CLIMATE ADAPTATION AND SAFETY ELEMENT

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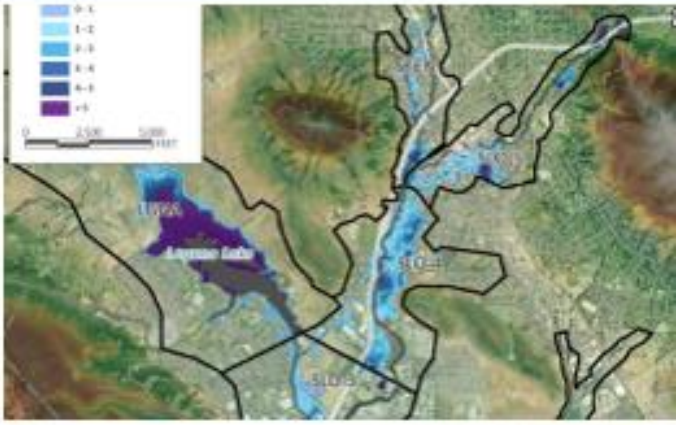
City of San Luis Obispo
990 Palm Street
San Luis Obispo, CA 93401

City of San Luis Obispo

Climate Adaptation and Safety Element

2022



City of San Luis Obispo

Climate Adaptation and Safety Element

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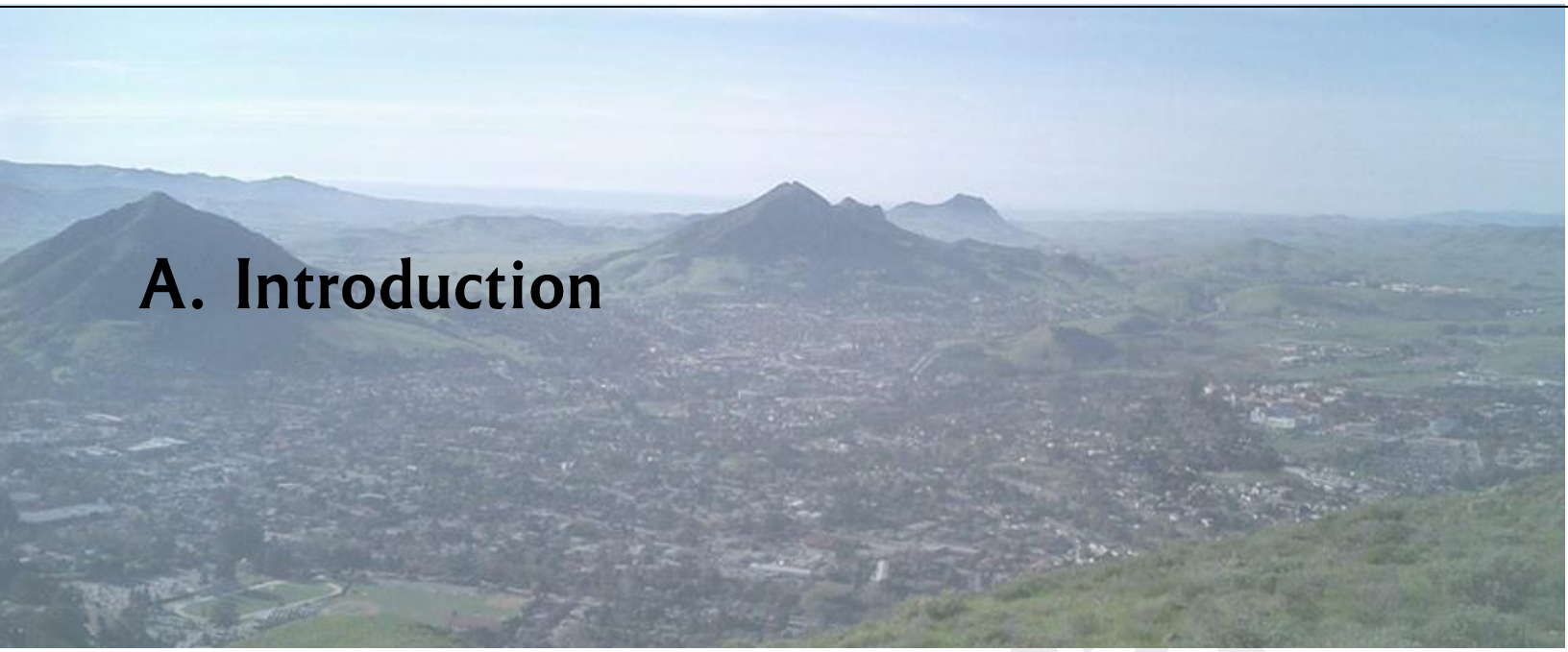


A. Introduction

The City of San Luis Obispo (City) is committed to protecting the community from natural and human-made hazards and building resilience to existing and projected climate change risks. The Climate Adaptation and Safety Element assesses the city's vulnerability to these hazards and establishes goals, policies, and implementation measures to protect people, property, and the natural environment. It is designed to realize an equitable, resilient community that thrives despite the changing climate and other known hazards, as articulated below in the Climate Adaptation and Safety Element's Vision.

CLIMATE ADAPTATION AND SAFETY ELEMENT VISION

The City of San Luis Obispo works diligently to protect all forms of life and property. While the changing climate has impacted us in expected and unexpected ways, the priorities identified by the community and our regional partners have shaped a San Luis Obispo that is thriving, equitable, and resilient. Community members, businesses, and neighborhoods support each other through climate disruptions, and civic life is stronger than ever. Critical facilities are resilient, incorporate innovative sustainability practices, and continue to provide core community functions in a cost-effective manner. San Luis Obispo's efforts also support environmental justice, and all community members have access to services and opportunities to influence the way we adapt to climate change. The world around us is impacted, but our natural resources and our built environments are designed to provide places of refuge and buffer against these disruptive forces. Climate change is one of the biggest challenges we have ever faced, but we have risen together to be safe, healthy, and prosperous.

PURPOSE

The Climate Adaptation and Safety Element serves as the City's Safety and Environmental Justice elements, which are required elements of general plans subject to the requirements of

Government Code 65302(g)(h). Under state law, a safety element promotes protection for the community from unreasonable risks related to slope instability, seismic activity, subsidence, liquefaction, known geologic hazards, flooding, wildland and urban fires, tsunami, seiche, dam failure, and climate change. An environmental justice element addresses unique or compounded health risks in vulnerable and disadvantaged communities by decreasing pollution exposure, increasing community assets, and improving overall health.

The City is focusing on climate change adaptation in this Safety Element update because state law requires that safety elements include a vulnerability assessment that identifies the risks posed by climate change and a series of adaptation goals, policies, and implementation measures designed to protect the community (Senate Bill [SB] 379, 2015). The City's Hazard and Vulnerability Assessment is included in Appendix A. The City is also including climate adaptation due to the unprecedented disruptions that climate change will cause through and beyond General Plan buildout. Due to decades of rapidly increasing global greenhouse gas (GHG) emissions and insufficient climate action at all levels of government and industry, atmospheric GHG concentrations have reached a level that guarantees substantial and unavoidable impacts for the foreseeable future. California's recent historic heat, wildfires, droughts, floods, mudslides, and public safety power shutoffs represent the types of climate change impacts that will be experienced with increasing frequency and severity. These impacts threaten to make all the significant issues currently faced by the City (e.g., economic recovery, the housing crisis, homelessness, equity, sustainable water supply, etc.) more critical, challenging, and expensive. By centering climate change consideration in General Plan goals, policies, and programs now, the community can have sufficient capacity to thrive in the face of a rapidly changing future.

The City is focusing on the integration of environmental justice in this Safety Element update because as the state requires analysis of existing hazards and climate change impacts on the community related to existing and future hazards, climate change can further impact vulnerable and disadvantaged communities that already suffer from disproportionate environmental burdens and health risks. These communities would experience heightened risk and increased sensitivity to climate change due to having less capacity and fewer resources to cope with, adapt to, or recover from climate impacts (Office of Planning and Research, July 2020). Consideration of environmental justice in climate adaptation and safety planning provides an opportunity to improve resilience of the entire community over time, especially vulnerable and disadvantaged populations.

REGULATORY AND PLAN CONSISTENCY

The Climate Adaptation and Safety Element has been developed in compliance with State laws and regulations, consistent with other plans prepared or adopted by the City, including the San Luis Obispo County Multi-Jurisdiction Hazard Mitigation Plan (Hazard Mitigation Plan), Climate Action Plan for Community Recovery, and other elements of the City's adopted General Plan. A brief description of laws, regulations, and plans reviewed for consistency is provided below, with additional information provided in Appendix B (Compliance with Laws and Regulations).

Consistency with State Laws and Regulations

Key State laws informing preparation of the Climate Adaptation and Safety Element, including recent legislation related to planning for climate change adaptation and environmental justice, Include Senate Bill (SB) 379 (Climate Change and Resilience), SB 99 (Emergency Evacuation

Routes), SB 1000 (Environmental Justice), Assembly Bill 747 (Emergency Evacuation Routes), the Alquist-Priolo Earthquake Faulting Zone Act, the National Flood Insurance Program, and Government Code Section 65302(g) (Authority for and Scope of General Plans – Safety Element).

Consistency with City General Plan

To ensure that the goals, policies, and programs included in the Climate Adaptation and Safety Element are internally consistent with other elements of the City's General Plan a policy audit was conducted to identify any similar or overlapping goals, policies, and programs from other elements of the City's adopted General Plan, and other plans the City has adopted that support implementation of the General Plan. Based on this assessment, the City finds that the Climate Adaptation and Safety Element is consistent with the other elements of the General Plan.

Consistency with Multi-jurisdictional Hazard Mitigation Plan

In June 2020, the City adopted the San Luis Obispo County Multi-Jurisdictional Hazard Mitigation Plan (Hazard Mitigation Plan) and accompanying city-specific Annex G: City of San Luis Obispo (Appendix C). The city-specific annex includes an assessment of natural and manmade hazards affecting the city and a comprehensive set of goals, objectives, strategies, and actions to mitigate potential impacts to life and property. It addresses the following medium and high significance hazards based on the potential impact which takes into account the geographic area, probability of future occurrences and magnitude/severity:

- Adverse Weather: Thunderstorm/Heavy Rain/Hail/Lighting/Dense Fog/Freeze
- Adverse Weather: High Wind/Tornado
- Agricultural Pest Infestation and Disease
- Biological Agents
- Drought and Water Storage
- Earthquake
- Flood
- Human Caused: Hazardous Materials
- Wildfire

The San Luis County Multi-jurisdiction Hazard Mitigation Plan is incorporated by reference into the Climate Adaptation and Safety Element

The Hazard Mitigation Plan was submitted to the Governor's Office of Emergency Services and Federal Emergency Management Agency (FEMA) for approval. By reviewing and updating the Hazard Mitigation Plan every 5 years, the City maintains eligibility for certain hazard mitigation funding from FEMA. The Hazard Mitigation Plan is incorporated by reference into the Climate Adaptation and Safety Element. The goals and policies of the Climate Adaptation and Safety Element are complementary to and consistent with the recommended mitigation strategy of the Hazard Mitigation Plan and its identified medium and high significance hazards, which the City also will consult when addressing known hazards.

Consistency with the Climate Action Plan for Community Recovery

In August 2020, the City adopted the Climate Action Plan for Community Recovery. It establishes a community-wide goal of carbon neutrality by 2035 and a municipal operations goal of carbon neutrality by 2030, adopts sector specific emissions goals, and provides foundational actions to establish a trajectory towards achieving those goals. The plan recognizes the importance of reducing greenhouse gas (GHG) emissions to limit the amount of global warming that will occur and lessen the severity of future climate impacts, while also acknowledging that climatic changes

have already been set into motion as a result of past, present, and future GHG emissions generated throughout the world. The Climate Adaptation and Safety Element illustrates the City's commitment to simultaneously addressing the causes and impacts of climate change.

B. Climate Adaptation and Safety Element Goals

ELEMENT STRUCTURE

The Climate Adaptation and Safety Element includes a set of broad goals for various aspects of the city derived from broad public outreach summarized in Appendix D. To provide a holistic approach, the goals focus on desired future conditions for key physical, natural, and social systems needed to achieve community safety and resilience. To facilitate ease of reference, this Element is organized into sections based on major hazards present in the city. These sections include a discussion of the hazard, how climate change is projected to influence the hazard (where relevant), and a comprehensive set of policies and programs to help achieve the goals. A brief definition of goal, policy, and program is provided below.

Goal - A statement that describes in general terms a desired future condition or "end" state. A goal serves to set a general direction.

Policy – A statement that guides a specific course of action for decision-makers to use to achieve a desired goal.

Program – An action, procedure, program, or technique that carries out a policy.

The Climate Adaptation and Safety Element is also supplemented by a series of appendices which provide additional information that was used to develop this Element.

CLIMATE ADAPTATION AND SAFETY ELEMENT GOALS

The Climate Adaptation and Safety Element has six goals, each of which contributes to achieving the vision presented in Chapter One. The six goals are as follows:

GOAL 1: PUBLIC SAFETY

Minimize injury and loss of life, damage to public and private property, and social and economic disruptions resulting from injury, death, and property damage.

GOAL 2: COMMUNITY RESILIENCE

All community members are enabled and empowered to prepare for, respond to and recover from disruptions while seizing opportunities to thrive in changing conditions.

GOAL 3: CITY GOVERNMENT RESILIENCE

The City's facilities, infrastructure, and operations are resilient, innovative, and continue to cost-effectively provide core functions and services for all community members in times of acute disaster and ongoing disruptions.

GOAL 4: ENVIRONMENTAL JUSTICE

A diverse, equitable, and healthy community where those who are disproportionately affected by natural hazards and climate change have the resources and capacity to participate in public processes and have an active role in preparing and responding to future impacts.

GOAL 5: NATURAL SYSTEMS

The natural environment sustains and supports ecological and community health, safety, and natural beauty, provides equitable access to nature, and can adapt and keep pace with a dynamic, changing climate.

GOAL 6: BUILT ENVIRONMENT

Community buildings, public spaces and transportation systems withstand the natural hazards and escalating impacts of climate change, provide places of refuge, foster social cohesiveness, minimize injury and loss of life, and equitably protect personal and community assets.

C. Policies and Programs

1. High Impact Multi-Hazard Resilience

OVERVIEW

In the coming decades San Luis Obispo will experience more fires, floods, droughts, and extreme heat than ever before. Throughout the development of this plan, the community has called for bold, just, and proactive measures that build resilience amid increasing climate hazards (Baseline Conditions Report, Appendix E). While some of the resilience solutions presented in the Climate Adaptation and Safety Element will help our community adapt to a specific hazard, this chapter identifies strategic actions wherein a singular change in City policy or practice can co-solve for multiple climate hazards simultaneously. This chapter's cross-cutting policies and programs represent the highest leverage actions available to the City, which can broadly improve the community's ability to endure and recover from a range of disturbances.

Public infrastructure, private development, and natural resources are all subject to a confluence of natural and manmade hazards that can threaten human life and safety. The high-impact multi-hazard resilience solutions presented in this chapter offer clear points of intervention that boost community resilience amidst the unpredictable and compounding threat of fires, floods, earthquakes, and droughts facing San Luis Obispo.

This chapter also includes actions that boost social cohesion, connectedness, and community solidarity – as social cohesion is one of the strongest indicators of resilience during disaster events and post-disaster recovery efforts (Townshend et al. 2015). Alongside the steps the City and partner agencies are taking, it is important to recognize the role community organizations and informal social networks can play in building adaptive capacity to the impacts of climate change, especially for vulnerable populations.

MULTI-HAZARD RESILIENCE POLICIES

Policy MH-1.1: Climate Adaptation and Safety Element Policies

The policies and programs included in the Climate Adaptation and Safety Element are critical to maintaining community safety and to supporting disaster preparedness.

Policy MH-1.2: Climate-Informed Capital Improvement Program, Engineering Standards and Natural Resources Management

The City shall incorporate climate projection data, risk modeling, and adaptive management, as appropriate, to account for future changes in key climate variables (e.g., changes in precipitation and flooding behavior, fire and smoke risk, maximum daily temperatures) in the City's Capital Improvement Program, Engineering Specifications and Standards, and natural resource projects and planning documents.

Policy MH-1.3: Post-Disaster Recovery Resources

The City shall expand equitable access to post-disaster recovery resources for residents and businesses (e.g., recovery funding, recovery services) including debris management.

Policy MH-1.4: Regional Collaboration for Climate Adaptation

The City shall integrate regional collaboration as a key component of the City's climate adaptation planning strategy, recognizing the regional nature of climate impacts and climate adaptation strategies.

MULTI-HAZARD RESILIENCE PROGRAMS

Program MH-1.5: Update the City's Capital Improvement Program to Incorporate Climate Projections

Assess existing public infrastructure systems vulnerable to changes in key climate variables (e.g., flooding, extreme heat) and incorporate upgrades to critical infrastructure in the City's Capital Improvement Projects (CIP) planning process. Identify key pieces of existing public infrastructure that are likely to be compromised by climate impacts and prioritize these upgrades as part of the City CIP process. Use data from the Climate Change Hazards and Vulnerabilities Report, the Cal-Adapt tool, and supplemental climate projection data and research to inform an appropriate list of public infrastructure upgrades.

Program MH-1.6: Update City's Engineering Standards and Specifications to Incorporate Climate Projections

The City shall evaluate and update the City's building and engineering standards and specification to account for future changes in key climate variables (e.g., changes in the size of large storm events, maximum daily temperatures) that are likely to affect critical public

infrastructure. Use data from the Climate Change Hazards and Vulnerabilities Report, the Cal-Adapt tool, and supplemental climate projection data and research to inform the updates to the City's standards update process. Use a climate-informed adaptive management approach to continually monitor the performance of the updated building and engineering standards against the observed changes in climate variables, adjusting standards as need to match future changes in these variables caused by climate change.

Program MH-1.7: Climate Smart Natural Resource Management

The City shall integrate climate projections and adaptation projects (e.g., clearing or removal of dead material and replanting with more resilient shrubs and trees) regarding changes in average temperatures, extreme heat, flooding, fire, drought, etc. into updates of the City's natural resource planning documents as they occur, including, but not limited to:

- Open Space Conservation Plans
- Conservation Guidelines for Open Space Lands of the City of San Luis Obispo
- Waterway Management Plan.

Program MH-1.8: Climate Resilience Hubs

Work with community organizations, faith-based organizations, and other institutions to develop a network of conveniently located Climate Resilience Hubs including a mix of public facilities, community centers, businesses, and community-oriented facilities (e.g., churches, synagogues, mosques). Ensure the chosen facilities are equipped to provide aid to vulnerable populations during other emergency events such as periods of poor air quality from wildfire smoke, utility disruptions, flooding events, or other climate-related hazards (CDC n.d.). Ensure the Climate Resilience Center is centrally located and accessible.

Program MH-1.9: Post-Disaster Recovery Debris Management

Prepare and update solid waste agreement(s) addressing post disaster debris management activities including clearing, collection, removal, and disposal.

Program MH-1.10: Post-Disaster Recovery Resources and Education

Work with community organizations, the San Luis Obispo County Office of Emergency Services, and other key stakeholders to: 1)assess effectiveness in post-disaster recovery efforts including establishing metrics to ensure that post-disaster recovery resources are allocated equitably; 2) Assess potential barriers for rehabilitation and rebuilding in post-disaster situations and develop protocols to remove barriers; and 3) educate individuals and households about strategies to increase preparedness for emergency events and climate-related impacts. Use information from the City's Hazards and Vulnerabilities Report (Appendix A) to identify areas in the City with vulnerable populations (e.g., linguistically isolated households, elderly, youth, homeless, individuals with chronic health conditions) to conduct targeted outreach to these neighborhoods and areas in the City. Strategies could include:

- Creating emergency kits emergency supply kits for homes, cars, and at work locations
- Creating personal emergency funds for short- and long-term emergency events
- Implementing household hazard mitigation projects such as defensible space, home hardening, earthquake retrofitting, and home insulating to improve ability to inhabit home during and post emergency event or climate-related impact.
- Information on mental health and support services for post-disaster recovery

Program MH-1.11: Regional Collaboration and Community Resilience Ambassadors

Develop consistent communications and participate with key community partners including: 1) communicate and provide updates on adaptation strategy implementation to the general public and key partners including San Luis Obispo County, other incorporated cities in the County, and community organizations; 2) continue the City's active participation in the Central Coast Climate Collaborative (4C) by sharing lessons learned, strategy collaboration opportunities, and regionally relevant data included in the Climate Change Hazards and Vulnerabilities Report (Appendix A); 3) identify members of the City's Green Team to serve as city liaisons for regional adaptation-focused organizations and key regional climate adaptation planning efforts; 4) work with community organizations and other institutions to establish a network of Community Resilience Ambassadors who can support outreach efforts, educate residents on climate preparedness, and connect residents to existing resources and organizations.

2. Equity and Environmental Justice

OVERVIEW

The City is committed to integrating diversity, equity, and inclusion in its operations and delivery of community services. The intersection of equity, environmental justice, and public safety is particularly important as the impacts of climate change will inequitably affect vulnerable and disadvantaged communities.

The policies and programs in the Climate Adaptation and Safety Element integrate equity considerations listed in Table 1, which derive from the State's Adaptation Planning Guide (Cal OES 2020) and align with the equity commitments made in the Climate Action Plan for Community Recovery (City of San Luis Obispo 2021). In addition to having equity as a lens through the entire Element, this Chapter provides policies and programs focused specifically on equity and environmental justice.

Example: Utility Relief program increases household resiliency

The City offers water and sewer bill relieve programs for qualifying customers, which are required by California Proposition 218 to be funded outside of revenues generated by rate payers (i.e., water and sewer customers). The City's Customer Assistance Program provides a 15 percent discount on monthly water and sewer bills for qualifying customers. The City also shares information with the community regarding other local, state, and federal programs that may not be affiliated with the City, but that can offer financial assistance with utility bills.

Table 1 Types of Equity in Climate Adaptation and Public Safety Planning

Type Of Equity	Equity Metrics
Procedural Equity	Create processes that are transparent, fair, and inclusive in developing and implementing any program, plan, or policy. Ensure that all people are treated openly and fairly. Increase the civic engagement opportunities of communities that are disproportionately impacted by climate change.
Distributional Equity	Fairly distribute resources, benefits, and burdens. Prioritize resources for communities that experience the greatest inequities and most disproportionate impacts and have the greatest unmet needs.

Type Of Equity	Equity Metrics
Structural Equity	Make a commitment to correct past harms and prevent future unintended consequences. Address the underlying structural and institutional systems that are the root causes of social and racial inequities. Include adaptation strategies to eliminate poverty, create workforce development, address racism, increase civic participation, protect housing availability, increase education, and provide healthcare.

Source: Cal OES 2019.

DISADVANTAGED COMMUNITIES IN SAN LUIS OBISPO

The San Luis Obispo Council of Governments (SLOCOG) has defined disadvantaged communities as disproportionately burdened areas in the region that are economically distressed and/or historically underrepresented as a part of the local government process. The Disadvantaged Communities Assessment identifies 13 variables that address a wide range of socioeconomic and population-based factors to geographically define these disproportionately burdened areas. Figure 1 below includes the locations of the Regionally Defined Disadvantaged Communities identified in the city. For a more detailed discussion of environmental justice including survey summary and disadvantaged communities in the city, see Appendix F-1 and F-2 and the Hazards and Vulnerabilities Report (Appendix A).

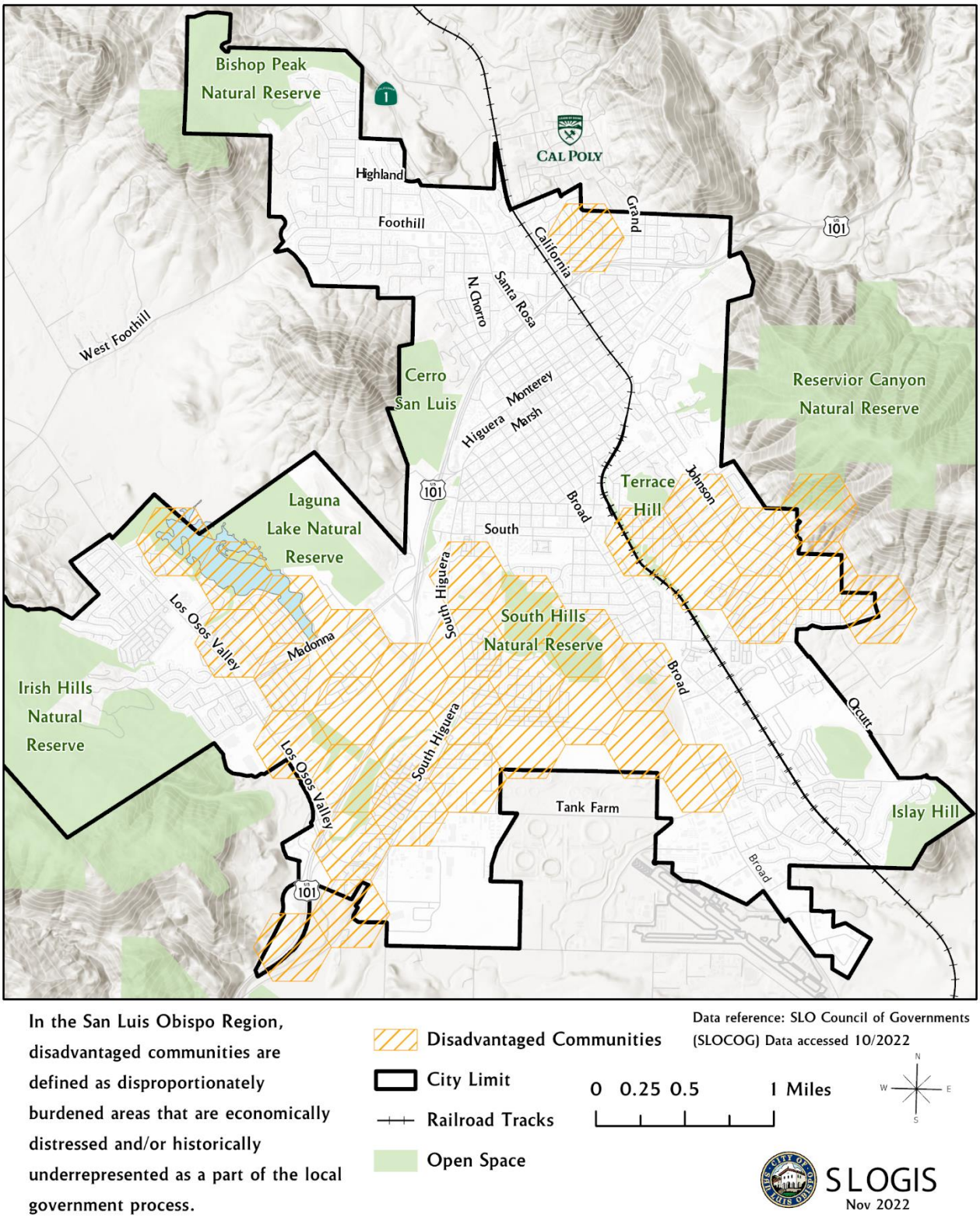


Figure 1: Regionally Defined Disadvantaged Communities in the City of San Luis Obispo.

EQUITY AND ENVIRONMENTAL JUSTICE POLICIES

Beyond the items listed below, environmental justice related policies and programs are integrated throughout the safety element.

Policy EJ-2.1: Equity and Justice in All Policies and Programs

The City shall ensure that the implementation of the Climate Adaptation and Safety Element prioritizes equity and justice and addresses the community's greatest needs, including the needs of persons living in poverty, older adults, children, persons with disabilities, people of color, and immigrants.

Policy EJ-2.2: Equitable Civic Engagement

The City shall support an equitable and comprehensive approach to civic engagement and public outreach on all aspects of City governance and delivery of services.

EQUITY AND ENVIRONMENTAL JUSTICE PROGRAMS

Program EJ-2.3: Empower Community Organizations

Identify key community organizations working with underserved and historically disadvantaged communities and ensure these organizations and representatives from historically disadvantaged communities play a substantive role in implementing the Climate Adaptation and Safety Element.

Program EJ-2.4: Ensure Public Engagement Noticing Manual Advances Procedural Equity

Maintain the Public Engagement Noticing Manual (PEN Manual) as the guiding framework for all departments to participate in meaningful two-way communication with the public on all aspects of County governance and delivery of services. Community outreach and education opportunities should include multi-lingual options for both written materials and in-person engagement. The events should also include demographic surveys as part of community outreach events to ensure that participants are representative of the demographic makeup (e.g., race, age, ethnicity) of the city's population as a whole. The City shall provide opportunities for community organizations and other stakeholders to review strategy details before implementation.

Program EJ-2.5: Develop Equity Checklist for City Programs and Capital Improvement Projects

Use equity metrics included in the State's Adaptation Planning Guide, or similar metrics, to develop an Equity and Environmental Justice Project Checklist to be used during the design and development of City-led programs and capital improvement projects to ensure they are implemented equitably and, where appropriate, historically disadvantaged communities are prioritized in receiving the benefits of the project.

Program EJ-2.6: Establish Community Resilience Fund

Develop funding mechanisms through the State's Integrated Climate and Resiliency Program and develop criteria to administer a Community Resilience Fund that provides grants to individuals or community organizations to implement projects that support social cohesion as it relates to public safety, climate change impacts, and disaster recovery. Criteria would be developed to evaluate applications and prioritize the allocation of funding to projects that focus on protecting the most vulnerable populations (i.e., low-income, minority, or elderly populations).

Program EJ-2.7: Report on Equity and Environmental Justice Progress

Include "Equity and Environmental Justice" as a category for reporting in the General Plan Annual Report.

3. Flooding

OVERVIEW

This chapter provides an overview of flood risk in the city and includes a comprehensive set of policies and programs to mitigate flooding impacts and recover from flooding events when they occur.

The City has adopted floodplain management regulations in Chapter 17.78 in the San Luis Obispo Municipal Code that are approved by FEMA that are included by reference into the Climate Adaptation and Safety Element (Appendix H).

FLOODING CHARACTERISTICS

Floods occur when the amount of water within a creek or river channel exceeds the channel capacity, causing water to spill over the banks and into the surrounding land. In these flat, flood-prone areas beyond the channel, called floodplains, slow moving or stagnant water that escapes the channel may remain until water levels within the channels recede or the areas are drained by infrastructure, percolation, or evapotranspiration.

Naturally, these floodplain areas would have been flooded every few years, but as the city developed onto portions of the floodplains of the creeks within the San Luis Obispo Creek watershed, channel incision and flood protection measures constrained flows to the creeks. During periods of intense rainfall, however, the watershed outflow, including urban runoff, can exceed the capacity of the channels. Under existing conditions, different creeks within the watershed may experience flooding every 10–25 years (Questa Engineering Corporation 2003).

There are several overall mechanisms by which flooding can occur:

- dam inundation flooding, in which impounded water is released because of dam breaching;
- localized flooding, which occurs when intense rainfall overwhelms the capacity of local drainage infrastructure; causing the ponding of water; and
- riverine flooding, which occurs when channels (i.e., the relatively deep, narrow sections of creeks and rivers) cannot contain the flow volume moving through them, causing water to spill out into the overbank areas (i.e., the relatively wide, flat regions on one or both sides of the channel, also called “floodplains”).

According to the Annex G of the County's HMP, the city is not at risk of dam inundation flooding, as there are no major reservoirs within the watershed, and localized flooding is considered a minimal risk. The highest flooding concern for the city is riverine flooding, which may include "flash" flood risks (San Luis Obispo County 2019b).

SAN LUIS OBISPO CREEK WATERSHED

As shown in Figure 2, San Luis Obispo Creek flows through the city in a northeast to southwest direction, passing through the downtown area and generally following U.S. Highway 101 (U.S. 101) on its way to the Pacific Ocean at Avila Beach.

The watershed for San Luis Obispo Creek, the land area that captures rainfall and contributes water directly to the creek system, covers an area of approximately 84 square miles, ranging in elevation from approximately 2,460 feet in the upper watershed near the Cuesta Grade to its outlet into the Pacific Ocean. Along its main flow path, it transitions from steep canyons to the gently sloping alluvial plain underlying the city, descending more than 2,230 feet to downtown.

In the city's downtown, San Luis Obispo Creek flows through the "under-city culvert," consisting of a system of covered, constructed channels between Osos Street and Chorro Street before emerging into Mission Plaza.

Flooding Definitions

Two interchangeable, technical terms that characterize flood frequency are used throughout the section and are defined as follows:

Recurrence Intervals: Refers to how often, on average, a given flood may occur. A 100-year event, for example, is described as an event that may occur about once in every 100 years, on average. However, this terminology can be misleading because flood events are statistical occurrences, and events may occur more frequently than their recurrence interval suggests.

Exceedance Probability: The exceedance probability of a given flood event is the percent chance that a larger flood will occur in any given year, and it is calculated by dividing the number 1 by the recurrence interval. Thus, the "100-year event" becomes the "1-percent exceedance event," or a flow rate that has a 1-percent chance in any given year of being equaled or surpassed by a larger flow rate. This representation, although interchangeable with the recurrence interval, provides a more helpful way to think about flood risk.

Further downstream, near the intersection of Marsh Street and Higuera Street, San Luis Obispo Creek is joined by a major tributary, Stenner Creek, which in turn receives flow from Brizzolara and Old Garden Creeks. San Luis Obispo Creek then continues south along the alluvial plain, intercepting Prefumo Creek as it exits Laguna Lake and joining East Fork San Luis Obispo Creek near the Higuera Street/U.S. 101 interchange by the Johnson Ranch Open Space. Near the confluence of San Luis Obispo Creek with Davenport Creek, the channel enters "the Narrows" (Questa Engineering Corporation 2003), passing through a steep, confined canyon before being joined by San Miguelito Creek coming out of See Canyon and discharging to the Pacific Ocean. Flows in the watershed are "flashy," meaning that water moves quickly through the system and that stream levels rise and recede rapidly in response to rainfall events. This is a result of the steep topography of the upper watershed and the relatively shallow soils, land cover, and rainfall characteristics for the region (Questa Engineering Corporation 2003).

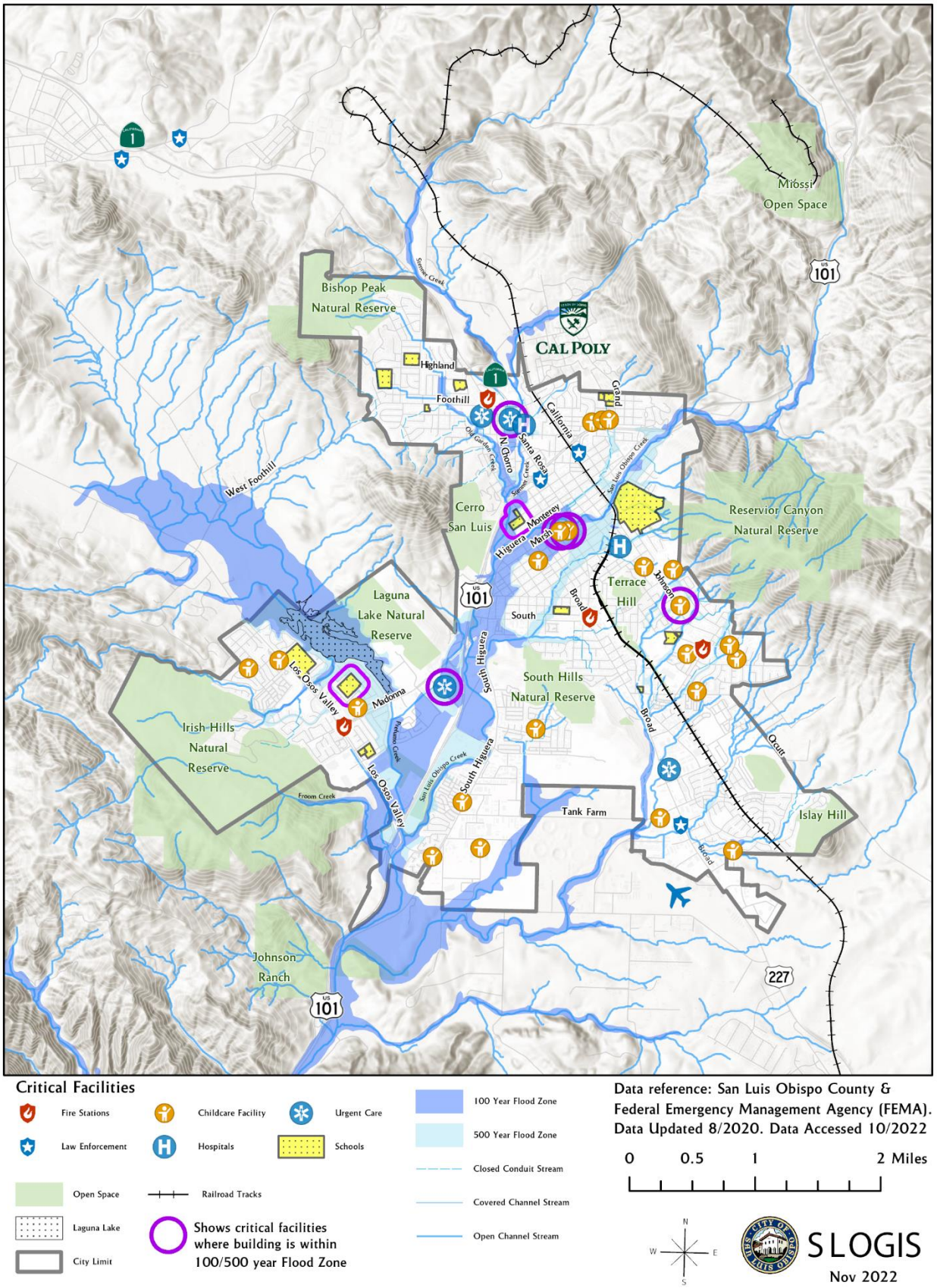


Figure 2 Waterways and Flood Zone Areas in the City of San Luis Obispo with Critical Facilities

HISTORICAL FLOODING

The San Luis Obispo Creek watershed has a long history of flooding, with a series of storms over the last 50 years that have caused millions of dollars' worth of damage.[1] Damaging flood events have occurred in 1868–1872, 1884, 1897, 1911, 1948, 1952, 1962, 1969, 1973, 1995, 1998, and 2001 (Questa Engineering Corporation 2003; City of San Luis Obispo 2014).

Higuera Street, San Luis Obispo, January 1969 flood event.

The flooding events in January and March 1995 occurred during one of the wettest periods on record, causing the watershed to be relatively saturated for long periods, which prevented soils from absorbing incoming precipitation. The 1995 flooding events followed the 1994 Highway 41 fire, which burned major areas of the Stenner Creek and upper San Luis Obispo Creek watersheds and caused increased runoff and sediment delivery to channels. Flow spilled out of the San Luis Obispo Creek channel in the region around Marsh and Higuera Streets, causing extensive damage, and remained out of the creek banks for nearly 3 miles downstream. The events, for which the peak flow was estimated to be the 17-year flood event[2] (6-percent exceedance probability), caused $2.3 million in damage (Questa Engineering Corporation 2003).

Prior events were even more damaging: The 1969 flood caused $6.92 million in damage, and the 1973 flood caused $13.6 million in damage. During the 1973 flood, depths of inundation over U.S. 101 exceeded 4 feet near the Madonna Inn and were up to 3 feet near the Prefumo Creek confluence (Questa Engineering Corporation 2003).

FLOOD RISK

Following the 1973 flood, watershed studies and plans were developed and updated, including the 1974 U.S. Army Corps of Engineers floodplain study of San Luis Obispo Creek (USACE 1974), 1977 Nolte & Associates study (George S. Nolte & Associates 1977), and 1978 FEMA flood insurance study. The extent of 100-yr and 500-yr flood zones, based on these studies, is shown in Figure 3.

In 2003, the City's Waterway Management Plan (WMP) was completed, which relied on updated analyses for flow frequency. In general, the flow estimates provided by the WMP for a given recurrence interval are higher than those reported in the prior studies, leading to the

[1] Storm damages were normalized to reflect costs in the year 2000.

[2] According to the flood frequency analysis conducted for the 2003 Waterway Management Plan (Questa Engineering Corporation 2003), which represent updated flood frequency information compared to the Federal Emergency Management Agency study (1978).

recommendation that the WMP be used for design considerations for projects in the city, as a conservative assumption, as well as the adoption of the updated flow frequency estimates by the City. According to the WMP, nearly all streams in the San Luis Obispo Creek watershed have less than a 25-year (4-percent exceedance probability) flood capacity, with some experiencing flooding in the 10- to 15-year range (Questa Engineering Corporation 2003).

FLOOD RISK FACTORS

For the San Luis Obispo Creek watershed, factors that may directly contribute to flooding are infrastructure-induced flow constrictions, wildfire, and degraded riparian corridors (Questa Engineering Corporation 2003). In terms of flooding from infrastructure, bridges often serve as flow constrictions because the abutments, or structures connecting the bridge deck to the ground, may occupy part of the floodplain for a channel in order to reduce the span width of the deck. In addition, bridge piers can intercept transported debris, particularly woody vegetation, and reduce conveyance through the structure.

Undercity Culvert

One of the greatest flow constrictions in the watershed is the undercity culvert. This flow rate is below the 25-year flood event (4-percent exceedance probability) according to FEMA flood insurance studies (FEMA 1978), indicating that the culvert is unable to manage water flow during the 25-year flood event. Flows exceeding the undercity culvert capacity may exit the channel at Osos Street or further upstream at the Santa Rosa or Marsh Street bridges and cause overland flooding within downtown, particularly along the Marsh Street corridor and areas surrounding the creek channel.

Post-Wildfire Runoff

Post-wildfire runoff represents another risk for flooding because burned areas in the watershed will contribute more runoff and higher sediment loads than vegetated areas. As previously mentioned, the 1995 floods, which caused approximately $2.3 million in damages, followed the 1994 Highway 41 fire and the loss of vegetation on hillslopes contributed to high runoff volumes. Overall, about one third of the San Luis Obispo Creek watershed is considered by the California Department of Forestry and Fire Protection (CAL FIRE) to be in Very High Fire Hazard Severity Zones, based on an analysis of publicly available GIS data (CAL FIRE 2020).

Degradation of the City's Riparian Corridors

The degradation of riparian corridors, the thin strips of trees and other vegetation lining the creeks, may contribute to flooding within the San Luis Obispo Creek watershed. Historically, riparian zones would have been composed of tall, single-trunk sycamores, cottonwoods, and willows, but these areas are now characterized by shrubby willow growth (Questa Engineering Corporation 2003). This results in more low-hanging branches coming into contact with flowing water, which increases the roughness of the creek channels and consequently reduces flow velocities. When the water is slowed, water levels in the channel are increased and overflow into surrounding lands becomes more likely.

The conversion of land to impervious surfaces as a result of urban development, known generally as "urbanization" has indirectly affected flood risk by altering the shape and function of the creek channels within the watershed. Overall, the San Luis Obispo Creek watershed is about 10 percent

urbanized, meaning that 10 percent of the land area within the basin[3] that drains to the outlet of San Luis Obispo Creek at Avila Beach is covered by urban development. However, when considering only the portion of the watershed upstream of Los Osos Valley Road, the drainage basin is 15 percent urbanized (Questa Engineering Corporation 2003). Conversion to impervious surfaces accompanying urban development results in higher runoff rates because rainfall cannot be absorbed by the underlying soil from these surfaces. This causes water to enter the creek channels more quickly and leads to higher flow volumes and faster channel velocities on a more frequent basis. The City has adopted post construction stormwater regulations that include provisions for the upgrade of certain existing developed sites upon redevelopment to improve historic watershed processes through retention.

For periods of sustained, heavy rainfall, the watershed soils may be highly saturated at the time of peak rainfall and the watershed may therefore, have a limited ability to absorb the incoming precipitation, even if the impervious surfaces had not been in place. Impacts from additional urbanization of the San Luis Obispo Creek watershed will need to be determined, as a result of build-out according to the general plans for the City, County, and the California Polytechnic State University at San Luis Obispo (Cal Poly).

In addition to urbanization, there are other causes of riparian corridor degradation. The historic presence of small dams in the upper watershed (near Stagecoach Road, which has been removed, and the larger Reservoir Canyon facility) prevented large sediments (cobble and large gravels) from being transported downstream. Naturally, these eroded sediments would have continuously filled in the channels, but instead they became trapped behind the dams and filled in the small reservoirs. The creek channels continued to erode the underlying material, and with reduced incoming sediment to offset this erosion, the channels cut deeper into the landscape.

FLOOD MANAGEMENT CHALLENGES

Flood management continues to be a high priority for the City, but there are several important barriers that can make management more difficult. Much of the creek corridor that runs through the city along San Luis Obispo Creek and its tributaries is not owned by the City. Although the City has some authority under the City's Municipal Code for emergency removal of vegetation and other debris, general maintenance of the creeks falls upon the owners of property adjacent to the creek.

Additionally, the creek corridor is highly confined in areas, particularly through downtown, making projects such as channel widening infeasible. Following the 1973 flood, the George S. Nolte & Associates study, completed in 1977, identified proposed flood control projects, but few were adopted because of the environmental effects associated with channel widening and other alternatives (Questa Engineering Corporation 2003). Several areas of the city, including downtown areas along San Luis Obispo Creek, the intersection of U.S. 101 and Los Osos Valley Road, the Johnson Avenue railroad underpass, and areas surrounding Laguna Lake have been at a high risk for frequent flooding (City of San Luis Obispo 2011).

To address these issues, large projects have been proposed to manage flood risk in the increasingly urbanized city. One such proposed project is the Mid-Higuera Bypass Project, which would increase conveyance capacity of San Luis Obispo Creek between Marsh Street and Madonna Road. This area, downstream of the confluence of Stenner and San Luis Obispo Creeks, has flooded and received extensive damage in some of the historical floods previously mentioned.

[3] Basin, or drainage basin, is another term for watershed.

The planned removal of sediment and Arundo stands from San Luis Obispo Creek south of Los Osos Valley Road will also serve to reduce local flood risk.

CLIMATE-INFORMED FLOOD RISK MODELING

As part of the development of the Climate Adaptation and Safety Element, a climate-informed flood risk modeling exercise was conducted to understand how changes in precipitation caused by climate change are likely to affect the frequency and severity of large storm events (e.g., 100-year storm event) and how these changes would affect the city's existing flood plains. To read details on the full Flood Risk Modeling Methodology, see Section 2.6 in Appendix A (Hazards and Vulnerability Report).

Table 2 includes the modeling results for various size storm events in the San Luis Obispo Creek watershed for the long-term period (2070-2099) under a high emissions scenario.

Table 2 Climate-induced Changes in Peak Stream Flow for the San Luis Obispo Creek Watershed

Flood Event (Return Interval)	Percent chance of flood occurring in any given year	Percent increase in peak stream flow		
		90th Percentile	50th Percentile (median)	10th Percentile
500-Year	0.2%	122%	38%	4%
200-Year	0.5%	116%	38%	4%
100-Year	1%	110%	38%	4%
50-Year	2%	103%	37%	4%
20-Year	5%	93%	35%	3%
10-Year	10%	84%	33%	3%
5-Year	20%	73%	29%	3%
2-Year	50%	51%	28%	8%
1-Year	99%	64%	17%	-31%

Source: cbec eco engineering 2021. The late century (2070-2099), RCP 8.5 scenario was used to determine flood impacts.

As shown in Table 2, the 10th percentile results indicate an extremely dry scenario, which experiences decreases in flow for events with less than a 2-year recurrence interval, while the 90th percentile results represent an extremely wet future scenario and results in peak flows more than doubling for events that occur every 50 or more years. For flood events occurring more rarely than every 2 years, flows are expected to increase across all scenarios including the 10th percentile projection. Overall, the median projection represents the best available estimate at this time for the San Luis Obispo Creek watershed for how peak flows are likely to change if global GHG emissions maintain the high emissions scenario trajectory for the long-term period.

The climate-induced increases in flood magnitude are due to increases in precipitation intensity. As the atmosphere warms, its ability to hold water vapor increases. While total annual precipitation in different parts of the state is projected to increase, decrease, or stay the same depending on the location, the trend of increasing rainfall within shorter periods of time (increasing intensity) is projected to occur broadly (OPR et al. 2018a). In this way, even areas

that may become drier and experience water scarcity as a result of climate change may also experience increased flood risk.

Based on California's location next to the Pacific Ocean, the state is exposed to the atmospheric river (AR) phenomenon, a narrow corridor of concentrated moisture in the atmosphere. California is subject to precipitation from an AR that transports water vapor from as far south as Hawaii to the state. The presence of the AR contributes to the frequency of "wet years" in the state, when there is an above-average number of AR storms and above-average annual precipitation. Projected peak stream flow increases are also greater for larger (less frequent) flood events than for smaller ones, as a result of the watershed's diminishing ability to absorb increasingly high levels of rainfall. For example, following a long, dry summer, the land surface, soils, and vegetation will have a relatively high capacity to hold incoming rain and very little stream flow may be generated from a notable amount of rainfall. In the mid-winter months, after a series of precipitation events has passed through, the soils are relatively saturated and generate runoff more quickly. For very large precipitation events, the capacity of the watershed to absorb incoming rainfall can be quickly exceeded, causing large increases in stream flow within the system. For the median scenario, peak flow rates are projected to increase from 17 percent to 38 percent for events that occur every year to every 500 years, on average, as show in Table 2.

While research indicates that the frequency of large storm events do increase in these wet years, the most severe flooding from ARs may not be in wet years (Swain et al. 2018). The largest flooding impacts are caused by persistent storm sequences on sub-seasonal timescales (i.e., short time periods, typically 2 weeks to 3 months), which bring a significant fraction of annual average precipitation over a brief period. These storm events are similar to the Great Flood events of 1861–1862, which caused widespread damage throughout northern California (Swain et al. 2016). Based on current climate modeling, the frequency of these large storm sequences over short timeframes is projected to increase noticeably under the high emissions scenario. It is estimated that a storm similar in magnitude to the Great Flood events is more likely than not to occur at least once between 2018 and 2060 (Swain et al. 2018).

Although annual precipitation is anticipated to increase in the city and the larger central coast region, California's climate oscillates between extremely dry and extremely wet periods with annual precipitation varying widely from year to year. Climate change is anticipated to exacerbate these seasonal extremes with dry periods becoming dryer and wet periods becoming wetter (OPR et al. 2018b:19). As a result, the frequency and severity of large storm events are anticipated to increase as well. These oscillations between extremely dry and extremely wet periods, which have occurred historically in the state, are anticipated to become more severe with rapid shifts from dry to wet periods known as "whiplash events" (Swain et al. 2016). As Swain et al. note in their research, the recent 2012–2016 drought followed by the 2016–2017 flood events throughout the state serve as a good example of the type of whiplash events that will occur more frequently over the next century. These types of events are estimated to increase by approximately 100 percent in southern California, with increases in frequency occurring largely after 2050 (Swain et al. 2016).

FUTURE FLOOD MAPPING RESULTS

Based on hydraulic modeling discussed above, future floodplain maps were generated to understand how changes in precipitation for the 10-year, 50-year, and 100-year storm events would impact the city as shown in Figures 3 through 11. Additional modeling for the 10-year, 50-year, 100-year, and 500-year storm events are included in the appendix (Detailed Flood Mapping

Results) of the Hazards and Vulnerabilities Report (Appendix A). Figures 4 through 11 show the generated depth maps for historic and future (long-term high emissions [RCP 8.5] scenario) conditions for the 10-year (Q10) and 100-year (Q100) events within the San Luis Obispo Creek – Stenner Creek and San Luis Obispo Creek – Prefumo Creek confluence areas. These figures provide an illustration of the future extent of flood plains in the San Luis Obispo Creek watershed. However, there are limitations preventing these maps from being used for more detailed or more absolute flood extent delineations for historic and future conditions. One main limitation is the reliance upon hydraulic models that are almost two decades old and do not cover all areas of the city as well as an uncertain range of possibilities for future precipitation and future global emissions trends during the late-century period. However, the mapping exercise is useful for indicating the locations and extents of relative flood impacts that may reasonably be expected to occur due to climate change under the late-century high emissions scenario.

To further understand relative flood impacts, the hydraulic model domain was divided into nine analysis regions where changes in inundated area in acres and average depth on the floodplain (ft) were compared between historic and future conditions for each flood event. To determine these statistics for floodplain areas, the regions within the creek channels and Laguna Lake were removed from the analysis.

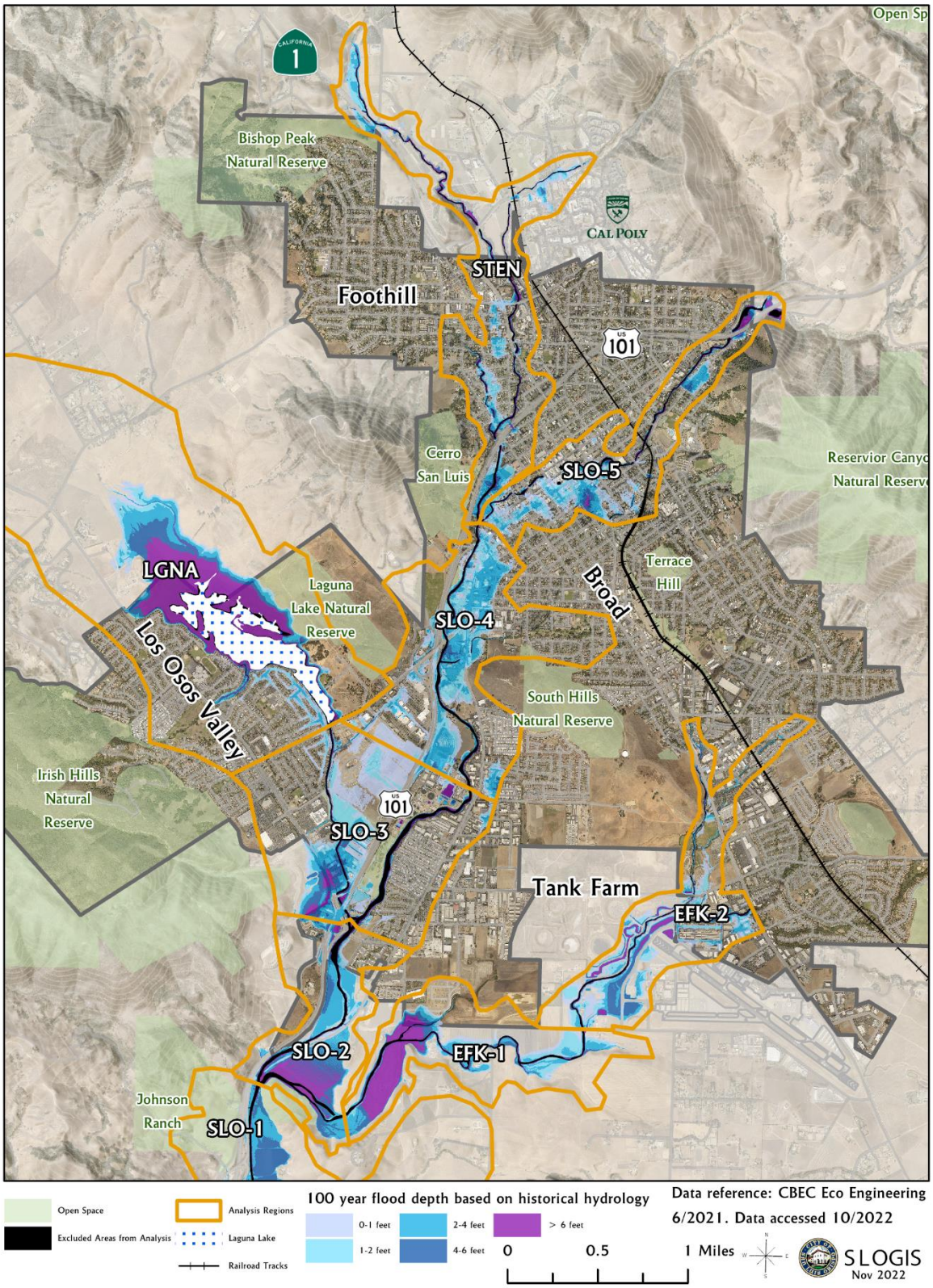


Figure 3 Flood depth: SLO Stenner - Historic (year 2000) Q100 event (1% chance of occurring in any given year) - based on historical hydrology

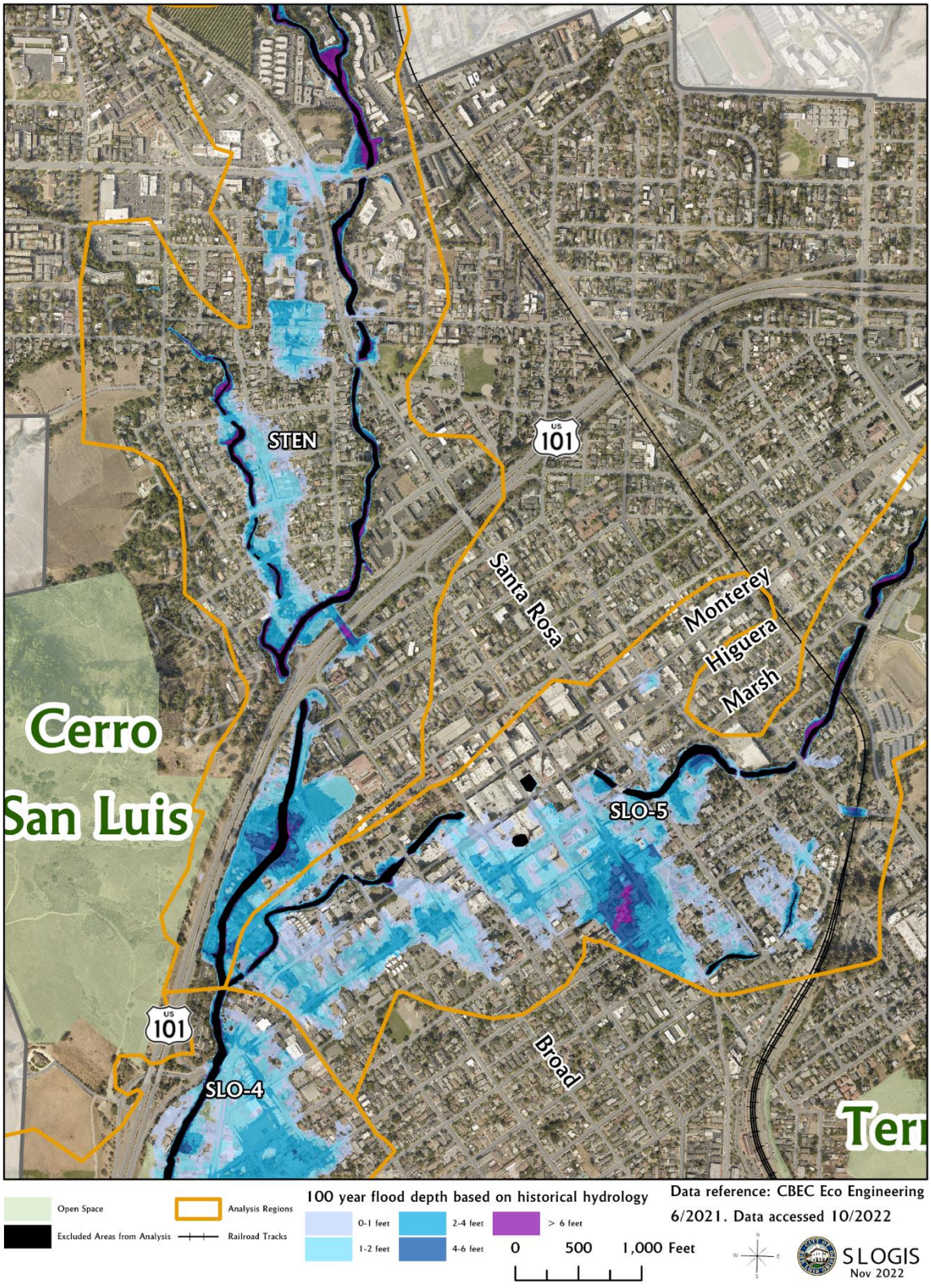


Figure 4 Flood depth: SLO Stenner Historic (year 2000) Q100 event (1% chance of occurring in any given year) based on historical hydrology

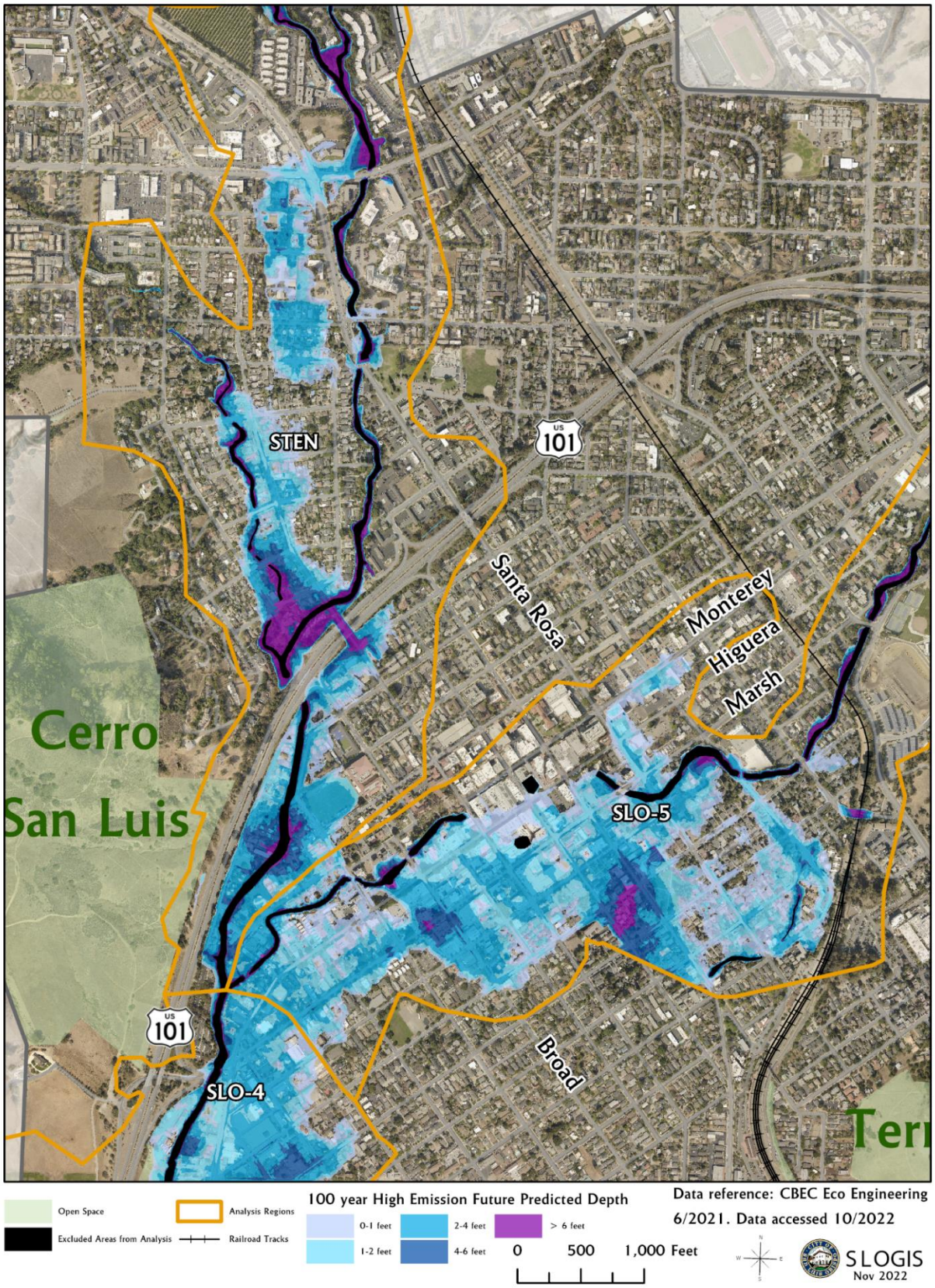


Figure 5 Flood depth: SLO Stenner Future (years 2070-2099) Q100 event (1% chance of occurring in any given year) - based on climate-projected hydrology using the RCP 8.5 (high emissions) scenario

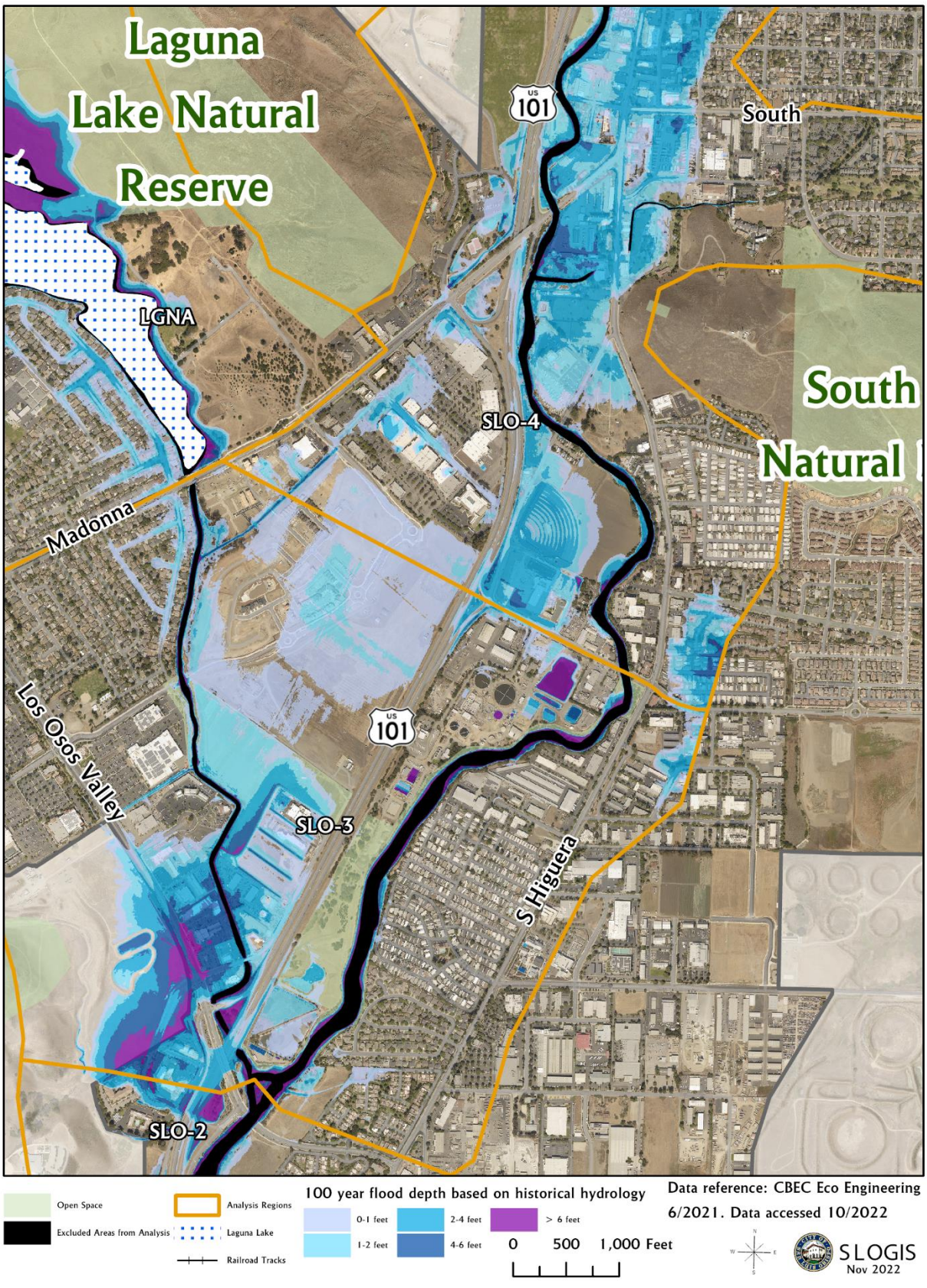


Figure 6 Flood depth: SLO Perfumo Historic (year 2000) Q100 event (1% chance of occurring in any given year) - based on historical hydrology

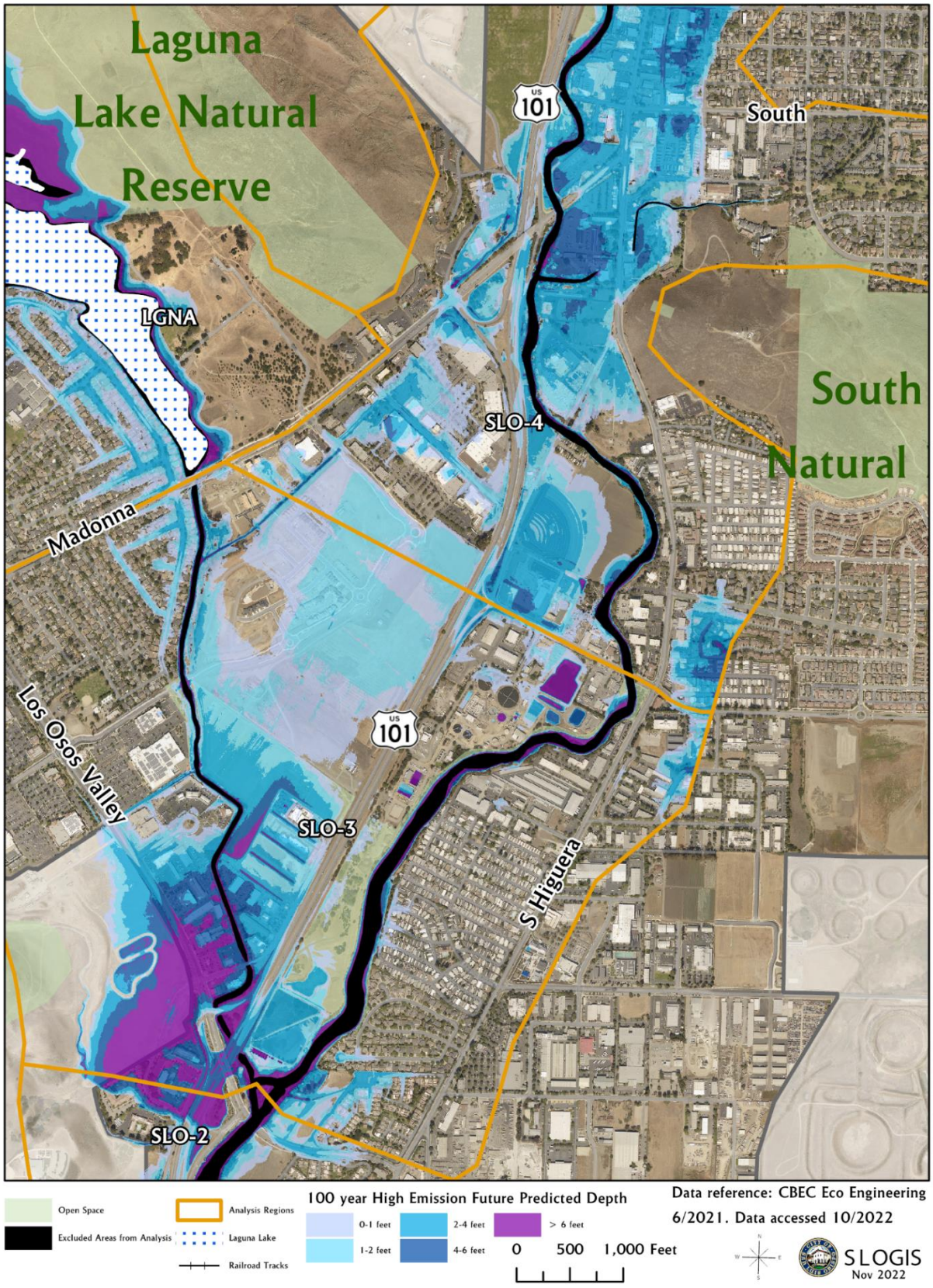


Figure 7 Flood depth: SLO Perfumo Future (years 2070-2099) Q100 event (1% chance of occurring in any given year) - based on climate-projected hydrology using the RCP 8.5 (high emissions) scenario

FLOODING POLICIES

Policy FL-3.1: Climate-Informed Flood Management

The City shall incorporate the climate-informed flood risk modelling in flood management plans, programs, and procedures.

Policy FL-3.2: Flood Protection for New Development

The City shall ensure that all new development adheres to all provisions in Chapter 17.78 “Flood Damage Prevention” in the City’s Municipal Code, consider climate models, and update the provisions accordingly to remain consistent with any future federal, state, and local regulatory requirements.

Policy FL-3.3: Flood Protection for Existing Development

The City shall continue identification and mapping of areas that are at increased flood risk from large storm events using the climate-informed flood risk modeling that was developed as part of the City’s climate change vulnerability assessment.

Green Infrastructure: Bioswale

Policy FL-3.4: Flooding and Post-Wildfire Debris Flow

The City shall conduct a detailed assessment to identify key impact areas in the city from a post-wildfire debris flow scenario and the implications this scenario would have on stormwater runoff during larger storm events. Develop a set of pre-disaster mitigation measures to be implemented to help mitigate impacts from post-wildfire debris flow events. Mitigation measures could include:

- rapid reforestation and stabilization of wildfire-affected areas susceptible to debris flow runoff to stabilize soils;
- communication and coordination with residents and businesses located within potential impact areas from post-wildfire debris flow events; and
- development of analysis techniques to predict debris flow events based on rainfall and moisture conditions.

Policy FL-3.5: A Resilient Flood Management System

The City shall explore opportunities to add redundancy to the city’s existing stormwater and flood management systems to mitigate impacts from increased storm intensities, as needed. To provide co-benefits to the SLO community, design flood management system redundancies to serve multiple purposes that add value to the community (e.g., detention basins that serve as parks or recreation areas). Resilient flood management projects should be prioritized in locations of the city that are the most vulnerable.

Policy FL-3.6: Regional Coordination for Flood Control

The City shall continue to coordinate with regional partners (e.g., San Luis Obispo County, Cal Poly San Luis Obispo, Caltrans, LOSSAN Rail Corridor Agency) on flood preparedness and flood management initiatives.

FLOODING PROGRAMS

Program FL-3.7: Waterway Management Plan

The City shall work with County to update the Waterway Management Plan to incorporate the climate-informed flood risk modeling that was developed as part of the City's Hazard and Vulnerability Assessment. The City will encourage the County to include the following components in the updated Waterway Management Plan:

- Incorporate future changes in precipitation patterns into the City's Drainage Design Manual to ensure that future development in the city can properly accommodate changes in runoff from small and large storm events caused by climate change.
- Incorporate climate-informed flood risk modeling in all flood management-related capital improvement projects in the Waterway Management Plan.
- Develop strategy to offset the increase in stormwater runoff from existing residential and nonresidential land uses from small storm events through green infrastructure to help offset climate impacts on the City's stormwater management system from climate change. Prioritize green infrastructure design improvements, including rain gardens, rainwater catchment barrels, green stormwater infrastructure, bio-swales, detentions basins, permeable parking lots, and permeable pavement.
- Identify critical bridges, railways, and roadways (e.g., high-volume roadways, key evacuation routes) and prioritize upgrades to flood managent and drainange infrastructure associated with these roadways to account for future increases in large storm events. Identify anthropogenic bank protection features that could lead to flooding through channel constriction and mitigate those structures (e.g., rock gabion baskets, stacked concrete sack walls).
- Identify riparian corridors and floodplains particularly suited for water retention (e.g. is suitable to receive flood waters, can slow down in-channel water through) and prioritize conservation and restoration projects on these areas to restore and retain natural floodplain function and slow in-channel velocity with vegetation.

Green Infrastructure Definition
"Green infrastructure" encompasses natural features, such as forests and wetlands, that provide similar or complementary flood-management benefits as engineered infrastructure. While engineered infrastructure can degrade rivers and the values they provide, green infrastructure tends to support a diverse array of other benefits. A sustainable and resilient approach to flood-risk management will deploy a mix of green and engineered infrastructure solutions, tailored to specific challenges and objectives (The Nature Conservancy 2014).

Program FL-3.8 Flood Damage Prevention

Update the provisions in Chapter 17.78 "Flood Damage Prevention" to incorporate climate risk and information from the updated Waterway Management Plan.

Program FL-3.9: Sustainable Flood Management and Open Space

Develop a program to work with public and private landowners upstream of waterways passing through the city (e.g., Stenner Creek, San Luis Obispo Creek) to manage stormwater runoff through sustainable land conservation practices (e.g., conservation easements) that achieve multiple objectives including habitat restoration, land conservation, carbon farming, reconnection/enhancement of floodplain areas and vegetation management, with a focus on strategies that will reduce current and future flood risk.

Program FL-3.10: Urban Creeks Vegetation Management Plan

Develop Urban Creeks Vegetation Management Plan to address excessive and noxious vegetation growth and remove dead material to prevent debris jams and reduce likelihood of flooding in and around the City and integrate as an additional section in the updated Waterway Management Plan.

Program FL-3.11: Flood-Prepared Neighborhoods Program

Work with the San Luis Obispo County Office of Emergency Services, community organizations, and regional partners to develop neighborhood readiness plans for areas of the city that are at current and future risk from flooding events. The City should prioritize planning efforts in neighborhoods that are the most vulnerable, and ensure additional supports are available for community members to participate in the planning process and invest in flood resilience.

Program FL-3.12: Community-Driven Flood Education

Continue to work with the San Luis Obispo County Office of Emergency Services to provide accurate and readily available flood risk information through the County Ready SLO and City Prepare SLO websites and resources and integrate future flood risk and climate-related flood impacts into County Ready SLO and City Prepare SLO materials. Creative community-driven flood risk and resilience workshops should be developed to build awareness with hard-to-reach populations and high-risk neighborhoods. These workshops could occur through collaboration with the County of San Luis Obispo Zone 9 Flood Control and Watershed Protection District.

Program FL-3.13 Flood Warning Monitoring System

Explore the feasibility, costs, and benefits of developing a dedicated early warning flood monitoring system or incorporate early flood warning into existing alert and notification systems, in coordination with regional partners to provide alerts to residents and visitors in the city during large storm events. Ensure that such a program provides benefits to the most vulnerable members of the region, including persons experiencing homelessness and mobile home communities.

Program FL-3.14 Research and Develop Flood Protection Measures

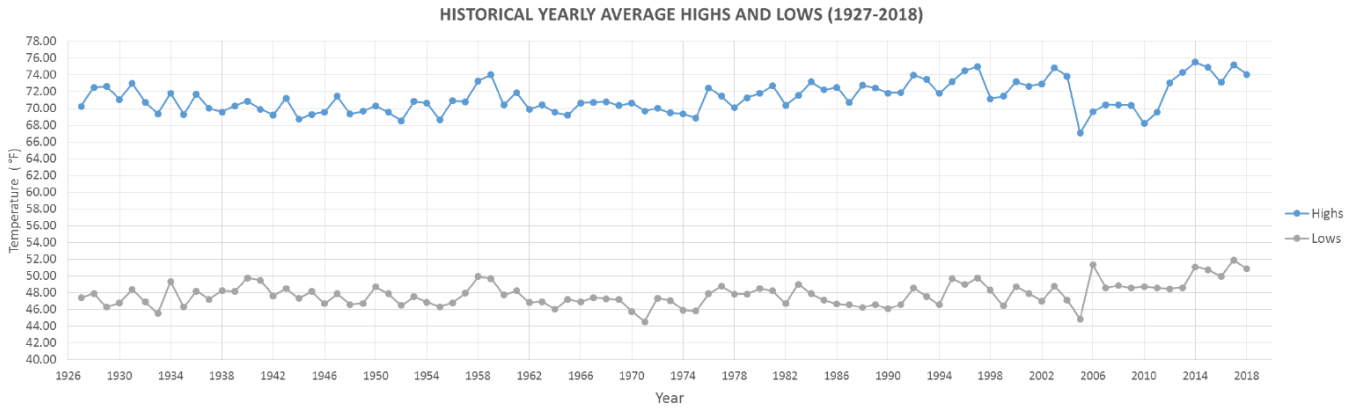
Research and develop flood damage prevention measures that can be applied to existing properties that will be at increased flood risk due to climate change

4. Extreme Heat

OVERVIEW

Heat is emerging as a critical hazard in San Luis Obispo. While the city generally has a mild, Mediterranean climate, recent observed extreme heat events and a projected increase of extreme heat events mean that heat is increasingly a public safety issue.

Although the city has not historically experienced many extreme heat conditions, the city is likely to experience increased sensitivity to extreme temperatures because residents are not acclimatized to or prepared for extreme heat conditions, even if increases are relatively mild compared to other parts of the state. Extreme heat events are described in this section in terms of their intensity (i.e., average maximum temperature), frequency (i.e., how often they occur), time of year in which they occur, and duration (total number of consecutive extreme heat days). Figure 8 includes the average annual maximum and minimum temperatures for the city from 1926 through 2018.



Sources: Cal Poly 2020.

Figure 8 Average Annual Maximum and Minimum Temperatures in the City (1926-2018)

CLIMATE CHANGE AND EXTREME HEAT

As shown in Table 3, both annual maximum and minimum are projected to increase throughout the 21st century. The average annual maximum temperature in the city is projected to increase to 71.6°F in the near-term and 73.1°F in the midterm under the high emissions scenario. The average annual maximum temperature is projected to increase to 73.1°F and 75.6°F in the late-century period under the medium and high emissions scenarios, respectively. The average annual minimum temperature in the city is projected to increase to 48.7°F in the near-term and 49.7°F in the midterm under the high emissions scenario, and the late-century average annual minimum temperature is projected to increase to 50.1°F and 52.7°F under the medium and high emissions scenarios, respectively (CEC 2019a). Increased temperatures in the city will influence secondary climate effects, including extreme heat events, wildfire, and drought.

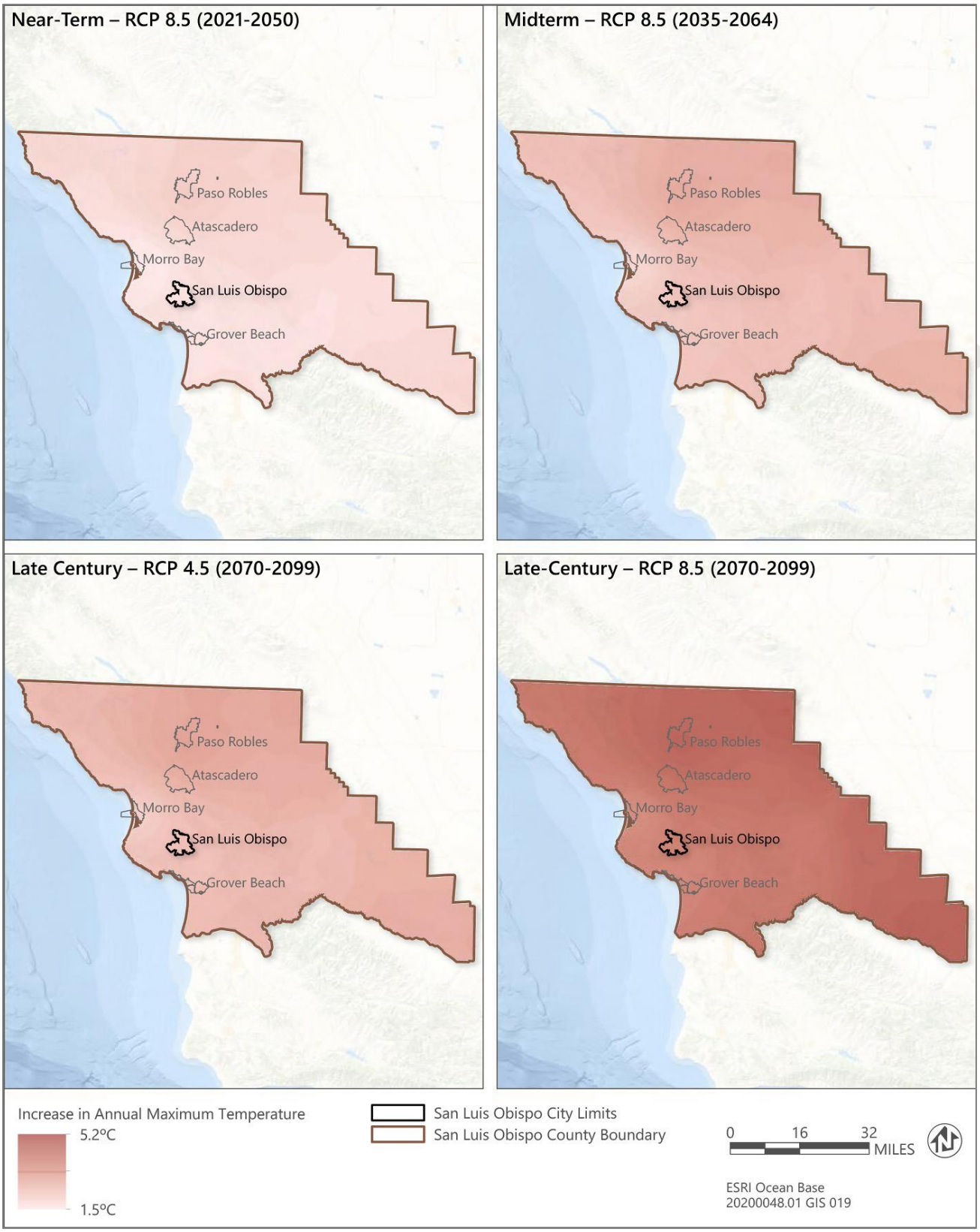
Table 3 Changes in Average Annual Temperature in City of San Luis Obispo

Geography	Average Annual Temperature	Historic Average Annual Temperature (1961-1990)	Near-Term (2021-2050)	Midterm (2035-2064)	Late-Century (2070-2099)	
					Medium Emissions	High Emissions
City of San Luis Obispo	Maximum Temperature (°F)	68.4	71.6	73.1	73.1	75.6
	Minimum Temperature (°F)	45.7	48.7	49.7	50.1	52.7
San Luis Obispo County	Maximum Temperature (°F)	69.8	72.9	74.3	74.7	77.3
	Minimum Temperature (°F)	42.2	45.4	46.6	46.9	49.8

Notes: °F = degrees Fahrenheit; RCP = Representative Concentration Pathway.

Source: CEC 2019a.

Figure 9 illustrates the projected change in average annual maximum temperature in the city and in San Luis Obispo County (County) in the near-term and midterm periods under the high emissions scenario and average annual maximum temperature in the late-century period under both emissions scenarios. As shown in the Figure 9, the average annual maximum temperature is expected to rise through the late-century period under both emissions scenarios. As shown in Table 3, the County compared to the City, has had slightly higher maximum and minimum temperatures historically with this trend continuing under both emissions scenarios as temperatures continue to rise in both the City and the County. This difference is also reflected in Figure 9, which shows the city experiencing smaller increases in annual average maximum temperatures compared to northern and eastern portions of the County.



Sources: Data downloaded from City of San Luis Obispo in 2020 and County of San Luis Obispo in 2020 and downloaded from Cal-Adapt in 2021.

Figure 9 Changes in Annual Average Temperature in San Luis Obispo County through 2099

Extreme Heat Events

The Cal-Adapt tool provides estimates of future instances of extreme heat events. Extreme heat events include extreme heat days and heat waves. Cal-Adapt defines an extreme heat day as a day when the daily maximum temperature exceeds the 98th historical percentile of daily maximum temperatures based on observed data from 1961–1990 between April and October. Heat wave events are characterized as periods of sustained extreme heat and are defined by Cal-Adapt as four or more consecutive extreme heat days.

Extreme Heat Definitions for City of San Luis Obispo

Extreme Heat Day = Day with maximum temperature above 89.6°F

Heat Wave = Four or more consecutive Extreme Heat Days

The extreme heat threshold for the city is 89.6°F, meaning 98 percent of all recorded temperatures in this period were below 89.6°F. Historically (1961-1990), the city experienced an average of four extreme heat days per year. As a result of rising temperatures from climate change, the city is projected to experience up to 7 extreme heats days annually in the near-term and 10 extreme heat days annually in the midterm under the high emissions scenario. In the late-century period, the city is projected to experience up to 10 extreme heat days annually under the medium emissions scenario and 18 extreme heat days annually under the high emissions scenario (CEC 2019b). As shown in Table 4, the number of extreme heat days is already increasing from historic averages and will continue to increase under both emissions scenarios. The city is beginning to experience increases in extreme heat with a record high temperature of 117°F being set on September 6, 2020 (NOAA 2021).

Table 4 Changes in Extreme Heat Events in City of San Luis Obispo

Annual Averages	Historic Annual Averages (1961-1990)	Near-Term (2021-2050)	Midterm (2035-2064)	Late-Century (2070-2099)	
				Medium Emissions	High Emissions
Number of Extreme Heat Days	4	7	10	10	18
Number of Heat Waves	0.2	0.3	0.4	0.4	1.3
Number of Days in Longest Stretch of Consecutive Extreme Heat Days	2.6	2.8	3	3.4	4.6

Notes: RCP = Representative Concentration Pathway; Extreme Heat Day = day with maximum temperature above 89.6°F; Heat Wave = four or more consecutive extreme heat days

Source: CEC 2019b.

While heat waves have historically been infrequent in the city, with a historical average of less than one heat wave annually, climate change is expected to increase the frequency of heat waves. Under the high emissions scenario, the city is projected to still experience less than one heat wave per year in the near-term and in the midterm. In the long term, the city is projected to experience less than one heat wave per year under the medium emissions scenario and 1.3 heat waves per year under the high emissions scenarios.

The average number of days in the longest stretch of consecutive extreme heat days per year is also projected to increase. Historically, the longest stretch of consecutive extreme heat days lasted for an average duration of approximately two-and-a-half days. The longest stretch of consecutive

extreme heat days is projected to increase only slightly in the near-term and 3 days in the midterm under the high emissions scenario. In the late century, the duration is projected to increase to an average of 3.4 days under the medium emissions scenario and 4.6 days under the high emissions scenario (CEC 2019b). The timing of extreme heat days is also projected to change over the 21st century with more extreme heat days and heat wave events occurring earlier in the year (April through May) and more severe events occurring in the historically hot months of September and October (CEC 2019b). The projected number of heat waves and number of days in the longest stretch of consecutive extreme heat days is shown in Table 4.

URBAN HEAT ISLAND

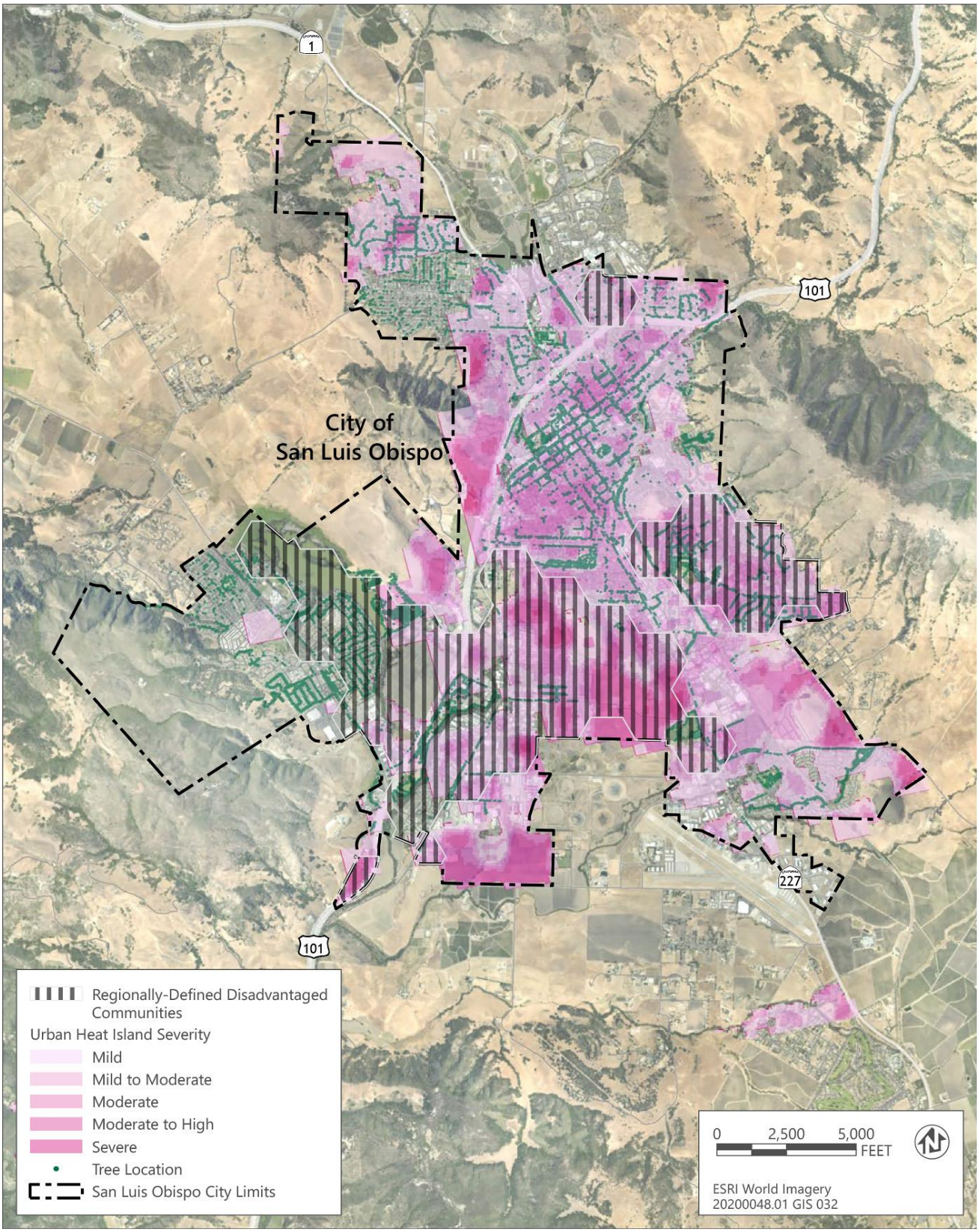
The city's urban land use patterns can intensify periods of extreme heat through the "urban heat island" (UHI) effect. The UHI effect is the phenomenon of urban areas being significantly warmer than surrounding rural areas because of human activity and land use patterns in the built environment. Several factors contribute to the effect, with the primary cause being changes in land surfaces (EPA 2008). The albedo of a surface is the measure of the ability to reflect or absorb solar radiation, with darker surfaces having a lower albedo and absorbing more solar radiation. As urban areas develop over time, resulting in the development of more land surfaces with low albedos (e.g., asphalt pavement, dark building surfaces), more solar radiation is absorbed in these materials causing increased ambient temperatures and warmer nighttime temperatures. Another factor contributing to the UHI effect is the loss of evapotranspiration in urban areas. Evapotranspiration, the movement of water to the air from sources such as the soil, plants, and bodies of water, reduces ambient air temperatures (EPA 2008). As cities grow and often reduce the extent of available vegetation that contributes to evapotranspiration, UHI effects increase. Additionally, waste heat from human activities involving machinery (e.g., vehicle traffic, using air conditioning, industrial activity) can also contribute to the UHI effect, with excess heat absorbed by surrounding surfaces (Sailor 2011; Zhu et al. 2017).

ENVIRONMENTAL JUSTICE AND EXTREME HEAT

Alongside populations with health sensitivities, residents with specific sociodemographic characteristics are at increased sensitivity to extreme heat events (CDC 2019). Research has found that low-income residents spend a larger proportion of their income on utilities, including electricity use for cooling, with these residents being disproportionately affected during extreme heat events (Voelkel et al. 2018). Additionally, research has found that low-income neighborhoods can often have less tree coverage and park space, further contributing to the disproportionate impact on low-income residents (Zhu and Zhang 2008). Decreased access to transportation services can further increase exposure and health risks from extreme heat events for the unhoused community (Ramin and Svoboda 2009). Unhoused individuals are also at increased risk from extreme heat events with, generally, less access to places to cool off and healthcare resources during these events. Figure 10 shows the location of low-income areas in the city, based on SLOCOG regional definition of low-income. The map shows urban heat island hotspots and areas where average income level is less than 80 percent of the region's average median income.

The Margarita Avenue Neighborhood (Census Tract 111.03) is an area of the city with a particularly vulnerable population in regard to extreme heat. This area includes a high percentage of elderly and disabled residents, a high percentage of residents experiencing linguistic isolation, and 50 percent of residents earning less than 200 percent of the federal poverty level. This census tract also is located in a portion of the city that experiences a more

intense severity of the urban heat island effect, resulting in potentially disproportionate impacts on this population during extreme heat events. The West of South Higuera neighborhood (Census Tract 115.01) also stands out as a particularly vulnerable to extreme heat, with the area also near urban heat island hotspots and includes a high percentage of elderly and disabled residents.



Source: Data received and downloaded from City of San Luis Obispo and the Trust for Public Land.

Figure 10 Urban Heat Island Effect, Regionally-Defined Disadvantaged Communities, and Tree Cover in the City

EXTREME HEAT POLICIES

Policy HE-4.1: Climate-Smart Urban Heat Mitigation

The City shall equitably mitigate the effects of extreme heat in outdoor environments.

Policy HE-4.2: Equitable Access to Safe Indoor Spaces

The City shall support equitable access to climate controlled indoor spaces.

Policy HE-4.3: Green and Healthy Buildings

The City shall support fuel switching retrofits (from fossil fuel to high-efficiency electric appliances), energy efficiency retrofits, and distributed energy resources as low carbon solutions to create safe, cool, and healthy buildings and consider programs and projects that support these retrofits as critical to maintaining community safety and to supporting disaster preparedness.

EXTREME HEAT PROGRAMS

Program HE-4.4: Urban Heat Island Mitigation Program

Develop and implement a program to mitigate the projected increasing impacts from the urban heat island effect. This program should include:

- A strategy to maintain and enhance the city's urban tree canopy and other vegetative features to help reduce the urban heat island effect while accounting for the effect of shifting average minimum and maximum temperatures on sensitive tree species and vegetation.
- A "cool pavement" pilot to reduce the urban heat island effect being generated from the city's pavement surfaces, focusing on large surface parking lots and urban heat island hotspots. Should the pilot prove effective, consider scaling the program, including through the adoption of new standards for new development projects, as appropriate, to use high-albedo or cool pavements for surface parking lots.
- A Climate-Smart Green Infrastructure Strategy with regular updates to the City's Capital Improvement Program and Foundational Action Natural Solutions 2.1 in the City's Climate Action Plan which focuses on preparing the City's first Community Forest Plan by 2022 and planting and maintaining 10,000 new trees by 2035.
- A review of and update to Section 12.38.090 "Landscaping Standards" in the City's Municipal Code and other design guidelines to incorporate strategies to increase shading of buildings and parking lots to mitigate the urban heat island effect while also ensuring that the updated landscaping standards are aligned with recommended fire wise plant species.
- A review of and update to City development standards, where appropriate, to include building and site design features that mitigate the urban heat island effect including reflective roofing, solar carports.

Program HE-4.5: Climate-Smart Urban Tree Canopy

Conduct analysis and incorporate climate change considerations into the City's Community Forest Plan and update the City's Street Trees Master List to prepare for increases in minimum and maximum temperatures and extreme heat events and corresponding drought and fire risk, identifying which trees will be most vulnerable to climate impacts and which species will thrive during future increases in temperature. Ensure that the updated Street Trees Master List does not include high water use trees or highly combustible trees. Emphasize the planting and care of appropriate climate-ready trees in locations where they will have the greatest chances of success in environmental conditions that are predicted to become more challenging (i.e., "right tree, right place"). Communicate the results of the analysis to help community members prepare for impacts on trees on private property.

Give high priority to water conservation in all urban forest-related actions. This could include species selection, irrigation method and time-of-day recommendations, mulching, co-location with natural drainages and stormwater runoff, etc.

Lumber from removed trees should be used in ways that store carbon indefinitely instead of releasing it back into the atmosphere, and these uses should be publicized to build awareness and support for climate action.

Program HE-4.6: Community Cool Zones Network

Work with community organizations, faith-based organizations, businesses, local government entities in SLO County, and other institutions to develop a Community Cool Zone Network comprised of air-conditioned spaces conveniently located throughout the city that can be opened during heat wave events to help prevent heat-related illness for vulnerable populations (e.g., elderly, youth, homeless, residents without air conditioning). Support network participants to conduct energy efficiency and building decarbonization improvements consistent with the City's Climate Action Plan. Prioritize opening cool zone locations in areas with identified heat-vulnerable populations and disadvantaged communities and consider co-locating with Resilience Hubs. Assess feasibility and efficacy of providing transportation options to the cooling network location to elderly residents and transit-dependent populations.

Program HE-4.7: Green and Healthy Buildings Program

Expand the City's Green and Healthy Buildings Program (the existing building retrofit program focused on electrification per the 2020 Climate Action Plan) to include climate resilience retrofit features to help residents prepare for the impacts of climate change (e.g., extreme heat, wildfires, and wildfire smoke). This work should include conducting a gap analysis to identify portions of the city's housing stock that are not equipped with air-conditioning or other cooling systems to address the projected increases in temperature and extreme heat events. As part of the building retrofit program, include proactive efforts (i.e., incentives, matching funds) to retrofit or assist with retrofitting the identified housing stock with climate resiliency features including:

- Adequate climate control equipment (e.g., heat pump HVAC-systems) with air filtration systems.
- Weatherization and energy efficiency improvements.

- Distributed energy resources (e.g., rooftop solar, battery storage, electric vehicle battery to building equipment, etc.) to support grid-independent operation and to offset utility energy costs.
- Home hardening improvements to protect against wildfire.

Program HE-4.8: Extreme Heat and Emergency Preparedness

As part of the next update of the City's Emergency Operations Plan, incorporate a protocol for emergency operations during extreme heat events in the city. Identify extreme heat thresholds which, if exceeded, would trigger the opening of cooling centers in the city as well as emergency response efforts from appropriate City departments (e.g., Police Department, Fire Department, Parks & Recreation). Coordinate emergency response efforts in Program HE-4.9 regarding heat-related community outreach with this strategy.

Program HE-4.9: Equitable Community Outreach For Extreme Heat

Use information from the Hazards and Vulnerabilities Report that identifies areas in the City with vulnerable populations (e.g., linguistically isolated households, elderly, youth, homeless, individuals with chronic health conditions) to conduct targeted outreach to these neighborhoods and areas in the City. Increase education and training opportunities for residents to prepare for extreme heat events, with a prioritization on participation from vulnerable populations and businesses and institutions that house and/or support vulnerable populations. Work with community organizations and the San Luis Obispo County Health Department to provide additional resources and training to staff working with elderly populations on how to prevent health-related heat impacts (Paterson et al. 2014). Work with community organizations and schools to help mitigate the impacts of extreme heat and heat wave events on youth. Educate and train staff working with youth populations on how to prevent health-related impacts from extreme heat. Continually assess the effectiveness of the City's public information and education efforts during heat wave events.

5. Fire

OVERVIEW

A wildfire is defined as an uncontrolled fire spreading through vegetative fuels that poses a threat to life and/or property (San Luis Obispo County 2019). Wildfires can be ignited by natural events, such as lightning strikes, or can be caused by damaged infrastructure (e.g., downed power lines) or human activities (e.g., campfires, arson). Wildfires can move quickly, casting embers into downwind areas and spreading to developed areas, putting human lives and properties at risk.

Three factors that contribute significantly to wildfire behavior are topography, fuel, and weather:

Topography—An area's terrain and slope affect its susceptibility to wildfire spread. Both fire intensity and the rate of spread increase as slope increases because heat from a fire tends to rise through convection. For this reason, wildfires tend to spread more slowly downhill. The arrangement of vegetation on a hillside can also contribute to increased or decreased fire activity on slopes.

Fuel—The type, condition, and volume of fuel material are key factors that influence wildfire behavior. Fuel sources are diverse and can include dead vegetative matter, live trees, brush, and cured grasses. Buildings and other structures, such as homes, can also be sources of fuel. Certain types of plants are more susceptible to burning or will burn with greater intensity, and dead, dry plant matter tends to burn more easily than living plant matter. Thus, fire risk is increased significantly during periods of prolonged drought. The density of vegetation increases the amount of combustible material available, also called the fuel load.

Weather—Factors such as temperature, humidity, wind, and the occurrence of lightning affect the potential for wildfire and its spread. High temperatures and low humidity can dry out wildfire fuels, creating a situation in which fuel will ignite more readily and burn more intensely. Thus, wildfire risk increases during periods of drought. Wind is one of the most significant weather factors in the spread of wildfires. Higher wind speeds lead to faster wildfire spread and, oftentimes, greater fire intensity.

Environmental and climatic conditions in and around the city influence the frequency and magnitude of wildfires. The city often experiences high-wind events, such as the Santa Lucia winds, which originate inland and flow westward during the late summer and early fall, counter

to the prevailing westerly winds that occur throughout much of the year. Santa Lucia winds contain little humidity, and summers in the city are hot and dry, with precipitation primarily occurring in the winter months. Thus, the combination of the relatively hot, dry Santa Lucia winds occurring at a time when vegetation in the County and the city is particularly dry following the summer months can contribute to the ignition and spread of large wildfires. Periods of low relative humidity, when dead trees and vegetation cannot absorb moisture from the air, can also increase the risk of wildfires (City of San Luis Obispo 2011).

The risk of wildfires and subsequent impacts to property and life is greatest at the wildland-urban interface (WUI), which is where urban development borders wildland fuels. Wildfire risk is compounded in areas of the WUI that are also located in or near High or Very High Fire Hazard Severity Zones. As such, the City has adopted WUI emission resistant exterior construction method and materials for exposure from wildfire citywide. Figure 11 includes CAL FIRE designated Fire Hazard Severity Zones in and surrounding the city. Portions of southwestern and northeastern parts of the city are located in or near a Very High Fire Hazard Severity Zones, and many of these portions of the city overlap with the WUI. Locations identified by CAL FIRE as Hazard Severity Zones for the City and County are identified in Appendix G (Cal Fire San Luis Obispo County Fire Hazard Severity Zone Map). Beyond these areas of the city, the risk of urban fires decreases, with most of the areas surrounding the city located in a Moderate Fire Hazard Severity Zone.

In addition to portions of the City that overlap with the WUI there are several City facilities outside of City limits that are located in, or adjacent to, High or Very High Fire Hazard Severity Zones including the Water Treatment Plant, Reservoir #2. These City facilities are located in the State Responsibility Area moderate zone, and, the road between the facilities cross through a High Fire Severity zone. Additionally, the Salinas Reservoir (Santa Margarita) is within Federal Responsible Area high and very high zones.

Figure 12 shows the locations of fires that have occurred within 10 miles of the city between 1900 and 2020; four fires have occurred within city boundaries. Between 1900 and 2018, 490 wildfires have been recorded in the County (San Luis Obispo County 2019a). Notable fires that have occurred in the County include the Weferling fire (1960), the Las Pilitas fire (1985), the Chispa fire (1989), the Highway 41 fire (1994), the Highway 58 fire (1996), the Logan fire (1997), and the Chimney fire (2016). In total, these fires burned approximately 400,000 acres, destroyed numerous structures, and cost millions of dollars to suppress (City of San Luis Obispo 2019). The Las Pilitas fire burned 75,000 acres and burned within city limits, damaging a number of structures (City of San Luis Obispo 2011). The 1994 Highway 41 fire burned more than 50,000 acres close to the city's northern boundary and destroyed 42 homes, 61 other structures, and 91 vehicles (San Luis Obispo County 2019).

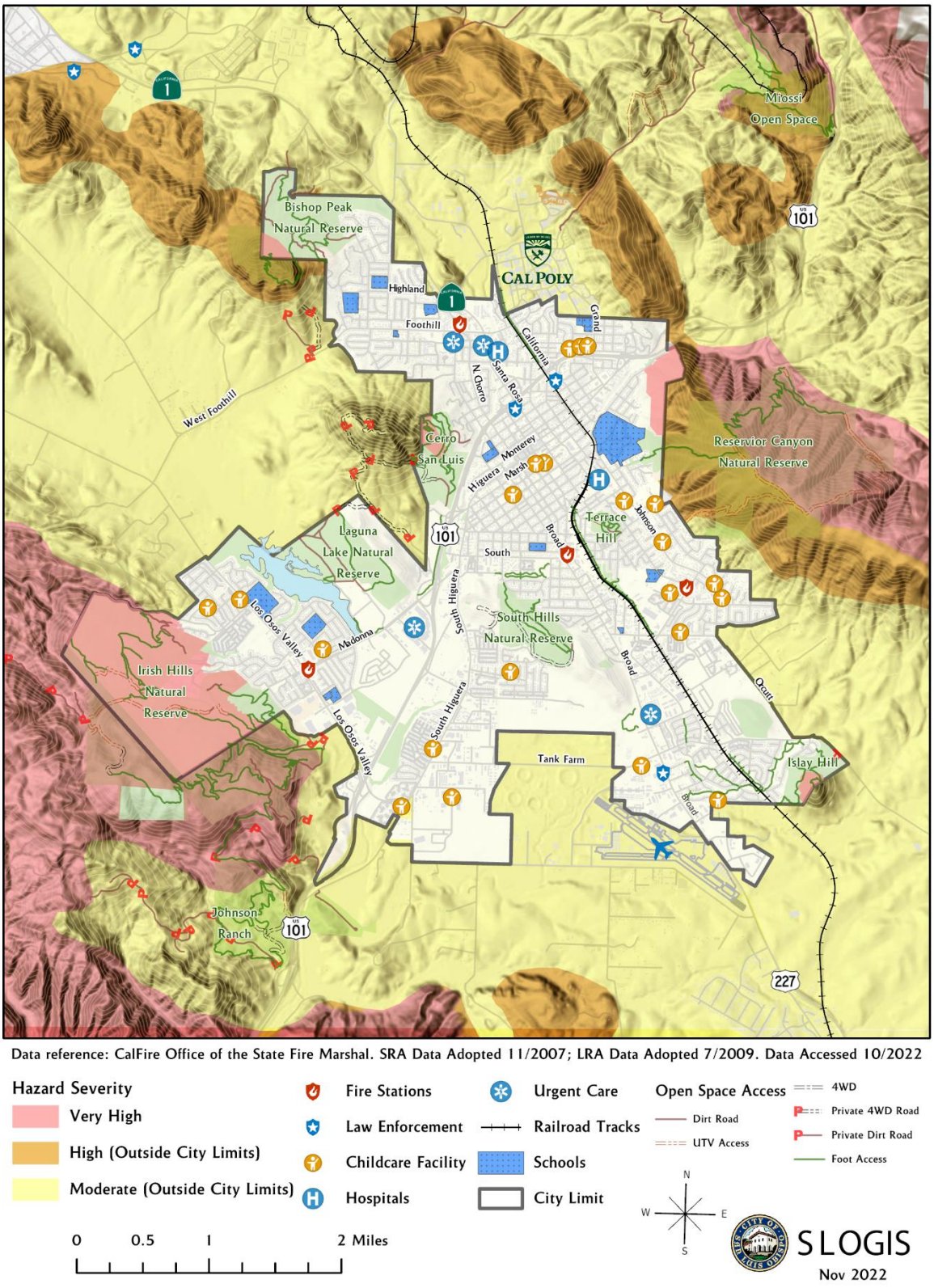


Figure 11 Wildfire Hazard Severity Zones in and Surrounding the City of San Luis Obispo with Critical Facilities

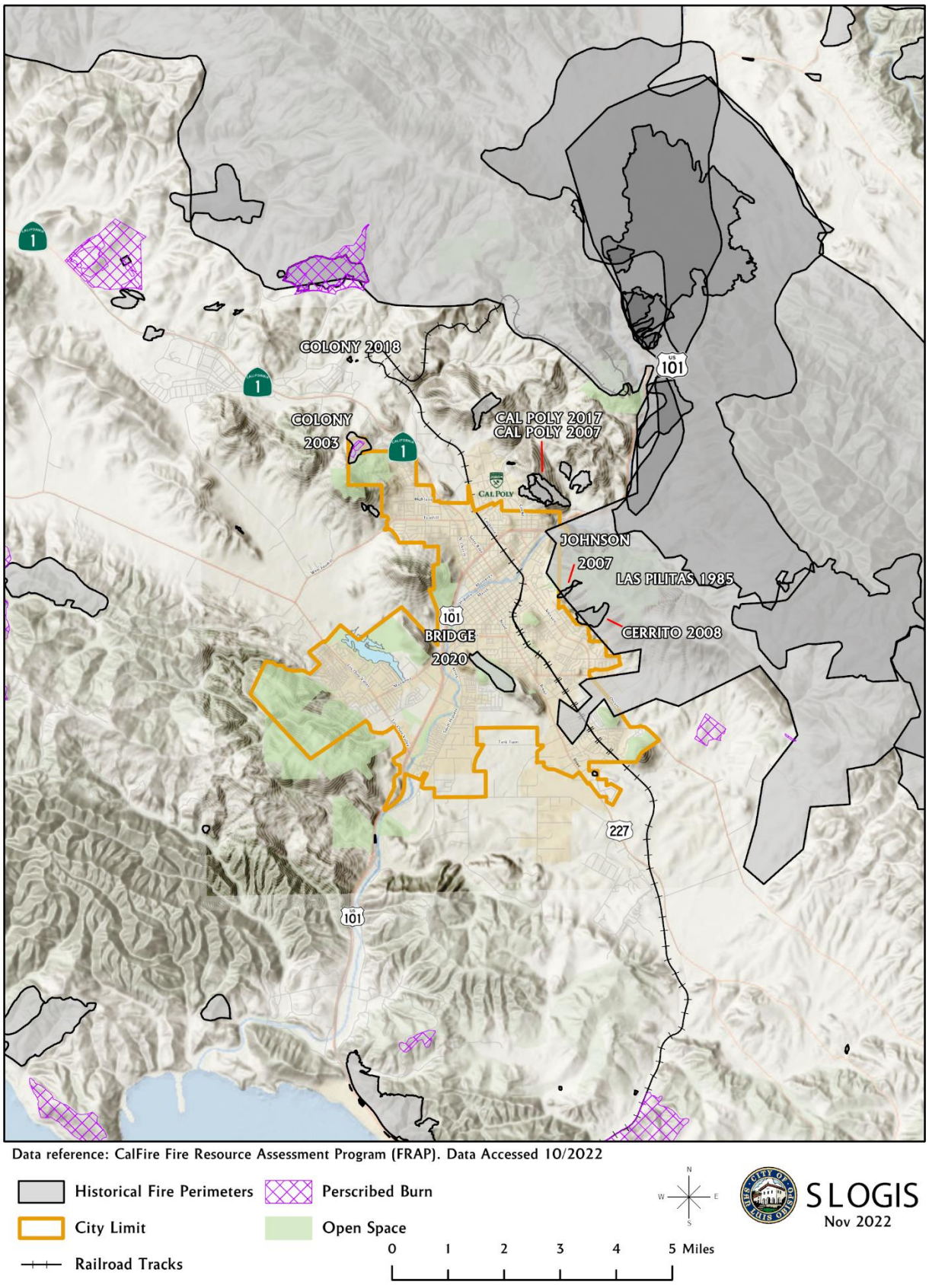


Figure 12 Wildfire Perimeters for Wildfires within 10 Miles of the City of San Luis Obispo (1900–2020)

Wildfire Management

The City's Fire Department is the main agency responsible for wildfire response, management, and mitigation in the city, with many fires being addressed through mutual aid by both the City's Fire Department and CAL FIRE. Several agencies, including the County, provide support to incorporated areas, including the City, during wildfire events. Supporting agencies, such as CAL FIRE, are also available to mobilize during fire response if needed. In addition to having the authority to declare local emergencies, the County can provide support for evacuations, shelter, and other forms of assistance for municipalities, including the City (San Luis Obispo County 2016). The City can also declare a disaster declaration through the City's Disaster Council, absent the County. Because fire risk is highest for regions of the city within the WUI, the City has produced detailed maps of these regions, indicating evacuation routes and other critical information for responders. Locations identified by CAL FIRE as Hazard Severity Zones for the City and County are identified in Appendix G (Cal Fire San Luis Obispo County Fire Hazard Severity Zone Map). The City's Community Wildfire Protection Plan serves as the primary document for assessing wildfire risk in different areas in the city and helping to implement a series of policies and strategies to reduce this risk, including:

Education – The goal of the education policies and strategies are to prepare response organizations, communities, the public, and policy makers regarding appropriate community actions and interactions to reduce the unwanted impacts of fires in the WUI.

Fuel – The goal of the fuel policies and strategies are to mitigate the unwanted impacts of wildfires on communities through proper vegetation management techniques that reduce hazardous fuels and the resulting wildfire intensity.

Planning – The goal of the planning policies and strategies are to mitigate the unwanted impacts of wildfires on communities through community planning (including new resilient community design, retrofitting existing communities, and efforts that support community recovery from the impact of fire), response planning, evacuation planning, and preparedness planning for responders, communities, individuals, animals, and livestock.

Response – The goal of the response policies and strategies are to mitigate the unwanted impacts of wildfires on life, property, and resources by having an efficient and effective response that includes properly trained personnel, appropriate equipment, and a community prepared to take appropriate action or evacuation.

Ignition Resistance - The goal of the ignition resistance policies and strategies are to eliminate or mitigate structural ignitions from radiant heat, flame contact, or embers from WUI fires.

Wildfire Smoke

While the city is at risk from the impacts of wildfires, the city and its residents are also susceptible to impacts of smoke from wildfires in the coastal mountain ranges of central California and the Los Padres National Forest to the east of the city. Wildfire smoke in the surrounding region and, due to wind patterns, wildfires along the central coast in general, can greatly reduce air quality in the city and cause public health impacts as well as impacts to tourism and normal community functions. Community public health factors that can increase the impacts of wildfire smoke include the prevalence of asthma in children and adults; chronic obstructive pulmonary disease; hypertension; diabetes; obesity; percent of population 65 years of age and older; and indicators of socioeconomic status, including poverty, income, and unemployment. Exposure to wildfire smoke, particularly exposure to vulnerable populations, can result in worsening of respiratory

symptoms, increased rates of cardiorespiratory emergency visits, hospitalizations, and even death (Rappold et al. 2017). In the summer of 2020, wildfire smoke alerts were issued for San Luis Obispo County due to poor air quality caused by the Dolan Fire near Big Sur. Wildfire smoke can also have impacts on the labor market and the economy in general, with air quality affecting the ability of outdoor workers to perform their work and impact industries that operate in the open air (e.g., wineries, recreation activities, sporting events) (Borgschulte et al. 2019).

Climate Change and Wildfires

The effects of climate change, including increased temperatures, and changes to precipitation patterns, will exacerbate many of the factors that contribute to wildfire risk. Recent research has found that increases in global temperatures may be affecting wind patterns and increasing global wind speeds, however these changes would not be experienced uniformly across geographies in the future (Chen 2020). While the impact of climate change on wind speeds is still uncertain, it is important to recognize this potential effect and how it may also contribute to wildfire risk in the future.

Increased variability in precipitation may lead to wetter winters and increased vegetative growth in the spring, and longer and hotter summer periods will lead to the drying of vegetative growth and ultimately result in a greater amount of readily burned fuel for fires. This has already been seen across the state in recent years, with the area burned by wildfires increasing in parallel with rising air temperatures (OEHHA 2018). These factors, combined with the increasing frequency and severity of intense wind conditions, will cause fires to spread rapidly and irregularly, making it difficult to predict fires' paths and effectively deploy fire suppression forces. Pacific Gas and Electric (PG&E) also has several electrical transmission lines running through the city, which carry significant potential fire risk (Figure 13).

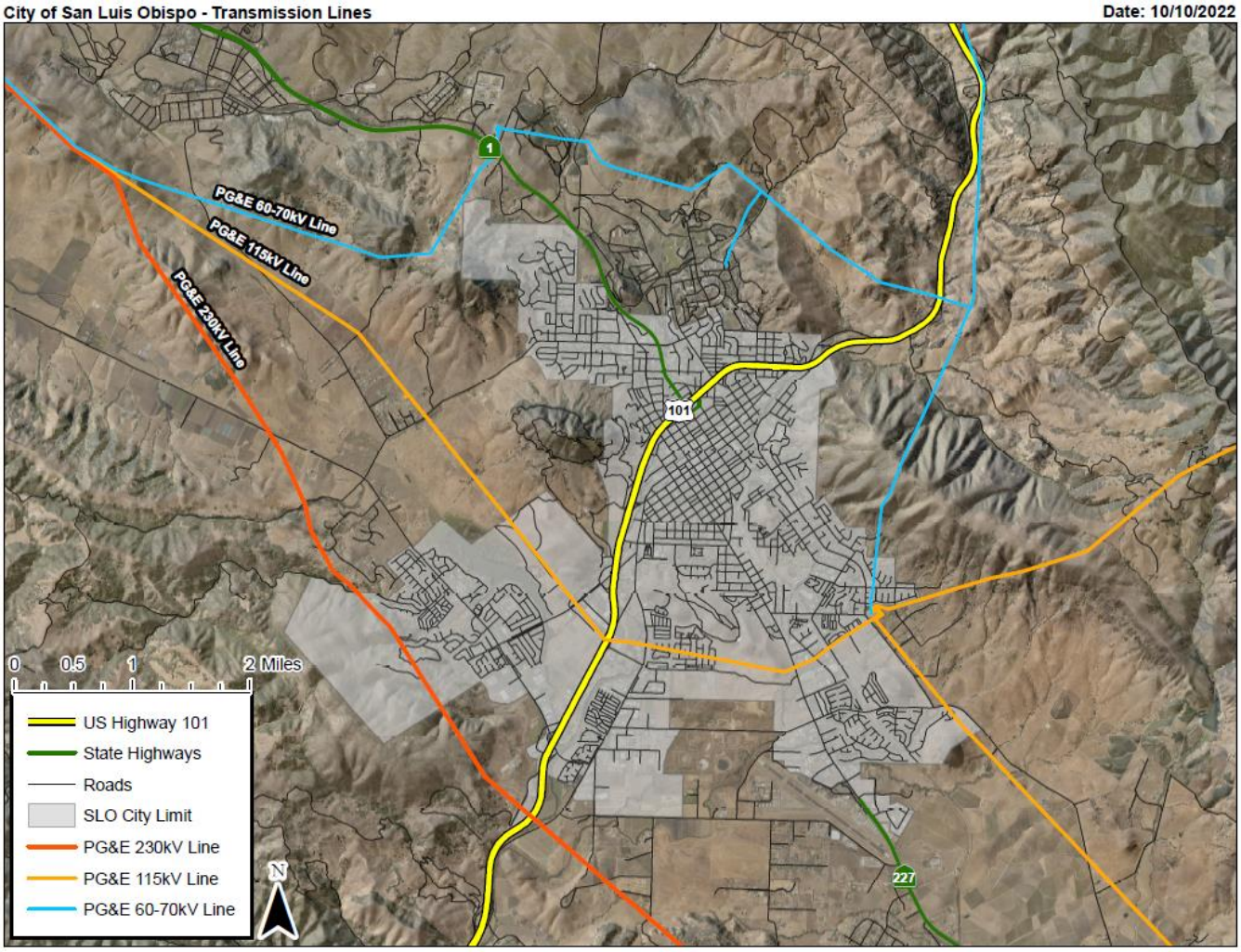
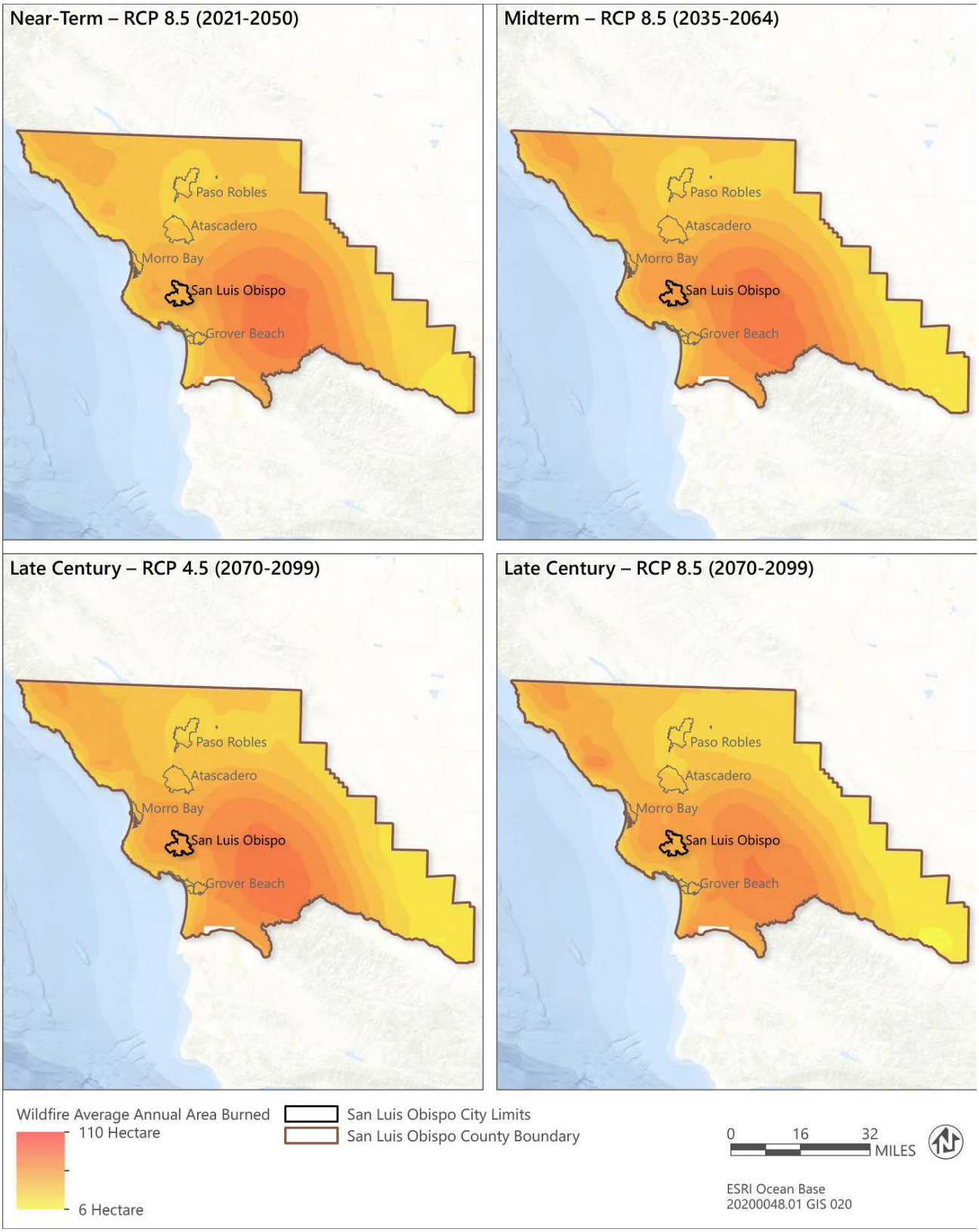


Figure 13 PG&E Transmission Lines in the City of San Luis Obispo

Relative humidity is also an important fire-related weather factor; as humidity levels drop, the dry air causes vegetation moisture levels to decrease, which consequently increases the likelihood that plant material will ignite and burn. With an increase in hotter and drier landscapes, humidity levels may continue to drop and result in higher fuel loads, increasing the risk of wildfire (Schwartz et al. 2015).

Given the city's urban setting, with minor portions of the city in the VHFHSZ, the analysis for future wildfire risk analyzes changes in wildfire risk at the County level to assess how larger regional risks and potential impacts may affect the city. Using a statistical model based on historical climate vegetation, population density, and large fire history, Cal-Adapt provides projections for future annual mean acres burned within the County when wildfires do occur. Cal-Adapt does not account for current or planned wildfire management projects. Table 5 and Figure 14 shows the projected change in average annual area burned within the County under low and high emissions scenarios for the central population growth scenario at midterm and late-century timescales. The total area burned annually by wildfire within the County is expected to rise 15 percent from the historic (1961–1990) annual average of 22,852 acres to 26,497 acres in the near-term and increase in the midterm to 26,509 acres burned annually. In the late-century, average annual area burned in the County is projected to increase to 26,509 acres and decrease slightly to 24,382 acres under the low and high emissions scenarios, respectively (CEC 2019b).

This reduction in annual average acres burned in the late-century period is noted in the research conducted to develop the Cal-Adapt wildfire tool. As vegetation type and fuel amount, structure, and continuity change in the future due to altered disturbance regimes (e.g., changes in the frequency, seasonality, duration, extent and severity of wildfire and infestations by beetles and other pathogens) and climate, future wildfire activity and its response to climatic variability may reduce wildfire activity in some ecosystems (Westerling 2018).



Sources: Data downloaded from City of San Luis Obispo in 2020 and County of San Luis Obispo in 2020 and downloaded from Cal-Adapt in 2021.

Figure 14 Projected change in average annual area burned within San Luis Obispo County through 2099

Importantly, Figure 14 illustrates that anticipated changes in wildfire impacts are not homogenous across the County; for instance, the Santa Lucia Wilderness and the La Panza Mountain range located in the southern central portions of the County will experience the larger increases in average area burned over the 21st century under both emissions scenarios. While these areas are outside of the city boundaries and jurisdiction, due to the regional characteristics of wildfire impacts, wildfire events in these areas could affect the city through secondary impacts such as short-term and long-term wildfire evacuees, wildfire smoke, and impacts on the County's regional transportation network.

Table 5 Changes in Annual Average Area Burned in San Luis Obispo County

Average Annual Area Burned	Historic Modeled[1] Average Annual Area Burned (1961-1990)	Near-Term (2021-2050)	Midterm (2035-2064)	Late-Century (2070-2099)	
				Medium Emissions	High Emissions
Average Annual Area Burned (acres)	22,852	26,497	26,509	26,509	24,382

Notes: RCP = Representative Concentration Pathway.

[1] Observed historical average annual area burned data were not available from Cal-Adapt; the modeled historical average annual area burned data under the medium emissions scenario was available and used as proxy data.

Source: CEC 2019d, hectares converted to acres

FIRE POLICIES

Policy FI-5.1: Reduce Wildfire Risk

The City shall reduce the risk of wildfires in city open spaces and in the wildland urban interface through timely implementation of the City's Community Wildfire Protection Plan and the Vegetation Management Plan.

Policy FI-5.2: City-Wide Fire-Smart Land-Use Planning

The City shall minimize fire risk in land-use planning decisions including updates to zoning, subdivision codes and design criteria to mitigate wildfire hazards and reduce risks to new development.

Promote the following risk reduction measures in future land use planning efforts in the city:

- Use wildfire risk analysis resources such as the CAL FIRE's Fire and Resource Assessment Program data in updates to future housing site constraints analyses.
- Promote the use of clustered development patterns for subdivisions to require less fire suppression resources and that are easier to defend during wildfire events.

Policy FI-5.3: City-Wide Fire-Smart New Development

The City shall only approve development when adequate fire suppression services and facilities are available or will be made available concurrent with development, considering the setting, type, intensity, and form of the proposed development. Ensure that new development projects

include adequate measures to minimize fire hazards while remaining in compliance with housing laws regarding objective design standards and discretionary review.

Fire protection plans should address wildland fuel transition zones surrounding the development and include the following components:

- Provisions for the maintenance of vegetation within the subdivision to reduce wildfire risk
- Requirements for hardening of structures to mitigate fire risk that meets or exceed the California Building Code
- Landscaping and defensible space design around a proposed structure that reduces wildfire risk.

Policy FI-5.4: Fire-Smart Buildings and High Or Very High Fire Hazard Severity Zones

The City shall reduce wildfire risk associated with new development by requiring all new development located within any CAL FIRE designated High or Very High Fire Hazard Severity Zone to:

Meet or exceed the State's Fire Safe Regulations (title 14, CCR, division 1.5, chapter 7, subchapter 2, articles 1-5 commencing with section 1270) and Fire Hazard Reduction Around Buildings and Structures Regulations (title 14, CCR, division 1.5, chapter 7, subchapter 3, article 3 commencing with section 1299.01).

Include designs to minimize pockets or peninsulas or islands of flammable vegetation within a development.

Include additional access roads, where feasible, to ensure adequate access for emergency equipment and civilian evacuation concurrently. All requirements and any deviations will be at the discretion of the Fire Code Official.

Meet or exceed the California Building Code for Materials and Construction Methods for Exterior Wildfire Exposure (Title 24, part 2, Chapter 7A).

For all remodeled or rebuilt structures, require projects to meet current ignition resistance construction codes included in the State's Fire Safe Regulations.

Policy FI-5.5: Wildfires and Critical Facilities

The City shall locate, when feasible, new essential public facilities outside of high fire risk areas, including, but not limited to, hospitals and health care facilities, emergency shelters, emergency command centers, and emergency communications facilities, or identifying construction methods or other methods to minimize damage if these facilities are located in a State Responsibility Area or Very High Fire Hazard Severity Zone.

Policy FI-5.6 Maintain Fire Flow

The City shall ensure adequate fire flow is maintained within the City limits through ongoing maintenance, capital improvement public infrastructure upgrades, and improvements required in association with development projects.

Policy FI-5.7 Fire Suppression Infrastructure Resiliency

The City shall maintain fire flow during scheduled and unscheduled power outages and interruptions through incorporation of power source resiliency and redundancy within City public water supply, treatment, and distribution infrastructure.

Policy FI-5.8: Wildfire and Parking Management

The City shall restrict on-street parking in high wildfire risk areas in San Luis Obispo during increased fire risk days in accordance with the Fire Code to ensure full access for fire trucks and emergency vehicles and to increase roadway accessibility during evacuation events. The City Fire Department and other departments shall identify streets and neighborhoods that are at increased wildfire risk using the CAL FIRE Fire Hazard Severity Zones, Wildland Urban Interface Areas identified by the City, or another internal process. Conduct community outreach to neighborhoods affected by the policy and provide detailed information on how and when the parking restrictions will be implemented.

Policy FI-5.9: Concurrency of Fire Protection Services

The City shall ensure that adequate fire protection staffing, facilities, and equipment required, to serve developments operating before, or in conjunction with development.

Policy FI-5.10: Climate-Smart Fire Protection

The City shall incorporate the most current climate science regarding wildfires into all future reviews and updates to the City's fire and wildfire related documents (e.g., community wildfire protection plan).

Policy FI-5.11: Proactive Communications on Fire Risks and Prevention

The City shall proactively communicate with the public about fire risks and prevention, including information about:

- wildfire smoke health impacts and available mitigation strategies
- The "Ready, Set, Go!" wildfire preparedness program including defensible space, home hardening, personal wildfire action planning, and evacuation actions.
- Public safety power shutoffs associated with high fire danger.

FIRE PROGRAMS

Program FI-5.12: Implement the Community Wildfire Protection Plan

Continue to implement the City's Community Wildfire Protection Plan (CWPP) to reduce wildfire risk in the City's wildland-urban interface including implementation of the CWPP Tactical Policy Measures which focus on the four key policy areas of community education, fuels management, planning, and emergency response preparedness on an ongoing basis. Update the CWPP, every 5 years or sooner, to incorporate new best practices, funding opportunities, new legislation regarding wildfire protection, and other wildfire protection planning resources.

Program FI-5.13: Implement the Vegetation Management Plan

Continue to implement the City's Vegetation Management Plan, conducting fuel reduction projects at the 12 large open space lands included in the plan, using vegetation management techniques appropriate for each open space including manual vegetation removal; tree removal; mechanical treatment, prescribed burning, livestock grazing, and chemical treatment. Update the Vegetation Management Plan, as needed, to incorporate regulations regarding new best practices, and new funding opportunities for vegetation management projects.

Meet with the yak tityu tityu yak tiłhini (Northern Chumash Tribe San Luis Obispo County and Region (ytt Tribe)), Northern Chumash Tribal Council, and other tribal bodies on an annual basis, or as needed to incorporate Traditional Ecological Knowledge approaches to vegetation management in the City where appropriate.

Work with private property owners, San Luis Obispo County, and Caltrans to conduct roadside vegetation clearance along public and private roadways in Very High Fire Hazard Severity Zones in the city. Ensure that fuel reductions provide an appropriate fuel buffer for evacuees should these roadways become congested during an emergency incident.

Develop an Urban Creek Vegetation Management Plan as part of the Waterway Management Plan update. The plan shall set forth a holistic vision to address excessive and noxious vegetation and dead material in the creeks and waterways in San Luis Obispo and surrounding areas. Work with private property owners and San Luis Obispo County to review and conduct vegetation management to ensure dead trees and vegetation are reduced to prevent fire from spreading to adjacent lands.

Program FI-5.14: Wildfire Ignition Source Reduction Program

The City will work to reduce wildfire ignition sources within the City's open space and creek systems in accordance with fire code amendments that restricts public access to hazardous fire areas as designated by the Fire Chief.

Program FI-5.15: Wildland-Urban-Interface Defensible Space and Home Hardening Program

Implement a program to assist homeowners, landlords, and business owners in improving the defensible space for structures in or near the very high fire hazard severity zones. The program will serve to connect participants to contractors with experience in developing or improving home hardening improvements (e.g., fire-safe building materials, fire resistant home vent upgrades). The program will seek funding to supplement the costs associated with defensible space improvements, prioritizing low-income participants and elderly or disabled residents who would not be able to implement defensible space improvements on their own. The program would be developed and administered in close collaboration with the City's Fire Department and CAL FIRE to ensure appropriate standards for defensible space are implemented as part of the program consistent with AB 3074 ("Fire Prevention: wildfire risk : defensible space: ember-resistant zones").

Program FI-5.16: Resident Information and Training on Fire Hazards

The City will inform homeowners and tenants about local fire hazards, appropriate responses to fire, and ways to prevent loss, including home improvements that can reduce the impact of fire.

The City will promote the efforts of the Fire Safe Council.

The City will continue hosting community preparedness sessions and workshops as effective preparation resources for residents to aid themselves when needs exceed the availability of professional emergency response workers.

The City will support education programs in the lower grades, using displays and demonstrations to inform young children about fire safety, and in secondary schools, demonstrating the dynamic aspects of fire, including major factors contributing to fire hazard and the relationship of fire to the natural ecology. Fire prevention and evacuation lessons will be included in each program.

Program FI-5.17: Wildfire Smoke Protection Outreach Strategy

Work with the San Luis Obispo Air Pollution Control District to ensure residents are educated on how to protect themselves and their homes from wildfire smoke impacts. Prioritize outreach campaigns to populations who are vulnerable to poor air quality and those who work with the population (e.g., elderly care nurses and assistances, teachers), conducting educational events at convenient locations for these residents.

The outreach strategy should also focus on supporting employers to maintain compliance with California Code of Regulations, Title 8, Section 5141.1, which applies to most outdoor workplaces where the current Air Quality Index (current AQI) for airborne particulate matter is 2.5 micrometers or smaller is 151 or greater, and where employers should reasonably anticipate that employees could be exposed to wildfire smoke. Compliance requirements and training instructions are included in California Code of Regulations, Title 8, Section 5141.1.

Program FI-5.18: Support Community Resilience During Public Safety Power Shutoffs

Proactively provide information for the installation of battery storage systems for existing residential and non-residential developments, prioritizing opportunities for essential services such as hospitals, grocery stores, pharmacies, and other essential service businesses.

Develop a streamlined permitting process, including appropriate CEQA exemptions, for the installation of small- and large-scale battery storage systems in existing residential and nonresidential development as well as providing applicants information on available financing options. Prioritize grant or other resource allocation to residents facing additional risks from Public Safety Power Shutoffs (PSPSs) including the elderly and disabled. Explore the viability of vehicle-to-building (V2B) technologies that can provide resilience by using the energy stored in PEV batters to power loads inside residential, commercial, or public buildings.

6. Earthquakes and Other Geologic Hazards

OVERVIEW

Geologic conditions encompass the form of the ground surface, the composition and character of soils, rocks, and water at the ground surface and below, and the long-term movement of the Earth's crust and mantle. These conditions determine the stability of the ground at a site, and how that site will respond to changes caused by people and by the natural forces of earthquakes and weather.

Numerous faults transect valleys and hillside areas in San Luis Obispo.

The frequency and strength of earthquakes depend on the number and type of faults that pass through an area. The city is in a geologically complex and seismically active region. Seismic conditions here have the potential to result in significant harm to people and property. Some fault locations and characteristics have been identified, however, recent earthquakes in California have shown that not all active faults are revealed by surface features. Safety precautions should be based on known factors, as well as an awareness of the limitations to current knowledge. This Element must consider two of the direct effects of an earthquake: rupture of the ground surface along a fault, and ground shaking that results from fault movement. Other hazards associated with earthquakes are settlement, liquefaction, landslide, collapse of pipes and structures, fires, and flooding from dam failure.

Surface Rupture

Surface rupture refers to the top of the ground moving unevenly along a fault: one side moves horizontally, vertically, or both, with respect to the other side. It typically occurs within an area of linear traces along previous ruptures, which mark a fault zone, and often in concert with movement on adjacent or intersecting faults. Rupture of the ground surface along a fault trace typically occurs during earthquakes of about magnitude 5 or greater. Surface rupture endangers life and property when structures or lifeline facilities are located on, or cross over, a fault.

The Los Osos Fault, adjacent to the City of San Luis Obispo, is identified under the State of California Alquist-Priolo Fault Hazards Act (Figure15). This fault's main strand lies near the intersection of Los Osos Valley Road and Foothill Boulevard. It has been classified as active within the last 11,000 years. Additional site-specific studies may find other segments of the fault, in which case it would be appropriate for the California Department of Mines and Geology to expand the zone. The Los Osos Fault presents a high to very high fault rupture hazard to development and facilities in the Los Osos Valley.

Other faults in the vicinity of San Luis Obispo are the West Huasna, Oceanic, and Edna faults. These faults are considered potentially active and present a moderate fault rupture hazard to developments near them. Figure 15 shows the locations of faults in the immediate San Luis Obispo area.

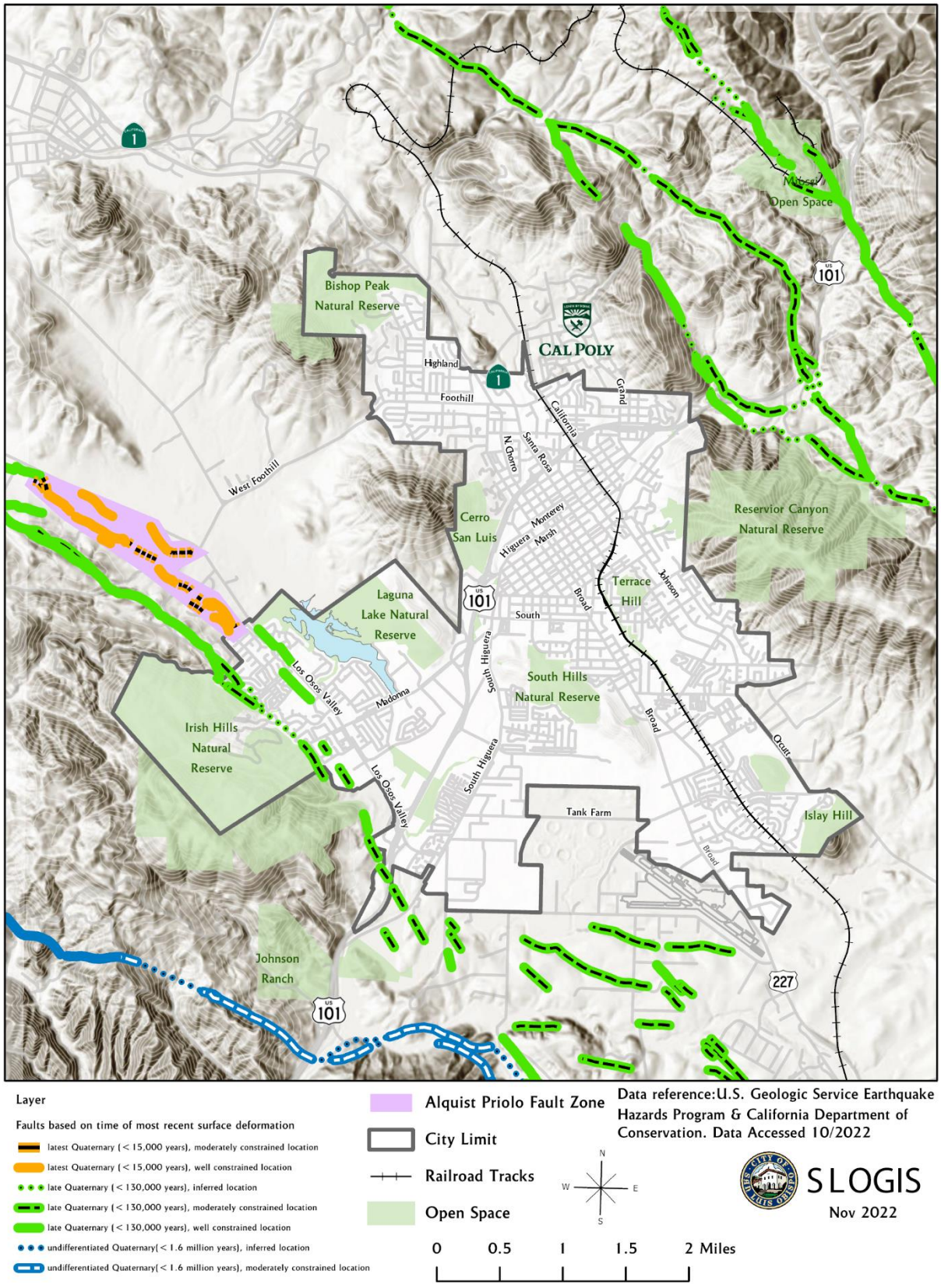


Figure 15 Regional Faults and Seismic Hazard Designation Area

Ground Shaking

Ground shaking refers to the vibration that occurs in response to displacement along a fault. Typically, ground shaking has a side-to-side component as well as a vertical component, with the actual movement depending on the type of fault, a site's distance from the fault, and the rock and soil conditions at the site. Shaking endangers life and property by damaging or destroying structures and lifeline facilities, including water distribution systems that carry water to the city from Whale Rock, Nacimiento and Salinas reservoirs. City reservoirs are not located near one another which reduces the likelihood of damage and loss of all water supplies. Several faults can produce strong ground motion in San Luis Obispo. These are the Los Osos, Point San Luis, Black Mountain, Rinconada, Wilmar, Pecho, Hosgri, La Panza, and San Andreas faults (Figure 15). The San Andreas Fault and the offshore Hosgri Fault, which present the most likely source of ground shaking for San Luis Obispo, have a high probability of producing a major earthquake within an average lifespan. The highest risk from ground shaking is found on deep soils that were deposited by water, are geologically recent, and have many pore spaces among the soil grains. These are typically in valleys.

Engineering standards and building codes set minimum design and construction methods for structures to resist seismic shaking. Model standards and codes are typically updated every few years at the recommendation of professional advisors, in response to review of the performance of structures and lifelines that have been subject to recent earthquakes. Local governments then amend or replace their codes to reflect those required by State law or recommended.

Settlement and Liquefaction

In this context, settlement means the ground supporting part of a structure or facility lowers more than the rest or becomes softer, usually because ground shaking reduces the voids between soil particles (and often with groundwater rising in the process). The result can be more strain on the supporting features than they were built to withstand, leading to cracked walls or floors and broken water and sewer lines. Liquefaction is the sudden loss of the soil's supporting strength due to groundwater filling and lubricating the spaces between soil particles as a result of ground shaking. Soils with high risk for liquefaction are typically sandy and in creek floodplains or close to lakes. In extreme cases of liquefaction, structures can tilt, break apart, or sink into the ground. The likelihood of liquefaction increases with the strength and duration of an earthquake.

The soils in the San Luis Obispo area that are most susceptible to ground shaking, and which contain shallow ground water, are the ones most likely to have a potential for settlement and for liquefaction (Figure 16). The actual risk of settlement or liquefaction needs to be identified by investigation of specific sites, including subsurface sampling, by qualified professionals. Previous investigations have found that the risk of settlement for new construction can be reduced to an acceptable level through careful site preparation and proper foundation design, and that the actual risk of liquefaction is low. (An example is the City's fire station at Madonna Road and Los Osos Valley Road.)

The building code requires site-specific investigations and design proposals by qualified professionals in areas that are susceptible to settlement and liquefaction.

Subsidence is the gradual settling or sinking of the earth's surface due to subsurface material movement at depth and is frequently associated with groundwater level declines and groundwater pumping. The San Luis Obispo Valley Basin Groundwater Sustainability Plan (GSP) adopted by the San Luis Obispo Valley Groundwater Basin Groundwater Sustainability

Agencies includes an evaluation and mapping of subsidence potential within the San Luis Obispo Valley Basin, and identifies a preliminary sustainable yield estimate of 5,800-acre feet per year (afy) for the Basin, including 2,500 afy for the San Luis Valley Sub Area (San Luis Obispo Valley Basin Groundwater Sustainability Plan, WSC, 2021).

As required by Sustainable Groundwater Management Act legislation and regulations, land subsidence is a specific sustainability indicator that is monitored in the Basin, pursuant to management criteria regulated by the Department of Water Resources.

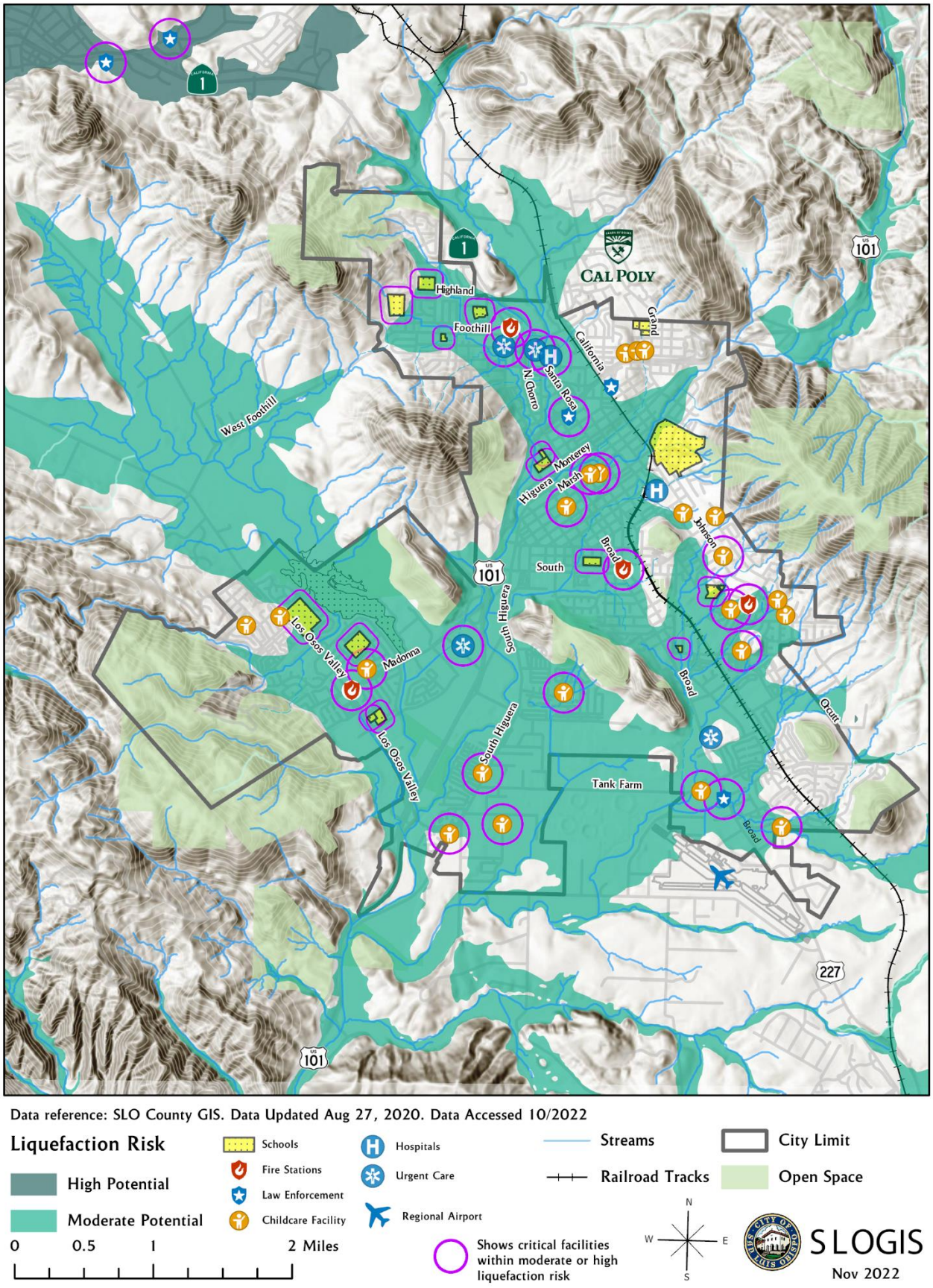


Figure 16 Liquefaction Risk Areas

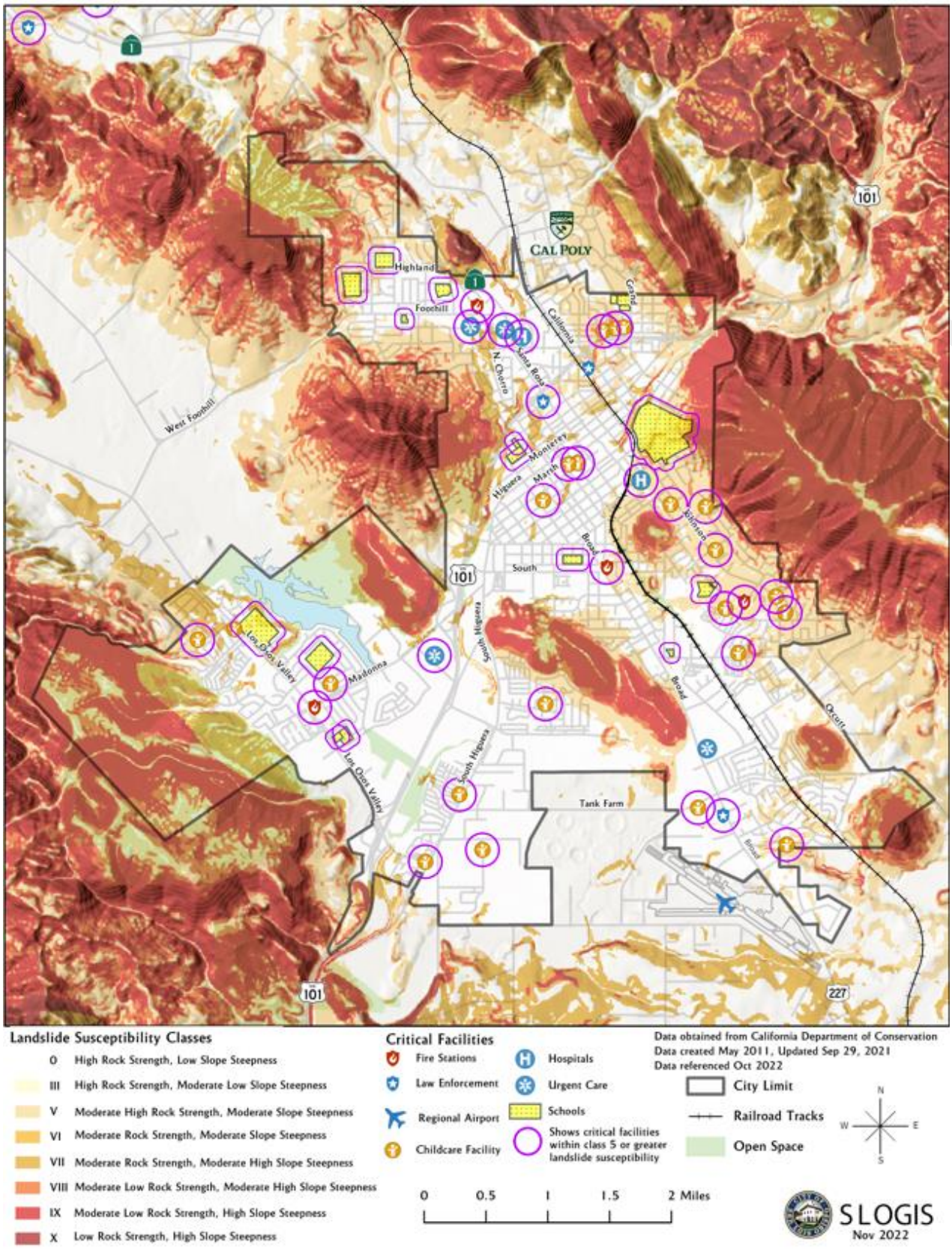


Figure 17 Landslide Susceptibility Classes

Slope Instability and Landslides

Slope instability can occur as a gradual spreading of soil, a relatively sudden slippage, a rockfall, or in other forms. Causes include steep slopes, inherently weak soils, saturated soils, and earthquakes. Improper grading and manmade drainage can be contributing factors. Slope instability may result in gradual or sudden damage to buildings, roads, and utility lines. Sudden movement can be a threat to lives through immediate injury or suffocation, or loss of access.

In the late 1990s, rain-saturated soil moved above houses on the Santa Lucia foothills.

Much of the development in San Luis Obispo is in valleys, where there is low potential for slope instability. However, the city contains extensive hillsides. Several are underlain by the rocks of the Franciscan group, which is a source of significant slope instability. The actual risk of slope instability needs to be identified by investigation of specific sites, including subsurface sampling, by qualified professionals.

The building code requires site-specific investigations and design proposals by qualified professionals in areas that are susceptible to slope instability and landslides.

Damage-Prone Buildings

Any type of building can be damaged in an earthquake, but some types are much more able to withstand quakes. In the past, many buildings were constructed of clay blocks, bricks, stone, or concrete blocks, with few or no steel members to resist separation of the masonry units. The weight and lack of connectivity within these unreinforced masonry buildings make them a particular threat to safety in an earthquake. Because many unreinforced masonry buildings have historic and architectural value, and contain viable businesses, there is reluctance to remove or replace them quickly. State law has required the City to identify unreinforced masonry buildings and implement a locally devised program to reduce risks. The City has surveyed them and required owners to evaluate their deficiencies and reinforcing needs. The City requires upgrades as buildings are remodeled or uses change, and provides fee credits to help offset some of the cost. A City law required the owners to complete seismic upgrades or demolish the buildings by 2017.

Some non-masonry buildings are especially prone to earthquake damage because they lack connections to their foundations or resistance to side-to-side motion. Examples include wood-frame buildings with apartments over garages that have one side occupied by a door opening, and hillside houses with little or no bracing for tall supports on the downhill side. The City participates in a rehabilitation loan program and a Voluntary Seismic Retrofit Program that includes standard retrofit plans for free that helps correct such problems, along with other measures such as bracing masonry chimneys and anchoring water heaters, mainly for older homes.

Expansive Soils

Expansive soils can change dramatically in volume depending on moisture content. When wet, these soils can expand; conversely, when dry, they can contract or shrink. Sources of moistures that can trigger this shrink-swell phenomenon include seasonal rainfall, landscape irrigation, utility leakage, and/or perched groundwater. Expansive soil can develop wide cracks in the dry season, and changes in soil volume have the potential to damage concrete slabs, foundations, and pavement. Special building/structure design or soil treatment are often needed in areas with expansive soils

POLICIES

Policy GE-6.1: Avoiding Faults

The City shall prohibit development atop known faults. Applications for development approvals within 100 meters (330 feet) of any fault that is previously known or discovered during site evaluation shall be subject to review and recommendation by a State-registered engineering geologist.

Policy GE-6.2: Avoiding Slope Instability

Development shall not be located on or immediately below unstable slopes, or contribute to slope instability. Any development proposed in an area of moderate or high landslide potential shall be subject to review and recommendation by a State-registered engineering geologist.

Policy GE-6.3: Avoiding Liquefaction Hazards

Development shall not be located in areas of high liquefaction potential unless a site-specific investigation by a qualified professional determines that the proposed development will not be at risk of damage from liquefaction. The Chief Building Official may waive this requirement upon determining that previous studies in the immediate area provide sufficient information.

Policy GE-6.4 Structural Stability

Require new development to ensure structural stability while not creating or contributing to erosion, subsidence, or geologic instability or destruction of the site or surrounding area. Ensure that soils reports are prepared by a licensed civil engineer with expertise in soils and geology. Prior to acceptance, require soils reports by a certified engineering geologist when developing in the following areas:

a. Expansive soils and potential for subsidence
b. All areas having cut or fill material on property
c. Where there are known or suspected geologic, soils or hydrologic problems in the immediate vicinity.

PROGRAMS

Program GE-6.5: Update The Hillside Planning Program

Update the City's Hillside Planning Program to ensure orderly development along the City's hillside areas prioritizing slope stability, safe access, circulation, and evacuation routes.

Program GE-6.6 Safeguard The Integrity Of Utility Conveyance Systems

Incorporate climate models and hazard impact assessment in the design and planning of maintenance and upgrades of public utility conveyance systems.

7. City Operations and Emergency Services

OVERVIEW

The City has a comprehensive set plans, policies, and procedures in place to prepare for and respond to a variety of emergency events. In coordination with San Luis Obispo County, the City provides emergency services to the community.

EMERGENCY OPERATIONS

City government consists of approximately 457 regular full-time employees and 8 regular part-time employees and 11 departments at the time of the Climate Adaptation and Safety Element update. Key departments involved in emergency operations activities include:

- The City of San Luis Obispo Police Department;
- The City of San Luis Obispo Fire Department;
- The City of San Luis Obispo Utilities Department;
- The City of San Luis Obispo Public Works Department;
- The City of San Luis Obispo Parks & Recreation Department; and
- The City Manager's Office.

The City has many staff with specific training on the use of specialized equipment or areas of expertise that are essential in implementing mitigation actions. Additionally, the City has several key planning documents related to emergency operations that help support emergency operations. These plans and a brief description of their content and purpose are included below.

Emergency Operations Plan– This Plan provides policy and guidance for the coordination of planning efforts involving the City and related organizations. The San Luis Obispo Fire Department is responsible for Disaster Leadership and Preparedness coordination and will regularly revise and exercise Hazard Specific Annexes and related support materials, as appropriate. The 2022 Emergency Operations Plan covers the following types of major events:

- Earthquake
- Hazardous Materials Release

- Multiple Casualty Event
- Transportation
- Fire
- Civil Disturbance-Terrorism-Active Shooter
- Diablo Canyon Nuclear Power Plant
- Adverse Weather
- Utility Disruption
- Pandemic

The Emergency Operations Plan also provides resource materials for staff in the event of an Emergency Operations Center activation, such as position specific checklists, resource directory, and specific plans related to debris management, disaster recovery, and Continuation of Operations and Reconstitution of Government.

City of San Luis Obispo Hazard Mitigation Plan (Annex G in the San Luis Obispo County Multi-Jurisdictional Plan) – The 2020 San Luis Obispo County Multi-Jurisdictional Hazard Mitigation Plan was adopted by the City in June 2020. It includes a profile of existing hazards in the city, assess the probability and severity of each hazard event, and includes a comprehensive set of mitigation actions and implementation strategies while taking into account agency capabilities to help the City reduce risk from the identified hazards. To remain eligible for many state and federal funding, grants and assistance programs, the City must update the Hazard Mitigation Plan, at a minimum, every 5 years, which is based on the date of FEMA plan approval.

The City also coordinates with many external agencies (e.g., local, state, federal, private sector, and non-profits) which have capabilities to support hazard mitigation activities. Many of these agencies participated in the hazard mitigation planning process, including the following:

- County of San Luis Obispo – Airports
- County of San Luis Obispo – Office of Emergency Services
- County of San Luis Obispo – Public Health Department
- Cal Poly – City & Regional Planning Department
- Cal Poly – Administration and Finance
- French Hospital Medical Center
- American Red Cross
- Sierra Vista Regional Medical Center
- San Luis Coastal Unified School District
- California Highway Patrol
- PG&E
- San Luis Obispo County Fire Safe Council

In addition to the plan and policy resources available to the City to mitigate hazards, the City has developed or participated in several hazard mitigation programs including:

- Unreinforced Masonry Hazard Mitigation Program
- Disaster Preparedness Program
- Floodplain Management Educational Program
- San Luis Obispo Chamber of Commerce Business Continuity Planning
- County Public Health Emergency Preparedness Advisory Committee
- National Flood Insurance Program and FEMA Repetitive Loss Properties
- Community Wildfire Protection Program
- Greenbelt Protection Program

CRITICAL FACILITIES

Critical facilities and infrastructure provide essential services to the public, such as preserving the quality of life and providing essential public safety, emergency response, and disaster recovery functions. Different types of critical facilities include medical facilities, evacuation and community centers, potable water and wastewater facilities, fire stations, and local law enforcement stations. The County's HMP organizes critical facilities the following four categories:

Emergency Services – Facilities or centers aimed at providing for the health and welfare of the whole population (e.g., hospitals, police, fire stations, emergency operations centers, evacuation shelters, schools).

Lifeline Utility Systems – Facilities and structures such as potable water treatment plants, wastewater, oil, natural gas, electric power and communications systems.

Transportation Systems – These include railways, highways, waterways, airways, and city streets to enable effective movement of services, goods and people.

High Potential Loss Facilities – These include nuclear power plants, dams, and levees.

Transportation infrastructure is discussed in greater detail in Section 3.1, "Assets at Risk" of the Hazard Mitigation Plan. Table 6 includes the City's critical facilities and infrastructure are that have been evaluated for their replacement value and are included in Appendix G of the Hazard Mitigation Plan.

Table 6 Critical Facilities and Infrastructure in the City of San Luis Obispo

Category	Facility/Infrastructure Asset
Community and Recreational Facilities	City Hall
	Library
	Ludwick Community Center
	Meadow Park Recreational Center
	Mitchell Park Senior Center
	Sinsheimer Pool and Park
Medical Facilities	Sierra Vista Regional Medical Center
	French Hospital Medical Center
Schools	California Polytechnic State University
	Cuesta College
	Laguna Middle School
	San Luis Obispo High School
Infrastructure	Critical Bridges
	Essential Bridges
	Higuera Box Culvert
	Evacuation Route Roads
	Other Essential City-Owned Roads
	Communication Towers
Other City-Owned Facilities	City Corporation Yard

Category	Facility/Infrastructure Asset
	Community Development and Public Works Administration
	Parking Garages
	Parks and Recreation Building
	Prado Day Center
	Utilities Administration
Police and Fire Stations	Dispatch Center
	Fire Station #1
	Fire Station #2
	Fire Station #3
	Fire Station #4
	Police Main Building, Garage, Annex
Potable Water and Wastewater Facilities	Fire Station #4 Well
	Pacific Beach Well
	Reservoirs
	Eight Sewer Lift Stations
	Sewer System Infrastructure (pipes) – Approx. 140 miles
	Water Resource Recovery Facility
	Seven Water Pump Stations
	Water System Infrastructure (pipes) – Approx. 180 miles
	Eleven Treated Water Storage Tanks
	Water Treatment Plant

Note: N/A = not available.

Source: Modified from Table G.9 in San Luis Obispo County 2019b.

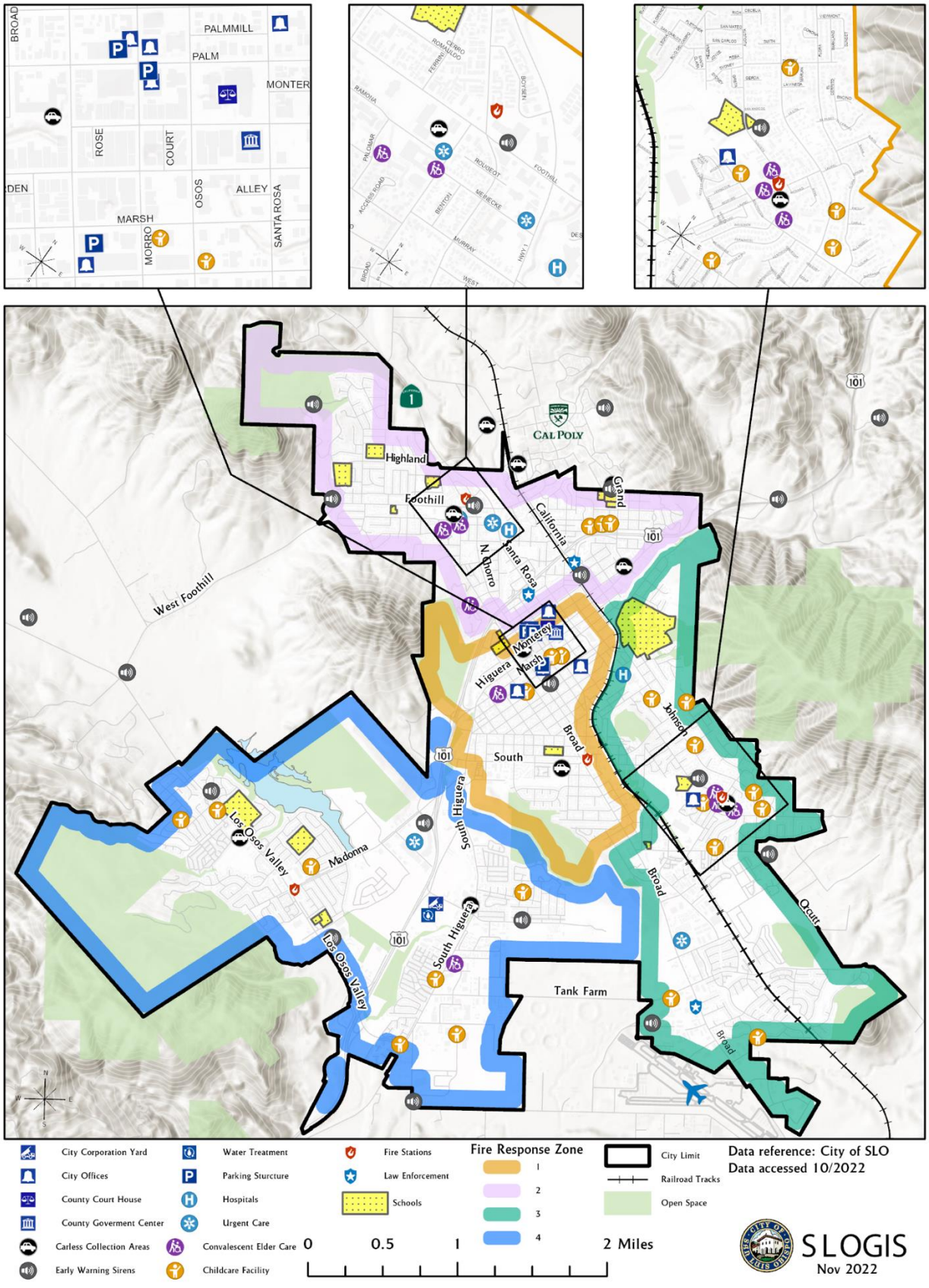


Figure 18 Map of Critical Facilities in San Luis Obispo

ACCESS AND EVACUATION

Per California Senate Bill 99 (SB99) the City has completed analysis to identify residential developments in hazard areas, including wildfire (Cal Fire Very High Hazard Severity Zones), flood (FEMA 100 and 500-year flood zones) and geological (areas of high landslide potential), that do not have at least 2 emergency evacuation routes. The analysis produced figure 18 which will be utilized to inform access and evacuation planning efforts and emergency operations conducted by the City.

RADIATION HAZARDS

The Diablo Canyon Power Plant is the primary hazard for ionizing radiation in the San Luis Obispo area. Risks result from the potential for mistakes during day-to-day operations, accidents associated with refueling, and damage from earthquakes or other causes. There is added risk from on-site storage of spent fuel that remains radioactive for several generations. Long-term, off-site storage facilities for spent fuel are not available. Protective systems are installed, and emergency plans are in place in the event that any part of the reactor system fails. Diablo Canyon is scheduled to be decommissioned in 2025 with potential extended operations through 2030 per Senate Bill 846 (SB 846, Dodd). Decommissioning will take approximately ten years after units are shutdown. The plant operator and local agencies have jointly prepared plans for warning, sheltering, evacuation, and other responses to radiation emergencies. Updated information regarding the Emergency Response Plan is distributed to the public each year.

Relatively low-level radioactive materials and waste result from some medical facilities and other sources. The use, transportation, and disposal of these materials are governed by State and Federal regulations.

Radon is a naturally occurring gas produced by the breakdown of traces of uranium in certain soils and rocks. This gas can accumulate inside structures where building materials emit or trap radon, posing a significant health hazard. Soils and rocks in the San Luis Obispo area are not known to be sources of radon, so it is not considered a substantial local hazard.

HAZARDOUS MATERIALS

Hazardous materials include a wide range of solids, liquids, and gases that are flammable, explosive, corrosive, or toxic. Because large amounts of hazardous materials are shipped through the San Luis Obispo area daily, transportation accidents pose the most significant hazardous material risk to residents and the environment. Hazardous materials are transported along highways, the railroad, and pipelines, which pass through the city.

Public exposure to hazardous materials also can result from their use by industry, agriculture, and services. In 2022, there were about 195 businesses in the city using hazardous materials in sufficient quantities to require filing a report with the Fire Department, as required by the California Health and Safety Code. Household use of hazardous materials is also a threat to health and the environment if used or disposed of improperly.

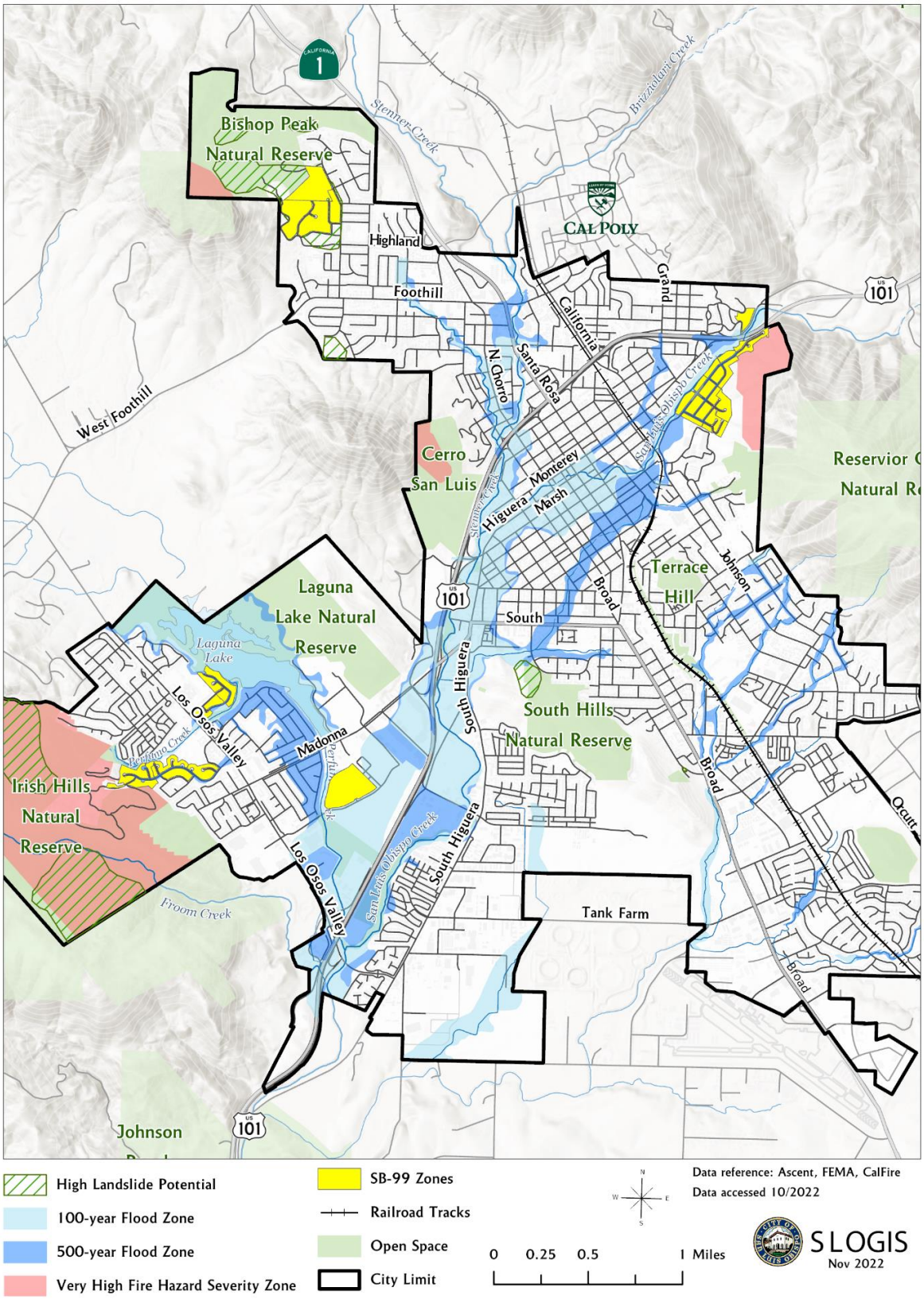


Figure 19 Limited Evacuation Route Areas (SB-99 Zones)

AIRPORT HAZARDS

The San Luis Obispo County Airport provides commuter, charter, and private service to the area. The primary hazard associated with the airport is the risk of aircraft crashing on approach and take-off. Aircraft flight operations are determined largely by the physical layout of the airport and rules of the Federal Aviation Administration. Activities on the airport property are managed by the County.

Existing land uses under the approach and take-off paths include agriculture and businesses close to the airport, and shopping centers, dwellings, and schools at greater distances. State law requires the independent, countywide Airport Land Use Commission to adopt an Airport Land Use Plan for each airport. This plan establishes zones based on flight patterns, with the aim of having future development be compatible with airport operations, considering safety and noise exposure. State and County policies encourage future development to be consistent with the Airport Land Use Plan.

On May 26, 2021, The County of San Luis Obispo Airport Land Use Commission (ALUC) adopted the Amended and Restated San Luis Obispo County Regional Airport (SBP) Land Use Plan (ALUP) including Safety Zones as depicted in Figure 19. In accordance with state law, unless an overrule action is taken, the City's General Plan is required to be consistent with the ALUP. City actions to approve permits, entitlements, or other land uses and project development must be consistent with policies of the ALUP and/or specific plans which were found consistent with the ALUP at the time of the update.

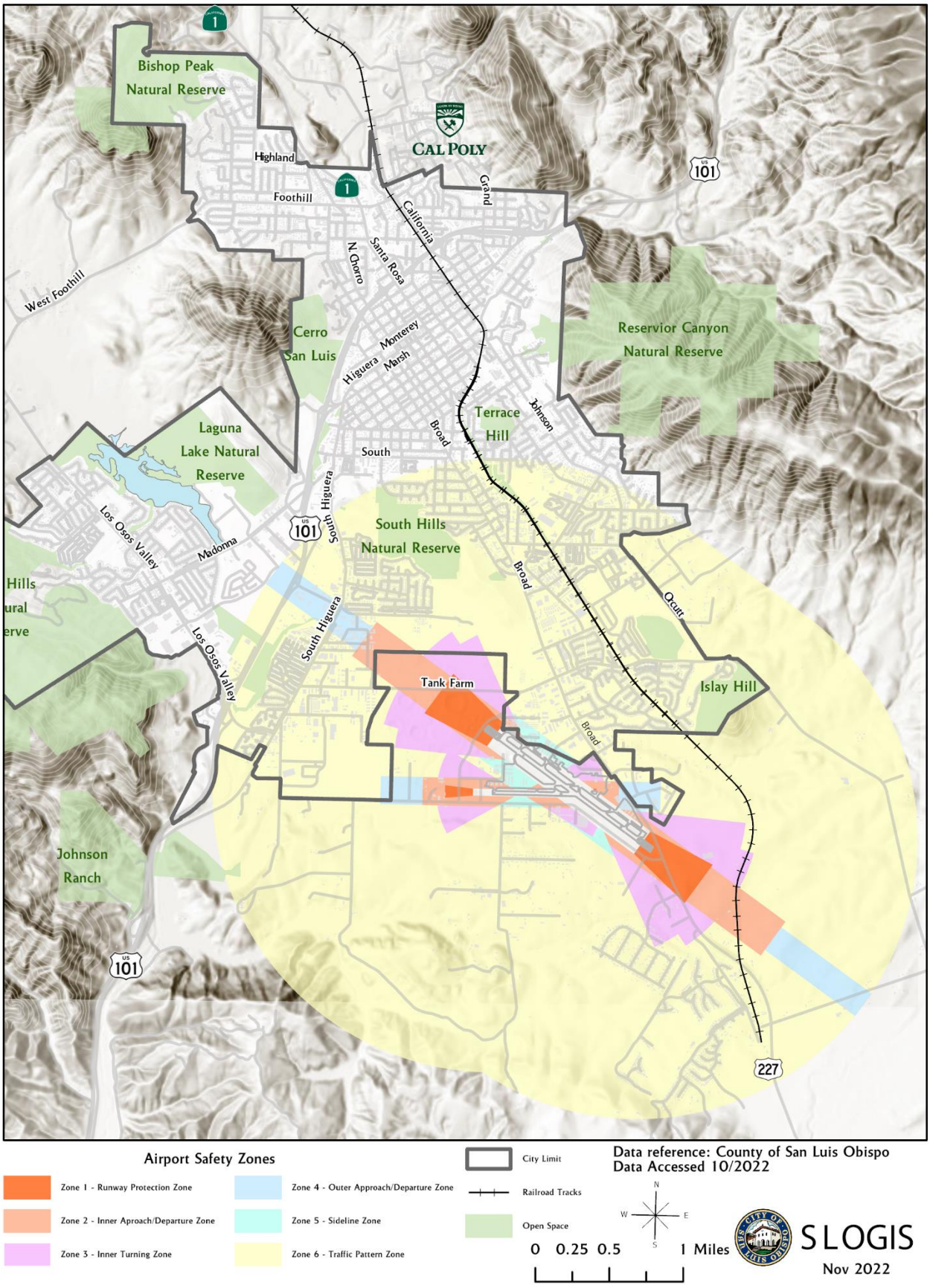


Figure 20 ALUP Safety Zones

CITY OPERATIONS AND EMERGENCY SERVICES POLICIES

Policy OP-7.1: Emergency Preparedness and Response

Ensure the City and all relevant City departments have adequate planning, organization, and resources for emergency preparedness and emergency response.

The following response-time programs are intended to apply to recurrent types of emergencies, not rare, area wide disasters:

A. The Fire Department has set a response-time objective of four minutes. (The Fire Department's Master Plan recommends that a three-person engine company, with paramedic, meet this standard 90 percent of the time).

B. The Police Department has set a one-third (33%) available-time objective for patrol response. ("Available time" is the fraction of total time that a patrol unit is not previously assigned or otherwise unavailable for response to a new emergency call for service.) The presence of available time during a shift allows Officers to perform proactive policing methods to deter and prevent crime, rather than responding to crime once reported.

Policy OP-7.2: Climate-Informed Emergency Operations Planning

The City shall incorporate climate projections and climate impact data into the Emergency Operation Plan updates.

Policy OP-7.3: Emergency Access and Evacuation

Substantial development will be allowed only where multiple routes of road access can be provided, consistent with other General Plan policies on development location and open space protection and community risk reduction. "Substantial development" means industrial, commercial, and institutional uses, multifamily housing, and single-family dwellings in accordance with adopted fire code. "Multiple routes" include vehicle connections that provide emergency access only, as well as public and private streets.

Policy OP-7.4: Minimizing Hazardous Materials Exposure

The City shall minimize people's exposure to hazardous substances through ensuring businesses that use, store, or transport hazardous materials to take adequate measures to protect public health and safety.

Policy OP-7.5: Mitigating Hazards from New Development

New development with sensitive land uses shall be buffered from stationary sources and mitigated from non-stationary sources of pollution. Development, including access and utility systems, shall be directed away from hazardous areas as described in the Hazard Mitigation Plan. Where development, including access and utility systems, cannot avoid hazardous areas, the development shall adequately mitigate the hazards and provide that the City and all relevant City departments have adequate planning, organization, and resources for emergency preparedness and emergency response. Hazard mitigation measures shall not significantly impact the environment, including wildlife habitats. Development shall pay an equitable share of

the costs to mitigate area wide hazards. Hazard mitigation measures shall not burden taxpayers with high maintenance costs. Development shall not increase hazards for other properties in the area.

Policy OP-7.6: Hazardous Materials in City Operations

The City shall avoid using hazardous materials in its own operations to the greatest extent practical, and will follow all established health and safety practices when they are used. When managing pests and invasive plants, the City should use Integrated Pest Management practices and avoid the use of chemical insecticides and herbicides to the greatest extent practical.

Policy OP-7.7: Business and Economic Resilience

The City shall incorporate climate projections and climate impact data to develop business and economic resiliency.

Policy OP-7.8: Climate Change and Food Security

The City shall minimize potential impacts of climate hazards on food security.

CITY OPERATIONS AND EMERGENCY SERVICES PROGRAMS

Program OP-7.9: Climate Resilience Fund

Establish a Climate Resilience Fund to support the implementation of climate adaptation strategies identified in the Community Safety and Resilience Element by identifying and pursuing funding and financing opportunities for specific climate adaptation and climate-related hazard mitigation strategies. Identify high-priced climate adaptation strategies or capital improvement projects and research the feasibility of financing these efforts through green bonds or similar financing mechanisms.

Program OP-7.10: Emergency Operations Center

The City will maintain an Emergency Operations Center Plan, to prescribe the intended activation and operation of a single facility from which disaster response and essential city services will be supported. Fire Station 1 will serve as the Emergency Operations Center, with the Ludwick Center serving as the back-up emergency operations center. The Corporation Yard and the Police Station serving as department operating centers or tertiary back-up emergency operation centers if the primary and back-up locations are not viable. The primary Emergency Operations Center will transfer to the new Public Safety Center located at the existing Police Headquarters when construction is complete, and occupancy is permitted, at which time, the Fire Department will become the back-up EOC. The City will maintain back-up power sources for the primary and secondary EOC. If a permanent back-up power source is not feasible, the City will maintain portable back-up power sources.

Program OP-7.11: Clean-Energy Microgrid for City Facilities

Continue supporting the City's current Carbon Neutral City Facilities plan. As part of this plan, if appropriate, conduct a feasibility study for developing a clean energy microgrid for key City facilities to provide clean, and reliant back-up power during utility disruptions (e.g., Public Safety Power Shutoffs or other disruptions) as well as providing local solar power to City facilities for non-emergency use during the day. Ensure that the feasibility study includes the following details to allow for the development of a City microgrid, if deemed feasible:

- A review of regulatory and operational considerations
- A conceptual shovel-ready design of the technical components for a fully connected microgrid and an "islandable" solar + storage system
- A phasing strategy and procurement plan for implementation
- An operational strategy that includes governance and cybersecurity
- Key considerations for operation of the microgrid during short-term and long-utility disruptions

Seek funding sources including the California Energy Commission's Electric Program Investment Charge (EPIC) Program and the Pacific Gas and Electric Community Microgrid Enablement Program (CMEP) to conduct a feasibility study.

Program OP-7.12: Critical Facilities Locations

The following City facilities are necessary for community function and emergency response:

- fire stations
- police main station
- water treatment plant
- raw water storage reservoirs/lakes
- wastewater treatment plant
- public works and utilities corporation yards
- principal telecommunications facilities

New City Critical facilities should not be located in 100-year floodplains, in areas of high or extreme wildland fire hazard, on sites subject to liquefaction or landslide (as distinguished from areas with potential for these hazards), atop earthquake faults or withing State-designated special studies zones, or where prohibited by the Amended and Restated San Luis Obispo County Regional Airport (SBP) Land Use Plan (ALUP). Where city operated critical facilities are located in these high hazard areas, they shall be flood protected and the city will identify, and when feasible, implement, mitigation strategies to limit the impacts of associated hazards.

The following facilities operated by entities other than the City, which are necessary for community function and emergency response, should not be located in 100-year floodplains, in areas of high or extreme wildland fire hazard, on sites subject to liquefaction or landslide [as distinguished from areas with potential for these hazards], atop earthquake faults or within State-designated special studies zones, or where prohibited by the Amended and Restated SBP ALUP:

- hospitals
- Caltrans and utilities corporation yards
- principal electrical substations
- principal natural gas transmission mains and pumping stations

- principal public-utility telecommunications and emergency broadcast facilities
- resilience hubs and community centers

Program OP-7.13: Water System Response Performance Standards

The City will evaluate fire-flow capacities and identify deficiencies through testing and modeling of the public water system. For identified deficiencies, the Utilities and Fire Departments will propose remedies to meet recommended service levels based American Water Works Association (AWWA) standards and Fire Code regulations.

Program OP-7.14: Reducing Structural Hazards

The City will identify and evaluate hazards in existing structures and work toward reducing those hazards to acceptable levels of risk. The City will advocate that other organizations and agencies do the same. Highest priority will be given to critical facilities (listed in Program OP-7.12) and transportation facilities. This overall effort has five basic components:

A. The City's continuing steps to evaluate, maintain, and replace its own facilities, in particular bridges, public assembly rooms, fire stations, water tanks, and water and wastewater treatment plants.

B. Routine inspections for code compliance in commercial, industrial, public-assembly, group-housing, and multifamily residential buildings.

C. Complaint-based inspections for code compliance in all buildings.

D. Implementation of the City-adopted program to identify and mitigate hazards of unreinforced masonry buildings.

E. Subject to adequate resources being provided through the budget process, outreach for private, woodframe buildings involving attachments to adequate foundations, cripple-wall bracing, water-heater attachment, and bracing or attachment of masonry chimneys.

Program OP-7.15: Coordinated Emergency Planning

The City will work within the Standardized Emergency Management System, an emergency response and coordination system used throughout California, the National Incident Management System, and the National Response Framework. The City will participate in periodic disaster-response drills, on a regional basis with all involved jurisdictions and involving the news media.

The City will review the SB99 Analysis, the hazard assessment studies and emergency response plans of utilities and of transportation agencies and companies operating in the San Luis Obispo area, and update the City's Emergency Plan, including evacuation routes, as necessary.

The City will work with Caltrans to assure transport of hazardous materials follows Caltrans-approved routes, with all necessary safety precautions taken to prevent hazardous materials spills. The City will train fire fighters, police officers, building inspectors, and public works.

Program OP-7.16: Climate Resiliency Checklist for New Development

Similar to the City's GHG Emissions Analysis Compliance Checklist, develop a Climate Resiliency Checklist to ensure that new residential and nonresidential development in the city is

designed and built to withstand the forecasted impacts of climate change and incorporate Environmental Justice. Incorporate all appropriate policies related to new development that are included in the Community Safety and Resilience Element into the checklist. Items in the Climate Resiliency Checklist should be objective and comply with all relevant housing laws to eliminate discretionary review. Checklist items could include:

A. Energy design standards that incorporate future changes in annual average minimum and maximum temperatures

B. Additional battery storage requirements for certain types of development to mitigate impacts from future utility disruptions

C. Defensible space and home hardening requirements for development located in high wildfire risk areas designated by the City

D. Additional building design or site plan requirements to mitigate flood-related impacts in areas with current or future flood risk

E. Additional building design or landscaping requirement to reduce water consumption in new development

Program OP-7.17: Development Review and Inspections

The City will maintain and administer its Zoning and Subdivision Regulations and Community Design Guidelines in conformance with the General Plan. The standards and guidelines will be consistent with the requirements and recommendations of City police and fire departments.

A. City fire, police, public works, and utilities personnel will review applications for subdivisions and development projects, for consistency with safety objectives.

B. The City will maintain and administer its building and fire regulations in conformance with State requirements, including adoption of updated editions of uniform codes.

C. The City will conduct safety inspections for fire and hazardous materials in commercial, industrial, and multifamily residential buildings.

Program OP-7.18: Staff Training

The City will train fire fighters, police officers, building inspectors, and public works and utilities staff to levels appropriate for their tasks and responsibilities. The City will provide training for those of its staff who apply its building regulations and planning standards, emphasizing the lessons learned in locations that have experienced disasters. The City will conduct disaster-response exercises for the types of non-nuclear disasters discussed in this element, coordinated with participation in required, periodic nuclear-disaster response training exercises. All public employees in the State of California are considered Disaster Service Workers (DSW) and as such the City will train all employees to ensure basic understanding of DSW responsibilities, the State Emergency Management System, National Incident Management System and the Incident Command System.

Program OP-7.19: Building City Capacity for Climate Resilience

Identify key gaps in the City's knowledge of climate adaptation planning and how to integrate the topic into work efforts. Establish a 1–3 year strategy and workplan to increase City staff capacity to fully integrate climate change adaptation as a key component of their work for

appropriate departments and staff. Assess progress towards increasing staff capacity to address climate change on an annual basis and adjust strategy accordingly based on results and new information and guidance regarding climate adaptation planning. Establish the City's Green Team as the official working group to help implement the suite of climate adaptation strategies included in the Climate Adaptation and Safety Element, identifying representatives from key City departments to lead climate adaptation efforts in those departments.

Program OP-7.20: Traditional Ecological Knowledge

Work with the yak tityu tityu yak tiłhini (Northern Chumash Tribe San Luis Obispo County and Region (ytt Tribe)), Northern Chumash Tribal Council, and other tribal bodies listed by the Native American Heritage Commission to incorporate Traditional Ecological Knowledge approaches into the City's Conservation Guidelines for Open Space Lands.

Program OP-7.21: Climate-Smart Pest Management

Integrate Climate-Smart Pest Management Practices into the City's Open Space Conservation Guidelines with consideration of how climate change is going to affect pest control and invasive species.

Program OP-7.22: Climate Informed Emergency Operation Plan

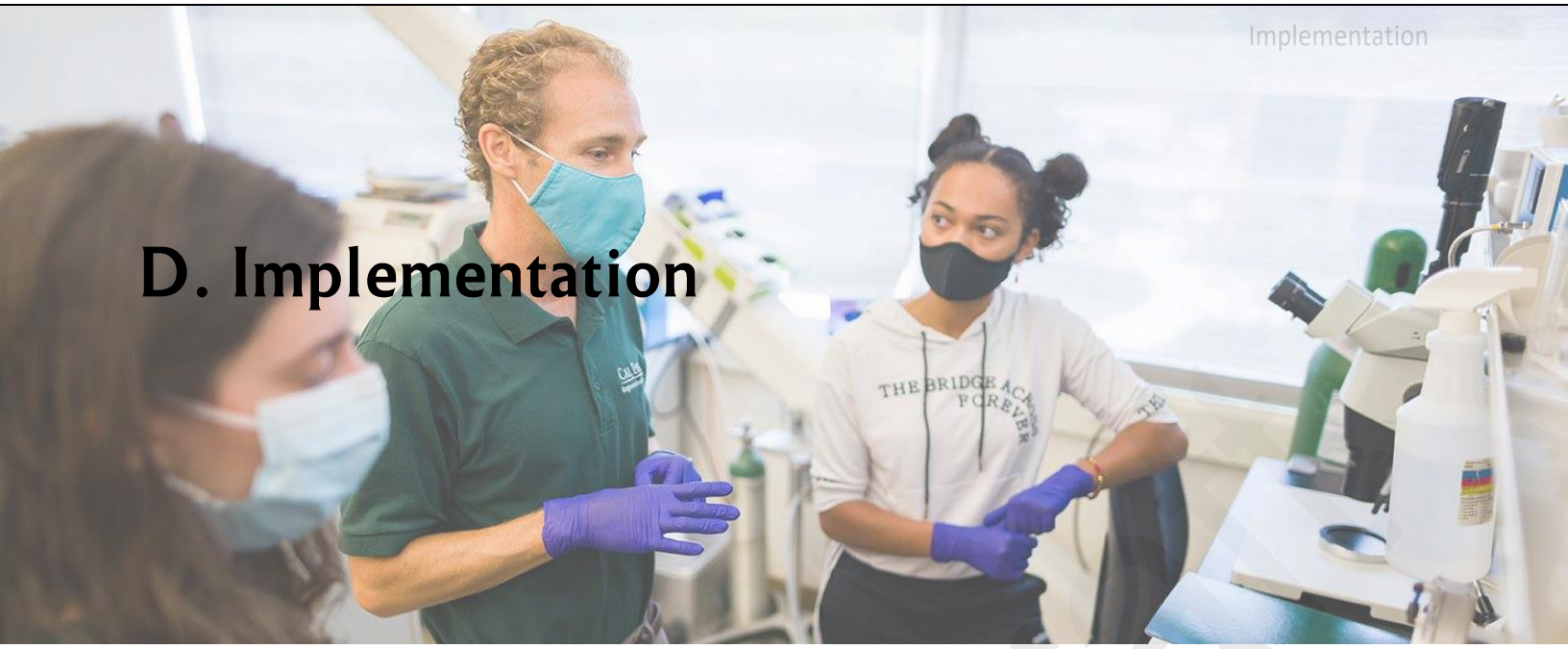
During the City's next comprehensive update of the Emergency Operations Plan (EOP), incorporate climate projections and climate impact data from the Climate Change Hazards and Vulnerabilities Report into the plan's hazard identification and analysis to ensure hazard specific annexes address climate-related disasters. Analyze future staffing and resource requirements to adequately address the future frequency and intensity of climate-related hazards in the city. Develop protocols for novel climate-related hazards that the city has previously experienced which are not adequately addressed in existing EOP hazard-specific annexes.

Program OP-7.23: Climate Informed Economic Development Strategic Plan

Work with the local business community to identify key economic sectors that are vulnerable to impacts from climate-related hazards and other hazards identified in the Hazard Mitigation Plan (e.g., tourism) and develop a strategy to diversify the City's economy to avoid overreliance on economic sectors that are vulnerable to climate impacts and local hazards. Work with the San Luis Obispo Chamber of Commerce to identify businesses and local industries already being affected by climate-related impacts (e.g., drought, wildfire smoke, extreme heat, flood) and identify opportunities to help support affected industries. Where economic vulnerabilities pose a risk to ongoing City revenues, develop programs to bolster the City's financial resilience through a Resilience Fund or other measures.

Program OP-7.24: Food Security

Work with community organizations (e.g., SLO Food Bank) and the SLO County Health Department to assess potential impacts of climate hazards on food availability, food prices and food insecurity in the city, particularly for disadvantaged communities. Partner with community organizations to address food insecurity including opportunities to support food recovery efforts as part of implementation of Senate Bill 1383 to reduce food waste and associated greenhouse gas emissions.



D. Implementation

OVERVIEW

This section provides information on how the City can successfully implement the set of policies and programs included in the Climate Adaptation and Safety Element. It describes how best to conduct ongoing community engagement during implementation as well as develop key regional and community partnerships to ensure successful implementation of the policies and programs. The section also identifies appropriate funding and financing sources to support implementation. Finally, the section provides a succinct timeline to help the City prioritize implementation of the policies and programs.

COMMUNITY ENGAGEMENT AND PARTNERSHIPS

Effective implementation of the policies and programs in the Climate Adaptation and Safety Element will require sustained collaboration with community partners and regional agencies, as well as collaboration among City departments. Collaboration with partners during the strategy implementation process ensures that knowledge and resources will be shared and allows the City to implement strategies effectively. Many of the strategies that focus on hazard preparedness involve helping residents prepare their household and neighborhoods for climate-related hazards (e.g., flooding, heat wave events). By conducting community outreach and involving residents in the implementation process, the City will ensure that the community overall will be better prepared to respond to and adapt to changing circumstances, whether they are chronic stresses, such as climate change, or acute shocks, such as an earthquake. Community engagement during implementation can also help create a committed group of community stakeholders who will help implement strategies and help create sustained commitment in the community for achieving successful implementation (Cal OES 2020). The City will utilize a whole Community approach which will attempt to engage the full capacity of the private and nonprofit sectors, including businesses, faith-based and disability organizations, and the general public, in conjunction with the participation of local, tribal, state, territorial, and Federal governmental partners. This Whole Community approach is a means by which residents, City officials, organizational and community leaders can collectively understand and assess the needs of their respective communities and determine the best ways to organize and strengthen their assets, capacities, and interests (FEMA 2011).

SUSTAINED COMMUNITY ENGAGEMENT

The City will need to host community outreach events to gather input on how best to implement the strategy and identify community priorities to help design strategy implementation. Many of the programs in the element will require sustained community participation or comprehensive infrastructure updates, requiring significant City staff time and resources. By conducting sustained community outreach during implementation, the City can gain support and buy-in from members of the community who will help advocate for and support implementation of these strategies.

The City is developing an interactive website that will provide a platform for easy access for residents and serve as a real-time tool to monitor and provide input on implementation of specific strategies. The website will also serve as a platform for community members to receive the most up-to-date information on ways to get involved in implementation of certain strategies, attend community events, and participate in other activities to support implementation. The website will be updated regularly to report progress on implementation of individual strategies.

IMPLEMENTATION WORKPLAN

The tables included in this section provides a ten-year timeline for when programs related to each hazard in the element should be implemented by the City. The implementation timelines have been designed to account for overlaps in similar programs to maximize the City's capacity and resources for implementation as well as for the time required for the strategy to be fully implemented and become effective in mitigating various hazard.

PROGRAM IMPLEMENTATION TIMELINE

Program	Program Name	Lead Department	Immediate	Near Term (2023-27)	Long term (by 2035)	Ongoing
High Impact Multi Hazard Resilience Solutions						
MH-1.5	Update the City's Capital Improvement Program to Incorporate Climate	Public Works		x		
MH-1.6	Update City's Engineering Standards and Specifications to Incorporate	CDD		x		
MH-1.7	Climate Smart Natural Resource Management	Office of Sustainability				x
MH-1.8	Climate Resilience Hubs	Office of Sustainability		x		
MH-1.9	Post-Disaster Recovery Debris Management	CSG	x			
MH-1.10	Post-Disaster Recovery Resources and Education	CDD		x		
MH-1.11	Regional Collaboration and Community Resilience Ambassadors	Office of Sustainability				x
Environmental Justice						
EJ-2.3	Empower Community Organizations	Office of Sustainability	x			
EJ-2.4	Ensure Public Engagement Noticing Manual Advances Procedural Equity	Office of Diversity,	x			
EJ-2.5	Develop Equity Checklist for City Programs and Capital Improvement	Public Works	x			
EJ-2.6	Establish Community Resilience Fund	Administration				
EJ-2.7	Report on Equity and Environmental Justice Progress	Administration	x			
Flooding						
FL-3.7	Waterway Management Plan	Office of Sustainability		x		
FL-3.8	Flood Damage Prevention	Office of Sustainability		x		
FL-3.9	Sustainable Flood Management and Open Space	CDD				x
FL-3.10	Urban Creeks Vegetation Management Plan	Office of Sustainability		x		
FL-3.11	Flood-Prepared Neighborhoods Program	Fire Department				x
FL-3.12	Community-Driven Flood Education	Administration				x
FL-3.13	Flood Warning Monitoring System	CDD	x			
FL-3.14	Research and Develop Flood Protection Measures	CDD		x		
Extreme Heat						
HE-4.4	Urban Heat Island Mitigation Program	CDD			x	
HE-4.5	Climate-Smart Urban Tree Canopy	Public Works				x
HE-4.6	Community Cool Zones Network	CDD		x		
HE-4.7	Green and Healthy Buildings Program	Office of Sustainability				x

Program	Program Name	Lead Department	Immediate	Near Term (2023-27)	Long term (by 2035)	Ongoing
High Impact Multi Hazard Resilience Solutions						
HE-4.8	Extreme Heat and Emergency Preparedness	Fire Department				x
HE-4.9	Equitable Community Outreach for Extreme Heat	CDD	x			
Fire						
FI-5.12	Implement the Community Wildfire Protection Plan	Fire Department				x
FI-5.13	Implement the Vegetation Management Plan	Office of Sustainability				x
FI-5.14	Wildfire Ignition Source Reduction Program	Fire Department				x
FI-5.15	Wildland-Urban-Interface Defensible Space and Home Hardening Program	Fire Department		x		
FI-5.16	Resident Information and Training on Fire Hazards	Fire Department	x			
FI-5.17	Wildfire Smoke Protection Outreach Strategy	Fire Department				x
FI-5.18	Support Community Resilience During Public Safety Power Shutoffs	CDD				x
Earthquakes and other Geologic Hazards						
GE-6.5	Update the Hillside Planning Program	CDD			x	
GE-6.6	Inspect and Safeguard the Integrity of Utility Conveyance Systems	Utilities				x
City Operations and Emergency Services						
OP-7.9	Climate Resilience Fund	CDD	x			
OP-7.10	Emergency Operations Center	Fire & Police				x
OP-7.11	Clean-Energy Microgrid for City Facilities	Public Works				x
OP-7.12	Critical Facilities Locations	CDD				x
OP-7.13	Water System Response Performance Standards	Utilities & Fire	x			
OP-7.14	Reducing Structural Hazards	CDD	x			
OP-7.15	Coordinated Emergency Planning	Fire & Police				x
OP-7.16	Climate Resiliency Checklist for New Development	CDD	x			
OP-7.17	Development Review and Inspections	CDD				x
OP-7.18	Staff Training	Administration				x
OP-7.19	Building City Capacity for Climate Resilience	Administration		x		
OP-7.20	Traditional Ecological Knowledge	Office of Sustainability				x
OP-7.21	Climate-Smart Pest Management	Office of Sustainability	x			
OP-7.22	Climate-informed Emergency Operations Plan	Fire & Police		x		
OP-7.23	Climate-informed Economic Development Strategic Plan	Economic Dev.	x			

Program	Program Name	Lead Department	Immediate	Near Term (2023-27)	Long term (by 2035)	Ongoing
High Impact Multi Hazard Resilience Solutions						
OP-7.24	Food Security	Administration & DEI		x		

FUNDING AND FINANCING

Successful implementation of the resilience strategies will require both City staff time and resources. In many cases, it also will require funding for consultants to assist with implementation, as well as material costs to complete physical upgrades to the city's infrastructure and the built environment. For other strategies, the City will be able to integrate strategies into existing operations and procedures, as well as into already planned projects. The funding required to implement the strategies will need to come from a variety of sources, including both external funding opportunities, such as grants, and the internal funding sources devoted to climate resilience, such as general fund revenue sources. The following discussion identifies available external funding opportunities and presents a summary of internal funding mechanisms that the City can use to implement the strategies.

EXTERNAL FUNDING OPPORTUNITIES

Federal, State, and local grants can help fill the gap for projects that cannot be funded from the City's general fund or local funding mechanisms.

Federal Emergency Management Agency: Hazard Mitigation Assistance Grants

FEMA's hazard mitigation assistance grants provide funding for eligible mitigation measures that reduce disaster losses. FEMA administers four hazard mitigation assistance grant programs relevant to the City:

Hazard Mitigation Grant Program—Assists in implementing long-term hazard mitigation planning and projects following a Presidential major disaster declaration

Flood Mitigation Assistance Program—Provides funds for planning and projects to reduce or eliminate the risk of flood damage to buildings that are insured annually under the National Flood Insurance Program

Building Resilient Infrastructure & Communities—Support for states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards

Pre-Disaster Mitigation Program—Provides funds annually for hazard mitigation planning and projects

National Oceanic and Atmospheric Administration: Environmental Literacy Grants

The goal of this funding opportunity is to improve the environmental literacy of K–12 students and the public so that they are knowledgeable of the ways in which their community can become more resilient to extreme weather and other environmental hazards and become involved in achieving that resilience. Projects are intended to build the collective environmental literacy necessary for communities to become more resilient to the extreme weather and other environmental hazards they face in the short and long term.

U.S. Department of Agriculture: Conservation Innovation Grants

The Conservation Innovation Grant program is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging federal investment in environmental enhancement and protection, in conjunction with

agricultural production. These projects may be watershed-based, regional, or statewide in scope.

CivicSpark Program

The CivicSpark Program supports sustainability-focused research, planning, and implementation projects throughout California by providing public agencies and other organizations with capacity-building support to implement sustainability projects or programs from CivicSpark Fellows. Fellows serve for 11 months and can work on variety of issues including social equity, climate resilience, water resource management, affordable housing, and mobility.

California Climate Investments

California Climate Investments is a statewide initiative that directs funds from the State's Cap-and-Trade Program to projects and programs that work to reduce greenhouse gas emissions in the state. These funds can support a variety of projects, including affordable housing, renewable energy, public transportation, environmental restoration, more sustainable agriculture, and recycling. Numerous State programs, including some discussed above, are funded through California Climate Investments; however, the State's Cap-and-Trade Program continues to evolve and is updated by the State periodically to include new or modified programs.

LOCAL FUNDING AND FINANCING MECHANISMS

Considering that major updates to the City's built environment (e.g., flood management system) may be needed to help prepare for current or future climate-relate hazards, financing mechanisms may need to be leveraged to pay for projects with large upfront costs. Financing requires a source of repayment, commonly referred to as funding, to secure a large upfront payment that is then paid back over time with interest.

In California, laws and regulations that govern how revenue can be raised from taxes, assessments, and fees, combined with the need for a variety of public investments competing for the same dollars, can make securing funding a larger challenge than securing financing. Making a compelling case that ensures broad-based public support by clearly articulating the cost of inaction (e.g., what will be lost without the investment in the context of progressive climate impacts) and the resulting co-benefits is an important component of securing funding for climate-related investments through mechanisms such as taxes, assessments, and fees, as well as successfully pursuing grants and other external funding opportunities.

After funding is secured, typical financing mechanisms used by local governments include municipal bonds and loans, although in recent years, additional types of bonds that include consideration of characteristics that may be relevant for climate-related investments, such as green bonds, are now offered. Selection of a financing mechanism should be based on the total cost of the financing and its suitability for funding the needed investment.

The mechanisms discussed below are a few of those commonly used to implement climate adaptation projects, which may have multiple sources of funding and/or financing. An assessment of which mechanisms would be used to pay for resilience strategies would be conducted as the City begins to implement the policies and programs.

Funding

Taxes: The cost of large infrastructure projects can be offset through various tax mechanisms. For adaptation and resilience projects, a tax is generally a special tax that is implemented to pay for a specific project or program. Because of voter approval requirements, special taxes can be more difficult to develop without a clear understanding by the public of their purpose and the specific benefits they provide. Under California law, if a jurisdiction would like to adopt, increase, or extend a special tax, a two-thirds-majority approval is required. General taxes can pass with a simple majority. The following common types of taxes could be used to fund appropriate resilience strategies:

- Ad valorem property tax—This is a tax levied on property owners based on a property's value. It can be used only to finance voter-approved debt or finance bonds for infrastructure projects. The requirements for voter approval to raise property taxes depend on the type of infrastructure project being funded. In general, property tax increases for infrastructure bonds need approval by two-thirds of local voters.
- Parcel taxes—This is a form of property tax assessed based on certain established characteristics of a parcel rather than a rate based on the assessed value of the property. A parcel tax is considered a special tax and requires approval from two-thirds of all local voters.
- Mello-Roos taxes—A Mello-Roos district is a special district established by a local government to obtain additional public funding for specific projects or services, such as emergency services (e.g., fire departments, police) or public work projects (e.g., infrastructure improvements).

Financing

Bonds: A bond is a financing tool whereby money borrowed from investors is paid back with interest. Bonds are bought and sold on the bond market. Local governments can finance specific resilience projects by issuing bonds.

Green Bonds: For adaptation and resilience projects, green bonds can expand the potential investor pool by characterizing aspects of the investment that interest investors focusing on projects with defined environmental performance characteristics, but this approach could have higher administrative costs. Several green and climate bond certifications, such as the Climate Bond Standard and the Green Bond Principles, have been created to standardize the definition of the environmental characteristics of green bond projects.

Loans

Loans are a financing tool whereby a party borrows money from a single source, such as a bank or the government, for a specific purpose. Loans can have fixed interest rates, as bonds do, but they often have variable interest rates, making them less attractive to cities that have budgets that fluctuate over time. Loan payback terms also tend to be shorter than bond payback terms. Commercial loans are available to local governments for resilience- and infrastructure-related projects in California from the Infrastructure State Revolving Fund, which provides financing to nonprofits and public agencies for infrastructure and economic development (excluding housing).

List of Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
AB	Assembly Bill
AR	atmospheric river
CAL FIRE	California Department of Forestry and Fire Protection
Cal Poly	California Polytechnic State University at San Luis Obispo
CIP	Capital Improvement Projects
City	City of San Luis Obispo
County	San Luis Obispo County
CWPP	Community Wildfire Protection Plan
EOP	Emergency Operations Plan
EMF	electromagnetic field
FEMA	Federal Emergency Management Agency
GHG	greenhouse gas
HMP	Hazard Mitigation Plan
LHMP	Local Hazard Mitigation Plan
PG&E	Pacific Gas and Electric
SB	Senate Bill
SLOCOG	San Luis Obispo Council of Governments
TAZ	traffic analysis zone
U.S. 101	U.S. Highway 101
UHI	urban heat island
VHFHSZ	Very High Fire Hazard Severity Zones
WMP	Waterway Management Plan

Definitions

100-Year Flood: A flood that has a 1 percent likelihood of occurring in any given year.

100-Year Floodplain: The areas that have a 1-in-100 chance of flooding in any given year using criteria consistent with, or development by, the Federal Emergency Management Agency.

200-Year Floodplain: The areas that have a 1-in-200 chance of flooding in any given year using criteria consistent with, or development by, the Department of Water Resources.

500-Year Floodplain: The areas that have a 1-in-100 chance of flooding in any given year using criteria consistent with, or development by, the Department of Water Resources.

Adaptive Capacity: 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).

Alquist-Priolo Earthquake Fault Zone: A regulatory zone, delineated by the State Geologist, within which site-specific geologic studies are required to identify and avoid fault rupture hazards prior to subdivision of land and/or construction of most structures for human occupancy.

Climate Adaptation: Adjustment or preparation of natural or human systems to a new or changing environment that moderates harm or exploits beneficial opportunities.

Climate Mitigation (Greenhouse Gas Emissions Reductions): A human intervention to reduce the human impact on the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks. Refer to Chapter 7, Climate Change, for more information.

Critical Facility: Facilities that either (1) provide emergency services or (2) house or serve many people who would be injured or killed in case of disaster damage to the facility. Examples include hospitals, fire stations, police and emergency services facilities, utility facilities, and communications facilities.

Extreme Weather Event: In most cases, extreme weather events are defined as lying in the outermost ("most unusual") ten percent of a place's history. Analyses are available at the national and regional levels.

Fault: A fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side. A fault zone is a zone of related faults which commonly are braided, but which may be branching. A fault trace is the line formed by the intersection of a fault and the earth's surface.

Active Fault: A fault that has exhibited surface displacement within Holocene time (approximately the past 11,000 years).

Potentially Active Fault: A fault that shows evidence of surface displacement during Quaternary time (the last 2 million years).

Flooding: A rise in the level of a water body or the rapid accumulation of runoff, including related mudslides and land subsidence, that results in the temporary inundation of land that is usually

dry. Riverine flooding, coastal flooding, mud flows, lake flooding, alluvial fan flooding, flash flooding, levee failures, tsunamis, and fluvial stream flooding are among the many forms that flooding takes.

Greenhouse Gases (GHG): gases that trap heat in the atmosphere.

Hardening Structures: An action to reduce the vulnerability of homes and structures to embers and heat that accompany most wildfires, including use of proper construction techniques and choice of building materials.

Hazardous Material: An injurious substance, including pesticides, herbicides, toxic metals and chemicals, liquefied natural gas, explosives, volatile chemicals, and nuclear fuels.

Hazard Mitigation: Sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects.

Landslide: A general term for a falling, sliding, or flowing mass of soil, rocks, water, and debris. Includes mudslides, debris flows, and debris torrents.

Liquefaction: A process by which water-saturated granular soils transform from a solid to a liquid state during strong ground shaking.

Representative Concentration Pathway (RCP): A term that represents plausible future greenhouse gas emissions trajectory through time. An RCP 8.5 is a no-mitigation scenario where global GHG emissions continue to rise throughout the 21st century that, for California, represents annual average temperatures increasing 4 -7 degrees Celsius by the end of the century.

Resilience: The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Seiche: An earthquake-induced wave in a lake, reservoir, or harbor.

Subsidence: The gradual, local settling or sinking of the earth's surface with little or no horizontal motion (subsidence is usually the result of gas, oil, or water extraction, hydrocompaction, or peat oxidation, and not the result of a landslide or slope failure).

Social cohesion: The extent of connectedness and solidarity among groups in society or community. Social cohesion is one of the strongest indicators of resilience during disaster events as well as in post-disaster recovery efforts (Townshend et al. 2015). Social cohesion can play an important role in helping protect residents, particularly vulnerable populations, during climate-related disasters. While measuring the degree of social cohesion present in the City is not possible at this point, this subject is discussed here to emphasize the importance of social cohesion in increasing community resilience to the impacts of the climate change.

Tsunami: A wave, commonly called a tidal wave, caused by an underwater seismic disturbance, such as sudden faulting, landslide, or volcanic activity. Wildland Fire: A fire occurring in a suburban or rural area that contains uncultivated lands, timber, range, watershed, brush, or grasslands. This includes areas where there is a mingling of developed and undeveloped lands.

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