	83,294	5,021	6.0%	L	2
City of Los Angeles (Total)	**Occasional**	**2**	**3,870,946**	**26,474**	**26474**	**0.7%**	**L**	**3**	**739,644**	**5,546**	**0.7%**	**L**	**2**

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
Central APC	$181,505,737,155.00	$0	0.0%	L	1	M	0	H	3	2.4	Low
East Los Angeles APC	$67,342,844,294.00	$0	0.0%	L	1	M	0	H	3	2.4	Low
Harbor APC	$43,236,295,870.00	$4,604,463,722	10.6%	M	2	M	0	H	3	3.0	Low
North Valley APC	$128,614,874,394.00	$0	0.0%	L	1	M	0	H	3	2.4	Low
South Los Angeles APC	$107,281,100,221.00	$0	0.0%	L	1	M	0	H	3	2.4	Low
South Valley APC	$151,519,907,890.00	$0	0.0%	L	1	M	0	H	3	2.4	Low
West Los Angeles APC	$102,102,941,046.00	$4,114,171,395	4.0%	L	1	M	0	H	3	2.7	Low
City of Los Angeles (Total)	**$781,603,700,869.00**	**$8,718,635,116**	**1.1%**	**L**	**1**	**M**	**0**	**H**	**3**	**2.7**	**Low**

High Winds

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	CHEI Index 43.56 - 48.57	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Frequent	3	396,309	64,717	16.3%	M	6	81,207	81,207	100.0%	M	4
East Los Angeles APC	Frequent	3	475,968	99,255	20.9%	M	6	90,628	90,628	100.0%	M	4
Harbor APC	Frequent	3	217,536	49,927	23.0%	M	6	41,797	41,797	100.0%	M	4
North Valley APC	Frequent	3	760,789	223,104	29.3%	M	6	142,352	142,352	100.0%	M	4
South Los Angeles APC	Frequent	3	761,718	242,455	31.8%	M	6	146,328	146,328	100.0%	M	4
South Valley APC	Frequent	3	816,016	146,384	17.9%	M	6	154,038	154,038	100.0%	M	4
West Los Angeles APC	Frequent	3	442,610	6,077	1.4%	L	3	83,294	83,294	100.0%	M	4
City of Los Angeles (Total)	**Frequent**	**3**	**3,870,946**	**831,919**	**21.5%**	**M**	**6**	**739,644**	**739,644**	**100.0%**	**M**	**4**

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
Central APC	$181,505,737,155.00	$181,505,737,155	100.0%	M	2	M	0	M	2	4.7	Medium

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
East Los Angeles APC	$67,342,844,294.00	$67,342,844,294	100.0%	M	2	M	0	M	2	4.7	Medium
Harbor APC	$43,236,295,870.00	$43,236,295,870	100.0%	M	2	M	0	M	2	4.7	Medium
North Valley APC	$128,614,874,394.00	$128,614,874,394	100.0%	M	2	M	0	M	2	4.7	Medium
South Los Angeles APC	$107,281,100,221.00	$107,281,100,221	100.0%	M	2	M	0	M	2	4.7	Medium
South Valley APC	$151,519,907,890.00	$151,519,907,890	100.0%	M	2	M	0	M	2	4.7	Medium
West Los Angeles APC	$102,102,941,046.00	$102,102,941,046	100.0%	M	2	M	0	M	2	3.8	Low
City of Los Angeles (Total)	**$781,603,700,869.00**	**$781,603,700,869**	**100.0%**	**M**	**2**	**M**	0	M	**2**	**4.7**	**Medium**

Tsunami and Seiche

Jurisdictions	PROBABILITY Frequency	Numeric Value	IMPACT ON POPULATION 2020 Decennial Redistricting Census	Total Population	% Pop in Hazard Area	Impact	Numeric Value X3	IMPACT ON PROPERTY Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Rare	1	396,309	0	0.0%	L	3	81,207	0	0.0%	L	2
East Los Angeles APC	Rare	1	475,968	0	0.0%	L	3	90,628	0	0.0%	L	2
Harbor APC	Rare	1	217,536	571	0.3%	L	3	41,797	434	1.0%	L	2
North Valley APC	Rare	1	760,789	0	0.0%	L	3	142,352	0	0.0%	L	2
South Los Angeles APC	Rare	1	761,718	0	0.0%	L	3	146,328	0	0.0%	L	2
South Valley APC	Rare	1	816,016	0	0.0%	L	3	154,038	0	0.0%	L	2
West Los Angeles APC	Rare	1	442,610	22,132	5.0%	L	3	83,294	4,235	5.1%	L	2
City of Los Angeles (Total)	**Rare**	**1**	**3,870,946**	**22,703**	0.6%	**L**	**3**	**739,644**	**4,669**	**0.6%**	**L**	**2**

Jurisdictions	IMPACT ON ECONOMY Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Adaptive Capacity Capability Impact	Capability Impact Numerical	Climate Change Climate Impact	Climate Impact Numerical	RISK RANKING SCORE	Hazard Ranking
Central APC	$181,505,737,155.00	$0	0.0%	L	1	M	0	L	1	2.2	Low

Jurisdictions	IMPACT ON ECONOMY					Adaptive Capacity		Climate Change		RISK RANKING SCORE	Hazard Ranking
	Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Capability Impact	Capability Impact Numerical	Climate Impact	Climate Impact Numerical		
East Los Angeles APC	$67,342,844,294.00	$0	0.0%	L	1	M	0	L	1	2.2	Low
Harbor APC	$43,236,295,870.00	$4,654,975,440	10.8%	M	2	M	0	L	1	2.5	Low
North Valley APC	$128,614,874,394.00	$0	0.0%	L	1	M	0	L	1	2.2	Low
South Los Angeles APC	$107,281,100,221.00	$0	0.0%	L	1	M	0	L	1	2.2	Low
South Valley APC	$151,519,907,890.00	$0	0.0%	L	1	M	0	L	1	2.2	Low
West Los Angeles APC	$102,102,941,046.00	$3,216,750,567	3.2%	L	1	M	0	L	1	2.2	Low
City of Los Angeles (Total)	**$781,603,700,869.00**	**$7,871,726,007**	**1.0%**	**L**	**1**	**M**	0	L	**1**	**2.2**	**Low**

Wildfire

Jurisdictions	PROBABILITY		IMPACT ON POPULATION					IMPACT ON PROPERTY				
	Frequency	Numeric Value	2020 Decennial Redistricting Census	Total Population	% Pop in Hazard Area	Impact	Numeric Value X3	Total # Bldgs	Bldgs Exposed	% Bldgs Exposed	Impact	Numeric Value X2
Central APC	Frequent	3	396,309	75,691	19.1%	M	6	81,207	13,731	16.9%	M	4
East Los Angeles APC	Frequent	3	475,968	193,116	40.6%	H	9	90,628	35,207	38.8%	H	6
Harbor APC	Frequent	3	217,536	1,125	0.5%	L	3	41,797	205	0.5%	L	2
North Valley APC	Frequent	3	760,789	116,949	15.4%	M	6	142,352	21,357	15.0%	M	4
South Los Angeles APC	Frequent	3	761,718	9,787	1.3%	L	3	146,328	1,770	1.2%	L	2
South Valley APC	Frequent	3	816,016	117,431	14.4%	L	3	154,038	21,419	13.9%	L	2
West Los Angeles APC	Frequent	3	442,610	102,366	23.1%	M	6	83,294	18,566	22.3%	M	4
City of Los Angeles (Total)	**Frequent**	**3**	**3,870,946**	**616,465**	15.9%	**M**	**6**	**739,644**	**112,255**	**15.2%**	**M**	**4**

Jurisdictions	IMPACT ON ECONOMY					Adaptive Capacity		Climate Change		RISK RANKING SCORE	Hazard Ranking
	Total RCV	$ Exposed	% RCV Exposed	Impact	Numeric Value	Capability Impact	Capability Impact Numerical	Climate Impact	Climate Impact Numerical		
Central APC	$181,505,737,155.00	$10,303,170,606.00	5.7%	L	1	H	-1	M	2	4.1	Medium
East Los Angeles APC	$67,342,844,294.00	$15,403,268,721.00	22.9%	H	3	H	-1	M	2	6.2	High
Harbor APC	$43,236,295,870.00	$134,978,121.00	0.3%	L	1	H	-1	M	2	2.6	Low
North Valley APC	$128,614,874,394.00	$15,583,324,723.00	12.1%	M	2	H	-1	M	2	4.4	Medium
South Los Angeles APC	$107,281,100,221.00	$1,049,133,334.00	1.0%	L	1	H	-1	M	2	2.6	Low
South Valley APC	$151,519,907,890.00	$17,692,455,504.00	11.7%	M	2	H	-1	M	2	2.9	Low
West Los Angeles APC	$102,102,941,046.00	$16,509,401,836.00	16.2%	M	2	H	-1	M	2	4.4	Medium
City of Los Angeles (Total)	**$781,603,700,869.00**	**$76,675,732,846.00**	**9.8%**	**L**	**1**	H	-1	**M**	**2**	**4.1**	**Medium**

F. Review of Previous Plan Actions

Backup Power—Backup Power at the Fire Station	
Hazards Addressed	Blackouts, Power Outages
Responsible Party	LAFD
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The LAFD is working to procure the generator and is working with the General Services Department to schedule the installation.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	The LAFD will continue the installation and maintenance of the generator.
If discontinue, explain why	Not applicable
DAS-01—Coordination with the Emergency Management Department	
Hazards Addressed	All Hazards
Responsible Party	Department of Animal Services (DAS)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DDS-01—Disaster Response Interpreting Training	
Hazards Addressed	All Hazards
Responsible Party	Department on Disability (DDS)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DDS-02—Emergency Preparedness Manual	
Hazards Addressed	All Hazards
Responsible Party	Department on Disability (DDS)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DDS-03—Emergency Preparedness for Socially Vulnerable Populations	
Hazards Addressed	All Hazards
Responsible Party	Department on Disability (DDS)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DDS-04—Online Disaster Preparedness for Disabled Individuals	
Hazards Addressed	All Hazards
Responsible Party	Department on Disability (DDS)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The DDS is currently developing material that will be incorporated in the Departments online resources.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-01—Stormwater Retrofitting	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-02— Prioritization for Capital Improvement Program	
Hazards Addressed	Flood, Sea-Level Rise, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-03— Flood Zone Notification	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-04— Bridge Improvement Program	
Hazards Addressed	Earthquake, Flood
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-05—Publicizing Dam Inundation Maps	
Hazards Addressed	Dam Failure
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-06— Brush Clearance at City Owned Landfills	
Hazards Addressed	Wildland Fire
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-07—Actively Participate in Flood Organizations	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The DPW will continue ongoing participation with Flood Organizations such as the CA Floodplain Management Association, the Association of State Floodplain Managers, and National Association of Stormwater and Floodplain Managers.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-08— Mitigate vulnerable Wastewater Facilities	
Hazards Addressed	Earthquake, Flood, Landslide, Tsunami, Dam Failure
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-09—Certified Floodplain Manager	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The DPW will continue to support a Certified Flood Plain Manager initiative within Department.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-10—Implementation of the Seismic Bond Program	
Hazards Addressed	Earthquake
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-11—National Flood Insurance Program Seminar	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.
DPW-12—Channel/Basin Debris Removal Program	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-13—Emergency Power for Wastewater Pumping and Treatment Plans	
Hazards Addressed	All Hazards
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-14—Seismic Structural and Nonstructural retrofit of Personnel Building	
Hazards Addressed	Earthquake
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-15—Hazard Mapping and Survey Support	
Hazards Addressed	All Hazards
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-16—GIS Mapping for Stormwater Facilities	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-17—Prioritize Flood Problem Sites	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-18—Seismic Structural Retrofit of Hollywood Recreation Center	
Hazards Addressed	Earthquake
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-19—Public Education of Debris in the Stormwater System	
Hazards Addressed	Flood
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.
DPW-20—Nonstructural Earthquake Hazard Mitigation of Vulnerable Facilities	
Hazards Addressed	Earthquake
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-21—Improve Soil Stability and Erosion Abatement Regulations	
Hazards Addressed	Wildland Fire
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.
DPW-22—Maintain and Evaluate FEMA Elevation Certificates	
Hazards Addressed	Flood
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-23—Integrate Floodplain Management Information into Zoning and Mapping	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-24—Identify Stormwater Projects through the DPW CIP	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-25—Implementation of Flash Flood Warning System for Plants	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-26—Identify Mitigation Measures under Department of Public Works	
Hazards Addressed	All Hazards
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-27—Potrero Canyon Slope Stabilization on Pacific Coast Highway	
Hazards Addressed	Wildland Fire
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-28— San Pedro 3rd Street Relief Storm Drain Project	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-29—Integrate and Maintain the City Flood Hazard Management Plan with this HMP	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-30—Maintain Compliance under the NFIP	
Hazards Addressed	Flood, Tsunami, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The Department will continue to enforce the flood damage prevention ordinance, participate in floodplain identification and mapping updates, and will provide public assistance on floodplain requirements and impacts.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-31—Oakdale Redwing Storm Drain Project	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-32—Burwood Figueroa Storm Drain Project	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DPW-33— Westgate Montana Storm Drain Project	
Hazards Addressed	Flood
Responsible Party	Department of Public Works (DPW)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	This project is no longer needed at this time.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.
DPWBE-02—Holly Drive and Bryn Mawr Drive Rock Fall Mitigation Project	
Hazards Addressed	Geological Hazards
Responsible Party	Department of Public Works-Bureau of Engineering (DPWBE)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	The slope was stabilized by drilling and installing rock anchor bolts and a wire mesh stabilization system.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This project has been completed.

DPWBE-03—Mulholland Drive Bulkhead Project	
Hazards Addressed	Geologic Hazards
Responsible Party	Department of Public Works-Bureau of Engineering (DPWBE)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	A new bulkhead extension has been created to restore lateral support to the roadway and the total cost was $634,000.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This project has been completed.
DWP-01—Generation Backup Program	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable

DWP-02—Integrate Customer Connect with Existing Centers	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable
DWP-03—Security Lighting Upgrade Program	
Hazards Addressed	Climate Change, Earthquake, Flood, Landslide, Tsunami, Wildland Fire, Severe Weather
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable

DWP-04—Install Perimeter Security Walls at LADWP Stations	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable

DWP-05—Weed Abatement	
Hazards Addressed	Wildland Fire
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DWP-06—Identify New Needs and Enhance Existing Facilities through the Pump Station Refurbishment Program	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable

DWP-07—Enhance Existing Facilities through the Regulator Stations Program	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable

DWP-08—Identify and Enhance Trunk Lines and Major System Connections through the Trunk Lines and Major System Connections Program	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable
DWP-09—Identify HMA Eligible Projects in the Infrastructure Reservoir Improvements Program	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable

DWP-10—Griffith Park Improvements Project	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable
DWP-11—Security Projects at Reservoirs, Dams, and Facilities	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

DWP-12—Water Quality Additions and Betterments	
Hazards Addressed	All Hazards
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable
DWP-13—Dam Infrastructure Improvements Program	
Hazards Addressed	Dam Failure
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has begun the planning portion of the action. Implementation has not yet begun.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The Department is evaluating the infrastructure of dams located within the City limits.
If discontinue, explain why	Not applicable

DWP-14—Water Quality Improvement Project and Reservoir Improvement Program	
Hazards Addressed	Dam Failure
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has begun the planning portion of the action. Implementation has not yet begun.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The Department is evaluating water quality and reservoir's within City limits.
If discontinue, explain why	Not applicable
DWP-15—Seismic Strengthen of DS Yard Walls	
Hazards Addressed	Earthquake
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	There has been no progress made on this action.
If discontinue, explain why	Not applicable

DWP-16—S. Haiwee Reservoir Spillway Channel Modifications	
Hazards Addressed	Flood, Dam Failure, Severe Weather
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	Harden Spillway channel needs modifications to prevent erosion and scour to protect the new LADWP owned facilities downstream of the S. Haiwee Dam.
If discontinue, explain why	Not applicable

DWP-17— Tinemaha Reservoir Spillway Channel Improvement Project	
Hazards Addressed	Flood, Dam Failure
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has started planning for this project, but the implementation has not begun.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The Earthen Spillway Channel requires a hardened invert and approach apron to prevent excessive erosion and scour. Higher Side Berms and Hardened Arizona crossings are needed to protect the channel from breaching its banks and preventing back flows towards the toe of the Dam. Increased spillway channel capacity back to the Owens River will reduce the risks of flooding State Highway 395 and reduce the risk of Dam failure.
If discontinue, explain why	Not applicable

DWP-18—Four Culverts Replacement and Bishop Flood Bypass Channel Project	
Hazards Addressed	Flood
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has started planning for this project, but the implementation has not begun.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The entire system of four CMP culverts and Regulatory slide gates, retaining walls and wing walls require 100% rebuild. This release facility protects the City of Bishop, CA from flood damage by rerouting flood waters to a Flood Control Channel designed by the Army Corps of Engineers.
If discontinue, explain why	Not applicable
DWP-19—Self Propelled Suction Dredge for Sediment Removal along the LAA	
Hazards Addressed	Flood
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Department has not had the time and funding to fully develop the planning and implementation of this action.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	A self-propelled suction dredge is required for sand trap cleaning, sediment removal operations in our aqueduct, and channel maintenance for flows through our reservoirs from inlet to outlet structures. The last suction Dredge was decommissioned in the late 1980's and needs to be replaced. New uses are channel maintenance for major Environmental Mitigation Projects like the 62-mile long Lower Owens River Project.
If discontinue, explain why	Not applicable

DWP-20— Tinemaha Reservoir Outlet Tower Seismic Evaluation & Hazard Mitigation Study	
Hazards Addressed	Flood, Severe Weather
Responsible Party	Department of Water and Power (DWP)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	A Hazard Mitigation Study was completed and determined that this project is not feasible.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	The project was determined to not be feasible after the Hazard Mitigation Study was performed.

DWPBE-01— Nichols Canyon Road and Side-Hill Structure Project	
Hazards Addressed	Erosion
Responsible Party	Department of Public Works-Bureau of Engineering (DPWBE)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	Project was determined unfeasible in the pre-design.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	Project was determined unfeasible in the pre-design.

EMD-01—Implementation of the 2023 HMP	
Hazards Addressed	All Hazards
Responsible Party	Emergency Management Department (EMD)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The Department integrated the 2018 plan.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The Department wants to implement the 2023 plan in the same fashion that they did in the 2018 plan.
If discontinue, explain why	Not applicable
GSD-01—Division Training in Emergency Procedures	
Hazards Addressed	All Hazards
Responsible Party	General Services Department (GSD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

HAR-01—Maintain Advanced Transportation Management Information System	
Hazards Addressed	All Hazards
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	This system provides the capability for the Ports to have real time information regarding traffic status on the primary routes into the Ports, and to provide port operations status information to truck drivers during an emergency. This system will reduce the risk of having unnecessary traffic congestion on the roads leading to the Ports due to truck drivers not knowing what the operational status of the Ports is during an emergency.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This project has been completed.

HAR-02—Design and Installation New Placement Variable Drives for the Badger Avenue Bridge	
Hazards Addressed	All Hazards
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	This project provides needed maintenance on a critical piece of port infrastructure. This bridge is the only rail bridge to Terminal Island. Rail operations on and off of Terminal Island are critical to goods movement for a significant portion of Port of Los Angeles and Port of Long Beach cargo. This project reduces the risk of a major disruption to cargo movement for both Port of Los Angeles and Port of Long Beach that would be occur if the bridge failed to properly operate.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This project has been completed.

HAR-03—Maintain Operational Capacity of Terminals During All Hazard Events	
Hazards Addressed	Cyber Attacks, Earthquake, Flood, Terrorism, Wildland Fire, Severe Weather
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	Generators are the responsibility of the owners.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	Emergency generators are tenant's responsibility.
HAR-04—Conduct Non-Structural Seismic Hazard Mitigation of Vulnerable Facilities	
Hazards Addressed	Earthquake
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	Project has been determined as not needed.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	Project has been determined as not needed.
HAR-05— 705 N. Front Street Inspection Facility	
Hazards Addressed	Terrorism
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	There has been a facility designed that provides multiple truck lanes with scanning equipment. A new Modular building was also installed to provide additional office space.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This project has been completed.

HAR-06— Wharf Improvements / 300 Water Street – Maritime Law Enforcement Training Center	
Hazards Addressed	Terrorism
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	Work included the purchase and installation of modular buildings (2 shower/locker rooms and conference room) with hook-ups, wharf improvements at Berths 195 to 196, modification of a multi-agency boat mooring facility which includes floating docks, gangways, piers, shore ties for law enforcement boats including electrical and freshwater connections, and the installation of a backup generator. Improvements within the site included paving, fencing, gates, striping, landscaping, and utilities. The landscaping portion of the work included new planter areas, walkways, a concrete patio, irrigation, plants, patio benches, tables, and trash cans.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	The project is complete.
HAR-07— Port Police Computer Aided Dispatch and Records Management System	
Hazards Addressed	Terrorism
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	CAD capability provides computerized dispatch functions that significantly increase the efficiency of deployment of Port Police units, rapidly coordinate joint- agency responses within the port complex and increase officer safety. The associated RMS efficiently creates and maintains records associated with response operations. Without the CAD/RMS feature to the Port Police communications system response would be less efficient, potential resulting in less effective law enforcement and port security.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	The project is completed.

HAR-08— Port Police Tactical Radio Communications Improvement	
Hazards Addressed	Terrorism
Responsible Party	Harbor Department, Port of LA (HAR)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	This project provided many much needed upgrades to the Port Police radio communications system, including compliance with new FCC regulations. Without a state of the art communications system, Port Police responses would be less efficient, potential resulting in less effective law enforcement and port security.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This project is completed.

HCID-01— Disaster Housing Recovery Strategy	
Hazards Addressed	All Hazards
Responsible Party	Housing Department (LAHD)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	There is a lack of available post-disaster housing, which could cause post-disaster homelessness. The Department is gathering materials to begin drafting a plan.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The Department is developing a plan that will provide the framework and strategy for how the City will manage the transition from mass care and shelter response to housing-related recovery in future disasters.
If discontinue, explain why	Not applicable

HCID-02— Seismic Retrofit Program	
Hazards Addressed	Earthquake
Responsible Party	Housing Department (LAHD)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	Over 71% of soft-story mandated seismic retrofits have been completed. The City continues to search for possible sources of funding to assist owners.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	This program seeks to complete mandatory seismic retrofitting of residential properties with identified soft-story hazards, as required by City Ordinance 184081 enacted in February 2016. Los Angeles Department of Building and Safety oversees compliance. LAHD oversees owner cost recovery program.
If discontinue, explain why	Not applicable
ITA-01— Geographic Information Systems (GIS) Hazard Mapping	
Hazards Addressed	Earthquake, Flood, Landslide, Tsunami, Wildland Fire, Dam Failure
Responsible Party	Bureau of Engineering
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the Bureau responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the Bureau regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

ITA-02—Disaster Recovery Support Services	
Hazards Addressed	All Hazards
Responsible Party	Information Technology Agency (ITA)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Agency is unable to determine what this action is referring to.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	The Agency is unable to determine what this action is referring to.
ITA-03— Emergency Operations Center Incident Management System (IMS) Software Support	
Hazards Addressed	All Hazards
Responsible Party	Information Technology Agency (ITA)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Agency is unable to determine what software this is referring to.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	The Agency is unable to determine what software this is referring to.

ITA-04— Participate in and provide IT support to Citywide & Departmental Emergency Exercises	
Hazards Addressed	All Hazards
Responsible Party	Information Technology Agency (ITA)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The Agency regularly provides support during exercises for Agency projects.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the Agency regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

ITA-05— Support EMD in the Maintenance of the Hazus Model	
Hazards Addressed	Earthquake, Flood, Sea-Level Rise, Tsunami, Dam Failure
Responsible Party	Information Technology Agency (ITA)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The Agency maintains licensing for HAZUS but does not have a role in ongoing support.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the Agency regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LADBS-01— Continue the Development and Distribution of; "Be Prepared, Homeowners" Guide for Erosion Control Booklets	
Hazards Addressed	Flood
Responsible Party	Department of Building and Safety
Action Review Status	 Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The guide is used to assist property owners in minimizing and reducing potential damage to property in the event of a flood.
Next Steps Include in the 2024 HMP or Discontinue?	 Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LADBS-02— Provide Updates to the Flood Hazard Mitigation Coordinator	
Hazards Addressed	Flood, Tsunami, Dam Failure
Responsible Party	Public Works BOE
Action Review Status	 Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps Include in the 2024 HMP or Discontinue?	 Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LADBS-03— Safety Assessment Program Training for Los Angeles Department of Building and Safety Inspectors and Engineers	
Hazards Addressed	All Hazards
Responsible Party	Department of Building and Safety
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	Safety Assessment Teams 1- 20 are to receive regular SAP, Safety Assessment Program training to ensure team members are versed in their duties and responsibilities of the SAT teams.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAFD-01—Protect Fire Stations 40, 49, 110, 111, 112 from Tsunami Impact	
Hazards Addressed	Sea-Level Rise, Tsunami
Responsible Party	Fire Department (LAFD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The Department protects stations via infrastructure and warning and alerting systems to maintain safety.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAFD-02— Continue Implementation of Fire Road Maintenance Program	
Hazards Addressed	Wildland Fire
Responsible Party	Fire Department (LAFD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The department continues to develop and maintain the fire roads.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAFD-03— Update/Maintain Wild Land Operational Plan	
Hazards Addressed	Wildland Fire
Responsible Party	Fire Department (LAFD)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The departments ongoing process of updating and maintaining a Wildland Operational Plan in coordination with departmental operational plans to effectively manage and mitigate wildfires within a specific operational district. This includes Risk Assessment and Analysis: Continuously assess and analyze the wildfire risk within the operational district. This involves considering factors such as weather patterns, fuel types, terrain, and historical fire data to identify areas of higher vulnerability.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The department is continuing to obtain information that will be useful in updating the Wild Land Operational Plan.
If discontinue, explain why	Not applicable

LAFD-04— Security/Safety action for Memorial Training Center at 1700 Stadium Way	
Hazards Addressed	All Hazards
Responsible Party	Fire Department (LAFD)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The front side of the property has been successfully secured with the completion of the iron security fencing installation. This important milestone was made possible through funding from VET contributions and grants.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	To fully achieve the security goals and ensure comprehensive protection for the entire premises, the department is in need of additional funding. The successful completion of the front side installation underscores the effectiveness of our approach, and the department is eager to replicate this accomplishment for the remaining sections.
If discontinue, explain why	Not applicable

LAFD-05— Franks Hotchkins Memorial Training Center Perimeter Security	
Hazards Addressed	Civil unrest, Terrorist Attack
Responsible Party	Fire Department (LAFD)
Action Review	
Status	Complete
Narrative describing progress or obstacles that have prevented implementation	Completed Front Side of full project to add perimeter security to 1700 Stadium Way, LA
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This project has been completed.

LAPD-01— Continue to Deploy the Mobile Command Response Unit	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-02—Technological, Chemical, and Biological Detection Devices	
Hazards Addressed	Radiological, Terrorism, Terrorist Attack, Hazardous Materials, Hazardous Substances, CBRN
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-03—Emergency Cyber Incident Response Program	
Hazards Addressed	Cyber Attacks
Responsible Party	City of LA
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-04—Video Downlink/Video Surveillance & Monitoring Equipment	
Hazards Addressed	Civil Unrest
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-05— The Archangel Program	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The Archangel program has been discontinued.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	The Archangel program has been discontinued.

LAPD-06—Regional Video Command Center Equipment	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This project enhances security at Critical Infrastructure / Key Resource through the use of closed-circuit television. It will also improve the capabilities to prevent, detect, and intervene in events that interfere with the continued operation of these Key Resources. The system also expands collaboration by granting access to regional partners.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-07— Explosive Detection Devices	
Hazards Addressed	Terrorism, Terrorist Attack
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-08—Update and Maintain the Brushfire Response Plan	
Hazards Addressed	Wildland Fire
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-09—LASD Program	
Hazards Addressed	Terrorism
Responsible Party	Sheriff's Department (LASD)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	This program was a Los Angeles County Sheriff's Department program and not LAPD. The responsibilities of this program were assumed by the Fusion Center of the Joint Regional Intelligence Center as a regional awareness and information sharing center.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	The responsibilities of this program were assumed by the Fusion Center of the Joint Regional Intelligence Center as a regional awareness and information sharing center.

LAPD-10— Hazardous Materials Unit	
Hazards Addressed	Terrorism, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The LAPD Hazmat mission is to assure the quality of life and environment for the residents, business community and police officers of Los Angeles by providing professional responses to and competent investigations of incidents involving hazardous materials, environmental crimes and terrorist acts using weapons of mass destruction.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-11—Emergency Management Public Outreach and Education	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This program is a community program to help public neighborhoods stay safe from terrorist activities. It is a partnership between public communities and the Los Angeles Police Department. This program is in conjunction with the Notify LA, the official mass notification system used to send voice messages, text messages and email messages to residents and businesses during times of emergencies and disasters. Notifying the public when a disaster strikes might be the one and only safeguard the public can count on to save their lives and protect their property.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-12— Update and Maintain the Police Department Emergency Operations Guide	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-13—Cellular Telephone Disruption Device	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	LAPD does not utilize this type of technology as it would be an FCC violation.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	LAPD does not utilize this type of technology as it would be an FCC violation.
LAPD-14—Radiation	
Hazards Addressed	Radiological, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	This action was replaced by LAPD-27 Personal Radiation Detector.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This action was replaced by LAPD-27 Personal Radiation Detector.

LAPD-15— Port Security Grant Program	
Hazards Addressed	Catastrophic Infrastructure Failure, Terrorism, Terrorist Attack
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The LAPD Port Security Grant Program is designed to train, deliver, evaluate, and respond to emergencies within the Port of Los Angeles to threats identified in the AMSP, Risk Mitigation Plan, and the Trade Resumption Plan. The Port of Los Angeles is part of the Critical Infrastructure within the City as well as a potential target for Terrorism.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-16— Southern California Situational Awareness Program	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This assumed the LARCOPP mission that has been renamed. This is a regional cooperation which provides the ability to respond to large scale pre-planned events or spontaneous incidents and maintain situational awareness between multiple jurisdictions by utilizing cellular, satellite connectivity capabilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-17— WMD and Multiple Assault Counter-Terrorism Action Capabilities (MACTAC) equipment and training	
Hazards Addressed	Civil unrest, Multiple Hazards, Public safety, Riots - All Hazards, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The WMD equipment and training support the certification, re-certification, training and personal protective equipment for officers to respond to incidents that involve criminal or terrorist attacks with hazardous materials. The MACTAC training and equipment provide officers with the initial and update training on effective small unit tactics that are necessary to utilize during multiple organized and sophisticated critical incidents or terrorist attacks.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-18— Automated License Plate Recognition	
Hazards Addressed	Civil unrest, Terrorism
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This program will assist in the continued implementation of new software that will incorporate color, make, and model of vehicles and expand sharing across the Southern California metro region. This increase in capability will also investigation to utilize software to rapidly identity candidate vehicles involved in crime or in other investigations. This will also allow for the better monitoring of Critical Infrastructure by increasing the ability to identity suspicious vehicles or activity.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-19— Bomb Squad Explosive Magazine Project	
Hazards Addressed	Public safety, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The objective of this project is to build a transportable ATF explosive storage magazine with all appropriate security measures. The magazine will secure the high explosives utilized by the Bomb Squad to render safe and mitigate explosive devices. This program directly supports the response to a terrorist attack with a WMD and the transportation of devices in a manner that ensures the safety of the public.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-20— Regional Explosive Device Detection, Imaging and Mitigation Maintenance Project	
Hazards Addressed	Infrastructure Failure, Multiple Hazards, Nuclear, Public safety, Radiological, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	As one of two FBI accredited and certified Bomb Squads in the Operational Area, LAPD has primary responsibility for the management of incidents involving potential explosive devices, including stabilization of nuclear devices and render safe of radiological dispersal devices in the City and at critical infrastructure such as LAX and the Port of Los Angeles. Throughout the region, the unit provides mutual aid via seamless integration with Los Angeles Sheriff's Department and the FBI bomb technicians. While providing service for emergency call outs, special events and dignitary visits. This project will upgrade and repair current equipment, extending the lifespan of the equipment while maintaining fiscal responsibility.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The department has begun the planning portion of the project and is starting the implementation.
If discontinue, explain why	Not applicable

LAPD-21— Bomb Squad Robot Upgrade Project	
Hazards Addressed	Nuclear, Radiological, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The Bomb Squad robot upgrade project will provide much needed enhancements and upgrades to our existing fleet of remotely operated Bomb Squad robots. As technology moves forward, there are upgrades and capabilities to robotic platforms which provide vital capabilities for down range operations at potential bomb related calls. These upgrades enhance officer safety and safety to the public.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	One robot upgrades complete, two additional upgrades in progress.
If discontinue, explain why	Not applicable

LAPD-22— Bomb Squad K9 Person Borne (PB) and Stand Off Detection Dog (SODD) Training Project	
Hazards Addressed	Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This project will enhance and continue the existing capability for canine explosives detection for preventive and response capabilities at various Critical Infrastructure and Key Resource sites throughout the Area of Operation. This is mandated training that must occur on an annual basis to retain certification.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-23— Bomb Detection Canine Video Relay Project	
Hazards Addressed	Public safety, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	Units have all been received and deployed. Project in its current state is complete. This project will be used to provide wireless video streaming from a long-lead or an off-lead explosive detection canine. This video feed can be shared with regional partners or incident commanders to facilitate rapid responses and mitigation of threats at various critical infrastructure sites throughout the Operational Area.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-24— HazMat JHAT (Joint Hazard Assessment Team)	
Hazards Addressed	Catastrophic Infrastructure Failure, Civil unrest, Infrastructure Failure, Multiple Hazards, Natural & Man-made Hazards, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The JHAT concept is a multi-agency and multi-discipline collaborative response that has been successfully implemented within the City of Los Angeles and has resulted in the full-time assignment of fire and police resources and includes Federal partners. This project universally outfits specialized personnel with interoperable equipment to ensure an all-hazards, multi-discipline response to incidents. The PPE ensembles are specific for use by operators, fire fighters, and specialist who are tasked with hazard identification, mitigation, render safe, and life safety operations in a contaminated environment.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-25— HazMat AWARE (Area Wireless Assessment Reconnaissance and Evaluation)	
Hazards Addressed	Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	AWARE is deployed to create a virtual and physical perimeter around critical infrastructure and key resources, special events and dignitary protection details throughout the OA. Real time sensor readings and associated metadata are live streamed from CBRN equipment that is deployed on stationary equipment, mobile platforms (aerial, maritime, and land-based equipment), as well as handheld devices. Annually, AWARE is deployed to entertainment industry awards shows as well as major sporting events, concerts, dignitary visits, in response to actionable intelligence or threats, and as a preventative measure. Staffed and maintained by the Joint Hazard Assessment Team (JHAT), a full time joint Police and Fire HazMat team. AWARE data is streamed from incidents via secure web access portals, streamed to a secure server, and is monitored by partner agencies at the local and federal level to provide situational awareness and facilitate a rapid response to incidents.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-26— HazMat Enhanced Training Project	
Hazards Addressed	Public safety, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The HazMat training project is in place to provide advanced training in chemical and biological detection, identification, and mitigation. The continued funding of this project will provide vital training the ensure that the Hazardous Materials Unit is utilizing the most current and relevant techniques.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.
LAPD-27— Preventative Radiological / Nuclear Detection	
Hazards Addressed	Nuclear, Public safety, Radiological, Radon, Terrorism, Terrorist Attack, Hazardous Materials
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This program partners LAPD with federal, state and local agencies to develop a sustainable Radiological/ Nuclear Detection (PRND) Program to combat the threat of a terrorist attack within high-risk metropolitan areas. LAPD has the responsibilities of developing the architectures for PRND activities within the Los Angeles Police Department and ensuring their coordination with 10 partnering first responder agencies.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-28— Microwave Downlink and Churchill Navigation System	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The Churchill Navigation system working in tandem with the microwave down-link will now provide an enhanced situational awareness for the end user and aircrew. Both will now be able to see a detailed overlay on top of the video, making it more user-friendly. This overlay will include but is not limited to; streets, addresses, parcels, business names, berths, channels and even AIS information on vessels. The Churchill system can also be used to task or drive the camera to specific points. This feature allows ASD, and the end user to collect comparison video to assist in detecting even minor changes at Critical Infrastructure sites. Furthermore, this system is fully interoperable with all port partners within the Los Angeles/Long Beach Port complex and is compatible with prior upgrades.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAPD-29— FLIR 380 HDC and High-Definition Dual Sensor Cameras	
Hazards Addressed	All Hazards
Responsible Party	Police Department (LAPD)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The continued upgrade of LAPD helicopters equipped with hi-definition dual sensor cameras and Forward Looking Infra-Red HDC Camera capabilities in conjunction with the Microwave Down-link system will transmit real-time images to provide incident commanders with an enhanced and unique situational awareness. The system's ability to stream enhanced additional information with a detailed overlay of those images will significantly enhance the Maritime Domain Awareness for the active incident commanders and analysts. This capability directly supports increased port-wide-risk management and addresses enhanced IED and CBRNE prevention and the protection, mitigation, response and recovery of critical infrastructure within the port.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-01— Special, Mobile Hazardous Waste Collection	
Hazards Addressed	Hazardous Materials
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-02— Spill Prevention Program at Industrial Waste Management Division	
Hazards Addressed	Hazardous Materials
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-03—Debris Removal	
Hazards Addressed	Hazardous Materials
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-04—Standby Power Generation for All Wastewater Pumping & Treatment Plants	
Hazards Addressed	Blackouts and Power Outages
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-05—Accelerated Sewer Repair	
Hazards Addressed	Earthquake
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-06—ICSD – Offsite Backup Tape Storage/Archiving for LASAN	
Hazards Addressed	Terrorism
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-07—Implementation of Flash Flood Warning System for Donald C. Tilman Plant, Los Angeles-Glendale Plant, Pumping Plant #3 and Pumping Plant #49	
Hazards Addressed	Flood
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-08—Refine the Use of the Plan Check Inspection System	
Hazards Addressed	Flood
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-09—Urban Flooding "hot spot" Map	
Hazards Addressed	Flood
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-10—Educate the Public About Debris in the Storm Water System	
Hazards Addressed	Flood
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LASAN-11—Establish New Flood Hazard Mitigation Techniques	
Hazards Addressed	Flood
Responsible Party	City of Los Angeles, Industrial Safety & Compliance Division, Hazardous Material & Waste management (LASAN)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	This action has been fully integrated into the department responsibilities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

LAWA-01— Improved LAX Airport Passenger Access and Airfield Modifications	
Hazards Addressed	Earthquake
Responsible Party	Los Angeles World Airports (LAWA)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	LAWA has begun the planning part of this project and is working towards implementation.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	Passenger access and airfield modifications improve safety and efficiency for airfield expansions.
If discontinue, explain why	Not applicable
LAWA-02—Assess and Install Crash Cushions on Critical Power Line Poles	
Hazards Addressed	Power Outage
Responsible Party	Los Angeles World Airports (LAWA)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The department has had issues with limited funding and staff to pursue funding avenues for this project.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The LAWA experiences power outages that impact their day to day operations.
If discontinue, explain why	Not applicable

LAWA-03— Purchase two X-Ray Vans	
Hazards Addressed	Terrorism
Responsible Party	Los Angeles World Airports (LAWA)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The department has had issues with limited funding and staff to pursue funding avenues for this project.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The LAWA needs X-ray vans or robots that can detect solid and liquid explosives in checked bags to ensure staff and passenger safety.
If discontinue, explain why	Not applicable

LAWA-05-— Install Earthquake Early Warning Technology	
Hazards Addressed	Earthquake
Responsible Party	Los Angeles World Airports (LAWA)
Action Review	
Status	No Progress
Narrative describing progress or obstacles that have prevented implementation	The department has had issues with limited funding and staff to pursue funding avenues for this project.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The LAWA intends for the early warning technology to connect to phones, speakers, desktops and digital signage so that an alert will be issued immediately if an anticipated shake of 5 MMI or higher is predicted.
If discontinue, explain why	Not applicable

PL-01—Integrate the City's HMP into Future Updates to the General Plan	
Hazards Addressed	All Natural Hazards
Responsible Party	City Planning Department (PL)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	In 2021 the City undertook a targeted update to the General Plan Safety Element, which included an action to adopt the HMP as a formal component of the Safety Element, bringing the HMP into the City of Los Angeles General Plan. Through this update the City satisfied the baseline requirements of SB 379 and related legislation by bringing HMP hazard maps into the General Plan. The City also verified that the current Health Element meets the requirements of SB 1000.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

PL-02—Plan Updates and Data Integration	
Hazards Addressed	All Natural Hazards
Responsible Party	City Planning Department (PL)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The City Planning Department worked with EMD to upload the HMP hazard area maps into an internal GIS database, allowing staff working in the Community Plan program and other policy sections to access these maps that use them to inform subsequent policy decisions. Revised maps will be uploaded once the HMP update is complete.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

PL-03—Consider Adopting Higher Regulatory Standards	
Hazards Addressed	All Natural Hazards
Responsible Party	City Planning Department (PL)
Action Review	
Status	Ongoing Capability
Narrative describing progress or obstacles that have prevented implementation	The City Planning Department has developed a draft a Wildlife Ordinance, which places additional restrictions on the scale and location of development in a targeted hillside geographic area of the Santa Monica mountains. This ordinance is focused on wildlife protections and biodiversity, but has significant related benefits for disaster resilience, as the impacted area is entirely within the Very High Fire Hazard Severity Zone, and includes areas subject to flooding, and landslides. Once adopted the City could expand the regulations to apply to other applicable hillside geographies.
Next Steps	
Include in the 2024 HMP or Discontinue?	Discontinue
If include, revise/reword as appropriate	Not applicable
If discontinue, explain why	This is a capability that the department regularly performs and is now included in the reoccurring department responsibilities. More information regarding capabilities is included in Section 5.

PL-04— Create a City of Los Angeles Climate Vulnerability Assessment	
Hazards Addressed	Extreme temperature, Flooding and Power Outages, Public safety, Wildfire, Severe Weather, Water Supply Contamination, Utility Interruption, Climate Change and Sea-Level Rise, Extreme Weather
Responsible Party	City Planning Department (PL)
Action Review	
Status	In Progress
Narrative describing progress or obstacles that have prevented implementation	The City Planning Department, EMD and CEMO will work alongside a consultant to launch a Climate Vulnerability Assessment in late 2023. The results of the assessment will shape future updates to the HMP and Safety Element and inform future climate action and adaptation planning through recommendations on equitable climate adaptation strategies and implementation measures that specifically address and prioritize the most impacted communities.
Next Steps	
Include in the 2024 HMP or Discontinue?	Include
If include, revise/reword as appropriate	The Department has begun planning for this assessment and plans to begin implementation.
If discontinue, explain why	Not applicable

G. Progress Report Template

Reporting Period: *(Insert reporting period)*

Background: The City of Los Angeles developed a hazard mitigation plan to reduce risk from hazards by identifying resources, information, and strategies for risk reduction. The federal Disaster Mitigation Act of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. To prepare the plan, the City organized resources, assessed risks from hazards, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from natural hazards. By completing this process, the City maintained compliance with the Disaster Mitigation Act, achieving eligibility for mitigation grant funding opportunities afforded under the Robert T. Stafford Act. The plan can be viewed on-line at:

INSERT LINK

Summary Overview of the Plan's Progress: The performance period for the Hazard Mitigation Plan became effective on __[date]__, with the final approval of the plan by FEMA. The performance period for this plan will be 5 years, with an anticipated update to the plan to occur before __[date]__. As of this reporting period, the performance period for this plan is considered to be __% complete. The Hazard Mitigation Plan has targeted 113 hazard mitigation actions to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

- __ out of __ actions (__%) reported ongoing action toward completion.
- __ out of __ actions (__%) were reported as being complete.
- __ out of __ actions (___%) reported no action taken.

Purpose: The purpose of this report is to provide an update on the implementation of the action plan identified in the Hazard Mitigation Plan. The objective is to ensure that there is a continuing and responsive planning process that will keep the Hazard Mitigation Plan dynamic and responsive to the needs and capabilities of the City of Los Angeles. This report discusses the following:

- Hazard events that have occurred over the reporting period.
- Changes in risk vulnerability within the planning area.
- Mitigation success stories.
- Review of the action plan.
- Changes in capabilities that could affect plan implementation.
- Recommendations for changes/enhancement.

The Hazard Mitigation Task Force: It was determined through the plan's development process that a Hazard Mitigation Task Force would be established to oversee maintenance of the plan. The Hazard Mitigation Task Force, made up of City staff and other stakeholders from the planning area, reviewed and approved this progress report at its annual meeting held on __[date]__. At a minimum, the Hazard Mitigation Task Force provides technical review and oversight on the development of the annual progress report.

It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the Hazard Mitigation Task Force membership is as indicated in Table 1.

Table 1. Hazard Mitigation Task Force Members

Name	Title	Department/Agency

Hazard Events within the Planning Area: During the reporting period, there were __ hazard events in the planning area that had a measurable impact on people or property. A summary of these events is as follows:

- ______________________________
- ______________________________

Changes in Risk Vulnerability in the Planning Area: *(Insert brief overview of any natural hazard event in the planning area that changed the probability of occurrence or ranking of risk for the hazards addressed in the hazard mitigation plan)*

Mitigation Success Stories: *(Insert brief overview of mitigation accomplishments during the reporting period)*

Review of the Action Plan: Table 2 reviews the action plan, reporting the status of each action. Reviewers of this report should refer to the Hazard Mitigation Plan for more detailed descriptions of each action and the prioritization process.

Address the following in the "status" column of the following table:

- Was any element of the action carried out during the reporting period?
- If no action was completed, why?
- Is the timeline for implementation for the action still appropriate?
- If the action was completed, does it need to be changed or removed from the action plan?

Table 2. Action Plan Matrix

Action Taken? (Yes or No)	Timeline	Priority	Status	Status (X, O, ✓)
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				

Action Taken? (Yes or No)	Timeline	Priority	Status	Status (X, O, ✓)
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				

Completion status legend:
ü= Project Completed
O = Action ongoing toward completion
X = No progress at this time

Changes That May Affect Implementation of the Plan: (*Insert brief overview of any significant changes in the planning area that would have a profound effect on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan's development*)

Recommendations for Changes or Enhancements: Based on the review of this report by the Hazard Mitigation Task Force, the following recommendations will be noted for future updates or revisions to the plan:

- ______________________________
- ______________________________
- ______________________________
- ______________________________
- ______________________________
- ______________________________

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. An update on this report will be given to the Emergency Operations Board during its next regular public meeting. The report is posted on* *the City of Los Angeles Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

Insert Contact Info Here

H. City Adoption Resolution and FEMA Approval

TO BE PROVIDED WITH FINAL DRAFT