CITY OF SANTA BARBARA

COMMUNITY WILDFIRE PROTECTION PLAN

DUDEK

February 2021

Printed on 30% post-consumer recycled material.

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Acronyms and Abbreviations

Acronym	Definition
ADU	Accessory Dwelling Unit
AMSL	above mean sea level
BMP	best management practice
CAL FIRE	California Department of Forestry and Fire Protection
CARB	California Air Resources Board
CDPR	California Department of Pesticide Regulation
CFTN	Community Fuels Treatment Network
City	City of Santa Barbara
CWPP	Community Wildfire Protection Plan
EPA	U.S. Environmental Protection Agency
FHSZ	Fire Hazard Severity Zone
GIS	geographic information system
JADU	Junior Accessory Dwelling Unit
LCP	Local Coastal Program
LRA	Local Responsibility Area
MFPD	Montecito Fire Protection District
PEIR	Programmatic Environmental Impact Report
RAWS	Remote Automated Weather Station
SBCFD	Santa Barbara County Fire Department
SBFD	Santa Barbara Fire Department
SBPD	Santa Barbara Police Department
SRA	State Responsibility Area
VHFHSZ	Very High Fire Hazard Severity Zone
VMU	Vegetation Management Unit
WFSAD	Wildland Fire Suppression Assessment District
WUI	Wildland Urban Interface

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Executive Summary

The City of Santa Barbara Fire Department (SBFD) is proposing to implement a comprehensive, coordinated Community Wildfire Protection Plan (CWPP) to protect lives, property, and natural resources threatened by wildland fire. This CWPP also updates the City's 2004 Wildland Fire Plan, accounting for changes in the City of Santa Barbara's (City's) fire environment and work completed under that Plan.

The City and surrounding landscape exhibits a complex wildfire environment that presents a significant wildfire risk due to steep and varied terrain, a mosaic of different vegetation types, and a Wildland-Urban Interface (WUI) development pattern. The southern side of the Santa Ynez Mountains, including portions of the City, has a significant history of devastating wildland fires, including 2 of the state's 20 most destructive wildfires—the 1990 Paint Fire and the 2017 Thomas Fire. The SBFD recognizes the catastrophic impact of wildfire in the community and is committed to reducing hazards and risk through fire protection, fuel hazard reduction, public education, preparedness, and community involvement.

Development of this CWPP included an assessment of wildfire hazard, which involved modeling potential fire behavior in the City under extreme wind and weather conditions, consistent with conditions experienced during a Sundowner wind event. Other wildfire hazard variables were evaluated (terrain, weather, fuels, development patterns, fire department response, structure density, etc.) to identify the High Fire Hazard Area of the City. City values potentially threatened by wildfire were also evaluated to understand the potential wildfire risk facing the City. The hazard assessment was used to evaluate the extent of the City's four High Fire Hazard Area Zones (Extreme Foothill, Foothill, Coastal Interior, and Coastal) and the locations of the City's Vegetation Management Units (VMUs) and Community Fuels Treatment Network (CFTN). This CWPP recommends expanding the geographic extent of the City's High Fire Hazard Area and increasing the quantity and extent of VMUs based on wildfire hazard.

CWPP development also included development of a Public Outreach and Engagement Plan to guide community engagement and coordination with other key stakeholders throughout the development of the CWPP. The City's central engagement goal was to develop a CWPP that builds on input from key stakeholders, including community members, City departments, neighboring jurisdictions (e.g., Santa Barbara County Fire Department, the U.S. Forest Service), and the California Department of Forestry and Fire Protection.

This CWPP outlines a series of policies and action items which are intended to guide implementation of the CWPP. The policies and actions focus on codes and standards, funding, fire rehabilitation, evacuation, fire protection, vegetation/fuels management, and public education. Action items identify tasks to be implemented by the SBFD, and other responsible City departments, to achieve the stated goal of protecting lives, property, and natural resources threatened by wildland fire.

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1 Introduction

The City of Santa Barbara (City) and surrounding landscape exhibits a complex wildfire environment that presents a significant risk to public and firefighter safety and the built and natural environment. This region has been subject to numerous damaging wildland fires, is influenced by local extreme wind and weather conditions (including Sundowner wind events), has steep and varied terrain with a mosaic of different vegetation types, and is characterized by wildland urban interface (WUI) development patterns that can exacerbate wildfire risk. The southern side of the Santa Ynez Mountains has a significant history of devastating wildland fires, including 2 of the state's 20 most destructive wildfires—the 1990 Paint Fire, which burned nearly 5,000 acres, destroyed over 600 structures, and resulted in 1 fatality; and the 2017 Thomas Fire, which burned over 280,000 acres, destroyed over 1,000 structures, and resulted in 2 fatalities (CAL FIRE 2019a).

As a key component of the Healthy Forest Restoration Act of 2003, a Community Wildfire Protection Plan (CWPP) serves as a mechanism for community input and identification of areas presenting high wildfire risk, as well as identification of potential projects intended to mitigate such risk. Further, the CWPP process is intended to provide the community a forum for identifying values at risk from wildfire, which may include people, property, natural resources, cultural values, economic interests, and infrastructure. The identification of these values at risk by the community strongly influences the potential wildfire hazard mitigation projects identified in this CWPP.

This CWPP was developed by the City of Santa Barbara with input and direction from stakeholders and the community. The purpose of this collaboratively prepared CWPP is to serve as a fire protection planning document that presents the City's physical characteristics, wildfire hazard, assets at risk from wildfire, vegetation/fuel management projects and specifications, and goals and action items intended to reduce wildfire risk in the City. The ultimate goal of this CWPP is to protect lives, property, and natural resources threatened by wildland fire.

1.1 Purpose and Need

The City recognizes the potential for significant loss of life, property, and natural resources from wildland fire and has a history of prioritizing development and implementation of a comprehensive wildland fire program.

The City of Santa Barbara General Plan Seismic Safety and Safety Element, adopted by the City Council in 1979, directed periodic review and revision of the Safety Element and was amended in the City's Fire Master Plan. An update of the City Master Fire Plan was completed in 1986. After the 1990 Painted Cave Fire, the Santa Barbara Fire Department (SBFD) recognized the 1986 Fire Master Plan did not fully develop recommendations to adequately address the City's vulnerability to wildland fire.

In 1992 and 1993 the City completed a Wildland (Vegetation) Fuels Management Plan for City-owned lands. The plan identified vegetation management projects on 1,600 acres of undeveloped City park and open space lands. The plan was adopted by the City Council in 1993 and was implemented by the Parks & Recreation Department and Water Resources Division. Maintenance currently continues; however, this plan only addressed City-owned lands.

In 1993, a City Wildland Fire Specialist was hired to update the Fire Master Plan and provide expertise and direction in developing a comprehensive wildland fire program. In 2000 and 2001 a hazard and risk assessment was completed to accurately portray existing conditions within the City and the surrounding area. The results of the assessment were compiled, and policies and actions were then developed into the City's 2004 Wildland Fire Plan. The 2004 Wildland Fire Plan was approved by City Council in January of 2004 and formally recognized as the City's CWPP in 2011.

The 2013 Safety Element of the City's General Plan identified various policies associated with wildfire hazard in the City. These policies included implementing fire hazard risk reduction programs, evaluating evacuation effectiveness, including fire department tactical areas in new developments, implementing fire hazard reduction as a development design component, continuing education and training, requiring defensible space, implementing vegetation management programs, adopting fire-related codes and standards, and evaluating water supply systems.

The purpose of this CWPP is to update the 2004 Wildland Fire Plan to account for changes in the City's fire environment and work completed under the 2004 Plan. The intended result is a comprehensive, coordinated plan to mitigate the impact of wildland fire to the City. This CWPP evaluates the City's existing High Fire Hazard Area based on hazard and risk, identifies changes to the High Fire Hazard Area, identifies policies and actions to reduce the community's threat from wildland fire, and identifies and prioritizes vegetation management projects to reduce wildfire threat. Intended users of this CWPP include the SBFD, all City Departments, City Boards and Commissions, the City Council, and members of the public. The policies and actions outlined in Chapter 6 include those that the City has already implemented and those proposed for implementation under this CWPP.

1.2 Development Team

This section lists the representatives or organizations either involved in the development of the CWPP or who provided information for the completion of this CWPP. The organization, roles, and responsibilities are indicated in Table 1.

Table 1. CWPP Development Key Stakeholders and Roles

CWPP Development Participant	Roles/Responsibilities
California Department of Forestry and Fire Protection (CAL FIRE)	Grant funding for CWPP and associated Program Environmental Impact Report (PEIR) Provide general guidance as needed Review and approve Final CWPP
Santa Barbara City Council and Planning Commission	Provide general guidance as needed Receive comments from the public on the CWPP and PEIR Approve Final CWPP Certify PEIR
City of Santa Barbara Fire Department	Manage CWPP and PEIR development and consultants Convene CWPP Working Group and Development Team Meetings
CWPP Working Group: • City leadership	Provide guidance and support for the CWPP and PEIR development
CWPP Development Team: • Community Development Department • Fire Department • Office of Emergency Services • Parks and Recreation Department • Police Department • Public Works Department	Provide guidance and expertise for the CWPP and PEIR Coordinate with neighboring jurisdictions Provide guidance on key stakeholders Distribute media releases about the CWPP through social media Conduct direct outreach as appropriate

Table 1. CWPP Development Key Stakeholders and Roles

CWPP Development Participant	Roles/Responsibilities
Key Stakeholders: • Los Padres National Forest • Neighboring Jurisdictions • Utility Companies • State Agencies • Elected Officials	Provide insights on the intersection of cross-jurisdictional hazard areas Collaborate on program and project development Review CWPP and PEIR drafts Participate in public workshops, as appropriate
Stakeholders and Interested Parties including Communities Most Vulnerable to Wildfire Risk	Attend stakeholder workshops Read electronic newsletters Provide input on the CWPP and PEIR
CWPP Consultant: Dudek	Develop CWPP Facilitate public meetings Develop CWPP website Distribute electronic newsletters Complete PEIR

1.3 Community Involvement

1.3.1 Stakeholders

The City recognizes that implementation of the CWPP is not possible without the support of the people, businesses, and organizations that live and work in the City, especially in the City's High Fire Hazard Area, as well as the many state, federal, and local agencies that have jurisdiction in these areas. These are the stakeholders that are impacted by this plan and must share in the responsibility for protecting themselves and their community.

The role of the SBFD is to identify wildland fire hazards and risks, develop recommended procedures and programs for City and private lands to minimize the threat of wildfire, educate the public about how to prepare and protect themselves from wildfire, enforce existing and new wildland fire codes to protect the public, and develop partnerships and cooperation from other City departments, property owner groups, and individual property owners to effectively manage and respond to wildfire threat.

The role of stakeholders is to be aware of the hazards and risks that threaten their properties and safety, comply with wildland fire codes, formulate wildland fire evacuation plans, support neighborhood preparedness and community groups focused on wildland fire safety, and become part of the solution in mitigating the threat of wildfire that faces the City.

Since adoption and implementation of the 2004 Wildland Fire Plan, residents living in the High Fire Hazard Area have gained a greater understanding of the need to decrease the impact of wildfire and their personal responsibility in making that happen. Significant wildfires occurring since the 2004 Plan was developed (including the 2007 Zaca Fire, the 2008 Tea Fire, the 2009 Jesusita Fire, and the 2017 Thomas Fire) have also increased public awareness of the wildfire threat facing the City. As a result, there has been a significant increase in public participation in wildland fire issues, such as involvement in regional task forces focused on wildland fire mitigation and evacuation, and public lobbying within City government to mitigate wildfire risk. There has also

been an increase in the involvement and support from property owner associations to complete cooperative fuel hazard reduction projects and to be involved in organizations, such as the Santa Barbara County Fire Safe Council, that support these mitigation projects.

The SBFD continues to work cooperatively with businesses and organizations in the City's High Fire Hazard Area to better plan, prepare, and reduce the potential hazards and risks associated with wildland fire. Federal, state, and other local fire agencies have also been working to develop community fire planning documents (for example, the Montecito CWPP), coordinating with the City in a collaborative approach. The City and the SBFD intend to continue these collaborative efforts.

1.3.2 Public Outreach and Engagement Plan

During CWPP development, a Public Outreach and Engagement Plan was developed as a guide for engaging with members of the community and coordinating with other key stakeholders throughout the development of the CWPP. The City's central engagement goal was to develop a CWPP that builds on input from key stakeholders including:

- the communities most vulnerable to wildfire risk;
- City departments with a role in preventing and responding to the spread of wildfires into communities;
- neighboring jurisdictions, including the Los Padres National Forest, Santa Barbara County Fire Department and Santa Barbara County Planning and Development Department; and
- the California Department of Forestry and Fire Protection (CAL FIRE).

The plan outlined a tiered engagement strategy with different levels of engagement for each key stakeholder group. Different engagement opportunities were identified in the plan and included:

- **A CWPP Website** (https://cwpp.santabarbaraca.gov/): The accessible website provides a central location for project information in English and Spanish and is fully compliant with the Americans with Disabilities Act, Section 508 and WCAG 2.1AA requirements (which address web content accessibility). The site included meeting announcements, documents available for review, electronic comment forms for stakeholders to provide direct feedback, and an area to subscribe for electronic newsletter updates. The website was updated throughout the CWPP development process and will function as the City's primary website for the final CWPP.
- **Social Media Distribution**: Media releases and updates were distributed through existing City social media sites and NextDoor. Each post directed viewers to the CWPP website for additional information and electronic newsletter subscription.
- **Public Meetings:** Public outreach meetings were held throughout the CWPP development phase. Two public workshops were held to obtain community feedback on the preliminary analysis and scoping of the CWPP, as identified below. Additional public meetings were held at the City Planning Commission and City Council to provide updates on the development of the CWPP.

1.3.3 Public Outreach Meetings

The following community meetings were held during the preparation of the CWPP in order to provide community members an opportunity to contribute to the CWPP process. Specifically, community input was sought to better understand the vulnerability of City residents, businesses, and resources to wildfire and to promote awareness of the City's wildland fire hazard and propose workable solutions to reduce the risk of wildfire. The meetings also provided a forum for the community to discuss how to best mitigate wildfire risk in the City. Two community workshops were conducted during CWPP development, as identified below:

- **February 20, 2020:** Adams Elementary School, Santa Barbara, California—workshop to outline CWPP development process and gather feedback on community priorities.
- **April 1, 2020:** On-line Webinar—workshop to introduce the hazard assessment conducted for the CWPP and gather community and stakeholder feedback. This meeting was held via online webinar due to coronavirus (COVID-19) shelter-in-place orders in effect at the time.

1.4 Funding/Grant Management

Funding for the preparation of this CWPP was made available from a CAL FIRE Community Fire Prevention Grant (Fiscal Year 2018–2019). The grant period started on June 6, 2019, and extends through March 15, 2021. Grant management and reporting is being conducted by SBFD.

1.5 Signatories

The signatories for the City of Santa Barbara Community Wildfire Protection Plan include:

1. Local Government: Cathy Murillo, Mayor, City of Santa Barbara
2. Santa Barbara City Fire Department: Chris Mailes, Interim Fire Chief
3. California Department of Forestry and Fire Protection (CAL FIRE): John Owens, Interim San Luis Obispo Unit Chief

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2 Plan Area Description

The fire environment comprises several factors. Fires can occur in any environment where conditions are conducive to ignition and fire movement. The three major components of the fire environment are climate, topography, and vegetation/fuel. The state of each of these components and their interaction with each other determine the potential characteristics and behavior of a wildfire at any given moment. Understanding these existing conditions is necessary to understand the potential for wildfire within the City.

Wildfires are a regular and natural occurrence in most of California. However, the number of fires and acres burned annually has increased in recent years. These wildfires are mostly human-triggered, suggesting that the historic fire interval has been artificially affected across large areas. In addition, wildfire suppression efforts over the last several decades may have aided in the accumulation of fuels in some natural communities (Minnich 1983; Minnich and Chou 1997), resulting in larger and more intense wildfires. Large wildfires have had, and continue to have, a substantial and recurring role in California landscapes (Keeley and Fotheringham 2003), in part because (1) California landscapes become highly flammable each fall; (2) the climate in the region has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with foehn winds[1] occurring during autumn after a 6-month drought period each year; and (3) ignitions via anthropogenic sources have increased or are increasing in many wildland or WUI areas.

2.1 Location

The City of Santa Barbara is an incorporated city located between the coastal Santa Ynez Mountains and the Pacific Ocean, approximately 100 miles northwest of Los Angeles (Figure 1). The City borders the Los Padres National Forest and unincorporated areas of Montecito, Mission Canyon, Hope Ranch, and Eastern Goleta Valley. Santa Barbara is a unique area known for its Mediterranean climate, natural beauty, and rich history. The natural diversity of the area provides many unique opportunities for the residents who live here and tourists who visit the area. The City encompasses approximately 20 square miles and has a population of just over 90,000 people.

While many of the action items recommended in this CWPP focus on the High Fire Hazard Area situated in the City's foothill and coastal areas, this CWPP covers all portions of the City, except the Santa Barbara Airport property located to the west of and disconnected from the City proper. The airport property was excluded from the CWPP as it does not exhibit high wildfire hazard conditions, as identified in the 2017 Santa Barbara Airport Master Plan.

2.2 Fire Hazard Areas

2.2.1 State Fire Hazard Severity Zones

Fire Hazard Severity Zones (FHSZs) are "geographical areas designated pursuant to California Public Resources Code, Sections 4201 through 4204 and classified as Very High, High, or Moderate in State Responsibility Areas (SRA) or as Local Responsibility Area (LRA) Very High Fire Hazard Severity Zones (VHFHSZ) designated pursuant to California Government Code, Sections 51175 through 51189" (California Building Standards Commission 2016). Santa Barbara City's VHFHSZ is a Local Agency VHFHSZ, as defined, and the City is considered an LRA. SBFD is

[1] A type of dry, warm, down-slope wind that occurs on the lee (downwind side) of a mountain range. Locally, Sundowner winds would be considered foehn winds.

the responsible agency for fire protection within the City's VHFHSZ. The City abuts lands where the responsibility for fire protection lies with the State of California SRA. The State VHFHSZ is presented in Figure 2 and is largely consistent with the City's High Fire Hazard Area located within the Foothill and Extreme Foothill Zones (see below).

California Public Resources Code Sections 4201–4204 and Government Code Sections 51175–51189 direct CAL FIRE to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. The resulting FHSZs define the application of various mitigation strategies to reduce the risk associated with wildland fires (CAL FIRE 2020a). The model used to determine the extent of FHSZs is based on an analysis of potential fire behavior, fire probability predicated on the frequency of fire weather, ignition patterns, expected rate of spread, ember (brand) production, and past fire history (CAL FIRE 2020a). Structures built in FHSZs are subject to more stringent fire hardening requirements than those that are not.

2.2.2 City High Fire Hazard Area

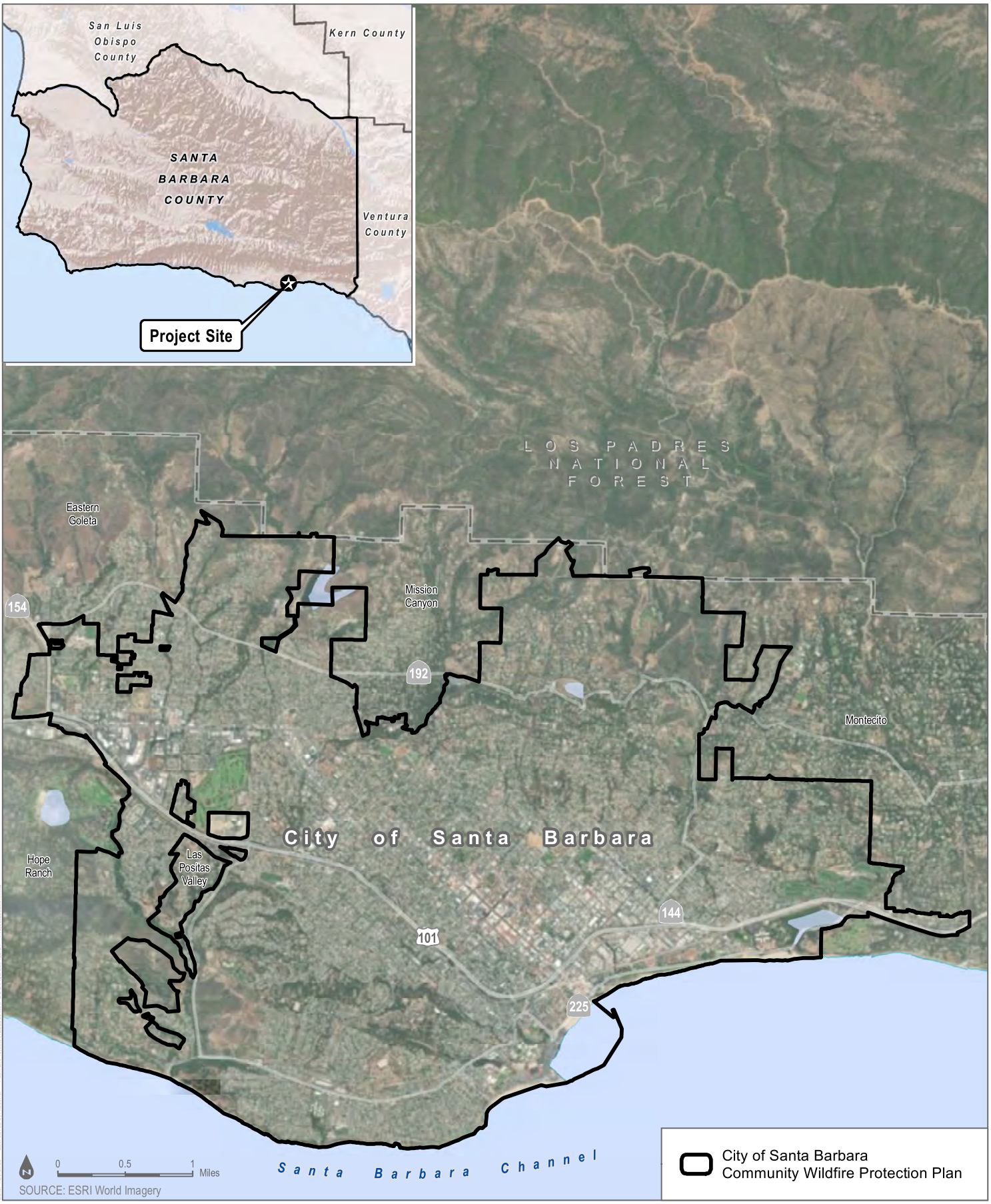
After the 1977 Sycamore Canyon Fire, the SBFD identified areas within City limits vulnerable to wildland fire. These areas were identified based on slope and vegetation and were designated as High Fire Hazard Area. Municipal codes and ordinances to impose fire and safety requirements in these areas were adopted (City Municipal Ordinance 5100). In 1992, after the Oakland Hills Fire, California State Assembly Bill No. 337 (Bates Bill) was approved by the governor. This bill required state fire agencies to ensure that local fire agencies identify areas vulnerable to wildfire, designate these areas as VHFHSZs, and allow local agencies to impose fire and safety requirements as authorized by law. SBFD reviewed the 1979 existing High Fire Hazard Area and determined that they met the intent of the Bates Bill VHFHSZ (SBFD 2004).

Since then, research, technology, and an understanding of wildfire severity and its impacts on communities have changed significantly. In support of the City's 2004 Wildland Fire Plan, SBFD reviewed the existing High Fire Hazard Area and felt that a hazard and risk assessment was needed to analyze the City's wildland fire threat. The High Fire Hazard Area developed in the 2004 Wildland Fire Plan is separated into four fire hazard zones. Each zone is described below (SBFD 2004a) and shown in Figure 2.

Extreme Foothill Zone

The Extreme Foothill Zone is located along the northern boundary of the City and includes the areas of the West Mountain Drive, upper Gibraltar Road, Parma Park, Coyote Road, upper San Roque Road, and upper Santa Teresita Drive in the Cielito and Foothill residential neighborhoods. Elevations of this zone range from approximately 450 to 1,250 feet above mean sea level (AMSL). This zone is defined by dense chaparral and oak forests along steep (higher than 30% gradient) south to southwest oriented slopes. Canyons in this zone are typically aligned north to south, which can act to funnel and accelerate down-slope Sundowner winds to result in frequent and severe, hot, dry wind conditions. These combined hazards make this zone vulnerable to extreme fire behavior (SBFD 2004, 2020; USGS 2015).

Building density in this zone is low and includes 175 structures within 724 acres. Roads are steep and winding, and many properties have long driveways. Resources or developments in this zone include, but are not limited to, Parma Park, Skofield Park, the Skofield Pump Station, and the former St. Mary's Seminary site. This zone is strategically important to SBFD since it is the last line of defense for fire protection resources to suppress a wildfire before it enters more highly populated areas of the City (SBFD 2004).



COMMUNITY WILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA
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FIGURE 1

Project Location

City of Santa Barbara Community Wildfire Protection Plan

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City of Santa Barbara / CWPP

Existing City of Santa Barbara High Fire Hazard Area Zones

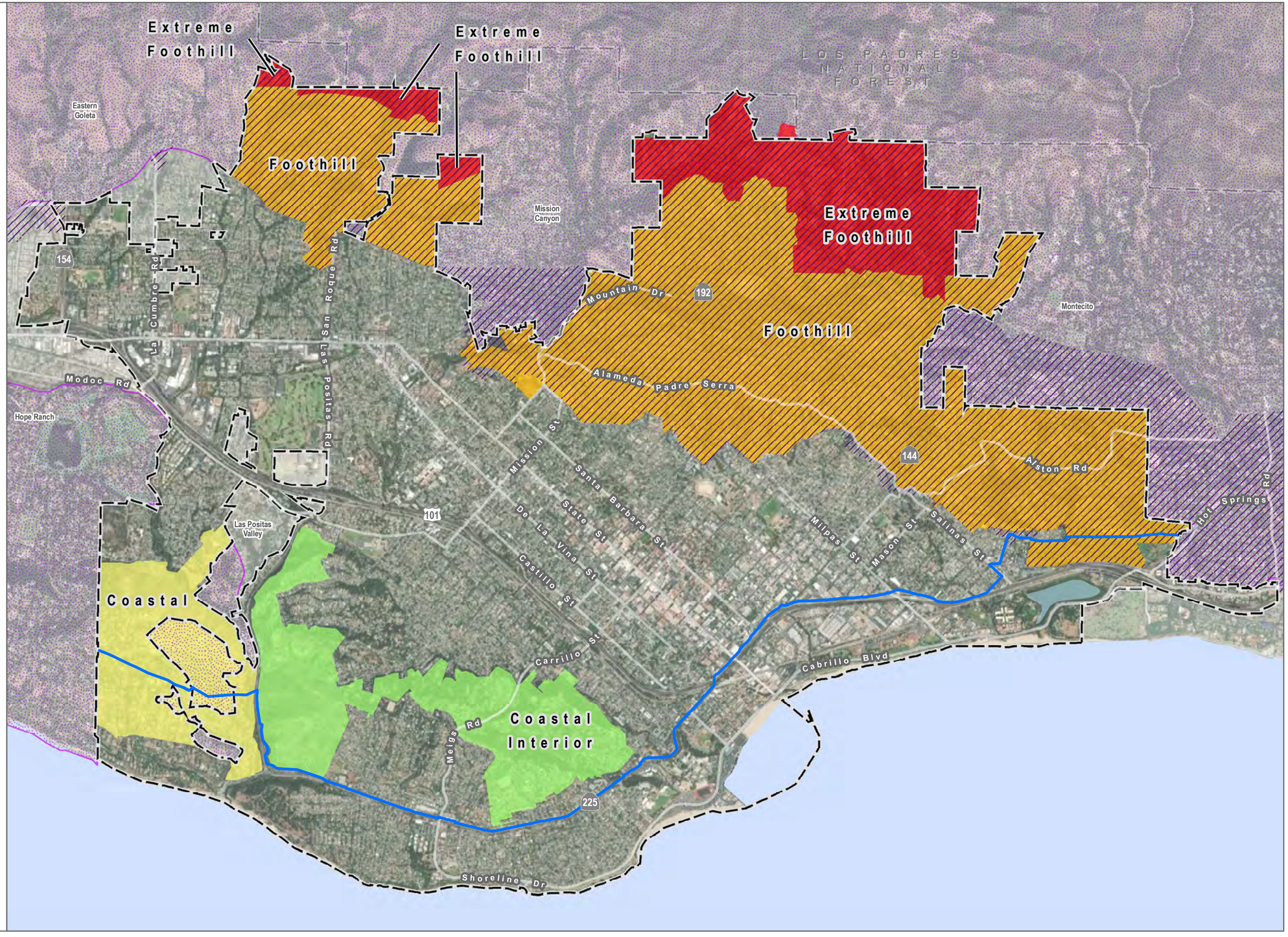
- Coastal Interior
- Coastal
- Foothill
- Extreme Foothill

CAL FIRE Adopted Very High Fire Hazard Severity Zone - 2007 (Within City Limits)

- Very High (State VHFHSZ)

Santa Barbara County High Fire Hazard Area (Outside City Limits)

- High Fire Hazard
- Coastal Zone Boundary



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara, County of Santa Barbara, CAL FIRE

COMMUNITYWILDFIRE CITY OF SANTA BARBARA PROTECTION PLAN

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FIGURE 2

Current High Fire Hazard Areas

City of Santa Barbara Community Wildfire Protection Plan

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Foothill Zone

The Foothill Zone is located within the northwest and northeast portions of the lower foothills, which includes either entirely or portions of the residential neighborhoods of Cielito, Riviera, Lower Riviera, Eucalyptus Hill, Foothill, Upper East, and the San Roque area surrounding Stevens Park. Elevations range from approximately 100 feet AMSL to the north of Andrée Clark Bird Refuge and Highway 101 to approximately 1,050 feet AMSL near Mount Calvary Road. This zone typically contains a mixture of flammable chaparral, oak forest, riparian vegetation, eucalyptus groves, and landscaped fuels intermixed with residential areas. The eucalyptus groves within this area are extensive, dense, and have significant accumulations of dead fuel that threaten the surrounding area. Most slopes in this area have a gradient of 20% to 40% and are oriented to the southeast, south, and southwest. As with the Extreme Foothill Zone, canyons in this zone are aligned north to south and can act to funnel and accelerate down-slope Sundowner winds, which contributes to extreme fire behavior conditions (SBFD 2004, 2020; USGS 2015).

Building density in this zone is typically low to moderate and includes 4,347 structures within 2,827 acres. A few areas of higher structure density (structures close to other structures; see Section 4.1.2.1) are present in the Foothill Road/Laurel Canyon Road area and in the southern portion of the Riviera. Roads in the zone are variable, with some portions in the south including wider, more heavily traveled roadways (e.g., Alameda Padre Serra, Sycamore Canyon Road, and Foothill Road) and other portions including steep, narrow, and winding roadways (e.g., Las Alturas Road, Mission Canyon Road, and Conejo Road). Resources or developments in this zone include, but are not limited to, the Mission, Hale Park, Franceschi Park. Montecito Country Club, Stevens Park, Riviera Business Park, El Encanto Hotel, Santa Barbara Bowl, Cater Water Treatment Plant, Sheffield Treatment Plant, City Public Works buildings, and City Fire Station No. 7.

Coastal Zone

The Coastal Zone is located along the southwest boundary of the City and includes the Campanil Hill and Hidden Valley residential neighborhoods. Elevation within this zone ranges from 150 to 600 feet AMSL. The majority of fuels are coastal sage scrub, grassland, and ornamental plants and intermixed with residential areas. Slopes in this zone range from 10% to 35%. The ocean influence dominates this area for much of the year, resulting in lower temperatures and increased fuel moistures, which reduce fire hazard. However, there are several canyons directly aligned to result in periodic hot, dry wind conditions that occur during our late summer and fall months. This zone has many pockets of moderate fuel made up of chaparral and landscape vegetation. Isolated areas of heavy fuel consisting of eucalyptus and oak vegetation increase the hazard in specific areas within this zone (SBFD 2004, 2020; USGS 2015).

Building density in this zone is typically low and includes 363 structures within 524 acres. Moderate and high building density occurs in the southern portion of the zone, in the Alan Road/Vista del Mar area. Roads in the zone are variable in width and the zone includes numerous long, dead-end driveways. Resources or developments in this zone include, but are not limited to, the Arroyo Burro Open Space, Arroyo Burro Creek, and Las Positas Road.

Coastal Interior Zone

The Coastal Interior Zone includes portions of the Alta Mesa, hillside areas of the Westside neighborhood, portions of the East and West Mesa and Bel Air residential neighborhoods, and part of Elings Park. Elevation in this zone ranges from approximately 250 to 450 feet AMSL. This zone is defined as areas within the City where the majority of fuel is made up of diverse pockets of vegetation consisting of dense chaparral, oak forests, coastal sage shrub, landscaped vegetation, agricultural lands, and eucalyptus groves. Slopes in this zone range from 10% to 35%. The canyons in this area are dissected and are not in direct alignment to receive hot, dry winds, although these winds are funneled through many of these areas. For the majority of the year, this area is greatly affected by

the ocean influence resulting in lower temperatures and increased fuel moistures, which reduce fire hazard; however, when late summer and fall Sundowner winds surface, the risk to this area is significantly increased (SBFD 2004, 2020; USGS 2015).

Building density in this zone is typically moderate and includes 755 structures within 702 acres. A few areas of low structure density are present in the Elings, and Honda Valley Park areas. Roads in the zone are variable, with some portions in the south including wider, more heavily-traveled roadways (e.g., West Carillo Street) and other portions including more steep and winding roadways (e.g., Miramonte Drive). Resources or developments in this zone include, but are not limited to, Vic Trace Reservoir, Hilda McIntyre Ray Park, Elings Park, and Honda Valley Park.

2.3 Climate

The climate in the City of Santa Barbara is characterized by warm summers and mild winters with relatively dry weather. The City's climate is influenced by the semi-permanent subtropical high-pressure cell off the Pacific Coast. This cell creates typically warm, dry summers and wet winters. Fog is also frequently experienced in the City due to the humid marine air coming into contact with the warmer air over land. This atmospheric condition usually occurs in the early morning or evening and particularly during late spring and early summer (City of Santa Barbara 2010). Fog regulates moisture content in the low-lying atmosphere, plants, and soils, and thus is inherently connected to fire hazard.

The majority of precipitation in the City occurs during the winter months due to the migration of mid-latitude cyclonic storms (fronts) arriving to the California coast. Rainfall amounts generally increase with elevation along the Santa Ynez Mountains due to orographic lifting and cooling processes. Inversions, or the trapping of a stable layer of cool air below warmer air, is caused in part by the Santa Ynez Mountains to the north of the City. Surface and upper-level wind flow vary seasonally and geographically, and lack of wind and the right meteorological conditions can lead to an inversion. Surface temperature inversions occur between 0 and 500 feet above the ground surface and are most common during the winter. Subsidence inversions (1,000 to 2,000 feet above ground surface) are most common during the summer (City of Santa Barbara 2010). Typically, air temperature decreases with an increase in altitude. During an inversion, warmer air is held above cooler air; the normal temperature profile with altitude is inverted.

Live fuel moisture content, a measure of the relative mass of water and indicator of ignitability, for most vegetation in the Santa Ynez Foothills reaches the driest point in the late summer or early fall period. Seasonal drying of vegetation produces conditions that can result in fuel-driven wildfires and fire-associated climatic changes. This condition is referred to as a plume-dominated wildfire. Plume-dominated wildfires are fires where the energy produced by the fire, in conjunction with atmospheric instability, creates significant convective forces and increased wind speeds. Such fires are incredibly unpredictable, spread in various directions simultaneously, and exhibit extreme fire behavior.

The average annual high temperature calculated from January 1893 to June 2016 for the Santa Barbara area is 70.8º Fahrenheit (ºF), with higher temperatures in summer and early fall (June through September) reaching up to an average of 77.1ºF. The average annual low temperature is 50.2°F and can reach an average low temperature of 43°F. The average annual precipitation for the area is 17.73 inches, with the most rainfall concentrated in December (2.82 inches), January (3.98 inches), February (3.86 inches), March (2.97 inches), and April (1.21 inches). Rainfall is much less during June (0.08 inches), July (0.02 inches), and August (0.03 inches) (WRCC 2020).

The regional prevailing wind patterns are from the west or northwest, but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. Santa Barbara also periodically experiences significant downslope wind and warming events. These strong winds are referred to as "Sundowner winds," since they often begin in the late afternoon or early evening. Sundowner winds are typically associated with a rapid rise in temperature and a decrease in relative humidity. In the most extreme Sundowner wind events, wind speeds can be gale-force or higher, and temperatures over the coastal plain can rise to above 100°F. These winds typically manifest in midsummer to midfall as a result of hot temperatures; however, recorded midwinter, mild temperature Sundowner winds have occurred. Sundowner winds have historically resulted in significant property damage, as well as extreme fire danger (UCLA 1998).

Dry Sundowner winds promote the ignition and rapid spread of wildfires by drying fuels and fanning the flames of fires once they are started. The wind's greatest effect on fire tends to be in autumn when vegetation has been desiccated after a long dry summer and before the onset of the winter rainy season. Winter rainfall is highly variable in southern California. However, large fires have occurred during Sundowner conditions as late as February. Surface winds can also be influenced locally by topography and slope variations (Westerling et al. 2004).

Santa Ana winds, which differ from Sundowners, have the potential to occur in the City, although their occurrence is rare. Santa Ana winds are also dry, off-shore winds that have the same effect on wildfire hazard and fire behavior as Sundowner winds. Due to their rarity in the Santa Barbara area, it is more applicable to consider Sundowner winds for wildfire planning purposes.

The fire season in the Santa Barbara area has historically occurred between June and October as the fog recedes earlier in the day, and vegetation begins to dry out from regular, dry, offshore winds. The fire season would typically end in November with the onset of winter rainfall, cooler temperatures, and higher relative humidity, with fires less common from December to April. However, climate change effects are extending fire season throughout the state, and the fire season in the Santa Barbara area may ultimately be year-round, as observed with the 2017 Thomas Fire (December) and the 2009 Jesusita Fire (May), for example. The greatest fire danger for this area coincides with the period when the Sundowner winds are at their strongest.

Micro-climates are present in Santa Barbara due to significant variations in topography. Micro-climates in the area range from low-elevation, wind-sheltered, and damp locations with northerly or easterly aspects to high-elevation, wind-exposed, and dry locations with southerly or westerly aspects. Microclimate conditions can greatly affect fire hazard and should be considered when determining vegetation treatment priorities and implementation timing. Such conditions are often not captured in weather station datasets or recorded in easily referenced weather almanacs but are usually well known to locals, land managers, and local agency fire personnel.

Certain weather conditions can increase fire risk, resulting in the declaration of a Red Flag Warning by the National Weather Service. A Red Flag Warning means warm temperatures, very low humidity, and strong winds are expected to combine to produce an increased risk of fire danger. The City is located in the Santa Barbara County South Coast Weather Zone (CAZ239). The City's Red Flag Warning Plan identifies policies and procedures to be followed by SBFD during Red Flag Warnings and High Risk Days and include monitoring weather conditions, notifying City Departments and the media, revoking burn permits, flying red flags at fire stations, and ensuring that staff and equipment are within the City should an event occur. High Risk Days are defined days when there is a minimum 20% chance of either a new large fire occurring or significant growth on existing fires within the South Coast Area.

2.3.1 Climate Change

As noted above in Section 1, California faces a dramatic increase in the number and severity of wildfires, with 10 of the most destructive fires occurring since 2015 (CAL FIRE 2019a). The state's major study on climate impacts, the Fourth Climate Assessment (OPR et al. 2019), projects that California's wildfire burn area is likely to increase by 77% by the end of the century. As identified in Governor Newsom's Strike Force report (State of California 2019), the growing risk of catastrophic wildfires has created an imperative for the state to act urgently and swiftly to expand fire prevention efforts. Current research has also identified that the frequency of autumn days with extreme fire weather has more than doubled in California since the early 1980s, a result of human-caused climate change. Such fire weather exhibits strong offshore winds (e.g., Sundowners) and is coincident with unusually dry vegetation resulting from warm conditions over the summer months prior to the onset of autumn precipitation (Goss et al. 2020).

Climate change is expected to make landscapes more susceptible to extreme wildfires by altering temperatures (Hayhoe et al. 2004) and the availability and aridity of fuels (Abatzoglou and Williams 2016). Anthropogenic climate change has emerged as a driver of increased fire activity, a trend that is expected to continue (Abatzoglou and Williams 2016). All analyses completed for fire occurrence and severity into the future predict more frequent fires, a greater number of fires, and higher fire severity under climate change scenarios (Fried et al. 2004; Lenihan 2008; Westerling et al. 2011; Westerling 2018).

A changing climate, combined with anthropogenic factors, has already contributed to more frequent and severe wildfires in the western United States (Abatzoglou and Williams 2016; Mann et al. 2016; Westerling 2016), with the number of human-caused fires being much higher in more populated regions of the state. Recently, the area burned by wildfires has increased consistent with increasing air temperatures (OEHHA 2018). Increased wildfire risk and severity are vulnerabilities that are anticipated throughout California (Westerling 2018; Krawchuk et al. 2009). Increased fire occurrence and severity under climate change would secondarily affect other areas of vulnerability, as noted below.

- **Increased Fire Risk:** Warmer air temperatures are expected to lengthen the fire season, drying out vegetation more quickly and increasing fire risk. Based on high- and low-emissions climate change scenarios, increases in the number of high-severity wildfires are anticipated (Westerling 2018). Multi-year severe drought is supported as a factor in increasing fire size and severity, as well as tree mortality (Crockett and Westerling 2018). On interannual and shorter time scales, climate variability affects the flammability of live and dead forest vegetation (Westerling 2016). Fire size in the Central Coast area also increases with both air temperature in the month of ignition and with low precipitation in the preceding 12-month period (Westerling 2018). Additionally, the frequency of extreme fire weather in the fall months has increased over the past 40 years, a trend which is expected to continue under climate change models (Goss et al. 2020).
- **Greater Fuel Loads:** Years with widespread fires are historically preceded by wet years, which influence greater vegetation growth, especially in the understory. Highly flammable species, which often populate disturbed areas quickly, may have a competitive advantage over other species, typically resulting in a higher, more flammable fuel load. Drought may result in increased tree mortality, which contributes to higher fuel loading and wildfire size and severity (Crockett and Westerling 2018). Increasing fire size and severity and tree mortality are linked to increasing temperatures and aridity (Crockett and Westerling 2018). Increased prevalence of dead or desiccated fuels resulting from drought effects is conducive to crown fires, which require ladder fuels to move from volatile grasses to the less volatile mid-level forest to the dry and volatile canopy cover (Crockett and Westerling 2018). Increased fuel aridity contributes to larger forest areas experiencing increased periods of high fire potential (Abatzoglou and Williams 2016).

- **Ecological Impacts:** Increased fire severity is expected to amplify and accelerate the ecological impacts of climatic change. Drought years may increase the vulnerability of tree populations to insects and disease, and the lower occurrence of extended freezing periods in the winter would allow higher insect survivability. Climate-induced changes in fire behavior and frequency would influence species distribution, migration, and extinction (Flannigan 2000). Greater occurrence of fires increases the amount of carbon and particulates released into the atmosphere (Westerling 2008).
- **Social Impacts:** Increased expenditures for fire suppression are anticipated, and the amount of burned property (in total area and monetary value) in coastal Southern California communities increases substantially under global climate models' high-emissions scenarios due to greater fire risk (Westerling and Bryant 2008; Levy 2018). In areas with the highest fire risk, wildfire insurance is estimated to see costs rise by 18% by 2055, and the number of properties insured lowered (Westerling 2018). Wildland fire smoke exposure is a growing risk to public health (Domitrovich et al. 2017). Secondary effects of increased fire, such as loss of recreational amenities, area closures, and excessive smoke, can have serious financial effects on regional business interests and local economies.

The management recommendations included in this CWPP include fuel management actions to reduce fuel loads, minimize ignitions, and reduce the potential for extreme fire behavior.

2.4 Topography

The City of Santa Barbara is characterized by steeply sloping foothills and narrow canyons to the north, low-lying and gently sloping coastal plains, and an uplifted mesa to the south. The foothills and canyons meet the coastal plain to the south and southeast and slope upward to the east–west trending Santa Ynez Mountains. The uplifted mesa steeply slopes from the coastal plain to form a relatively flat and high sheer cliff face. Multiple drainages and hillslopes extend upwards from the boundary of the coastal plain and foothills towards the ridgeline of the Santa Ynez Mountains. Prominent watersheds and drainages within the foothill area of the City, listed in a generally east to west order, include Sycamore, Mission, San Roque, and Arroyo Burro Creeks. Tributaries located in the foothills converge into a few larger creeks near or along the coastal plain before ultimately discharging into the Pacific Ocean (CAL FIRE 2008; City of Santa Barbara 2005). Elevations in the City range from sea level to approximately 1,100 feet AMSL north of Skofield Park along the northern boundary of the City (USGS 2015; CAL FIRE 2008; City of Santa Barbara 2005).

Slopes throughout the City and surrounding Santa Ynez mountains are predominately south to southwest facing. Aspect can affect solar exposure rates and thus increase a slope's susceptibility to fire hazards. South and west-facing slopes are subject to a higher intensity of thermal heating from the sun and consequently have higher temperatures and lower fuel moistures. These slope aspects are typically dominated by lighter fuels (brush, grasses). North--facing slopes receive less solar exposure (and thus less heating) and east-facing slopes have earlier heating but also earlier cooling as the sun tracks across the sky. North- and east-facing slopes typically have heavier fuel loads (trees).

Terrain affects wildfire movement and spread. Steep terrain typically results in faster upslope fire spread due to pre-heating of uphill vegetation. Flat areas typically result in slower fire spread when absent of windy conditions. Topographic features such as saddles, canyons, and chimneys (land formations that collect and funnel heated air upward along a slope) may form unique circulation conditions that concentrate winds and funnel or accelerate fire spread. For example, fire generally moves slower downslope than upslope. Terrain may also buffer, shelter, or redirect winds away from some areas based on canyons or formations on the landscape. Saddles occurring at the top of drainages or ridgelines may facilitate the migration of wildfire from one canyon

to the next. Various terrain features can also influence fire behavior, as summarized in Table 2. Terrain in the City is graphically presented in Figure 3.

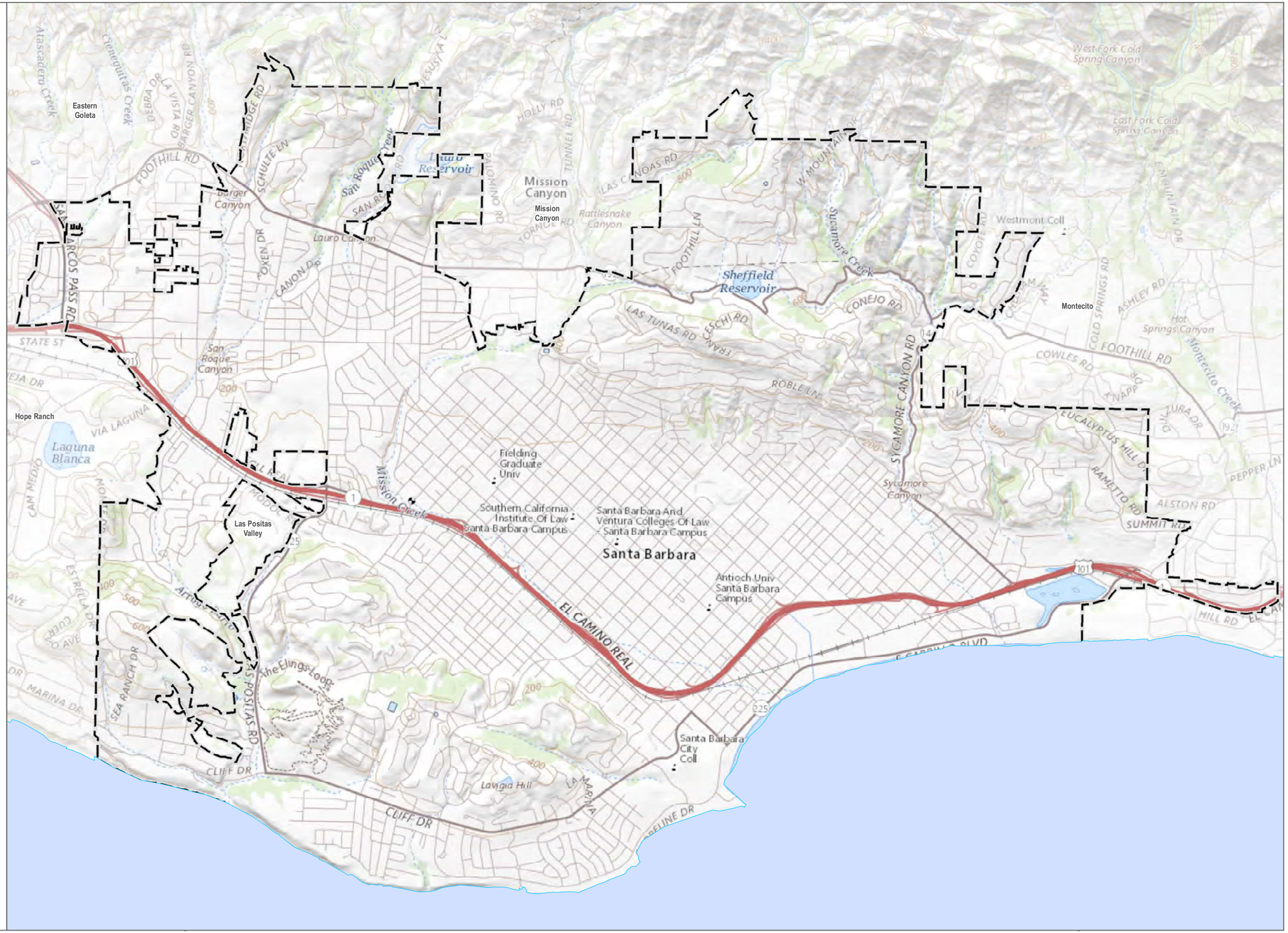
The narrow drainage and sub-drainage topographic features of the Santa Ynez Mountains have the capability to funnel winds, increase wind speeds, erratically alter wind direction, and facilitate fire spread and promote extreme fire behavior. This is especially true during Sundowner wind events when strong northerly winds are aligned with the downslope direction of the canyons and watersheds of the Santa Ynez Mountains. The topography of Santa Barbara is, therefore, capable of producing wind conditions that promote extreme wildfire behavior.

Table 2. Effects of Topographic Features on Fire Behavior

Topographic Feature	Effect
Narrow Canyon	Surface winds follow canyon direction, which may differ from prevailing wind; wind eddies/strong upslope air movement expected, which may cause erratic fire behavior; radiant heat transfer between slopes facilitates spotting/ignition on opposite canyon side.
Wide Canyon	Prevailing wind direction not significantly altered; aspect significant contributor to fire behavior. Wide canyons not as susceptible to cross-canyon spotting except in high winds.
Box Canyon/ Chute	Air drawn in from canyon bottom; strong upslope drafts. No gaps or prominent saddles to let heated air escape. Fires starting at canyon bottom can move upslope very rapidly due to a chimney-like preheating of the higher-level fuels and upslope winds.
Ridge	Fires may change direction when reaching ridge/canyon edge; strong air flows likely at ridge point; possibility for different wind directions on different sides of ridge. Ridges experience more wind. Fires gain speed and intensity moving toward a ridge. Fires burning at a ridge can exhibit erratic fire behavior. Strong air flows can cause a whirling motion by the fire. As the wind crosses a ridge it usually has a leeward eddy where the wind rolls around and comes up the leeward side.
Saddle	Potential for rapid rates of fire spread; fires pushed through saddles faster during upslope runs. Winds can increase when blowing through saddles due to the funneling effect of the constricted pass. On the other side, winds will slow, but erratic winds potentially occur at the saddle due to eddies.

Sources: Teie 1994; NFPA 2011.

City of Santa Barbara / CWPP Area



0 1,000 2,000 Feet

SOURCE: USGS National Map

COMMUNITY WILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA

DUDEK

FIGURE 3

Santa Barbara City Terrain

City of Santa Barbara Community Wildfire Protection Plan

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2.5 Vegetation and Fuels

Vegetation types (fuels) present in the City and their contribution to fire hazard are summarized in this section. Hazardous fuels include live and dead vegetation that exists in a condition that readily ignites; transmits fire to adjacent structures or ground, surface, or overstory vegetation; and/or is capable of supporting extreme fire behavior.

2.5.1 Vegetative Fire Hazard

The following sections summarize vegetative fire hazard of dominant vegetation types that occur within the City. Hazardous fuels include live and dead vegetation that exists in a condition that readily ignites; transmits fire to adjacent structures or ground, surface, or overstory vegetation; and is capable of supporting extreme fire behavior. All vegetation burns; however, some plants exhibit characteristics that make them more flammable than others. Flammability can be defined as a combination of ignitability, combustibility, and sustainability. Ignitability is the ease of or the delay of ignition; combustibility is the rapidity with which a fire burns; and sustainability is a measure of how well a fire continues to burn with or without an external heat source (White and Zipperer 2010). Flammability is influenced by several factors, which can be classified into two groups: physical structure (e.g., branch size, leaf size, leaf shape, surface-to-volume ratio, and retention of dead material) and physiological elements (e.g., volatile oils, resins, and moisture content) (Moritz and Svihra 1998; UCCE 2016; UCFPL 1997; White and Zipperer 2010). Plants that are less flammable have low surface-to-volume ratios, high moisture contents, and minimal dead material or debris. Examples of such plants include agave, oleander, and olive trees. More flammable species have high surface-to-volume ratios, exhibit low moisture contents, contain volatile oils, and have high levels of dead material or debris (Moritz and Svihra 1998; UCFPL 1997; UCCE 2016; White and Zipperer 2010). Examples of such plants include pampas grass, juniper, and pine. Plant condition and maintenance is also an important factor in flammability potential. Some plants that have more flammable characteristics can become less flammable if well maintained and irrigated. Conversely, plants can be explosively flammable when poorly maintained, situated on south-facing slopes, in windy areas, or in poor soils (Moritz and Svihra 1998).

The City has developed a list of desirable plant species for use in the City's High Fire Hazard Area (City of Santa Barbara 2020a). These plants have the ability to store water in leaves or stems and withstand drought, produce limited dead and fine material, are prostrate or prone in form, have extensive root systems for controlling erosion, can withstand severe pruning, have high levels of salt or other compounds that contribute to fire resistance, have low levels of volatile oils or resins, and/or can resprout after a fire. The City has also developed a list of plants that are prohibited in the City's High Fire Hazard Area (City of Santa Barbara 2020b). These plants are considered to be unacceptable in the landscape due to their flammable characteristics, which include large amounts of dead material retained within the plant, rough or peeling bark, production of profuse amounts of litter and the presence of volatile substances such as oils, resins, wax, and pitch. Certain native plants species contain these characteristics (e.g., sage, buckwheat, and coyote bush).

Insects, fungi, other microbes, and vertebrates are a natural component of California forests. Populations of pests are dynamic and fluctuate in response to climatic and environmental changes such as drought, stand density, fire, and other site disturbances. Healthy, vigorous trees are typically able to withstand pest attacks when pest populations are at low to moderate levels. When stressors exist in forests (e.g., overstocking, shading, drought), tree vigor is reduced, and tree susceptibility to pest attacks and infestations increases. Infestations of pitch canker (*Fusarium circinatum*) and sudden oak death (*Phytophthora ramorum*) have been reported within Santa Barbara County (Pitch Canker Task Force 2012; University of California 2004). Eucalyptus longhorned borer (*Phoracantha semipunctata* and *Phoracantha recurva*) has also been documented within the City (California

Agriculture 1996). These diseases/pests can contribute to wildfire hazards by increasing dead surface fuel loads and hindering firefighting efforts.

2.5.2 Vegetation Types

The following sections describe the existing vegetation types present in the City (City of Santa Barbara 2008) and their associated contribution to fire hazard. It should be noted that a large portion of the City has been mapped as urban land cover. Urban land cover typically represents noncombustible types (e.g., pavement) or developed and maintained landscapes (e.g., buildings, turf in parks), although some areas may be disturbed lands characterized by annual or perennial grass cover. Ornamental landscape vegetation also characterizes portions of areas mapped as urban land cover. Such vegetation is a combination of native and introduced ground cover, grass, shrub, and tree species. Some ornamental vegetation may increase fire hazard due to plant composition and structure (as described above) and the lack of irrigation and maintenance. Table 3 summarizes the different vegetation types identified and mapped in the City, and Figure 4 presents the distribution of vegetation types in the City.

Table 3. Vegetation Types in the City

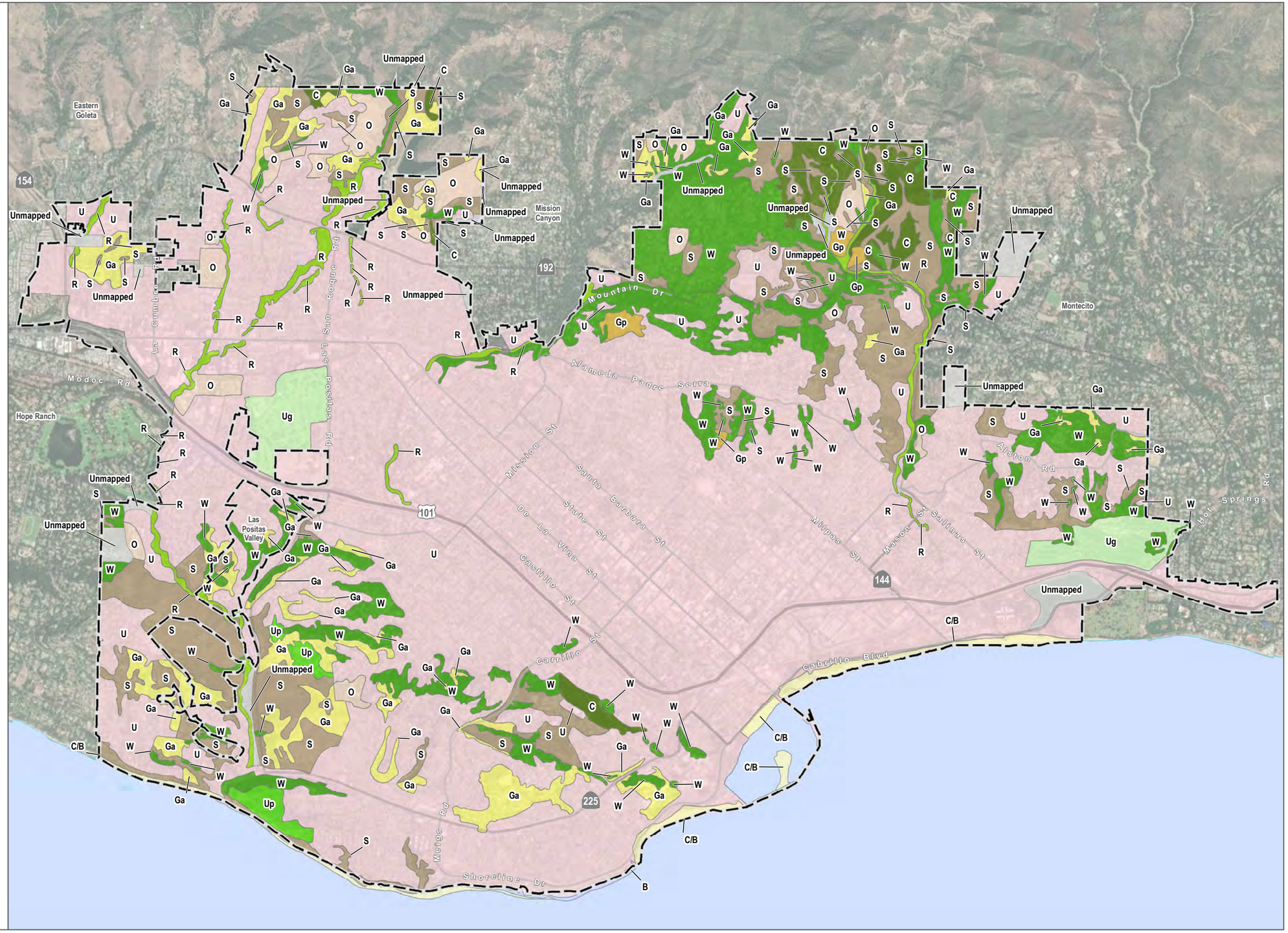
Vegetation Type	Acres	Percentage
Coastal bluff	14.57	0.12%
Chaparral	237.52	2.01%
Coastal strand/beach	122.92	1.04%
California annual grassland	535.03	4.53%
Coastal perennial grassland	36.42	0.31%
Orchard	236.54	2.00%
Riparian woodland	172.5	1.46%
Coastal sage scrub	1,181.69	10.01%
Urban	7,686.04	65.11%
Golf course	218.9	1.85%
Barren	21.55	0.18%
Southern oak woodland	1,140.46	9.66%
Unmapped	200.21	1.70%
Total	**11,804.35**	**100.00%**

Source: City of Santa Barbara 2008.

City of Santa Barbara / CWPP

Vegetation Communities and Land Cover Types

- B - Coastal bluff
- C/B - Coastal strand/beach
- C - Chaparral
- W - Southern oak woodland
- R - Riparian woodland
- Ga - California annual grassland
- Gp - Coastal Perrennial grassland
- S - Coastal sage scrub
- O - Orchard
- U - Urban
- Ug - Golf course
- Up - Parkland
- None/Unmapped



0 1,000 2,000 Feet

SOURCE: USGS National Map

COMMUNITYWILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA

DUDEK

FIGURE 4

Santa Barbara City Vegetation Types

City of Santa Barbara Community Wildfire Protection Plan

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2.5.2.1 Grass/Herbaceous

Grass/herbaceous fuels in the City are represented by the California annual grassland and coastal perennial grassland vegetation types and are found primarily in the southern, coastal area of the City, although smaller areas exist in the foothills along the City's northern boundary. Grassland types may include scattered and widely spaced trees and/or shrubs, although grasses are the dominant cover type. Grasses are fine fuels that are loosely compacted with a low fuel load.[2] Grasses have a high surface area-to-volume ratio, requiring less heat to remove fuel moisture and raise fuel to ignition temperature. They are also subject to early seasonal drying in late spring and early summer. Live fuel moisture content in grasses typically reaches its low point in early summer, and grasses begin to cure soon after. Due to these characteristics, grasses have potential for a high rate of spread, rapid ignition, and facilitation of extreme fire behavior. Grasses are the vegetation type in the City with the highest risk for wildfire ignition. Their low overall fuel loads typically result in faster moving fires with lower flame lengths and heat output. Untreated grasses can help spread fire into other adjacent surface fuel types (e.g., shrubs) or facilitate surface to crown fire[3] transition where they exist beneath tree canopies.

2.5.2.2 Brush/Scrub

Brush/scrub fuels in the City are represented by the chaparral and coastal sage scrub vegetation types. Brush/ scrub types may include scattered and widely spaced trees, small patches of grass/herbaceous vegetation, or grass herbaceous vegetation occurring beneath shrub canopies, although shrubs are the dominant cover type. Chaparral is found primarily in the foothills along the City's northern boundary, while coastal sage scrub is distributed evenly between the southern, coastal area of the City and the foothills along the City's northern boundary.

Chaparral and coastal sage scrub are considered moderately fine fuels that are loosely compacted. Chaparral has a high fuel load, and coastal sage scrub has a moderate fuel load. Both types have high surface area-to-volume ratios, requiring less heat to remove fuel moisture and raise fuel to ignition temperature. Both are subject to early seasonal drying in the late spring and early summer, but do not fully cure in the way that grasses do. The live fuel moisture content reaches its low point in the late summer and early fall months. Dead fuels consist mainly of 1-hour and 10-hour fuel sizes, or twigs and small stems ranging from 0.25 inches to 1 inch in diameter. Chaparral and coastal sage scrub have the potential for a high rate of spread, rapid ignition, and extreme fire behavior. Chaparral also has a high content of volatile organic compounds, which also contributes to extreme fire behavior potential.

2.5.2.3 Tree/Woodland

Tree/woodland fuels in the City are represented by the southern oak woodland and riparian woodland vegetation types. Also, while not mapped as a vegetation type, eucalyptus is included in this section due to its prevalence in the City. Tree/woodland types may also include scattered shrubs or shrub groupings, small patches of grass/ herbaceous vegetation, or shrub and grass herbaceous vegetation occurring beneath tree canopies, although trees are the dominant cover type. Oak woodlands are found in the City's drainages and canyons and along north-facing slopes throughout the foothills and southern, coastal area. Riparian woodlands are concentrated in narrow corridors primarily along San Roque, Mission, Sycamore, and Arroyo Burro Creeks.

Southern Oak Woodland

Oak stands are composed of fuel structures ranging from fine to heavy. In closed canopy stands, a sparse understory of grass, leaves, twigs, branches, and bark litter may be present. In open stands, understory may include grass, shrubs, leaves, twigs, branches, and bark litter. Fuel buildup typically occurs very slowly in oak woodland

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2 The amount of available and potentially combustible material, usually expressed as tons/acre (NWCG 2020).

3 A crown fire is a forest fire that advances often at great speed from tree top to tree top.

stands in California (USFS 2020a), and litter forms a thick, compacted mat resulting in very low surface fuel loads. In closed-canopy oak woodlands, understory fuel loads are low. The reduction of fire as an ecosystem process in oak woodlands, however, allows for an accumulation of fuels that had previously been consumed during regular, low-intensity fires. This can cause a build-up of woody vegetation in the understory, including significant increases in dead and downed woody material and ladder fuels connecting ground vegetation to tree canopies. As a result, some oak woodlands are more susceptible to severe, crown-consuming fires (McCreary 2004).

Oak trees are highly flame resistant as the leaves do not readily catch fire. Fires in oak stands tend to smolder in the duff, and consume surface fuels without generating enough heat to carry fire into the oak canopy (USFS 2020a). Oaks also do not spread fire crown-to-crown readily like many conifers (Sonoma Veg Map 2018). Oak woodland litter does little to facilitate fire spread as it has a low surface area-to-volume ratio and requires high heat levels to remove fuel moisture and raise fuel to ignition temperature. Oak woodland litter is subject to seasonal drying in the late summer and early fall months, but fog drip, solar shading, and the windbreak provided by oak canopies can sustain high fuel moisture content in the summer when fog is present. Oaks have a low content of volatile organic compounds, and the lack of highly combustible oils further reduces the fire hazard associated with oaks and oak woodlands.

Dead fuels consist of 1-hour[4] (litter and duff < 0.25 inches in diameter), 10-hour (twigs and small stems 0.25 inches to 1 inch in diameter), 100-hour (branches 1 inch to 3 inches in diameter), and 1,000-hour (large stems and branches > 3 inches in diameter) sizes. Oak woodlands are mostly lacking in features that promote fire spread, but weather and topography have a strong influence on fire behavior. Given extreme fire weather and steep terrain, oak woodlands have the potential for a moderate rate of spread, torching and crown fire, and extreme fire behavior, especially those with higher surface fuel loads and ladder fuels. Fire behavior in oak woodlands and forests is typically much less intense than wildfires burning in chaparral and coastal scrub communities. Low, compacted leaf litter understory, canopy shading of ground fuels, and wind velocity reduction from tree canopies significantly reduces the intensity and spread rates of surface fires in oak woodlands. Transition from ground to canopy fire increases fire intensity, spotting, and tree mortality potential.

Riparian Woodland

Riparian woodlands are concentrated within the drainages in the City and have a low fire hazard as their high moisture levels limit ignition potential and minimize the potential for wildfire spread. The vegetation within riparian woodlands responds slowly to changes in temperature and moisture, and significant surface shading from tree canopies limits fuel moisture loss. Surface fuels are relatively low in riparian woodlands; however, storm-related high water streamflow can deposit debris and contribute to fuel buildup as it dries out later in the season. During severe weather conditions, high fuel loads can result in high-intensity burning.

Eucalyptus

Eucalyptus stands and individual trees in the City are predominantly blue gum (*Eucalyptus globulus*). Eucalyptus stands are composed of fuel structures ranging from fine to heavy, and may include an understory of grass; brush; eucalyptus seedlings, saplings, and small trees; and eucalyptus leaf, twig, branch, and bark litter. Eucalyptus litter is generally moderately compacted with heavy to very heavy fuel loads; fuel loads in eucalyptus stands can reach between 45 and 100 tons per acre (Agee et al. 1973). Fuel buildup in blue gum eucalyptus stands is very rapid, exceeding that of other tree species, and its litter (dead leaves and debris) is especially

[4] Fuel moisture in these fuels can change within 1 hour according to environmental factors (e.g., temperature, humidity, shade).

flammable (Agee et al. 1973; NPS 2006; Wolf and DiTomaso 2016). Fuel reduction programs in eucalyptus stands are typically recommended to maintain low fuel load levels (USFS 2020b).

The leaves of blue gum eucalyptus may be moderately resistant to combustion under some circumstances (Dickinson and Kirkpatrick 1985); however, these trees are considered highly flammable as the bark catches fire readily, and deciduous bark streamers and lichen epiphytes tend to carry fire into the canopy, which tends to produce embers that can be carried by strong winds. These flying embers are carried downwind and result in the development of spot fires that have ignited in receptive fuel beds in advance of the fire's leading edge (Ashton 1981; USFS 2020b). Peeling bark is typical of many other eucalyptus species and contributes to ground-based fuels (litter) when it falls. Peeling bark is also retained for a period of time on tree trunks, where it can facilitate ground to canopy fire transition (ladder fuel). Eucalyptus litter has a moderate surface area to volume ratio, requiring moderate heat to remove fuel moisture and raise fuel to ignition temperature. Eucalyptus litter is subject to seasonal drying in the late summer and fall, but fog drip, solar shading, and windbreaks provided by the eucalyptus canopy can sustain high fuel moisture content in the summer when fog is present.

Like chaparral, eucalyptus also has a higher content of volatile organic compounds. Eucalyptus leaves produce a volatile (Gabbert 2014), highly combustible oil, and flammable gasses may be released from trees at very high temperatures, further increasing fire hazard (Gross 2013). The live fuel moisture content reaches its low point in the late summer and early fall months. Dead fuels consist of 1-hour (litter and duff < 0.25 inches in diameter), 10-hour (twigs and small stems 0.25 inches to 1 inch in diameter), 100-hour (branches 1 inch to 3 inches in diameter), and 1,000-hour (large stems and branches > 3 inches in diameter) sizes. Features that promote fire spread include heavy litter fall, flammable oils in the foliage, and open crowns bearing pendulous (i.e., downward-hanging) branches, which encourage maximum updraft (USFS 2020b). Given average weather conditions and terrain, eucalyptus has potential for a high rate of spread, torching and crown fire, and extreme fire behavior.

2.5.3 Wildfire Types and Potential Fire Behavior

Several wildfire types exist, as summarized below.

- **Ground Fire:** A fire burning on the ground or through understory vegetation and not reaching into the canopy (NWCG 2020).
- **Surface Fire:** A surface burning fire with low flame lengths (usually less than 1 meter) that does not result in significant movement into understory or overstory vegetation (NWCG 2020).
- **Crown Fire:** A fire that has burned upward from the ground and into the tree canopy. There are three types of crown fires:
    - **Passive Crown Fire:** A crown fire in which individual or small groups of trees torch out, but solid flaming in the canopy cannot be maintained except for short periods. Passive crown fire encompasses a wide range of crown fire behavior from the occasional torching of an isolated tree to a nearly active crown fire. Also called torching (Scott and Reinhardt 2001).
    - **Active Crown Fire:** A crown fire in which the entire fuel complex becomes involved, but the crowning phase remains dependent on heat released from the surface fuels for continued spread. Also called running and continuous crown fire (Scott and Reinhardt 2001).
    - **Independent Crown Fire:** A crown fire that spreads without the aid of a supporting surface fire (Scott and Reinhardt 2001).

Another component of fire behavior is spotting, the transfer of firebrands (embers) ahead of a fire front, which can ignite smaller vegetation fires (NWCG 2020). These smaller fires can burn independently or merge with the primary fire. Spotting can also result in structural ignitions when transported embers reach a receptive fuel bed (e.g., combustible roofing), especially in wind-driven fires, such as those occurring during the Sundowner wind events in the Santa Ynez foothills. Structure fires, as well as vegetation-fueled fires, can generate firebrands. Additionally, landscape features like ridges can dramatically affect fire behavior by changing prevailing wind patterns, funneling air, and increasing wind speeds, thereby intensifying fire behavior.

Each of the fire types mentioned above may occur within the City, depending on site-specific conditions. Fire behavior is how a wildland fire reacts to weather, fuels, and topography. The difficulty of controlling and suppressing a wildfire is typically determined by fire behavior characteristics, such as rate-of-spread, fireline intensity, torching, crowning, spotting, fire persistence, and resistance to control (NWCG 2020). Extreme fire behavior is that which precludes methods of direct control (e.g., flame lengths 8 feet and greater), behaves unpredictably and erratically, and typically involves high spread rates, crowning and spotting, the presence of fire whirls, and a strong convective column (NWCG 2017).

Fire behavior characteristics are an essential component in understanding fire risk and fire agency response capabilities. Flame length—the length of the flame of a spreading surface fire within the flaming front—is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews et al. 2008). While it is a somewhat subjective and nonscientific measure of fire behavior, it is imperative to fireline personnel when evaluating fireline intensity, and is worth considering as a vital fire variable (Rothermel 1993). Fireline intensity is a measure of heat output from the flaming front and also affects the potential for a surface fire to transition to a crown fire. The information in Table 4 presents an interpretation of flame length and its relationship to fire suppression efforts.

Table 4. Fire Suppression Interpretation

Flame Length	Fireline Intensity	Interpretations
Under 4 feet	Under 100 BTU/ft/s	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 feet to 8 feet	100–500 BTU/ft/s	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 feet to 11 feet	500–1,000 BTU/ft/s	Fires may present serious control problems—torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11 feet	Over 1,000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Source: Roussopoulos and Johnson 1975.
Note: BTU/ft/s = British thermal units per foot per second.

2.6 Fire History and Ignitions

Fire history is an important component of fire planning and can provide an understanding of fire frequency, fire type and behavior, most vulnerable community areas, and significant ignition sources, amongst others. Several large-scale fires have been recorded by fire agencies in the area, primarily associated with the Santa Ynez Mountain foothills. The topography, vegetation, and climatic conditions in the Santa Barbara area combine to create a unique situation capable of supporting large-scale, high-intensity, and sometimes damaging wildfires, such as the 2017 Thomas Fire. The history of regional wildfires in the Santa Barbara area is summarized in Table 5 and graphically presented in Figure 5.

Table 5. History of Wildfires in the Santa Barbara Area

Fire	Date	Cause	Acres Burned	Structures Damaged or Destroyed	Deaths
Cave	November 2019	Arson	3,126	0	0
Holiday	July 2018	Power lines	113	24 structures destroyed	0
Thomas	December 2017	Power lines	281,893	1,063 structures destroyed, 280 structures damaged	2
Alamo	July 2017	Under Investigation by San Luis Obispo County/CAL FIRE	28,687	1 residence destroyed, 1 structure damaged	0
Whittier	July 2017	Vehicle	18,430	16 residences destroyed, 1 residence damaged, 30 outbuildings destroyed, 6 outbuildings damaged	0
Rey	August 2016	Under investigation by U.S. Forest Service	32,606	0	0
Sherpa	June 2016	Misc. – disposal of burning log from fireplace	7,474	1	0
Gibraltar	October 2015	Arson	21	0	0
White	May 2013	Escaped embers from approved fire-use day site	1,984	0	0
La Brea	August 2009	Campfire associated with illegal marijuana plantation/grow	91,622	1	0
Jesusita	May 2009	Equipment Use	8,733	80	0
Tea	November 2008	Campfire	1,940	238	0
Gap	July 2008	Arson	9,443	4	0
Zaca	July 2007	Equipment Use	240,207	1	0
Perkins	July 2006	Lightning	14,988	0	0
Gaviota	July 2004	Lightning	7,440	1	0
Marre	September 1993	Smoking	43,882	0	0
Paint	June 1990	Arson	4,270	673	1
Wheeler	July 1985	Miscellaneous	119,361	26	0
Sycamore	July 1977	Kite into power lines	806	234	0
Romero	October 1971	Arson	14,538	N/A	4
Coyote	September 1964	Undetermined	65,338	94	1
Refugio	September 1955	Structure Fire	79,428	20	0

Sources: CAL FIRE 2020b; SBCFD 2018; VCFD 2020.

As presented in Table 5, nearly all significant wildfires have burned in the months of July, September, or October. This timeframe coincides with the end of the dry summer season, where vegetation has lower fuel moistures, and Sundowner winds are prominent. While not all the fires shown in Table 5 were associated with Sundowner winds, the largest and most damaging fires have occurred during such winds.

The history of wildfire ignitions in the Santa Barbara area is directly related to human activity. Wildfire occurrence in the Santa Barbara area predominately occurs in the Santa Ynez Mountains. Mechanized and power equipment use (e.g., mowers) is a potential ignition source and was responsible for the Jesusita and Zaca Fires. Arson, campfires, and a vehicle fire have also been sources of significant wildland fires in the Santa Barbara area, including the Whittier, Gibraltar, Brea, Tea and Gap fires. However, the largest recorded fire within the County, the Thomas Fire, ignited as a result of line slap (lines coming into contact with each other, creating an electrical arc, which deposits hot, burning or molten material onto the ground into a receptive fuel bed).

Fires in the coastal area of the City have been relatively small due to quick response and suppression actions taken by the SBFD and Santa Barbara County Fire Department (SBCFD). Such small fires are typically excluded from fire perimeter mapping databases. For example, fire perimeter data from CAL FIRE includes fires dating to the late 1800s, but only includes those larger than 10 acres (CAL FIRE 2020b). Although the fire history data presented in Table 5 and Figure 5 does not include mapped fire perimeters for this area of the City, this is attributed to a limitation in the perimeter mapping data set. However, fires do occur in the coastal area of the City, which can ultimately result in wildfire ignition and spread if not suppressed quickly. SBFD fire call and response data from 2004 to 2020 (including structure fires, vegetation fires, trash fires, and vehicle fires) (SBFD 2020a, SBFD 2020b) indicates that 725 fires have occurred within the coastal area of the City (south of Highway 101 and west of Castillo Street). The locations of these fires is presented in Figure 6. To date, successful SBFD response efforts have prevented these fires from becoming wildfires reaching sizes of 10 acres or more.

Interestingly, most vegetation fires ignited within the City occur in the more urban areas rather than in the foothill areas. However, ignitions in the foothill areas have the potential to spread throughout large expanses of wildland fuels and cause more widespread landscape damage than would a vegetation ignition in an urban setting (SBFD 2004).

2.7 Development Patterns

Just over 50% of the City's land area is designated and zoned for low-density residential land uses. This is reflected in the pattern of development and land use within the City's High Fire Hazard Area, which creates conditions that can be described as either a WUI or a wildland-urban intermix (Intermix). The WUI are areas where structures and other human development meets or intermingles with undeveloped wildland or vegetation fuels. This area typically consists of residential and commercial areas near or along foothills, such as found in the hillside and suburban low-density residential neighborhoods of the Riviera and Eucalyptus Hill. Intermix areas predominately consist of lower density housing units and structures more closely interwoven with vegetative fuels that are capable of propagating fire. This condition exists throughout the Foothill, Cielito, and Alta Mesa neighborhoods, including portions of the City's coastal area where steep terrain and sensitive habitat prevents more dense development.

The City's Local Hazard Mitigation Plan identifies the following subcategories of WUI:

- **Classic WUI:** where well-defined urban and suburban development presses up against open expanses of wildland areas.
- **Mixed WUI:** characterized by isolated homes, subdivisions, and small communities situated predominantly in wildland settings (this category would be described as Intermix).
- **Occluded WUI:** where islands of wildland vegetation occur inside a largely urbanized area. There are no examples of this type of WUI in the City.

All of the City's High Fire Hazard Area would be considered and classified as either the classic or mixed WUI category. Challenges with developments in WUI areas include narrow roads, long driveways, dead-end roads, steep slopes, and dense vegetation. Emergency response and evacuation from WUI areas during emergencies can also be hindered by these factors.

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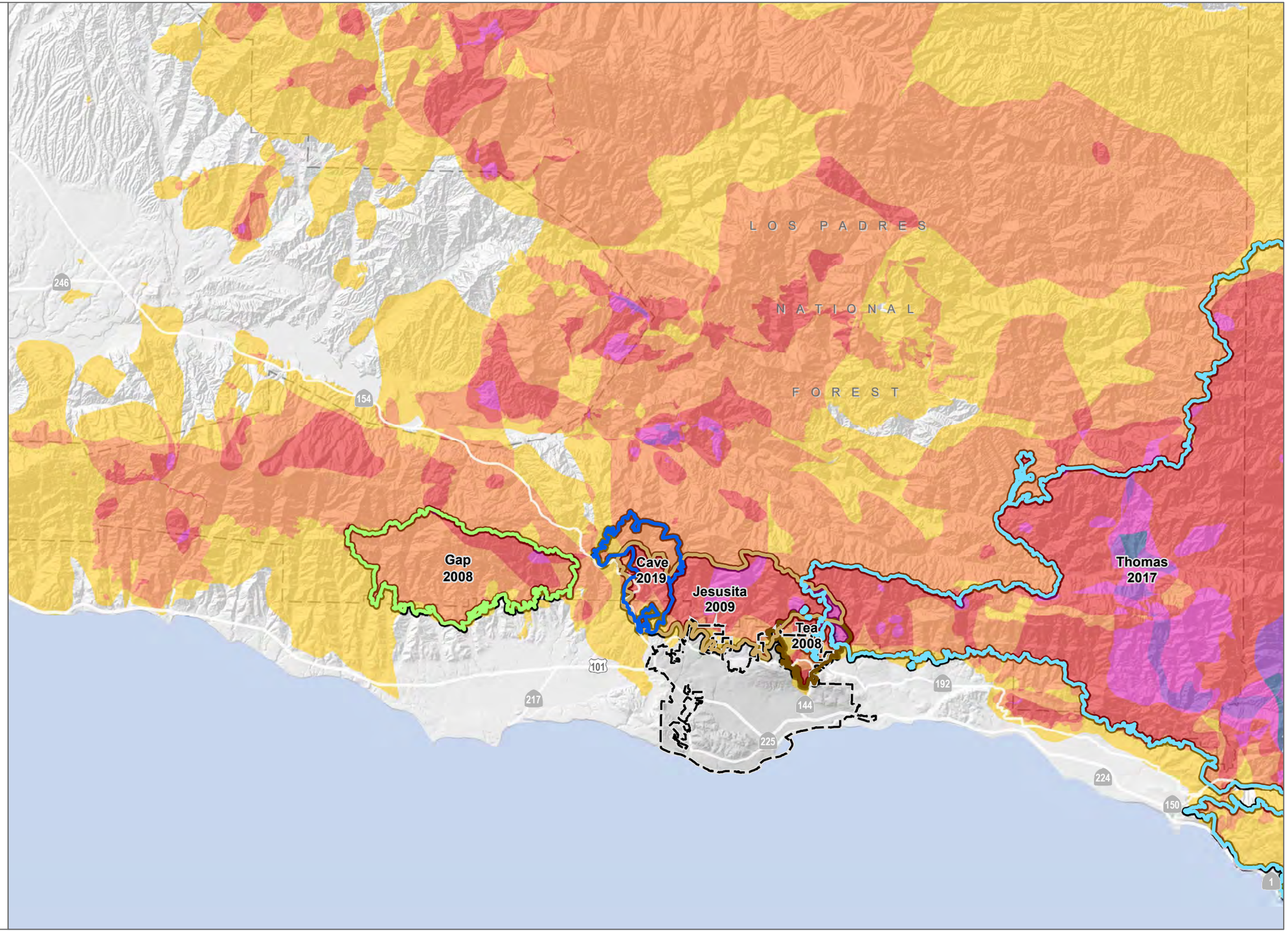
Most Recent South Coast Front Country Fire Perimeters

- Gap 2008
- Tea 2008
- Jesusita 2009
- Thomas 2017
- Cave 2019

Fire Frequency (Number of Times Burned)

- 1
- 2
- 3
- 4
- 5
- 6



0 1 2 4 Miles

SOURCE: CAL FIRE

COMMUNITYWILDFIRE CITY OF SANTA BARBARA PROTECTION PLAN

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FIGURE 5

Fire History in the Santa Barbara Area

City of Santa Barbara Community Wildfire Protection Plan

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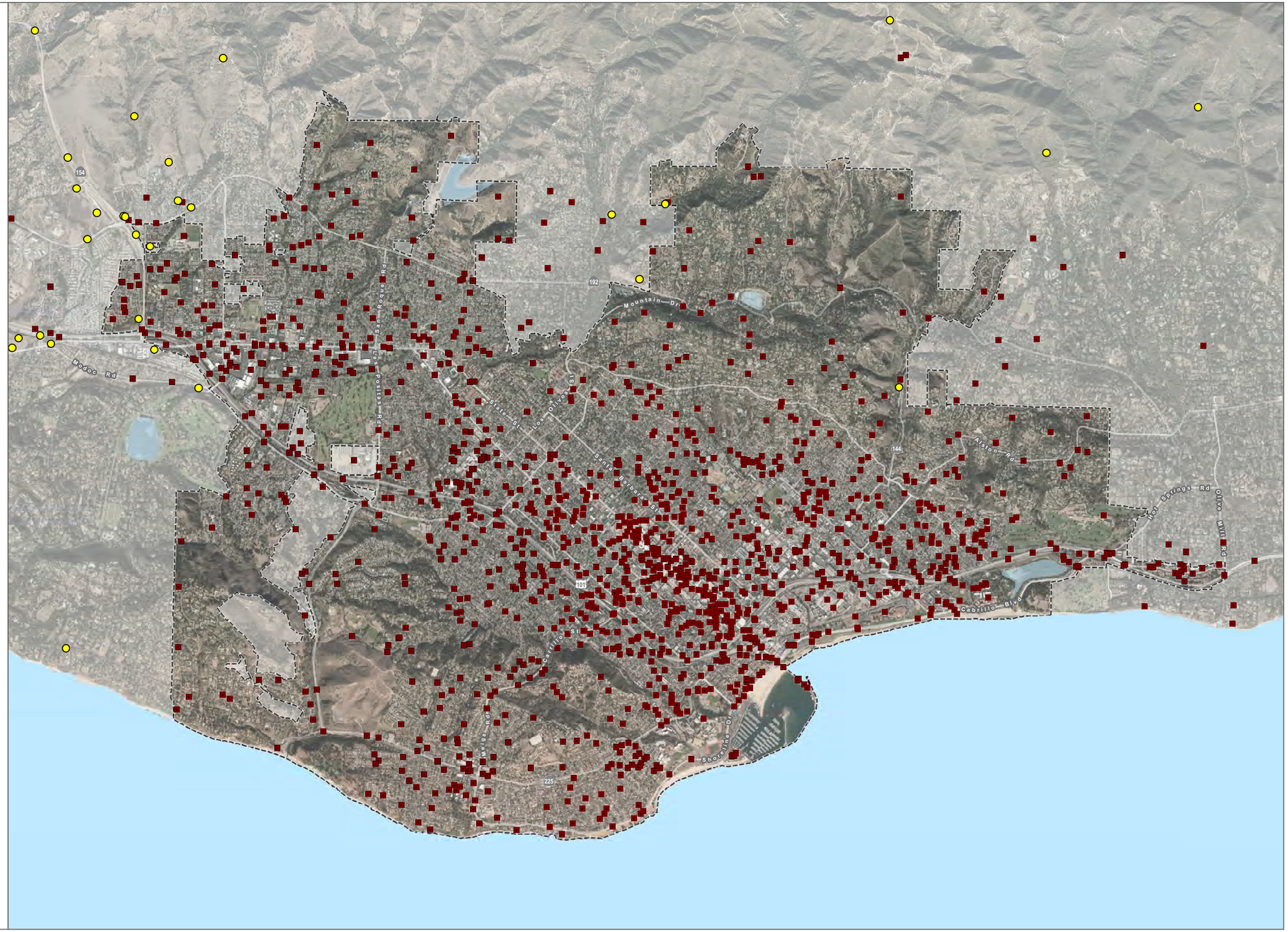
City of Santa Barbara Boundary

Fire Ignition Data

- City Fire (2004-2020) *
- County Fire (2007-2018)

* City Fire Ignitions occurring outside of the City Boundary are SBFD responses made under mutual aid agreements with neighboring Fire Authorities Having Jurisdiction.



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SOURCE: City of Santa Barbara Fire Department, County of Santa Barbara Fire Department

COMMUNITY WILDFIRE PROTECTION PLAN CITY OF SANTA BARBARA

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FIGURE 6

Santa Barbara Ignition History

City of Santa Barbara Community Wildfire Protection Plan

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2.8 Existing Hazard Abatement/Fuels Treatment

2.8.1 Defensible Space and Vegetation Management

As outlined in Chapter 8.04 of the City of Santa Barbara Municipal Code (adopted by Ordinance #5920), all parcels in the City's High Fire Hazard Area are required to meet City-defined defensible space requirements year-round. Vegetation within defensible space zones, native or otherwise, must be maintained to create an effective fuel break by thinning dense vegetation and removing dry brush, flammable vegetation, and combustible growth from areas within 30 to 150 feet (depending on High Fire Hazard Area Zone) of all buildings or structures. The following defensible space widths are required by High Fire Hazard Area Zone:

- **Coastal Interior Zone:** 30 to 50 feet of defensible space required from structure
- **Coastal Zone:** 50 to 70 feet defensible space required from structure
- **Foothill Zone:** 100 feet defensible space required from structure
- **Extreme Foothill Zone:** 150 feet defensible space required from structure

Chapter 8.04 outlines treatment standards and identifies exceptions to identified standards and special considerations for increasing defensible space widths (or distances), minimizing erosion potential, and reducing water quality and habitat impacts. Where required defensible space occurs on an adjoining property (e.g., property line setback is less than required defensible space distance), it is up to the adjoining property owner to provide defensible space for their neighbor. In cases where cooperation is not achievable, SBFD may enforce defensible space management requirements on adjoining properties.

2.8.2 City Vegetation Management Units

As a component of wildfire risk mitigation, the 2004 Wildland Fire Plan identified a series of Vegetation Management Units (VMUs) within the City's High Fire Hazard Area. These units have unique hazards and include, or are adjacent to, values threatened by wildfire; have the potential for extreme fire behavior; and pose a challenge for fire protection because of dense, flammable vegetation, lack of access due to topography and roads, and firefighter exposure. These VMUs encompass land outside defensible space requirements on both City-owned and private property where vegetation management would occur in cooperation with the affected property owners. The 2004 Plan outlined a suite of vegetation management methods to reduce wildland fuel hazards in and near the High Fire Hazard Area. SBFD has implemented treatments in the VMUs since 2004 on a case-by-case basis. Before commencing any work, SBFD develops a work plan that identifies the specific areas to be treated and the best methods to be used.

Treatment area identification is also informed by a site-specific biological evaluation conducted prior to operations. Consistent with Mitigation Measure BIO-1 outlined in the 2004 Wildland Fire Plan Environmental Impact Report (City of Santa Barbara 2004), the City consults with a qualified biologist during the preparation of work plans for each VMU. Based on this consultation, site-specific measures to avoid or reduce impacts to biological resources (including Environmentally Sensitive Habitat Areas) known or likely to occur in the VMU are identified. Vegetation management actions are then modified to reduce impacts to special status species. The biological assessments conducted prior to vegetation management work conducted in VMUs also consider the presence of invasive species. Treatment techniques are identified to minimize potential invasive species spread during vegetation management activities. Finally, the City implements a vegetation treatment hierarchy during work plan development at each VMU where vegetation treatment/removal is prioritized in the following order: dead plant material, dying plant material, invasive species, and native species.

VMUs are prioritized based on the level of hazard; however, implementation of fuels reduction work in VMUs has largely been dependent on funding, recent wildfire activity (e.g., recently burned VMUs would not be prioritized for treatment as fuel loads would be low) and, in the case of private property, property owner permission (SBFD and Community Development 2004). VMUs are listed below in order of priority (SBFD 2004). Figure 7 presents the locations of current VMUs.

Extreme Foothill Zone

Two VMUs identified:

1. Las Canoas Road (53 acres)
2. Upper Coyote Road (21 acres)

Foothill Zone

Eighteen (18) VMUs identified:

1. Westmont/Las Barrancas (47 acres)
2. Coyote Road (12 acres)
3. Coyote Circle (11 acres)
4. Conejo Road (86 acres)
5. Fire Station 7 (2 acres)
6. San Roque Creek (82 acres)
7. Hillcrest Road (67 acres)
8. Eucalyptus Hills Road (63 acres)
9. Alston Place (39 acres)
10. Owens Road (25 acres)
11. Cleveland School area (8 acres)
12. Jimeno/Garcia Road (64 acres)
13. Stevens Park area (15 acres)
14. Mountain/Las Tunas (43 acres)
15. Camino Viejo (24 acres)
16. Cima Linda (16 acres)
17. Alturas Del Sol (18 acres)
18. Garcia/Ferrelo Canyon (6 acres)

Coastal Zone

No VMUs identified.

Coastal Interior Zone

Four VMUs identified:

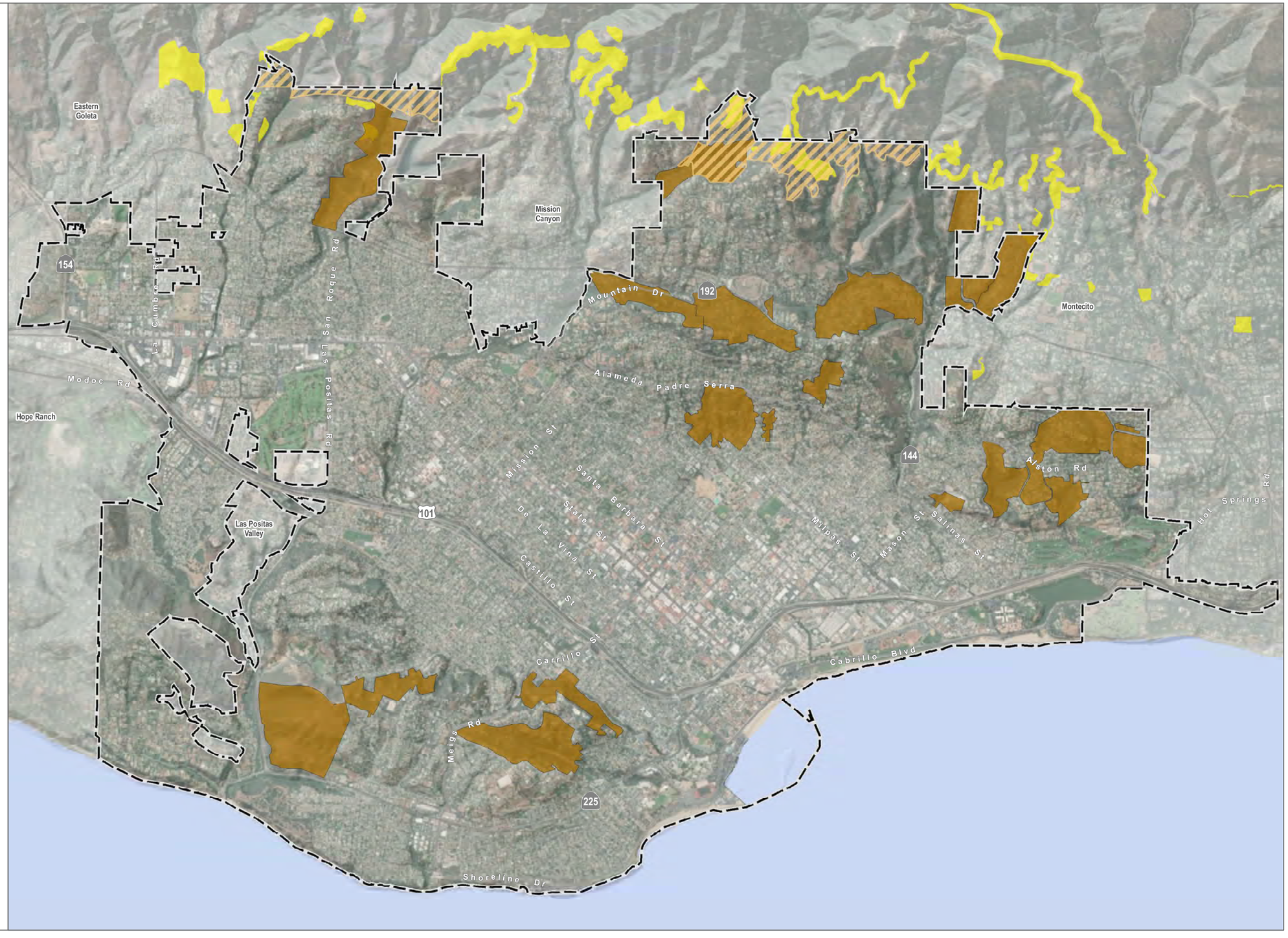
1. Hondo Valley (83 acres)
2. Las Positas Road (126 acres)
3. Flora Vista (40 acres)
4. Loma Alta (42 acres)

City of Santa Barbara / CWPP

Current Vegetation Management Units

Community Fuels Treatment Network

Adjacent Vegetation Management Areas



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SOURCE: City of Santa Barbara

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FIGURE 7

Current Vegetation Management Units, Community Fuels Treatment Network, and Adjacent Vegetation Management Areas

City of Santa Barbara Community Wildfire Protection Plan

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2.8.3 Community Fuels Treatment Network

As a component of wildfire risk mitigation, the 2004 Wildland Fire Plan also identified maintenance of the Community Fuels Treatment Network (CFTN) located along the northern portion of the Extreme Foothill Zone. The CFTN encompasses 242 acres and provides a break between continuous decadent stands (comprised of large shrubs with 25 percent or more dead material and typically 30+ years old) of chaparral fuel outside the City boundary and the City area. The CFTN also provides a strategic last line of defense for fire protection resources to suppress a wildland fire before it enters more highly populated areas of the City. The CFTN is an area where multiple property owners interlink their individual defensible space areas and treat continuous strips of hazardous vegetation to form a vegetation management network (SBFD 2004).

Since 2004, fuels management efforts in this area has reduced the amount of flammable vegetation by approximately one-third to one-half. Treatments in this area are focused outside of 150-foot defensible space areas for structures and target the removal of flammable vegetation (brush and understory) by preferentially removing exotic plants; thinning, pruning, and limbing of vegetation to remove fire ladders; limbing up of oak overstory; pruning out of dead material; and thinning out continuous areas of brush using a mosaic pattern. Eucalyptus trees are thinned to obtain 6 to 12 trees per 1,000 square feet. Vegetation management is accomplished via hand cutting and chipping, hand cutting and multi-cutting, and hand cutting and prescribed burning, and considers slope, exposure, vegetation type, and access (SBFD 2004). Figure 7 presents the locations of the current CFTN.

2.8.4 Neighboring Jurisdictions Vegetation Management Areas

Mutual vegetation management is essential for fire prevention and fire management. Both the Montecito Fire Protection District (MFPD) and the Santa Barbara County Fire Department (SBCFD) have fuel mitigation strategies independent of SBFD, to reduce the potential or slow the progress of wildfires. These programs include fuel reduction through identified VMUs, structural hardening (i.e., defensible spaces), and emergency preparedness. The SBFD coordinates vegetation management efforts with MFPD and SBCFD in areas adjacent to the City, where feasible. Figure 7 presents the locations of neighboring jurisdiction's vegetation management areas.

2.8.5 City Wildland Fire Suppression Assessment District

In 2006, the City of Santa Barbara adopted the Wildland Fire Suppression Assessment District (WFSAD). The WFSAD encompasses 3,480 acres and was created pursuant to California Government Code Section 50078 and Article XIIID of the California Constitution. The voters of the WFSAD agreed to a levy to fund certain services designed to reduce the severity and damage from wildland fires in the Foothill and Extreme Foothill Zones of the City's High Fire Hazard Area. These areas were included in the WFSAD based on the potential for high-severity wildfire in this portion of the City as presented in the City's 2004 Wildland Fire Plan. WFSAD funds are used to provide the services outlined in the following sections. The boundary of the WFSAD is presented in Figure 8.

2.8.5.1 Defensible Space Evaluation Program

The SBFD offers voluntary evaluations of private properties in the WFSAD to determine compliance with the defensible space requirements outlined in Section 3.2.1. Since 2008, a total of 256 evaluations have been completed, an average of 40 per year within the WFSAD. The intent of the voluntary defensible space evaluations in the WFSAD is to educate and assist property owners to ensure that defensible space requirements are met and that life and property are as safe as possible during a wildfire event.

2.8.5.2 Chipping

The City offers chipping services to those property owners who reside in or own properties within the WFSAD located in portions of the Foothill and Extreme Foothill High Fire Hazard Area Zones. Chipping services are provided to encourage property owners to meet defensible space requirements by providing a cost-effective way to dispose of cut material. Chipped material is hauled off site and delivered to property owners who have requested it. The material is for personal use and is delivered primarily within the City limits. Chipped material is not hauled to a landfill. Guidelines are in place to facilitate recycling of nearly 100% of chipped material (e.g., invasive plant species will not be chipped). Pile burning of treated vegetation has historically occurred on private properties in the City under the authority of City burn permits, though this practice has largely ceased in recent years. The City's chipping services have provided an alternative to burning cut material.

2.8.5.3 Road Clearance

The City conducts roadside vegetation management to reduce the amount of vegetation along roadways, enhance evacuation during a wildfire, and allow greater access for fire engines and equipment to respond during a wildfire. The City Municipal Code requires property owners maintain an area cleared of flammable vegetation and combustible growth on their property on each side of portions of highways and private streets, which are improved, designed, or ordinarily used for vehicular traffic for a distance of 10 horizontal feet; additionally, overhanging vegetation shall be removed for a vertical clearance not less than 13 feet 6 inches. The SBFD treats roadside vegetation through funds established by the WFSAD in both the Extreme Foothill and Foothill High Fire Hazard Area Zones of the City.

2.8.5.4 Vegetation Management

The WFSAD provides funding for managing vegetation within VMUs that occur within the WFSAD boundary and the CFTN. Vegetation management is implemented as discussed in Section 2.8.2.

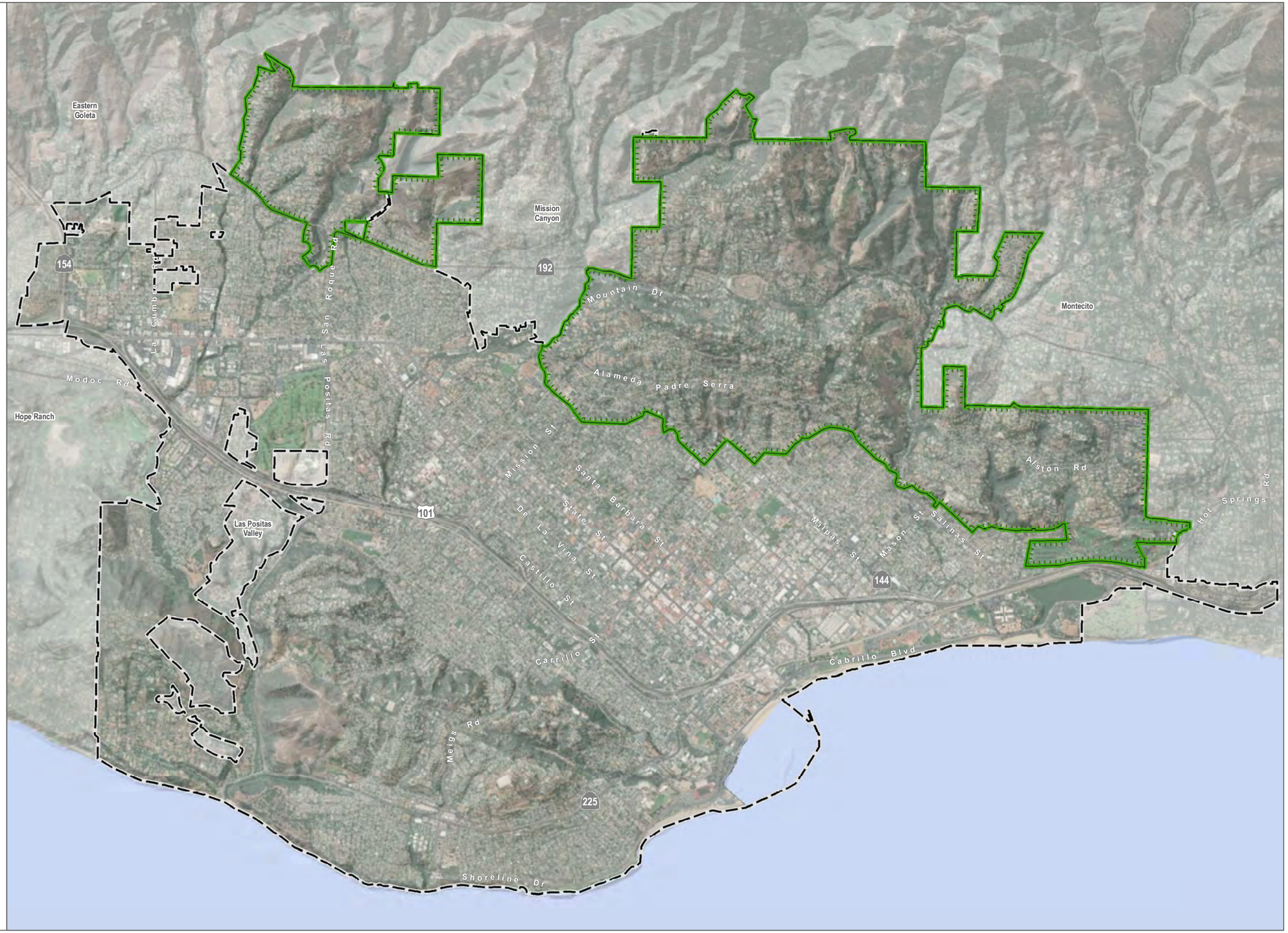
2.9 Evacuation

The City of Santa Barbara presents unique challenges for evacuation due to the speed and intensity at which wildfires occur as well as the high variability in transportation systems in the City, notably throughout the City's High Fire Hazard Area. Factors associated with evacuation, such as human behavior, population density, overloaded transportation routes, visitors, vulnerable populations, as well as the evacuation of pets and large animals, make the task of any evacuation more complex. Any combination of these factors may significantly increase the amount of time it takes to execute an evacuation. As a result, the decision by property owners and agencies to evacuate is often made quickly.

The 2004 Wildland Fire Plan, in part, contained basic evacuation procedures that identified public evacuation blocks and routes, fire resource ingress/egress routes, and traffic control points to facilitate evacuations. Historically, the evacuation plan appeared to successfully enable communities within and near the City of Santa Barbara's borders to evacuate during large wildfires, including the 2008 Tea Fire and the 2009 Jesusita Fire. However, despite the success of the plan, numerous fire scenarios had not been realized by the City. As a result, in 2014, the SBFD commissioned a Wildland Fire Evacuation Procedure Analysis to evaluate various wildfire scenarios as well as perform an overall evaluation of the evacuation procedures and recommend improvements that would guide the City toward greater preparedness and improved firefighter safety and evacuation efficiency (Dudek 2014).

City of Santa Barbara / CWPP Area

Wildland Fire Supression Assessment District (WFSAD) Boundary



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SOURCE: City of Santa Barbara

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FIGURE 8

City Wildland Fire Suppression Assessment District

City of Santa Barbara Community Wildfire Protection Plan

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Evacuation during a wildfire in Santa Barbara is not necessarily directed by the fire department, except in specific areas where fire personnel may enact evacuations on-scene. The Santa Barbara County Sheriff's Department, Santa Barbara Police Department (SBPD), and other cooperating law enforcement agencies have the primary responsibility for evacuations. These agencies work closely within the Unified Incident Command System with the County Office of Emergency Services, and responding fire department personnel who assess fire behavior and spread, which should ultimately guide evacuation decisions. To that end, the City Fire, Police, and Public Works Departments have worked with a County Pre-Fire Mitigation Task Force to address wildland fire evacuation planning for Santa Barbara. The task force also received input from the MFPD, Carpinteria/Summerland Fire Protection District, California Highway Patrol, the California Department of Transportation, as well as various property owners associations throughout the Santa Barbara area (Dudek 2014).

Through supportive measures, the Task Force prepared an evacuation preplan that outlines the SBFD response routes, probable public evacuation routes, traffic control points, and staging areas. The interagency evacuation preplan would be used by law enforcement, fire, and public works agencies during a wildfire evacuation. However, based on actual fire conditions occurring in the field, the preplans may be modified at the time of the incident (Dudek 2014).

The evacuation preplans separated the City's High Fire Hazard Area, including the Extreme Foothill, Foothill, Coastal, and Coastal Interior Zones, into evacuation areas or "evacuation blocks." The development of the evacuation blocks was determined by landforms, primarily major canyons, and road systems. A total of 26 blocks were identified within the City. The evacuation blocks are based on a variety of features, including watersheds, terrain including ridgelines, population areas, significant landscape transitions including roadways, and vegetation. The 2014 Plan (Dudek 2014) recommended maintaining existing preplan evacuation block maps, which are presented in Figure 9. The 2014 Plan also outlined management recommendations for enhancing evacuation capabilities, which are summarized in Appendix A.

2.10 Water Supply

Water systems that supply adequate quantity, pressure, and duration are essential to structure protection. Without adequate water supply the ability to safely protect structures and suppress fires is compromised. The Fire Department Water Supply and Fire Hydrant standards (City Municipal Code, Ordinance 5920) outline the City's water supply requirements. (Appendix B). The Public Works Department has developed an extensive water distribution system that consists of many components including reservoirs, pump stations, pressure zones, water mains, and fire hydrants. Fire hydrants (with fire flow ratings) and water reservoirs important for fire suppression were identified during development of the 2004 Wildland Fire Plan.

A portion of the Extreme Foothill Zone (Zone 2) is not connected to the City water system. Most of the water system on West Mountain Drive onto Coyote Road is owned and operated by Montecito Water District. A small section of West Mountain Drive in this area is not serviced by the City or Montecito Water District and does not have fire hydrants. This area has additional requirements included in the City's Municipal Ordinance (#5920). Specifically, for buildings, or portions of buildings, constructed within the boundaries of Zone 2, a water tank with a minimum capacity of 10,000 thousand gallons is required to be provided for fire protection purposes only and designated, installed and maintained in a manner approved by the Fire Code Official. The locations of City water mains and hydrants is presented in Figure 10.

2.11 Communications

Radio communications systems are critical to fire department response capabilities and the life safety of firefighters and the public depends on reliable, functional communication tools that work in harsh environments. Radios are the lifeline that connect firefighters to command and outside assistance and serve as a critical tool for communicating site information accurately and efficiently. The SBFD currently operates an analog radio system which is not compliant with Project 25 (P25). P25 is a suite of standards developed to provide digital voice and data communication systems suited to public safety and first responders and was initiated by the Association of Public Safety Communications Officials (APCO).

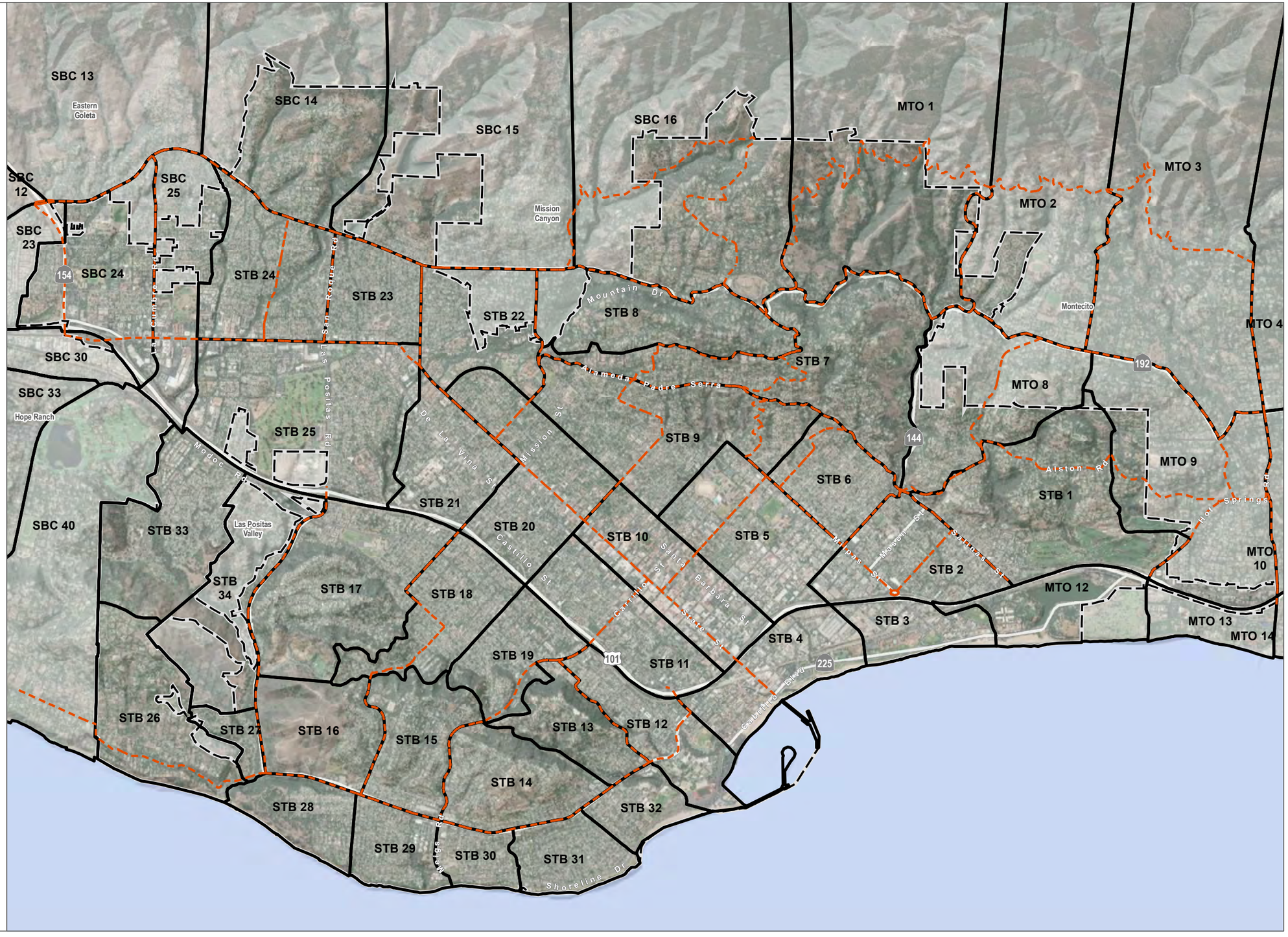
The City's current radio system generally functions well, though there are some interoperability issues between this system and other agency systems that operate on digital platforms. This can be problematic during day-to-day operations and is amplified during large scale events that bring in firefighters from other agencies. Additionally, radio coverage in the City is affected by terrain and the current placement of repeaters. Specifically, there are several "dead spots" in the City where radio communications do not work as radio signals are blocked by steep slopes, narrow canyons, or ridgelines. Coincidentally, these are areas where fire hazard is elevated due to these same terrain features.

Finally, the City's radio communications system components are aging and no formal plan exists for routine replacement of components. A structured and funded equipment replacement plan could minimize negative effects on fire department communications and allow for a proactive approach to equipment upgrades over time.

City of Santa Barbara / CWPP

Wildland Evacuation Preplanning Blocks

Wildland Evacuation Routes



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SOURCE: County of Santa Barbara

COMMUNITYWILDFIRE CITY OF SANTA BARBARA PROTECTION PLAN

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FIGURE 9

Wildfire Evacuation Preplanning Blocks

City of Santa Barbara Community Wildfire Protection Plan

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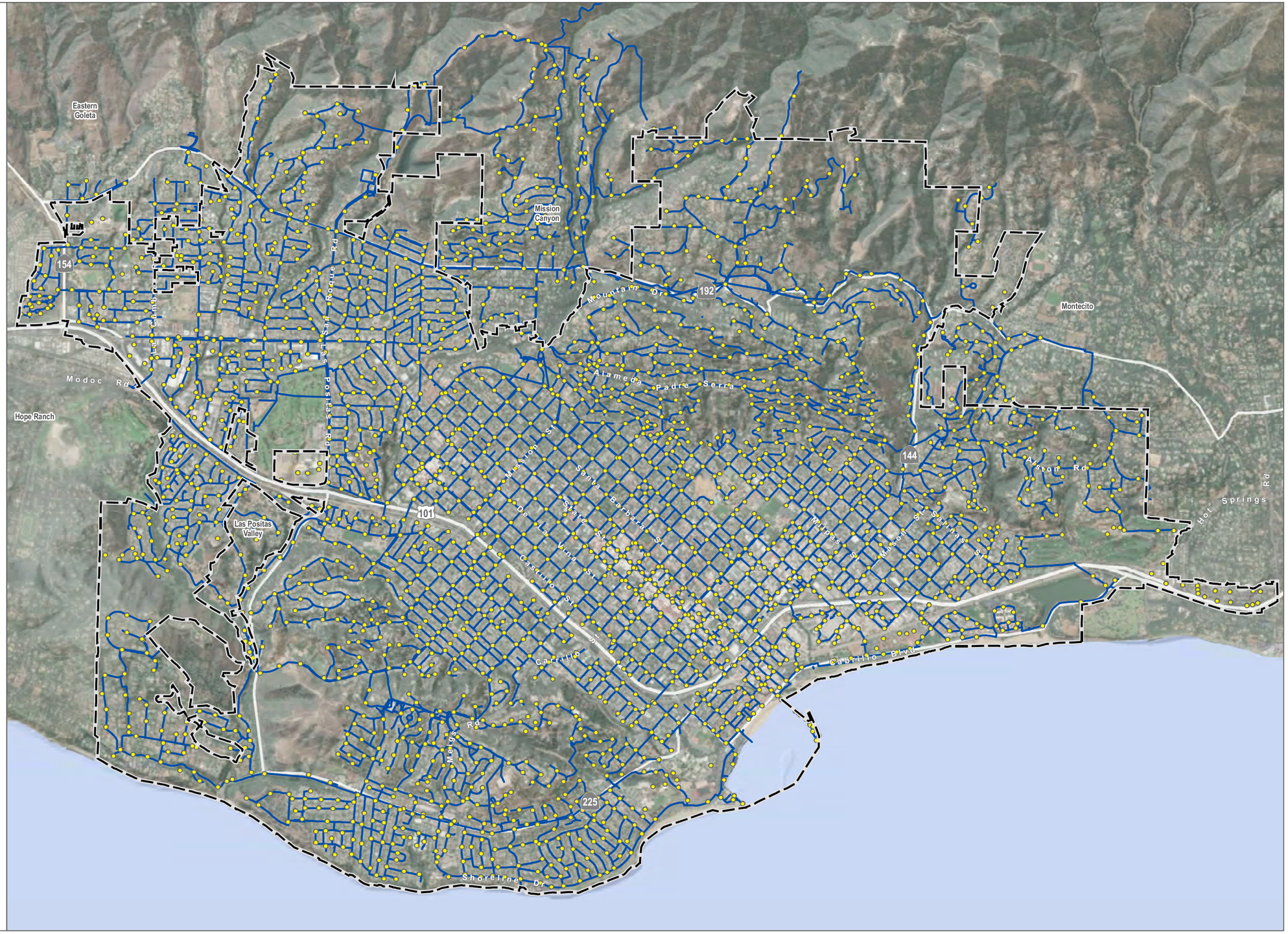
City of Santa Barbara / CWPP Area

City Water Main

City Fire Hydrant



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SOURCE: City of Santa Barbara

COMMUNITYWILDFIRE CITY OF SANTA BARBARA PROTECTION PLAN

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FIGURE 10

City Water Mains and Fire Hydrants

City of Santa Barbara Community Wildfire Protection Plan

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3 Planning and Regulatory Environment

This section describes the City's approach to fire protection, as well as existing codes and standards relevant to wildfire protection and fuels management in the City.

3.1 Fire Protection

The SBFD provides a complete range of fire protection, prevention, and educational services to the City and its residents. The department is largely staffed and equipped for structural fire protection, and has grown its capacity for prevention and protection in the event of wildland fire, including full-time staffing of wildland fire experts, development of codes and standards for vegetation management and structural protection in the City's High Fire Hazard Area, implementation of vegetation management projects and a defensible space inspection program, and working with the community to increase resilience in the event of a wildland fire. The SBFD recognizes that wildland fire in the City is inevitable.

The SBFD also recognizes the need to maintain a long-range wildland fire plan to reduce the catastrophic effects of wildfire. Without this plan, the ability to prioritize, fund, and implement projects and programs to minimize the impact of wildfire in the community would be jeopardized.

3.1.1 Fire Protection Philosophy

3.1.1.1 Public and Firefighter Safety

The SBFD's first priority is to protect lives and maintain safety. Safety continues to be first and foremost in the Fire Chief's fire protection philosophy and strategic plan (City of Santa Barbara 2019). The SBFD's mission statement, Standard Operating Procedures, training, fire protection, and fire prevention activities all support this priority.

3.1.1.2 Protection of Structures

The protection of structures is the SBFD's second priority. The ability to protect structures during a wildfire is complex. Much of the City was developed before the adoption of building and fire codes that required noncombustible roofing and building materials, adequate fire department access, and meet water supply standards in the High Fire Hazard Area. These existing nonconforming structures are at greater risk of loss than structures that meet current building, access, and water standards and limit the ability of the SBFD to provide adequate structure protection. Added to the complexity is the number of homes (both existing conforming and non-conforming structures) that do not have adequate defensible space or vegetation clearance around structures and along driveways and roadways.

3.1.1.3 Protection of Natural Resources

The third priority for the SBFD is to protect natural resources. The protection of natural resources has changed considerably over the years for fire agencies. Fire suppression and fire prevention strategies and procedures attempt to balance the need for wildland fire safety and protection of resources. The complexity of protecting lives and property, along with natural resources, is a reality for the SBFD.

The chaparral vegetation types within the City and surrounding areas has adapted over millions of years with fire as a natural part of its ecosystem. Current and past fire exclusion and suppression policies have resulted in large accumulations of flammable vegetation on hillsides. When these areas burn under wildfire conditions, they result

in intense fire behavior and increase the potential for resource damage. The SBFD realizes the best way to provide wildland fire protection and to protect natural resources is to implement a Community Wildfire Protection Plan that develops policies and actions to reduce accumulations of vegetation, and enhance natural resources and reduce their vulnerability to wildfire.

3.1.2 Fire Protection Partnerships

Like most California communities, the SBFD relies heavily on mutual aid resources to augment firefighting resources if a wildfire or other emergency situation occurs. No community has the resources sufficient to cope with all emergencies for which the potential exists. In times of large scale wildfires and disasters, the City of Santa Barbara relies on neighboring agencies, including the MFPD, Carpinteria-Summerland Fire Protection District, and SBCFD, to provide equipment and personnel for fire suppression, prevention, and investigation of wildfires. Likewise, when called upon, SBFD provides the same assistance to outside agencies in need (SBFD and CDD 2004).

3.2 City of Santa Barbara Codes and Standards

3.2.1 City Fire Code

Through Ordinance No. 5920, the Santa Barbara City Fire Code adopts and amends the California Fire Code (2019 Edition) based on the model International Fire Code, as published by the International Code Council (2018 Edition),[5] and all standards and secondary codes referenced in said codes, as defined in Santa Barbara Municipal Code Section 8.04.10. Amendments to the California Fire Code are specified in Santa Barbara Municipal Code Section 8.04.020, which established the City's 2004 Wildfire Plan (recognized as the CWPP in 2011) as providing policy direction for the WUI area.

Section 4907 of the Fire Code outlines defensible space requirements in the City. Specifically, Section 4907.1.1 states:

> Persons owning, leasing, controlling, operating or maintaining buildings or structures in, upon or adjoining hazardous fire areas, and persons owning, leasing or controlling land adjacent to such buildings or structures, shall follow defensible space requirements outlined in 4907. 1 through 4907.9. For purposes of this section, defensible space requirements shall apply to persons owning, leasing or controlling land with hazardous vegetation that is within the defensible space of structures on adjacent properties.

Section 4907.2 of the Fire Code requires the following defensible space setback requirements:

> Maintain an effective firebreak by removing and clearing away flammable vegetation and combustible growth from areas within 30 to 150 feet of such buildings or structures as outlined in the following zones:
>
> 1. Coastal Interior — 30 to 50 feet brush clearance from structures
> 2. Coastal — 50 to 70 feet brush clearance from structures
> 3. Foothill — 100 feet brush clearance from structures
> 4. Extreme Foothill — 150 feet brush clearance from structures.

[5] This includes Appendix Chapter 4 and Appendices B, BB, C, CC, and H; the 2019 California Fire Code (Title 24, Part 9 of the California Code of Regulations).

3.2.2 City Building Code

The City Building Codes (Municipal Code Chapter 22.04) adopts and amends the California Building Code (2019 Edition), based on the model International Building Code and others (e.g., California Electrical Code) by reference, subject to the amendments specified in Sections 22.04.020 through 22.04.070. Structural fire protection standards are addressed in the building codes and address structural hardening requirements for buildings located within a High Fire Hazard Area as defined by the City of Santa Barbara Fire Department and consistent with Chapter 7A of the California Building Code. Structural hardening requirements address roofing, exterior coverings, decking materials, windows and doors, eaves, and vents, among others. The intent of these requirements is to minimize the potential for structural ignition through radiant or convective heat exposure or ember intrusion.

3.2.3 City of Santa Barbara General Plan

The City of Santa Barbara General Plan establishes goals, policies, and implementation measures to guide development and sustainability, and address issues related to the health, safety and welfare of its current and future citizens. The following elements of the City's General Plan include goals, policies, and implementation measures that address the impacts of wildland fires.

- **Land Use Element:** Contains goals, policies, and implementation actions related to land use, growth management, community design, and neighborhoods.
- **Environmental Resources Element:** Establishes goals and policies that specifically address hillside protection and conservation of open space, discourage development in high fire areas, and limit development on steep slopes.
- **Safety Element:** Contains goals and policies to reduce the potential risk of death, injuries, property damage, and economic and social dislocation resulting from large-scale hazards.

City of Santa Barbara General Plan policies applicable to wildfire are included in Appendix C.

3.2.4 City of Santa Barbara Local Coastal Program

The California Coastal Act of 1976 establishes goals and provisions for a designated Coastal Zone (Figure 2) along the entire California coastline. Within the City of Santa Barbara, the Coastal Zone generally extends inland 0.5 miles from the ocean and includes about 6 miles of the City's shoreline. Approximately 70% of the City's Coastal Zone is held in public ownership, including numerous beaches and parks, an extensive public waterfront, and a full working harbor.

Development in the Coastal Zone is reviewed for compliance with the City's Local Coastal Program (LCP) and the Coastal Act. The LCP has two parts:

- A Coastal Land Use Plan, which includes the kind, location, density, and intensity of land uses within the Coastal Zone, and coastal access and coastal resource protection policies and development standards; and
- An Implementation Plan, which includes development standards and other ordinances relating to coastal access and coastal resource protection, and maps that delineate zoning districts within the Coastal Zone.

Vegetation management activities conducted in the Coastal Zone are to be consistent with the City's LCP. LCP policies applicable to wildfire and vegetation management are included in Appendix C.

3.2.5 Local Hazard Mitigation Plan

The City of Santa Barbara Local Hazard Mitigation Plan Annex to the Santa Barbara County Multi-Jurisdictional Hazard Mitigation Plan serves as a complete hazard mitigation planning tool for the City of Santa Barbara. The emphasis of this plan is on assessing and avoiding identified risks, implementing loss reduction measures for existing exposures, and ensuring critical services and facilities survive a disaster. Further, the plan contains updated capability assessment information, vulnerability assessment, and mitigation strategies for each of the identified hazards, including wildfire. By having a completed and approved plan, the City is eligible for mitigation grant funding made available by the Federal Emergency Management Agency, which may involve funds for identified fire hazard reduction projects. The plan is reviewed annually with input from the SBFD Wildland Specialist, then updated for Federal Emergency Management Agency approval every 5 years.

Under the plan, wildfires are classified as either wildland fires or WUI fires. WUI fires are further subdivided into three categories: (1) classic WUI exists where well-defined urban and suburban development presses up against open expanses of wildland areas; (2) the mixed WUI is characterized by isolated homes, subdivisions, and small communities situated predominantly in wildland settings; and 3) the occluded WUI exists where islands of wildland vegetation occur inside a largely urbanized area. Generally, much of the City's High Fire Hazard Area would be classified as either the classic or mixed WUI category.

4 Wildfire Hazard Assessment

The wildfire hazard assessment conducted in support of this CWPP involved an evaluation of field conditions, processing and analyzing spatial datasets in a geographic information system (GIS), conducting GIS-based modeling to identify areas that may be subject to extreme fire behavior, and analyzing existing plans and data sets related to wildfire hazard. The assessment effort is presented in the following sections and was used to inform proposed modifications to the City's High Fire Hazard Area and additions to the City's VMUs/CFTN.

4.1 Assessment Methods

4.1.1 Field Evaluations

Field assessments were conducted by Dudek and SBFD staff on December 16 and 17, 2019, in order to evaluate existing fuel load conditions, to gain an understanding of general fire hazard conditions in the City, and to better understand current vegetation management practices being conducted by SBFD and other agencies (SBCFD, MFPD) within and adjacent to the City. During field assessments, site conditions were documented via photographs and, in some cases, noted on digital or hard-copy field maps.

4.1.2 GIS Analysis

Development of this CWPP included analysis and processing of various GIS datasets (in ArcGIS, version 10.7.1) for variables influencing wildfire hazard in the City. The following datasets were analyzed:

- Fire history
- Vegetation management areas (CFTN, VMUs, neighboring VMUs)
- Boundaries (VHFHSZ, High Fire Hazard Area, WFSAD, City Boundary, Parcels)
- Vegetation
- Terrain
- Roads
- Structure locations
- Fire station locations
- Evacuation blocks and routes
- Water Infrastructure

4.1.2.1 Structure Density

Individual building footprint data (Microsoft 2018) was used to determine the proximity of structures to other structures. Footprint data was first converted to point data for use in the Point Density tool in ArcGIS. This tool then generated a density layer representing the quantity of structures per square mile. Structure densities in the City ranged from 0 to 6,220. It should be noted that the tool does not account for structure size, which results in lower density values in the City's downtown core where single commercial structures can occupy the majority of a City block. This effect is less pronounced in the City's High Fire Hazard Area where structures are predominantly single-family homes. Utilizing the Natural Breaks method, the data was divided into areas of high (2,537 – 6,220 structures per square mile), medium (829 – 2,536 structures per square mile), and low (0 – 828 structures per square mile) structure density. The results of the analysis are presented in Figure 11.

There are two primary concerns for structure ignition: (1) radiant and/or convective heat and (2) burning embers (National Fire Protection Association Standard 1144, Insurance Institute for Business and Home Safety, etc.). Burning embers have been a focus of building code updates for at least the last decade, and new structures in the WUI built to these codes have proven to be very ignition-resistant. Likewise, radiant and convective heat

impacts on structures have been minimized through the inclusion of structural hardening requirements included in Chapter 7A of the California Building Code, such as those for roofs, exterior walls, windows, and doors. However, in communities, or portions thereof, where structures are older and do not include ignition-resistant improvements (such as those identified in Chapter 7A), radiant heat from burning vegetation or adjacent structures is a primary concern. Areas with higher structure density (buildings are closer together) are therefore at greater risk of burning due to radiant heat exposure. The effect of radiant heat during wind-driven fires has been well documented (Cohen and Saveland 1997). Wind and slope can significantly increase the radiant heat exposure to surrounding structures. The type of building construction and the amount and kind of vegetation between structures also play a role in the ability of a structure to withstand radiant heat exposure.

The proximity of structures also limits the ability of property owners to maintain a minimum of 30 feet of defensible space between structures. The lack of defensible space inhibits firefighters from being able to safely maneuver around structures to provide protection.

4.1.2.2 Fire Department Travel Time

Road network and fire station location data were used to evaluate the amount of travel time necessary to reach an individual parcel from existing fire station locations. Fire stations used in the analysis included all SBFD Fire Stations plus SBCFD Stations No. 13 and 15, and MFPD Station No. 2. ESRI's Network Analyst tool was used to measure the distance in miles along the road network from each input station to every parcel point. Then, the Insurance Services Office (ISO) travel time formula (T=0.65 +1.7D) was applied to calculate travel time from each fire station to each parcel point. This formula was developed based on research regarding average emergency response speeds and assumes average terrain, average traffic, and weather conditions, and accounts for slowing for intersections. The formula applied for purposes of travel time does not calculate the wide range of variables involved in total response time, such as engine company turnout time. The response time to each parcel was then coded to the parcel data layer.

SBFD travel time was evaluated using the SBFD's 4-minute standard.[6] SBFD travel time was used to evaluate the increased risk of a large fire occurring. During periods of high fire danger weather (low relative humidity, high winds, low fuel moisture, and high temperatures) the potential for large fires increases. Extended travel times increase the potential for a fire to escape initial control efforts and increase the risk to the surrounding area. Each parcel that was reachable in 4 minutes or less by at least one station is presented in Figure 12.

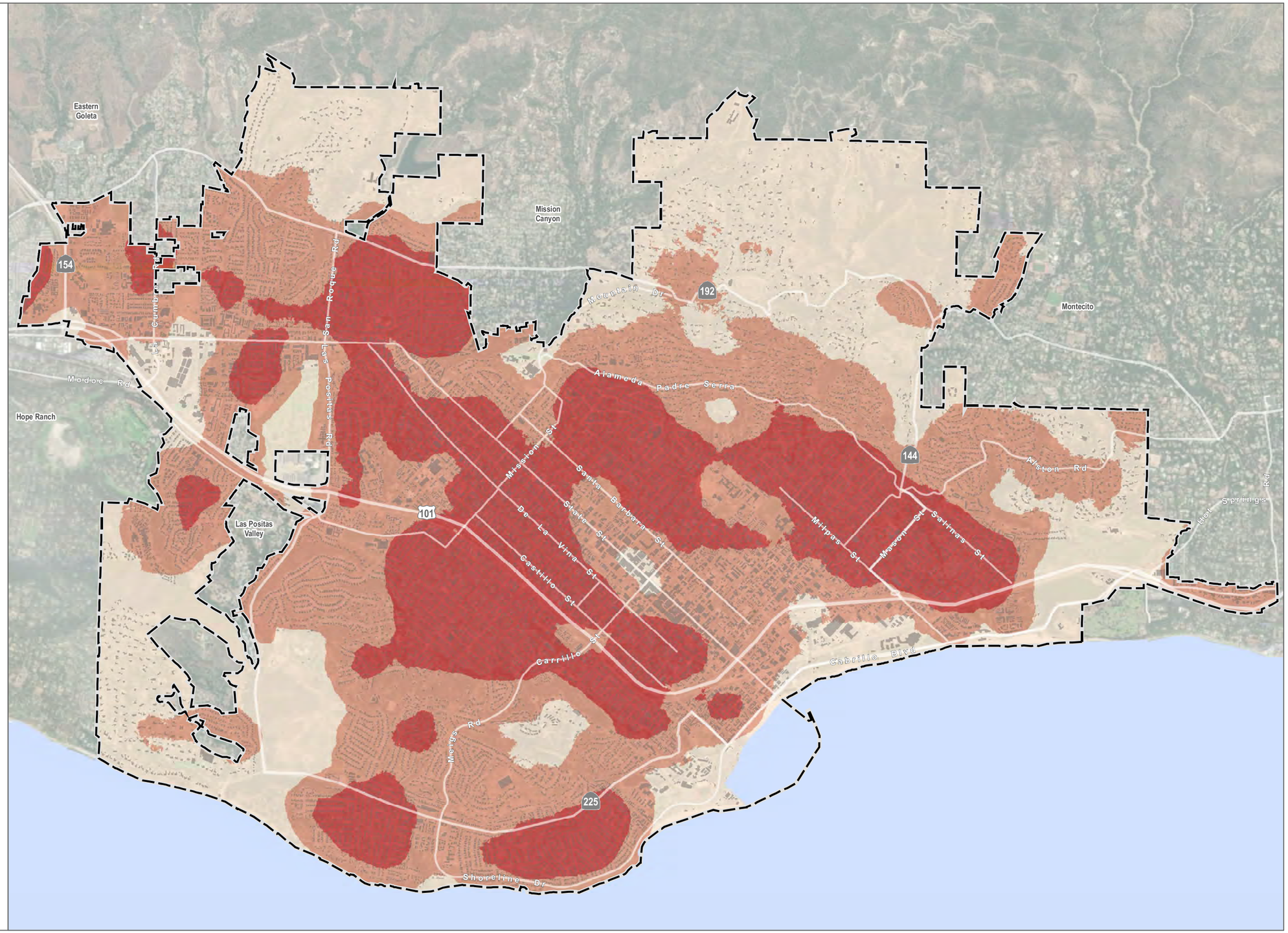
6 Travel time accounts only for drive time and excludes non-driving components of response time (e.g., turn out).

City of Santa Barbara / CWPP Area

Structure

Building Density
(structures per square mile)

- 0 - 800
- 801 - 2,400
- 2,401 - 6,400



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

COMMUNITY WILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA

DUDEK

FIGURE 11

City Structure Density

City of Santa Barbara Community Wildfire Protection Plan

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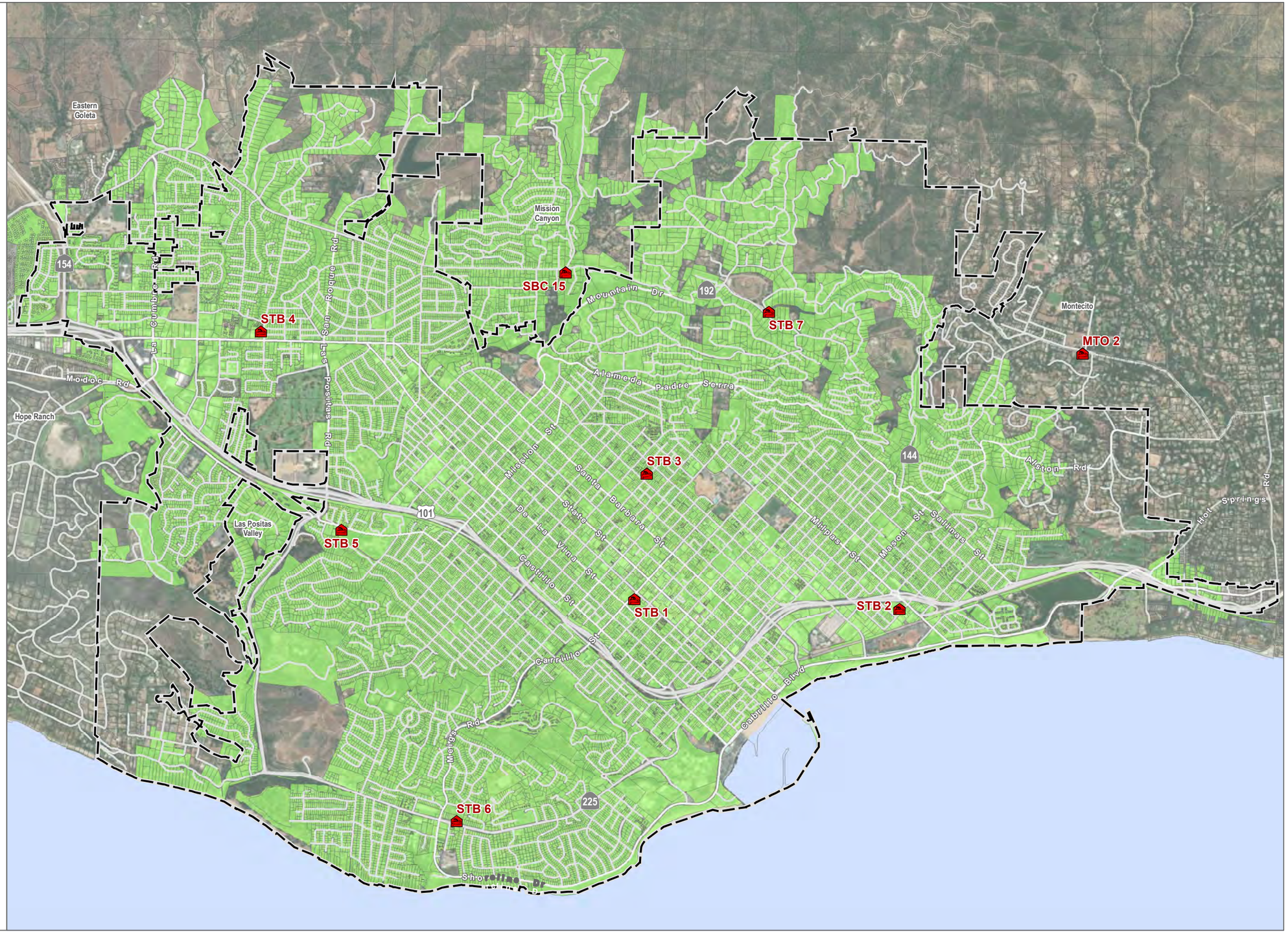
City of Santa Barbara / CWPP Area

City Fire Station

Road Network

Parcels within 4 Minute Travel Time



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SOURCE: City of Santa Barbara

COMMUNITYWILDFIRE CITY OF SANTA BARBARA PROTECTION PLAN

DUDEK

FIGURE 12

Fire Station Travel Time Analysis

City of Santa Barbara Community Wildfire Protection Plan

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4.1.3 Fire Behavior Modeling

Modeling of potential fire behavior was also conducted to support development of this CWPP. Specifically, the FlamMap software package was used to identify portions of the City that may be subject to extreme fire behavior, considering weather, fuels, and terrain variables. FlamMap (version 5.0.3) is a GIS-driven computer program that incorporates fuels, weather, and topography data in generating static fire behavior outputs, including values associated with flame length and crown fire activity, among others (Finney et al. 2015). It is a flexible system that can be adapted to a variety of specific wildland fire planning and management needs. The calculations that come from FlamMap are based on the BehavePlus fire modeling system algorithms, but result in geographically distinct datasets based on GIS inputs. FlamMap model outputs allow wildland resource managers to evaluate anticipated fire behavior, which provides important insight about the characteristics of wildfire spread within management areas. Each of the input variables used in FlamMap remain constant at each location, meaning that the input variables are applied consistently to each grid cell and the fire behavior at one grid cell does not impact that at a neighboring grid cell. Essentially, the model presents a "snapshot" in time and does not account for temporal changes in fire behavior or the movement of fire across the landscape. As such, the results of the models contained in this CWPP are best used as valuable information sources and tools to identify high hazard areas and prioritize fuel treatments based on potential risk rather than used as a forecast tool of an exact representation of how a fire would behave in the City.

The following are the basic assumptions and limitations of FlamMap:

- The model output files describe fire behavior only in the flaming front. The primary driving forces in the predictive calculations are the dead fuels less than 0.25 inches in diameter. These are the fine fuels that carry fire. Fuels greater than 1 inch in diameter have little effect in carrying fire, and fuels greater than 3 inches in diameter have no effect. While not contributing to the fire behavior calculation, larger fuels (1-inch and greater) are consumed by the fire and are components of the fuels being consumed. For example, the smaller portions (e.g., leaves, twigs, peeling bark) of a chaparral shrub will combust readily and affect fire behavior, while larger portions (e.g., trunk, main branches) do not affect fire behavior but are part of the overall fuel load and will combust after the flaming front has passed.
- The model bases calculations and descriptions on a wildfire spreading through surface fuels that are within 6 feet of the ground and contiguous to the ground. Surface fuels are classified as grass, brush, litter, or slash, which are general categories that are assigned to different vegetation types.
- The software assumes that fuel moisture conditions are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel must be carefully considered to obtain useful predictions.
- WindNinja software (version 2.1.0), which is incorporated into FlamMap, allows for the generation and incorporation of gridded wind data in the FlamMap simulation. This approach is preferable as it allows the model to account for the effect of terrain on wind speed and direction at different locations throughout the modeling area, rather than relying on one single input value applied to the entire modeling area (e.g., the entire City).

FlamMap was used to model flame length, crown fire activity, and spot fire potential for an area encompassing the entire City plus a buffer of approximately 5 miles. A detailed discussion of the FlamMap modeling process conducted for this CWPP is presented in Appendix D. A map depicting flame length outputs from the fire behavior modeling effort is presented in Figure 13.

The results presented in Figure 13 and discussed in Appendix D depict values based on inputs to the FlamMap software and are not intended to capture changing fire behavior as it moves across a landscape. For planning purposes, extreme fire behavior (e.g., that occurring during periods of low humidity and high, Sundowner winds) is the most useful information for identifying high-hazard areas and prioritizing vegetation management activities. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

4.2 Hazard Assessment Results

Upon completion of GIS data analysis and fire behavior modeling, the fire behavior model outputs and other fire hazard variables (fire history, fire hazard severity zoning, etc.) were visually compared with the City's High Fire Hazard Area boundaries, VMU boundaries, and CFTB boundaries in a GIS. SBFD and the consultant team also carefully scrutinized the fire behavior modeling results to address potential inaccuracies resulting from the landscape scale of the LANDFIRE data set used in the modeling effort. This second level of analysis was an important component of the fire hazard assessment effort. The following sections summarize the results of dataset comparisons and identify proposed modifications to High Fire Hazard Area and VMUs.

4.2.1 Modifications to High Fire Hazard Area

Certain areas of the City exhibit the potential for extreme fire behavior. Most of these areas are within the City's existing High Fire Hazard Area; however, some exist outside of this area. Potential additions to the City's existing High Fire Hazard Area were identified for such areas. Additions were based on the City's parcel data (e.g., entire parcels were added, rather than portions of parcels), and the potential additions were extended to logical boundaries (streets, blocks). This analysis also considered areas that could be removed from the existing High Fire Hazard Area. No areas were identified for removal based on hazard conditions; however, some areas were removed as they occur outside of City boundaries but were included in the 2004 Wildland Fire Plan. Table 6 summarizes the potential modifications to the City's High Fire Hazard Area. Proposed modifications to the City's High Fire Hazard Area is presented in Figure 14.

Table 6. City High Fire Hazard Area Modifications

Area ID	Status	Area	Change	Comments	Acres
A	Existing	Extreme Foothill	Existing	Existing	723.91
B	Proposed	Extreme Foothill	Add	Parcel omitted from previous 2004 High Fire Hazard Area mapping effort as it was previously outside the City, though surrounded by CAL FIRE's Very High Fire Hazard Severity Zone and Santa Barbara County's High Fire Hazard Area.	1.68
C	Proposed	Extreme Foothill	Remove	Parcels in County jurisdiction.	5.11
D	Existing	Foothill	Existing	Existing	2,827.18

Table 6. City High Fire Hazard Area Modifications

Area ID	Status	Area	Change	Comments	Acres
E	Proposed	Foothill	Add	5 City fires within/adjacent to Area 5 (2004-2020). Slopes immediately north of Area 5 reach 60-percent. Structure density is low to moderate. Extension to Scenic Drive provides a tactical boundary for SBFD. Western portion of Area 5 (11 individual parcels) omitted from previous 2004 High Fire Hazard Area mapping effort, though exists in CAL FIRE's Very High Fire Hazard Severity Zone.	6.25
F	Proposed	Foothill	Add	Fire behavior modeling indicates extreme fire behavior associated with lower Mission Canyon vegetation. 11 City fires within/adjacent to Area 3 (2004-2020). Slopes reach 70-percent on creek embankments. Structure density is moderate to high. Extension to State Street and E. Alamar Avenue provides a tactical boundary for SBFD.	25.26
G	Proposed	Foothill	Add	Area omitted from previous 2004 High Fire Hazard Area mapping effort as it was previously outside the City, though exists in CAL FIRE's Very High Fire Hazard Severity Zone.	5.31
H	Proposed	Foothill	Add	Fire behavior modeling indicates extreme fire behavior associated with San Roque Creek vegetation. 6 City fires within Area 2 (2004-2020). Slopes reach 37-percent on creek embankments. Structure density is moderate to high. 2009 Jesusita Fire pushed down San Roque Creek via strong Sundowner winds, stopped by suppression activities at Foothill Road. Extension to N. Ontare Road and Chuparosa Drive provides a tactical boundary for SBFD.	26.84
I	Proposed	Foothill	Add	Fire behavior modeling indicates extreme fire behavior associated with Cieneguitas Creek vegetation. 8 City fires within/adjacent to Area 1 (2004-2020). 4 Santa Barbara County Fire ignitions adjacent to Area 1, associated with Foothill Road and Highway 154). Slopes reach 30-percent on creek embankments. Structure density is moderate to high. Northern portion of Area 1 outside of SBFD 4-minute travel time standard. Extension to Primavera Road provides a tactical boundary for SBFD.	54.90

Table 6. City High Fire Hazard Area Modifications

Area ID	Status	Area	Change	Comments	Acres
J	Existing	Coastal Interior	Existing	Existing	702.18
K	Proposed	Coastal Interior	Add	Fire behavior modeling indicates extreme fire behavior associated with on-site and adjacent vegetation to the north. 2 City fires within/adjacent to Area 6 (2004-2020). Slopes reach 25-percent. Structure density is moderate to high. Extension to Terrace Road, La Marina, and Cliff Drive provides a tactical boundary for SBFD.	12.45
L	Proposed	Coastal Interior	Add	Fire behavior modeling indicates extreme fire behavior in adjacent park land. Capacity for defensible space on parcels in this area is significantly reduced due to limited structure setbacks. 4 City fires within/adjacent to Area 11 (2004-2020). Slopes reach 40-percent on and immediately off-site. Structure density is moderate.	24.62
M	Proposed	Coastal Interior	Add	Fire behavior modeling indicates extreme fire behavior associated with vegetation throughout Area 10. 18 City fires within/adjacent to Area 10 (2004-2020). Steep slopes throughout Area 10, reaching up to 48-percent. Structure density is moderate to high. Extension to W. Valerio Street, Hillside Road, Mountain Avenue, and Vista Del Campo provides a tactical boundary for SBFD.	223.37
N	Proposed	Coastal Interior	Add	Fire behavior modeling indicates extreme fire behavior associated with adjacent vegetation to the west, south, and east. 1 City fires within/adjacent to Area 8 (2004-2020). Slopes reach 80-percent. Structure density is moderate. Extension to W. Figueroa Street provides a tactical boundary for SBFD.	1.41
O	Proposed	Coastal Interior	Add	Fire behavior modeling indicates extreme fire behavior associated with adjacent vegetation to the south. 1 City fires within/adjacent to Area 9 (2004-2020). Slopes reach 50-percent on and immediately off-site. Structure density is moderate to high. Extension to Mountain Avenue, Clearview Road, and Calle Cerrito provides a tactical boundary for SBFD.	8.89

Table 6. City High Fire Hazard Area Modifications

Area ID	Status	Area	Change	Comments	Acres
P	Proposed	Coastal Interior	Remove	Road parcel removed from existing High Fire Hazard Area (paved).	1.65
Q	Existing	Coastal	Existing	Existing	523.51
R	Proposed	Coastal	Add	Fire behavior modeling indicates extreme fire behavior associated with vegetated slopes along west side of Area 12, and with vegetation in Arroyo Burro Creek. 9 City fires within/adjacent to Area 12 (2004-2020). Slopes reach 58-percent on-site. Structure density is low to moderate.	62.27
S	Proposed	Coastal	Remove	Parcels in County jurisdiction.	101.48
T	Proposed	Coastal	Add	Fire behavior modeling indicates extreme fire behavior associated with vegetation throughout Area 13. Capacity for defensible space on parcels along eastern edge of Area 13 is significantly reduced due to limited structure setbacks. 9 City fires within/adjacent to Area 13 (2004-2020). Steep slopes associated with Arroyo Burro Creek and sub-drainages reach 80-percent Structure density is low to moderate.	202.17

This CWPP recommends that the City's High Fire Hazard Area be modified as presented in Table 6 and Figure 14. As noted, Area T exists entirely within the state's Coastal Zone Boundary. Vegetation management and defensible space activities conducted in this Area are to be consistent with the City's LCP and may be subject to additional approvals. The proposed modifications allow for the retention of the City's naming protocol for the High Fire Hazard Area Zones (Extreme Foothill, Foothill, Coastal Interior, and Coastal). This is also addressed in the Action Items included in Section 6. A summary of proposed changes to the City's High Fire Hazard Area is presented in Table 7.

Table 7. City High Fire Hazard Area Modification Summary

2004 Wildland Fire Plan High Fire Hazard Area Zones	Existing Acres	Proposed Additions (acres)	Proposed Removals (acres)	Total (acres)
Extreme Foothill	723.91	1.68	5.11	720.48
Foothill	2,827.18	118.56	0.00	2,945.74
Coastal Interior	702.18	270.74	1.65	971.27
Coastal	523.51	264.44	101.48	686.47

4.2.2 Modifications to Vegetation Management Units

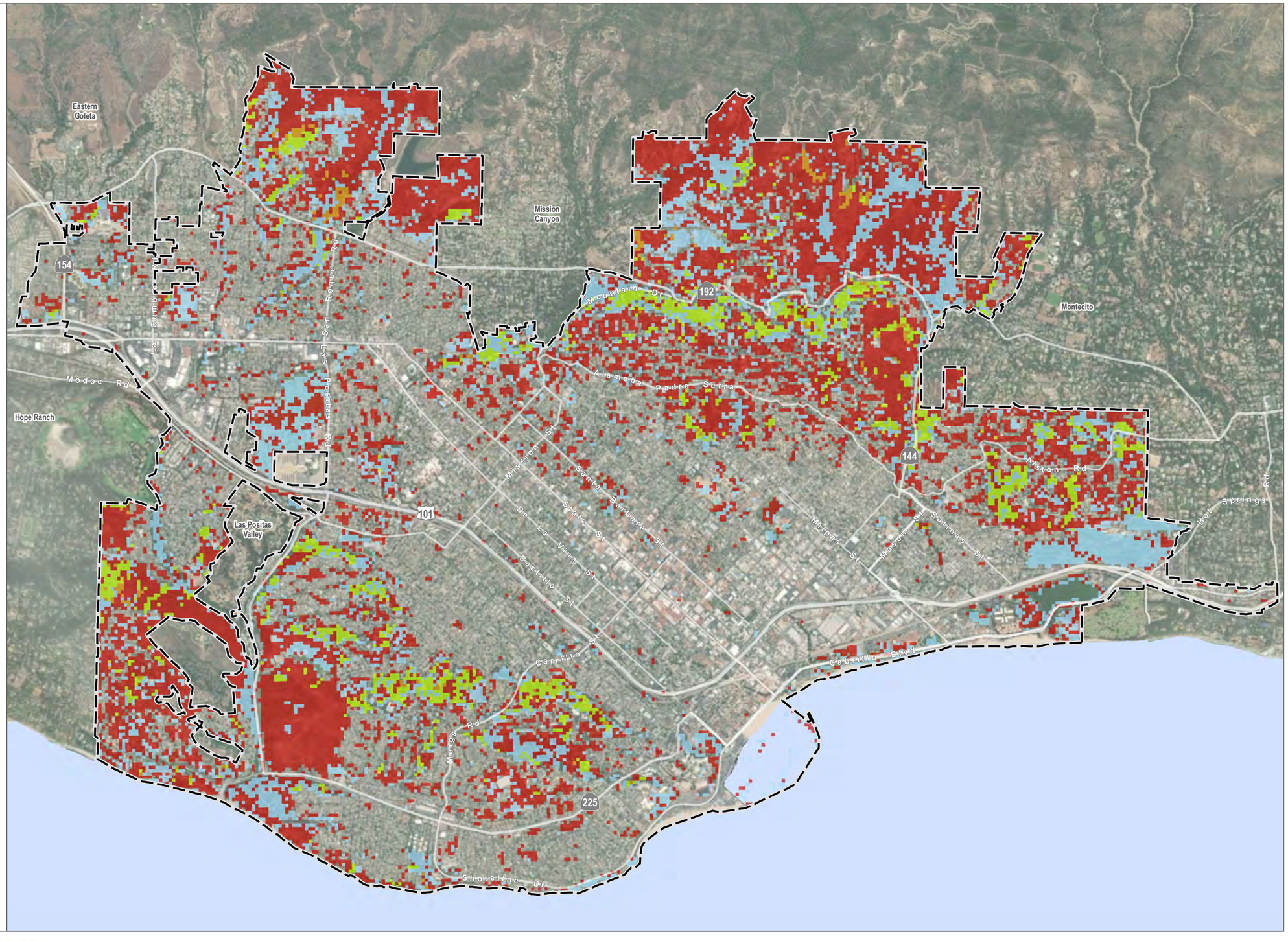
Existing VMUs and the CFTN was evaluated to determine if fire behavior/fire hazard warranted modifications to these areas. These areas were visually analyzed in a GIS and compared with fire behavior modeling results, fire hazard mapping data sets, fire history data, and the location of other City and non-City vegetation management areas. Additions were identified where they would close a gap between existing VMUs, provide additional protection to the community, or where historic fires have burned into the City. Additions were based on the City's parcel data, with the exception of an area identified in Parma Park that follows a ridgeline rather than a parcel boundary. Potential additions were extended to logical boundaries (streets, existing VMUs). This analysis also considered areas that could be removed from existing VMUs or the CFTN. Based on the results of the fire hazard assessment, no areas warranted removal.

City of Santa Barbara / CWPP Area

Fire Behavior Modeling Results

Flame Length (feet)

- 0 - 0.1
- 0.1 - 4
- 4 - 8
- 8 - 11
- 11+



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

COMMUNITYWILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA

DUDEK

FIGURE 13

Fire Behavior Modeling Results - Flame Length

City of Santa Barbara Community Wildfire Protection Plan

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City of Santa Barbara / CWPP Area

Existing City of Santa Barbara High Fire Hazard Area

Santa Barbara County High Fire Hazard Area (Outside City Limits)

CAL FIRE Adopted Very High Fire Hazard Severity Zone - 2007

Coastal Zone Boundary

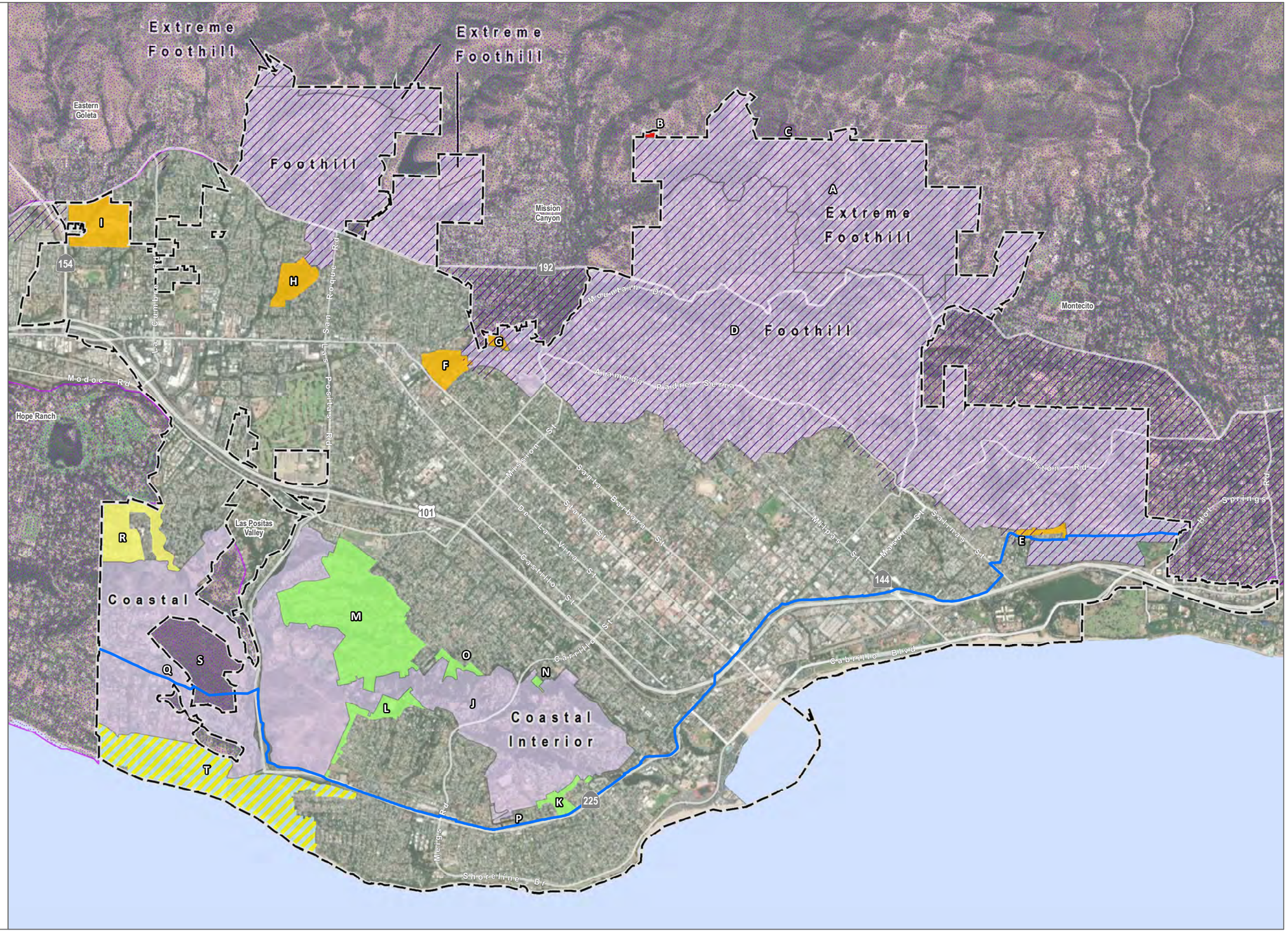
Proposed Modifications to City High Fire Hazard Areas

Proposed Additions in the Inland Area

- Extreme Foothill
- Coastal Interior
- Coastal
- Foothill
- Proposed Removals

Proposed Additions in the Coastal Zone

- Coastal



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

COMMUNITYWILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA

DUDEK

FIGURE 14

Proposed Modifications to City's High Fire Hazard Areas

City of Santa Barbara Community Wildfire Protection Plan

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The structure density and travel time analysis data was then used to prioritize vegetation treatment areas. High- and moderate-structure-density areas were prioritized over low-density areas. Areas located more than 4 minutes travel time from a fire station were prioritized over those located 4 minutes or less from a fire station. Table 8 summarizes the potential modifications to the City's VMUs and CFTN. Proposed modifications to the City's VMUs and CFTN is presented in Figure 15.

Table 8. Vegetation Management Unit and Community Fuels Treatment Network Modifications

Area ID	Status	Priority	Change	Comments	Acres
7	Existing	Low	Existing	Mountain/Las Tunas VMU	45.18
8	Existing	Low	Existing	Fire Station 7 VMU	2.42
26	Proposed	Low	Addition	Mountain Drive Extension	5.38
27	Proposed	Low	Addition	Las Alturas/Stanwood Connection	30.86
1	Existing	Medium	Existing	Conejo Road VMU	93.80
2	Existing	Medium	Existing	Jimeno/Garcia Canyon VMU	64.54
3	Existing	Medium	Existing	Las Canoas Road VMU	52.77
5	Existing	Medium	Existing	Coyote Road VMU	11.58
10	Existing	Medium	Existing	Eucalyptus Hill Drive VMU	63.02
11	Existing	Medium	Existing	Camino Viejo VMU	23.78
12	Existing	Medium	Existing	Alston Place VMU	39.10
15	Existing	Medium	Existing	Cleveland School Area VMU	7.91
16	Existing	Medium	Existing	Loma Alta VMU	42.05
17	Existing	Medium	Existing	Hondo Valley VMU	84.25
19	Existing	Medium	Existing	Flora Vista VMU	40.95
20	Existing	Medium	Existing	Garcia/Ferrelo Canyon VMU	5.51
21	Existing	Medium	Existing	Hillcrest Road VMU	69.53
22	Existing	Medium	Existing	Alturas Del Sol VMU	18.15
24	Proposed	Medium	Addition	Jesusita Drive	2.92
30	Proposed	Medium	Addition	Alston/Cleveland Connection	8.29
31	Proposed	Medium	Addition	Owen Road Extension	7.22
32	Proposed	Medium	Addition	Via Alicia	15.48
33	Proposed	Medium	Addition	Hondo Valley Extension	8.90
34	Proposed	Medium	Addition	Miramonte	1.75
35	Proposed	Medium	Addition	W. Carillo 1	6.66
36	Proposed	Medium	Addition	Skyline Way	7.28
37	Proposed	Medium	Addition	Loma Alta Extension	1.41

Table 8. Vegetation Management Unit and Community Fuels Treatment Network Modifications

Area ID	Status	Priority	Change	Comments	Acres
38	Proposed	Medium	Addition	Flora Vista Extension	25.92
39	Proposed	Medium	Addition	W. Victoria	1.79
41	Proposed	Medium	Addition	W. Carillo 2	1.38
42	Proposed	Medium	Addition	Nirvana Rd.	14.04
44	Proposed	Medium	Addition	Bel Air	38.75
45	Proposed	Medium	Addition	Calle de los Amigos	9.34
4	Existing	High	Existing	Upper Coyote Road VMU	23.36
6	Existing	High	Existing	Coyote Circle VMU	11.36
9	Existing	High	Existing	Westmont/Las Barrancas VMU	50.22
13	Existing	High	Existing	Cima Linda Lane VMU	16.96
14	Existing	High	Existing	Owen Road VMU	25.20
18	Existing	High	Existing	Las Positas Road VMU	125.70
23	Existing	High	Existing	San Roque Creek VMU	82.73
25	Proposed	High	Addition	Northridge Road	97.30
28	Proposed	High	Addition	Parma Park	105.83
29	Proposed	High	Addition	Lauro Canyon/Arriba Way	45.49
40	Proposed	High	Addition	Elings Park	91.94
43	Proposed	High	Addition	Campanil	124.71
46	Proposed	High	Addition	Senda Verde	22.44
47	Proposed	High	Existing	Community Fuels Treatment Network	15.31
48	Proposed	High	Existing	Community Fuels Treatment Network	47.62
49	Proposed	High	Existing	Community Fuels Treatment Network	120.55
50	Proposed	High	Existing	Community Fuels Treatment Network	17.97

Proposed modifications to the City's VMUs are presented in Figure 15. This CWPP recommends that the City's VMUs be modified as presented in Table 8 and Figure 15. This is also addressed in the Action Items included in Section 6.

City of Santa Barbara / CWPP Area

Existing Parks

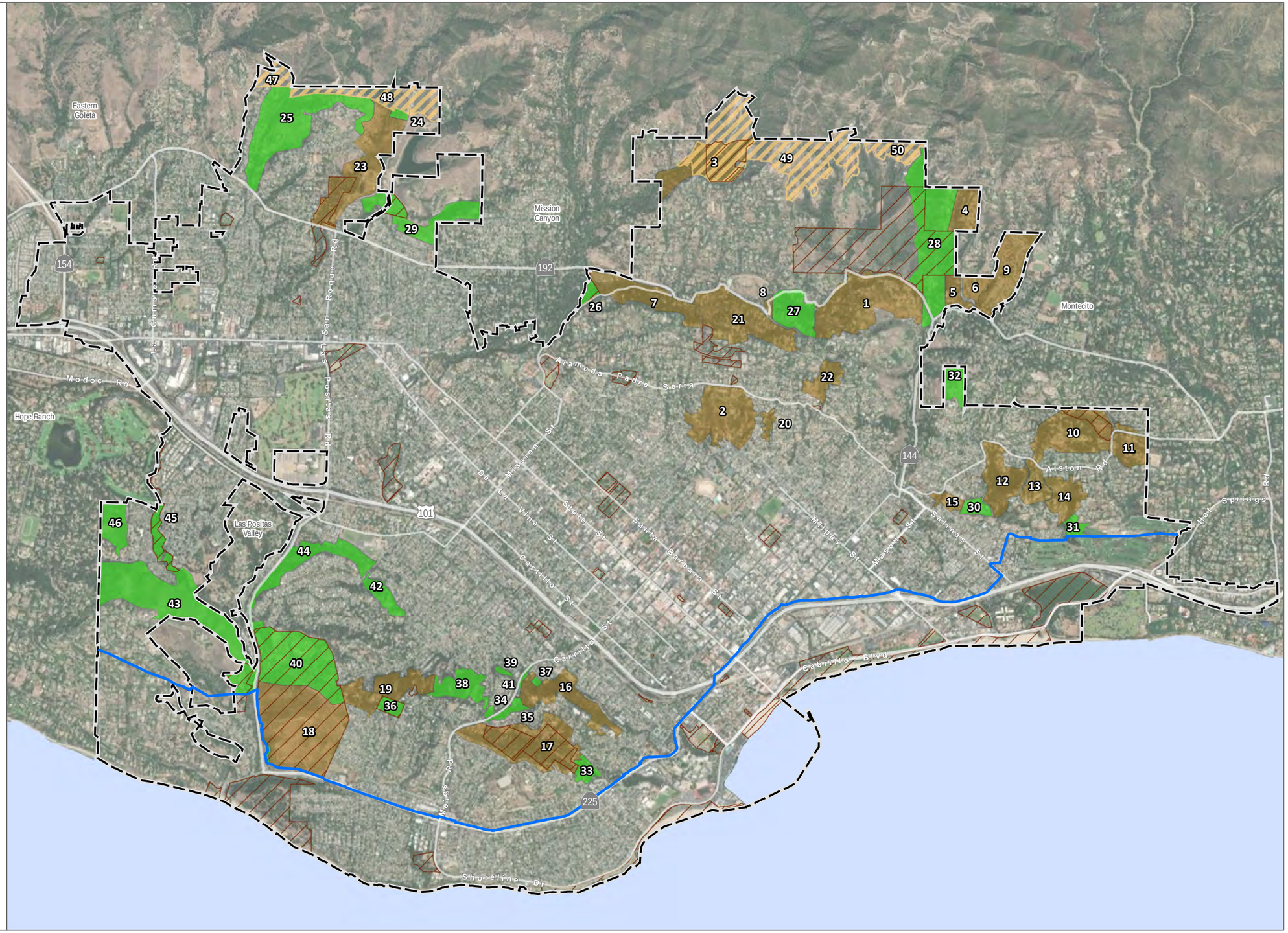
Coastal Zone Boundary

Current Vegetation Management Units

Community Fuels Treatment Network

Proposed Modifications to City's Vegetation Management Areas

Proposed Additions



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

COMMUNITY WILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA

DUDEK

FIGURE 15

Proposed Modifications to City's Vegetation Management Areas

City of Santa Barbara Community Wildfire Protection Plan

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5 Values at Risk

5.1 At-Risk Community

The Healthy Forest Restoration Act of 2003 identifies at-risk communities as an area:

> (A) that is comprised of—
>
> (i) an interface community as defined in the notice entitled ''Wildland Urban Interface Communities Within the Vicinity of Federal Lands That Are at High Risk From Wildfire'' issued by the Secretary of Agriculture and the Secretary of the Interior in accordance with title IV of the Department of the Interior and Related Agencies Appropriations Act, 2001 (114 Stat. 1009) (66 Fed. Reg. 753, January 4, 2001); or
>
> (ii) a group of homes and other structures with basic infrastructure and services (such as utilities and collectively maintained transportation routes) within or adjacent to Federal land;
>
> (B) in which conditions are conducive to a large-scale wildland fire disturbance event; and
>
> (C) for which a significant threat to human life or property exists as a result of a wildland fire disturbance event.

In addition to this definition, the Office of the State Fire Marshal maintains a list of Communities at Risk. The National Fire Plan directs funding to be provided for projects designed to reduce the fire risks to communities. These high risk communities identified within the WUI were published in the Federal Register in 2001 and include those communities neighboring federal lands. The City of Santa Barbara is identified as a Community at Risk in the Federal Register.

5.2 Values at Risk

Values threatened by wildfire include life, property, and natural and economic resources. The SBFD's mission statement is (City of Santa Barbara 2020):

> "The members of the Santa Barbara City Fire Department are dedicated to the safety and well-being of the community through preparedness, prevention and response."

The various SBFD program mission statements include the following.

Fire Prevention (Program 3121)

> "The mission of the Fire Prevention program is to protect life, property and the environment from the perils of fire, hazardous materials incidents, and other disasters through effective code enforcement, new development plan checks, fire investigation and support of the engine company fire inspection program."

Wildland Fire Mitigation (Program 3123)

> "The mission of the Wildland Fire Mitigation program is to protect lives, property and natural resources threatened by Wildland fire by the creation of defensible space through engineering, education, enforcement, fuel reduction and fuel modification activities."

The lives and property threatened by wildfire are of paramount importance. However, natural resource and economic values threatened by wildfire are also significant. A major wildfire affecting the City would potentially result in the loss of biological, cultural, and visual resources. In addition, the potential economic loss from the drop in tourism and damage to homes, businesses, and City infrastructure could substantially impact the local economy.

Wildland fire has always been a part of the City's Mediterranean environment and is a natural process. What has changed is the potential for the loss of life, property and reduction in natural habitat from wildfires as development pushes into WUI areas. Additionally, as described in Section 2.3.1, climate change is anticipated to exacerbate wildfire hazard in the City. As development continues in these areas, the importance of programs and projects for structural protection, public and firefighter safety, and natural resources protection are critical.

5.2.1 Life Safety

The potential for loss of life threatened by wildfire is difficult to calculate. Locally, as represented in Table 5, the 1990 Painted Cave Fire resulted in one fatality; the 1977 Romero Fire resulted in four fatalities; and the 1964 Coyote Fire resulted in one fatality. Most recently, the 2017 Thomas fire resulted in two fatalities. However, the potential for greater loss of life is possible during extreme wildfire events, as seen in the 1991 Oakland Hills Fire, where 25 people, both emergency responders and residents, perished while trying to evacuate from the fire. Additionally, 22 people perished in the 2017 Tubbs Fire and 85 in the 2018 Camp Fire as a result of these extreme wildfire events. Without a comprehensive approach to the problems that exist in the High Fire Hazard Area, the conditions that exist in these areas have the potential for greater loss of life, particularly as population increases.

Further, as seen after the 2017 Thomas Fire, which burned approximately 281,893 acres, there is potential for loss of life as a result of heavy rains that occurred after the fire. Without vegetation and trees to stabilize hillsides, heavy rains that follow a fire event can result in mudslides and debris flows. The fire, which burned into the eastern part of the City, was followed by the catastrophic debris flow on January 9, 2018, which affected Montecito and the Coast Village Road area of the City of Santa Barbara, causing millions of dollars in damage and taking 23 lives. This was the largest loss of life from a natural disaster in the Santa Barbara area in recent history.

5.2.2 Homes, Structures, and Neighborhoods

Home values in the Santa Barbara area are some of the highest in the nation. The median sales price of a home within the City of Santa Barbara is presently $1,273,000 (Santa Barbara Association of Realtors 2020). Table 9 lists the approximate number of structures within the City's High Fire Hazard Area, by Zone, and the associated potential property value loss based on this median sales price figure. Table 9 also accounts for proposed additions to the High Fire Hazard Area (identified as Additions in Table 9), which are discussed in Section 4.2. The quantity of structures presented includes all structure types in each High Fire Hazard Area Zone, the vast majority of which are residential structures. The 1977 Sycamore Fire destroyed 234 homes and resulted in $30 million in property loss. A fire of that size and intensity today would have an estimated property loss value of nearly $298 million.

Table 9. Structure Quantities and Values, by High Fire Hazard Zone

High Fire Hazard Zone	Quantity of Structures	Potential Cost of Property Loss
Extreme Foothill	175	$222,775,000
Extreme Foothill Addition*	2	$2,546,000
Foothill	4,347	$5,533,731,000

Table 9. Structure Quantities and Values, by High Fire Hazard Zone

High Fire Hazard Zone	Quantity of Structures	Potential Cost of Property Loss
Foothill Addition*	269	$342,437,000
Coastal Interior	755	$961,115,000
Coastal Interior Addition*	899	$1,144,427,000
Coastal	363	$462,099,000
Coastal Addition*	247	$314,431,000
Total:	**7,057**	**$8,983,561,000**

Note:
* 'Addition' rows account for proposed area additions to the High Fire Hazard Area, as discussed in Section 4.2.

5.2.2.1 Structural Hardening

As discussed, the topography, vegetation, climatic, and geological conditions in the Santa Barbara area combine to create a unique situation capable of supporting large-scale, high-intensity, and sometimes damaging wildfires. Vegetation management and defensible space are key components to an overall fire protection strategy; however, structural hardening also plays an important role in minimizing the potential for structure ignitions. Hardening refer to steps a property owner may take to enhance the survivability of an existing structure that may not be up to current building or residential code standards for wildland areas. Homes survive wildfires through a combination of vegetation management and maintenance, management of combustible materials on the property, and installation and maintenance of fire- and ember-resistant construction materials. Hardening of the homes and other structures to enhance survivability during a wildfire would include retrofitting the most vulnerable home features, including:

- roofs
- vents
- eaves and soffits
- windows
- walls
- decks
- rain gutters
- patio covers
- chimneys
- garages
- fences
- driveway and access roads
- address signage
- water supply

While high fire construction standards are mandatory for new buildings in the High Fire Hazard Area, hardening of existing structures is voluntary. Adopting mandatory home hardening provisions of building and fire codes is problematic because existing, nonconforming structures were typically approved and built to the codes in effect at the time of construction. The problem persists, however, that a burning structure in a wildfire contributes to the fire and presents a danger to other structures downwind by way of flying brands (embers). Retrofits to existing structures can reduce fire risk, and some cost-sharing and grant programs are available to offset costs.

Resources for hardening structures can be found on the following websites:

https://www.readyforwildfire.org/prepare-for-wildfire/get-ready/hardening-your-home/

https://ucanr.edu/sites/fire/Prepare/Building/

5.2.2.2 Accessory Dwelling Units

Accessory Dwelling Units (ADUs) are self-contained residential units, typically used as a rental, and either incorporated within, detached from, or attached to the primary residential unit(s) on the same property. A Junior Accessory Dwelling Unit (JADU) is a unit up to 500 square feet in size contained within an existing or proposed home with a separate exterior entry and an efficiency kitchen. The state views ADUs/JADUs as one important strategy to increase housing statewide and in 2017 significantly amended state law to remove local government barriers for their construction. In 2018, the City Council adopted Zoning Ordinance (Title 30) amendments for ADUs and JADUs in alignment with state law. Due to concerns about fire evacuation impacts of ADUs in High Fire Hazard Zones, the ordinance prohibited ADUs in the Extreme Foothill High Fire Hazard Zone and required additional development standards for ADUs in the Foothill High Fire Hazard Zone, no other restrictions were adopted for the remaining High Fire Hazard Zones. As of February 2020, 185 ADUs/JADUs have been constructed, and an additional 296 are in process or pending building permits citywide.

In 2019, the state continued to be concerned about local government barriers to ADUs and signed a new package of legislation that again significantly amended state law for ADUs/JADUs effective January 1, 2020. New state law significantly expanded the types and numbers of ADUs allowed per parcel and voided much of the City's existing ADU and JADU regulations. In response, City Council adopted amendments to the ADU ordinance in December 2020. The City now allows a specific category of "Special" ADU/JADUs with required additional fire safety development standards in the Foothill and Extreme Foothill High Fire Hazard Area Zones in compliance with new state law.

5.2.3 Critical Infrastructure

Critical infrastructure encompasses physical assets that are vital to maintaining essential services, such as water services, roads, and fire and police services. Table 10 identifies critical facilities within the City that are located within the High Fire Hazard Area. Additionally, Table 10 identifies water infrastructure in the foothills located outside City limits (Santa Barbara County jurisdiction) but that serve critical water needs and that would be at risk of damage during a wildfire. Damage to critical infrastructure during a wildland fire often results in the temporary delay or loss of critical services to some or all residents within the City.

Table 10. Critical Facilities, by High Fire Hazard Zone

Critical Facility	Address	Zone
Cater Water Treatment Plant	1150 San Roque Road	Foothill
Sheffield Treatment Plant	530 Mountain Drive	Foothill
Fire Station No. 15 (SBCFD)	2491 Foothill Road	Foothill
El Cielito Pump Station	2410 Stanwood Drive	Foothill
Skofield Pump Station	2117 Mount Calvary	Extreme Foothill
Fire Station No. 7 (SBFD)	605 Mission Ridge Road	Foothill

Table 10. Critical Facilities, by High Fire Hazard Zone

Critical Facility	Address	Zone
Skofield Park	1819 Las Canoas Road	Extreme Foothill
Bothin Pump Station/East Reservoir	55 Crestview Lane	County Jurisdiction
Rocky Nook Pump Station	2491 Foothill Road	County Jurisdiction
Tunnel Pump Station/Pump Station	1501 Tunnel Road	County Jurisdiction
Sheffield Pump Station	2375 Foothill Road	County Jurisdiction

Source: City of Santa Barbara, Safety Element

In addition to the facilities identified in Table 10, Southern California Edison transmission lines enter the City from the north over Mountain Drive near its intersection with Coyote Road, skirting the east side of Parma Park. These lines provide critical power to the City.

5.2.3.1 Evacuation Blocks and Routes

As presented in Section 2.9, the City has established evacuation blocks and wildland evacuation routes, which are presented in Figure 9. These evacuation blocks and routes, while not physical infrastructure, are critical components to mitigating wildfire hazard.

5.2.3.2 Water Supply

As described in Section 2.10, water supplies are essential for firefighting efforts and structure protection. A summary of water supply capabilities and constraints is presented in Table 11, by High Fire Hazard Zone.

Table 11. Water Supply, by High Fire Hazard Zone

High Fire Hazard Zone	Discussion
Extreme Foothill	• Limited water supply in parts of this zone increase the risk in this area to high. • 50% of the existing fire hydrants in this area meet Fire Department Water Supply Standards of greater than 750 gallons per minute. o However, the fire hydrant system only covers portions of this zone, as identified on City GIS maps depicting fire hydrant locations. The City water line supplies adequate water supply to the upper San Roque area and areas along West Mountain Drive from Gibraltar Road, east to 1421 West Mountain Drive. • City water is unavailable from 1421 West Mountain Drive, going east along West Mountain Drive to Coyote Road and along upper Gibraltar Road. Most of the water system on West Mountain Road onto Coyote Road is owned and operated by Montecito Water District. • Because of the lack of water supply, this area falls within the Fire Department's Fire Zone 2, which requires a minimum 10,000-gallon water tank be installed for each residential development. • These water tank systems limit fire control to structure protection, not outside fire exposures. • To reduce the fire risk, a more stable water supply system is needed. • Pump Stations – No pumps stations in this zone, water is gravity flow. • Lauro Reservoir is located on the northern boundary of the City, but would be used for helicopter aerial operations in this zone.

Table 11. Water Supply, by High Fire Hazard Zone

High Fire Hazard Zone	Discussion
Foothill	• Adequate water supply in this zone makes the risk in this area low. • Fire hydrants meet Fire Department Water Supply Standards. Fire hydrants within this zone are located every 500 feet and meet Fire Department standards. • Lauro Reservoir is located just north of this zone, but would be used for helicopter aerial operations.
Coastal Interior	• Adequate water supply for firefighting in this zone makes the risk in this area low. • Fire hydrants meet Fire Department Water Supply Standards. Fire hydrants within this zone are located every 500 feet and meet Fire Department standards. • Lauro Reservoir is located on the northern boundary of the City but would be used for helicopter aerial operations in this zone.
Coastal	• Adequate water supply in this zone makes the risk in this area low. • Fire hydrants meet Fire Department Water Supply Standards. Fire hydrants within this zone are located every 500 feet and meet Fire Department standards. • Lauro Reservoir is located on the northern boundary of the City, but would be used for helicopter aerial operations in this zone.

5.2.4 Natural Resources

Natural resources include biological resources, cultural and historic resources, visual resources, streams and water resources, slopes and soil stability, and air quality. The following sections address these City assets in more detail.

5.2.4.1 Biological Resources

Biotic Communities

The City's vegetation (biotic) communities provide important biological habitats for plant and animal species. The vegetation that exists in these communities also becomes fuel available to burn during a wildland fire. The impact of a wildfire in many of these communities can be devastating, especially under extreme wind and weather conditions. Table 3 summarizes the different vegetation types identified and mapped in the City, and Figure 4 presents the distribution of vegetation types in the City.

The City's General Plan Environmental Resources Element, General Plan Environmental Impact Report, and LCP identify sensitive biotic communities, which are defined as communities which cannot adapt to new environmental stresses. The Coastal Land Use Plan identifies "Environmentally Sensitive Habitat Area," which is any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem, and which could be easily disturbed or degraded by human activities and developments. The following sensitive biotic communities are present in the City and may be adversely affected by wildfire:

- Coastal Bluff
- Coastal Strand/Beach
- California Annual Grassland
- Coastal Perennial Grassland
- Coastal Sage Scrub
- Chaparral
- Monarch Butterfly Autumnal and Winter Roost Sites

- Perennial Grasslands (Coastal Prairie)
- Southern Coastal Bluff Scrub
- Southern Oak Woodland
- Riparian Woodland/Creeks
- Freshwater Marsh
- Saltwater Marsh
- Western Snowy Plover Nesting Habitat
- White-Tailed Kite Nesting and Communal Roosting Habitat

Rare, Endangered, or Threatened Plants and Wildlife

Because of the diversity of biotic communities in the City, many different rare, endangered, and threatened animal species exist. The protection of these plants and animals is required by law and is essential to biological diversity. Like biotic communities, these plants and animals are threatened by wildfire. The following rare, endangered, or threatened wildlife species are present in the City and may be adversely affected by wildfire:

- American peregrine falcon (*Falco peregrinus anatum*)
- southern bald eagle (*Haliaeetus leucocephalus leucocephalus*)
- California brown pelican *(Pelicanus occidentalis californicus*)
- California least tern (*Sterna albifrons browni*)
- light-footed clapper rail (*Rallus longirostris levipes*)
- Belding's savannah sparrow (*Passerculus sandwichensis beldingi*)
- black rail (*Laterallus jamaicensis coturniculus*)
- monarch butterfly (*Danaus plexippus*)
- white-tailed kite (*Elanus leucurus*)
- western snowy plover (*Charadrius alexandrinnus nivosus*)
- California gnatcatcher (*Polioptila californica*)
- California grunion (*Leurethese tenuis*)
- southern steelhead trout (*Oncorhynchus mykiss*)
- tidewater goby (*Eucyclogobius newberryi*)
- southwestern pond turtle (*Clemmys marmorata*)
- California least tern and bank swallow (*Riparia riparia*)
- silvery legless lizard (*Anniella pulchra pulchra*)
- California red-legged frog (*Rama draytonii*)
- big free-tailed bat (*Nyctinomops macrotis*)
- gray whale (*Eschrichtius robustus*)
- ring-tailed cat (*Bassariscus astutus*)
- short-eared owl (*Asio flammeus*)
- sharp-shinned hawk (*Accipiter striatus*)
- burrowing owl (*Athene cunicularia*)
- bank swallow (*Riparia riparia*)
- California black rail (*Laterallus jamaicensis*)

The following rare and endangered plant species are present in the City and may be adversely affected by wildfire:

- saltmarsh bird's beak (*Cordylanthus maritimus* spp. *Maritimus*)
- yellow dicentra (*Dicentra ochroleuca*)
- pholisma (*Pholisma arenarium*)
- Hoffman's sanicle (*Sanicula hoffmannii*)
- Contra Costa bueria (*Lasthenia conjugens*)
- purple needlegrass (*Nasella pulchra*)
- cliff aster (*Malacothrix saxatilis*)
- Davidson's saltscale (*Atriplex serranana* var. *davidsonii*)
- black-flowered figwort (*Scrophularia atrata*)
- Coulter's saltbush (*Atriplex coulteri*)
- Davidson's saltscale (*Atriplex serenana* var. *davidsonii*)
- Nuttall's scrub oak (*Quercus dumosa*)
- mesa horkelia (*Horkelia cuneata* ssp. *puberula*)

- Santa Barbara honeysuckle (*Lonicera subspicata* var. *subspicata*)
- Catalina mariposa lily (*Calochortus catalinae*)
- Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*)
- Hoffmann's bitter gooseberry (*Ribes amarum* var. *hoffmannii*)
- island morning glory (*Calystegia macrostegia* ssp. *amplissima*)
- southern tarplant (*Centromadia parryi* ssp. *australis*)
- white-flowered sticky phacelia (*Phacelia viscida* var. *albiflora*)

5.2.4.2 Cultural and Historic Resources

The City is committed to the conservation of its cultural and historic resources. The impact of a wildfire poses a threat to these resources through direct flame contact, radiant heat damage, fire byproducts such as smoke and ash, damage caused by fire suppression and rehabilitation activities, and post-fire erosion, debris flows, and flooding. The effects of wildland fire on cultural resources can be considered direct or indirect. Direct effects are those caused by fire and its byproducts (e.g., smoke and ash) and result from the physical state of the fire environment (fuels, weather, terrain) and the ignition pattern. Indirect effects are the biophysical processes acting on the fire-altered environment and human responses. Indirect effects occur when wildland fire or associated fire management actions change the context in which a cultural resource is found, leaving it vulnerable to impacts (e.g., post-fire erosion) (Ryan et al. 2012).

Table 12 identifies designated City Landmarks and Structures of Meritthat are located within the City's High Fire Hazard Area. Cultural resources occur within the City's High Fire Hazard Area ; however, their locations are kept confidential to protect them.

Table 12. Cultural and Historic Resources, by High Fire Hazard Zone

Resource	Zone
Carl Oscar Borg House	Coastal Interior
Hunt-Stambach House	Coastal Interior
Bernhard and Irene Hoffman Residence	Foothill
Birss-Campbell Residence	Foothill
Cobb Residence	Foothill
D'Alfonso House	Foothill
Ebbets Hall	Foothill
El Encanto Hotel Historic District	Foothill
Franceschi Residence	Foothill
Frederick H. Booth House	Foothill
Furse Hall	Foothill
Grand Staircase/Quadrangle Building	Foothill
Jack's Trough (aka Courtney Fountain)	Foothill
MacKellar Court	Foothill

Table 12. Cultural and Historic Resources, by High Fire Hazard Zone

Resource	Zone
Mission Historical Park	Foothill
Mission Santa Barbara	Foothill
Mont Joie Residence	Foothill
Oliver-Mistretta Residence	Foothill
Peter Grant House	Foothill
Riviera Campus Historic District	Foothill
Riviera Streetcar Shelter	Foothill
Santa Barbara Museum of Natural History	Foothill
Sipress House	Foothill
St. Anthony's Seminary and Grounds	Foothill
Stark House	Foothill

5.2.4.3 Visual Resources

The aesthetic qualities of the City vary as widely as the nature of the topography and land uses. The scenic foothills and ridgelines of the Santa Ynez Mountains that provide the backdrop for the City are also the natural features that contribute to wildfire hazard (weather, topography, and fuel). Management of vegetation for fire hazard reduction purposes may impact public scenic views of the mountains throughout the City. However, large wildfire burn scars would also impact public scenic views until the vegetation recovers. The preservation and enhancement of scenic resources provides important social, recreational, and economic benefits for both residents and visitors. Vegetation management conducted by the City under the 2004 Wildland Fire Plan, and as proposed in this CWPP, involves thinning and understory ladder fuel treatment, which retains tree canopies and leaves thinned shrublands in a mosaic pattern where 50% to 70% of existing plant material remains. This approach differs from fire break construction, which removes all vegetation down to bare soil, a practice that would have a significantly greater impact on public scenic views. The City's practice is consistent with Coastal Land Use Policy 4.3-15, which requires incorporation of alternative vegetation management measures to minimize the visual resource impacts associated with removal and thinning of natural vegetation (City of Santa Barbara 2019).

5.2.4.4 Streams and Water Resources

Vegetation in local watersheds and along streams and water courses provides many important functions in protecting water resources, water quality, and habitat in the watershed. Vegetated riparian corridors may provide water quality buffering benefits to the adjacent streams. Vegetation removal or treatment in riparian corridor areas must be conducted in careful consideration of potential effects on water quality and ecological function. Riparian vegetation provides habitat for terrestrial and aquatic wildlife species, provides streambank stability, reduces erosion, shades the water surface thereby affecting water temperature (which affects aquatic habitat), and is a source for large woody debris, which falls into streams and watercourses providing habitat and affecting flow patterns and pool development (Kocher and Harris 2007). However, when a watershed is catastrophically burned in an expansive wildfire, many of these functions and roles are lost or severely reduced until the

vegetation recovers. Following a catastrophic watershed-wide fire, hillslope erosion and sediment yields through watershed tributary channels typically increase by an order of magnitude (or greater) over non-fire average conditions (Neary et al. 2008).

Therefore, sound vegetation management that reduces the extent and frequency of watershed-wide extreme fires also helps avoid and minimize potential sediment and water quality impacts in the watershed. Vegetation management activities seek to maintain the water resource and water quality benefits of watershed vegetation while reducing the hazard and fire risk.

Historic large fires within the Santa Barbara area have been wind driven fires. Because of the east/west alignment of the Santa Ynez mountain range, winds are funneled down through major drainages. Some creek areas have heavy concentrations of flammable vegetation. A wildfire burning through these areas has the potential for significant loss of riparian habitat and water quality. In addition, erosion occurring on steeper slopes above drainages where soil conditions are susceptible to erosion or are accelerated from a wildfire will end up being deposited in creek areas where flow velocities are sufficiently reduced.

Regarding vegetation management within and near stream channels, the City currently conducts such activities as outlined in the 2015 Streambed Alteration Agreement issued by the California Department of Fish and Wildlife (City of Santa Barbara 2015). This agreement allows for certain vegetation management work to occur in jurisdictional areas (e.g., removal of non-native, invasive, and dead vegetation from stream channels) and outlines measures to avoid and minimize impacts. Measures include, but are not limited to, timing work to avoid bird nesting season, providing a qualified biologist for site monitoring, and properly storing and staging equipment.

5.2.4.5 Slopes and Soil Stability

Santa Barbara has a history of major flood events dating back to 1862. These major floods result from high-intensity rainfall, which produces heavy runoff in a short period of time.

Watersheds severely burned by wildfire are vulnerable to accelerated rates of soil erosion and can experience large amounts of post-fire sediment deposits. Increases in post-fire suspended sediments in streams can result from erosion and overland flow, channel scouring, and creep accumulations in stream channels after an event (USDA 2005). While less is known regarding the effect of fire on turbidity, it has been observed that post-fire turbidity levels in stream water are affected by the steepness of the burned watershed (USDA 2005). The little data available regarding post-fire turbidity levels has indicated that U.S. Environmental Protection Agency water quality standard for turbidity can be exceeded after a fire event (USDA 2005). In some cases, during severe, slow-moving fires, the combustion of vegetation during wildfires creates a gas that can penetrate the soil. As the soil cools, this gas condenses and forms a waxy coating that causes the soil to repel water. This phenomenon, called hydrophobicity, increases the rate of surface water runoff as water percolation into the soil is reduced (Moench and Fusaro 2012). This accelerated slope runoff can move dry soil material that has accumulated at the base of slopes, creating flooding and debris flows.

These conditions occurred after the 1990 Paint Fire, 1964 Coyote Fire, and the 1944 Polo Fire and resulted in additional property and soil loss. Most recently, this occurred after the 2017 Thomas Fire, when heavy rains following the fire caused a devastating debris flow, which resulted in 23 deaths and significant property damage.

Vegetation helps stabilize slopes and minimize soil erosion by providing root strength and by absorbing soil moisture. Plant roots can anchor into bedrock or more stable soils and can bind weaker soils through fibrous root development. Excessive, haphazard, or indiscriminate vegetation removal can result in the loss of root strength in

the soil, and their decay can increase soil moisture levels, increasing the potential for erosion and slope failure (Ziemer 1981). Vegetation also reduces stormwater runoff by capturing and storing rainfall in the canopy and releasing it through evapotranspiration. Vegetation also promotes infiltration of rainfall into the soil (Center for Watershed Protection and USFS 2008).

5.2.4.6 Air Quality

The California Air Resources Board (CARB) regulates the air quality within California. The Santa Barbara County Air Pollution Control District is mandated to develop plans to meet federal and state air quality standards, monitor air quality, and regulate activities that may result in air pollution within Santa Barbara County.

Wildland fire affects air quality by producing smoke emissions that may exceed CARB's standards for carbon monoxide, carbon dioxide, methane and non-methane hydrocarbons, and particulate matter less than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$). The amount of chemicals and particulate matter produced in a wildland fire is directly related to the amount of fuel consumed.

Carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, and other constituent materials are all present in wildfire smoke. The specific composition of smoke depends largely on the fuel type (vegetation types contain different amounts of cellulose, oils, waxes, and starches, which when ignited produce different compounds). In addition, hazardous air pollutants and toxic air contaminants, such as benzene and formaldehyde, are also present in smoke. However, the principal pollutant of concern from wildfire smoke is particulate matter. In general, particulate matter from smoke is very small in size and can be inhaled into the deepest recesses of the lungs, presenting a serious health concern (Lipsett 2008).

Factors including weather, stage of fire, and terrain can all dictate fire behavior and the impact of wildfire smoke. Wind, for instance, generally results in lower smoke concentrations because wind causes smoke to mix with a larger volume of air. Large quantities of pollutants can also be released by wildland fires over a relatively short period of time. Air quality during large fires can become severely hazardous and can remain impaired for several days after the fire is ignited (Lipsett 2008). During the 2017 Thomas Fire, for example, Santa Barbara experienced 9 straight days of unhealthy or hazardous air quality (Genet 2018). An analysis of air quality during the same period (Shi et al. 2019) revealed that 14-day averaged pollutant ($PM_{2.5}$) concentrations substantially exceeded the U.S. air quality standards, potentially leading to adverse health impacts.

Wildland fire mitigation involves many fuels management practices such as prescribed burning, cutting, chipping, and mechanical methods. Prescribed burning, like wildfire, produces chemical and particulate matter that has the potential to exceed CARB standards. But unlike wildfire, prescribed burning can be mitigated through smoke management practices outlined by CARB and the Santa Barbara County Air Pollution Control District to avoid exceeding air quality standards. Other fuel management practices where vegetation is not burned, but cut, chipped, or mechanically removed, do not exceed air quality standards and are considered a nonsignificant, short-term activity.

5.2.5 Economics

The potential impact of wildfire on structure loss is significant. The 1990 Painted Cave Fire resulted in 524 homes being destroyed and a dollar loss of over $290 million. With the buildup of fuels and new homes built in the High Fire Hazard Area, a wildfire of that proportion would have similar results and a much greater dollar loss. Additionally, repair and rebuilding of infrastructure following a wildfire can be a significantly costly effort for municipalities and utilities. Following the 2008 Tea Fire, for example, an underground water main was irreparably damaged by heat from the fire above, and area roads were degraded to the point where they needed to be resurfaced.

The local Santa Barbara economy is heavily dependent on the beauty of its natural and cultural resources, with a significant amount of revenue generated by the tourism industry. There is a high potential for a wildland conflagration to temporarily disrupt both the quality of life and economic stability of the City. Wildfire and post-wildfire related closures to local roads and highways, notably U.S. Route 101, can impact travel into and out of the City. Temporary closures of businesses and/or reduced volumes of tourist traffic affects local business and City tax revenues. The potential for economic losses due to litigation resulting from wildfire damage is also a reality. Damage claims against the property owners where the fire originated and/or spread from or through their property, due to untreated wildland areas, represents potential economic loss to both the City and private property owners. Utility companies have also been found responsible for wildfire ignitions and resulting damages, with significant settlements being paid to fire victims and local municipalities. For example, Pacific Gas & Electric (PG&E) settled with Sonoma County and the City of Santa Rosa for over $300 million (combined)—their share of the $1 billion deal the utility made with local governments to settle claims for damages caused by wildfires in 2017 and 2018 (Press Democrat 2020). Other potential economic impacts associated with wildfires includes increased insurance costs for property owners, the potential for dropped policies, and public safety power shutoffs implemented by utility companies to reduce ignition potential. A side effect of public safety power shutoffs is the loss of business revenue due to business closures and the direct loss of business materials or assets that require energy to produce, store, or maintain.

6 Action Plan

This section identifies the goals of the CWPP and identifies recommended action items to be implemented by the City that serve to minimize wildfire impacts to the community. Future project and actions identified in this section would need to be funded and approved by the City prior to implementation.

6.1 Goals

The goal of this CWPP is to identify action items that can be implemented by the City that serve to protect lives, property, and natural resources threatened by wildland fire. SBFD recognizes the catastrophic impact of wildfire in the community and is committed to reducing hazards and risk through fire protection, fuel hazard reduction, public education, preparedness, and community involvement.

6.2 Action Items

The policies and actions outlined in this section are a combination of policies and actions identified in the 2004 Wildland Fire Plan (some of which have been implemented) and those proposed for implementation under this CWPP. Recommendations for each action are provided. Some actions included in the 2004 plan are applicable and remain as proposed (recommended) actions in this CWPP.

6.2.1 Codes and Standards

Table 13 outlines policies and actions to reduce wildfire hazards that are related to codes and standards.

Table 13. Policies and Actions Related to Codes and Standards

Action Number	Description	Responsible Party
Policy 1. Revise the City High Fire Hazard Area based on hazard and risk as identified by the CWPP.		
1.1	Defensible space distances shall be 30 to 70 feet for the Coastal and Coastal Interior Zones and 100 to 150 feet for the Foothill and Extreme Foothill Zones. Within any High Fire Hazard Area Zone, additional defensible space may be required on slopes greater than 30% and may require up to 300 feet of defensible space.	Santa Barbara Fire Department (SBFD)
1.2	Evaluate opportunities to implement vegetation management and defensible space activities consistent with the policies of the City's Coastal Land Use Plan in the High Fire Hazard Area that occurs within the state's Coastal Zone Boundary (Area T in Table 6 and depicted on Figure 14).	SBFD
1.3	Apply mitigation and development standards required by policies, code, and site-specific studies to the City's High Fire Hazard Area.	SBFD
1.4	Adopt Fire Hazard Severity Zones pursuant to the 2019 California Fire Code, Section 4904.2 and in accordance with the California Public Resources Code, Sections 4201 through 4204 for State Responsibility Areas (SRA) and in accordance with Government Code Sections 51175 through 51189 for areas where a local agency is responsible for fire protections (LRA).	SBFD
1.5	Adopt the modifications to the City's High Fire Hazard Area as presented in Section 4.2.1 and Figure 14 of this Community Wildfire Protection Plan (CWPP).	SBFD
1.6	Revise the boundary of the City's High Fire Hazard Area to be consistent with CAL FIRE's VHFHSZ update when available.	SBFD

Table 13. Policies and Actions Related to Codes and Standards

Action Number	Description	Responsible Party
Policy 2. Increase the survivability of homes in the City's High Fire Hazard Area through the adoption of fire safe building codes.		
2.1	Monitor changes in Fire, Building, and Residential codes. Modify and adopt codes as needed.	SBFD
2.2	Encourage structural hardening retrofits for existing structures in the High Fire Hazard Area, consistent with the standards in the most current version of Chapter 7A of the California Building Code or other resources (Section 5.2.2.1). Structural retrofits may include, but are not limited to, the following: • Class A roof system • Ember-resistant vents • Plug all openings to prevent ember intrusion • Multi-paned windows with at least one or both panes tempered • Noncombustible, ignition-resistant-compliant exterior siding and decks • Automatic closing exterior doors • Battery backup for garage door opener (works when power is out)	SBFD
Policy 3. Increase the survivability of homes in the High Fire Hazard Area through the adoption of defensible space standards and landscape guidelines on new, remodeled, and existing homes.		
3.1	Require additions or remodels of existing residential properties in the High Fire Hazard Area to comply with the Fire Department "High Fire Hazard Landscape Guidelines and Defensible Space Requirements."	SBFD
3.2	Routinely review and update, as necessary, the City's High Fire Hazard Area Landscape Requirements document (for defensible space), including the prohibited plant species list.	SBFD
3.3	Routinely review and update, as necessary, the City's High Fire Hazard Area Desirable Plant List document.	SBFD
Policy 4. Create a defensible community by increasing the number of homes that comply with the SBFD "High Fire Hazard Defensible Space Requirements."		
4.1	Complete a survey of all homes in the High Fire Hazard Area to determine the percentage of homes that comply with the SBFD "High Fire Hazard Defensible Space Requirements."	SBFD
4.2	Pursuant to the California Fire Code and Santa Barbara Municipal Code Chapter 8.04, examine current SBFD enforcement capability and recommend policy, procedures, and funding sources to enhance the ability of the department to conduct initial inspections, follow-up enforcement of defensible space violations, and address issues where defensible space requirements span multiple parcels.	SBFD

Table 13. Policies and Actions Related to Codes and Standards

Action Number	Description	Responsible Party
4.3	Continue vacant lot enforcement program for "High Fire Hazard Defensible Space Requirements" on undeveloped and developed properties within the High Fire Hazard Area.	SBFD
4.4	Evaluate ways to allow the Fire Department to work with insurance companies and private property owners in reducing fire hazard on individual properties and within neighborhoods.	SBFD
4.5	To facilitate disposal of vegetation treated during defensible space treatment activities, evaluate opportunities for permitting pile burning activities on private properties.	SBFD

6.2.2 Funding

Table 14 outlines policies and actions to reduce wildfire hazards that are related to funding.

Table 14. Policies and Actions Related to Funding

Action Number	Description	Responsible Party
Policy 5. Develop funding sources and incentive programs for residents of the High Fire Hazard Area to encourage reduction of wildfire hazards and risks.		
5.1	Research grant funding opportunities for wildland fire projects and apply for appropriate grants or cost-share programs. Wildland fire projects may include those associated with vegetation management or treatment, structural retrofits (structural hardening), planning, and community education or engagement.	SBFD
5.2	Develop additional funding sources, in addition to the Wildland Fire Suppression Assessment District, to implement vegetation and fire management projects within the identified VMUs. Funding sources could include private property owner funding, City general fund, cooperative funds, etc.	SBFD
5.3	Continue work to support and develop funding sources for projects with the Parks and Recreation and Public Works, Water Resources Division that reduce the fire hazard in the High Fire Hazard Area.	SBFD, Parks and Recreation, Public Works, Water Resources
5.4	Assign a member of the Fire Prevention Bureau to the existing SBFD Grant Committee to better facilitate and coordinate department funding of wildland projects	SBFD

Table 14. Policies and Actions Related to Funding

Action Number	Description	Responsible Party
5.5	Continue to develop and annually update the permit fee schedule for zoning report inspections, plan review, Pre-application Review Team, and Development Application Review Team submittals reviewed for High Fire Hazard Area requirements.	SBFD
5.6	Expand the boundary of the Wildland Fire Suppression Assessment District to incorporate the High Fire Hazard Area as defined in Action 1.5.	SBFD
5.7	As appropriate, evaluate the opportunity to incorporate projects and actions identified in this CWPP into the City's Hazard Mitigation Plan and Capital Improvement Program.	SBFD

6.2.3 Fire Rehabilitation

Table 15 outlines policies and actions to reduce wildfire hazards that are related to fire rehabilitation.

Table 15. Policies and Actions Related to Fire Rehabilitation

Action Number	Description	Responsible Party
Policy 6. Post-fire rehabilitation guidelines should be established for the City.		
6.1	Develop appropriate post-fire rehabilitation guidelines for property owners that address post-fire effects of flooding and soil erosion.	SBFD
6.2	Develop a public education pamphlet on post-fire rehabilitation guidelines.	SBFD
6.3	Ensure that post-fire rehabilitation guidelines are developed in cooperation with appropriate federal, state, and local agencies including Incident Command, if applicable, and Santa Barbara County Flood Control.	SBFD

6.2.4 Evacuation

Table 16 outlines policies and actions to reduce wildfire hazards that are related to evacuation.

Table 16. Policies and Actions Related to Evacuation

Action Number	Description	Responsible Party
Policy 7. Increase evacuation safety for residents and the general public in the High Fire Hazard Area.		
7.1	Continue educational campaign to make residents, businesses, schools, and the public aware of evacuation planning and hazards.	SBFD
7.2	Continue educational campaign with property owners associations and neighborhoods on the Red Flag Warning Plan.	SBFD
7.3	Continue to ensure that vegetation road clearance is implemented along primary response routes in the High Fire Hazard Area.	SBFD
7.4	Investigate methods for publicly identifying evacuation routes along High Fire Hazard Area roadways.	SBFD
7.5	Develop training bulletins for SBPD employees identifying recommended evacuation routes and proposed traffic control points. SBPD staff in cooperation with SBFD staff would accomplish this action.	SBFD, Santa Barbara Police Department (SBPD)
7.6	Develop a simple, straightforward directive for the use of SBPD Watch Commanders and Field Supervisors identifying the duties and responsibilities of officers in the event of a major fire. This would be accomplished by SBPD staff in cooperation with SBFD staff.	SBFD, SBPD
7.7	Identify specific roads that do not meet SBFD Access Standards and develop feasible mitigations and/or appropriate tools that can be used to reduce fire risk in these areas. Tools may include, but are not limited to, expanding roadside vegetation clearance requirements, enacting on-street parking restrictions, installing and maintaining warning and notification signage, enacting parking or traffic flow restrictions during Red Flag Warnings, identifying turnouts for vehicle passage, and establishing one-way traffic flows to facilitate evacuation traffic.	SBFD
7.8	Prioritize and evaluate the feasibility of implementing the recommendations included in the 2014 Wildland Fire Evacuation Procedures Analysis report prepared for the City (Appendix A).	SBFD
7.9	Conduct a detailed evacuation study for the City's High Fire Hazard Area. The study should address the impact of increased residential density on roadway capacities and evacuation capabilities.	SBFD
7.10	Routinely update the City's Ready! Set! Go! brochure to reflect changing conditions, policies, and best practices.	SBFD

6.2.5 Fire Protection

Table 17 outlines policies and actions to reduce wildfire hazards that are related to fire protection.

Table 17. Policies and Actions Related to Fire Protection

Action Number	Description	Responsible Party
Policy 8. Reduce fire engine response times in all High Fire Hazard Areas to 4 minutes.		
8.1	Evaluate SBFD response times for the High Fire Hazard Area.	SBFD
8.2	Develop appropriate actions (development standards, vegetation management, signing, etc.) from evaluation of SBFD response times.	SBFD
Policy 9. Provide the highest level of fire protection services to the firefighters and residents within the High Fire Hazard Area.		
9.1	Conduct department training classes focused on Wildland-Urban Interface (WUI) Operations for all operations staff levels.	SBFD
9.2	Evaluate opportunities for mitigating the lack of fire hydrants in Fire Zone 2, including, but are not limited to installation of water tanks for firefighting purposes or modifying the Land Development Standard Fire Zone 2 Requirements (Ordinance #5920).	SBFD
9.3	Develop, fund, and implement a high fire hazard enforcement program to ensure annual "High Fire Hazard Defensible Space Requirements" are met to satisfy the California Fire Code, Chapter 49, to slow the spread of approaching wildfire and increase firefighter safety.	SBFD
9.4	Increase the amount of interagency wildland fire training to gain expertise in wildland firefighting strategies, tactics, communications, and equipment.	SBFD
9.5	Train firefighters to properly to turn off water to compromised structures that have free-flowing water in order to maintain water system supply and pressure.	SBFD, Water Resources
9.6	Maintain and regularly update the existing wildland fire pre-attack, firefighting safety zones, and escape routes mapping and preplan High Fire Hazard Area using Geographic Information Systems.	SBFD
9.7	Purchase a Remote Automatic Weather Station in cooperation with local fire agencies to monitor fire weather and get more accurate fire weather forecasts for the community.	SBFD
9.8	Work with neighboring jurisdictions on wildland fire mitigation projects and operational concerns.	SBFD
9.9	Develop appropriate improvements needed to make identified safety zones useable for fire suppression operations.	SBFD

Table 17. Policies and Actions Related to Fire Protection

Action Number	Description	Responsible Party
9.10	Explore options for resolving emergency communications platform issues between County Sheriff, Search and Rescue, SBFD, and SBPD. Coordinate technology use (e.g., Fulcrum app) to join a common communication portal across all County Fire and Law Enforcement departments.	SBFD
9.11	Improve SBFD's radio communications via infrastructure upgrades or completing projects that enhance coverage throughout the City.	SBFD
9.12	Create, fund, and implement a communications system equipment replacement plan.	SBFD

6.2.6 Vegetation/Fuels Management

Table 18 outlines policies and actions to reduce wildfire hazards that are related to vegetation/fuels management.

Table 18. Policies and Actions Related to Vegetation/Fuels Management

Action Number	Description	Responsible Party
Policy 10. Provide community protection from wildland fire through fuels management projects on private lands and City-owned lands.		
10.1	Retain VMUs identified in the 2004 Wildland Fire Plan and add VMUs identified in this CWPP as included in Table 8. VMUs to include private and City-owned lands.	SBFD
10.2	Develop project standards for each Vegetation Management Unit based on vegetation type, slope, aspect, biological concerns, and erosion potential. See Appendix E (Vegetation Management Standards and Techniques) for specific details on vegetation management standards to be implemented for VMUs.	SBFD
10.3	Complete public education outreach within each VMU. This initial outreach effort should address defensible space, fire access, building construction, public safety, resident addressing, evacuation, and the Red Flag Warning program.	SBFD
10.4	Continue to reduce invasive species in VMUs in coordination with project biologists.	SBFD
10.5	Work with the Parks and Recreation, Creeks Division to develop vegetation management techniques that reduce fire hazard in creek areas and maintain creek values.	SBFD, Parks and Recreation, Creeks Division

Table 18. Policies and Actions Related to Vegetation/Fuels Management

Action Number	Description	Responsible Party
Policy 11. Support collaborative fuels management projects between the City and residents of the High Fire Hazard Area to encourage fire hazard reduction and protection of natural resources. This includes compliance with SBFD "High Fire Hazard Defensible Space Requirements," as well as additional vegetation management projects requested by property owners.		
11.1	Develop affordable incentive programs to allow property owners to maintain defensible space around homes.	SBFD
11.2	Work with Creeks Division and Community Development Department to develop guidelines for private property owners conducting defensible space adjacent to creek areas that balances riparian values and fire hazard and risk on private lands.	SBFD, Creeks Division, Community Development Department
11.3	Work with neighboring jurisdictions on wildfire mitigation projects such as defensible space chipping, vegetation road clearance, and fuels management projects.	SBFD
11.4	Continue working with City departments in the development of SBFD "High Fire Hazard Defensible Space Requirements" to ensure that fuels management projects on private lands decrease fire hazard and balance natural resource values.	SBFD
Policy 12. Participate in regional efforts to manage hazardous fuels within the Foothill and Extreme Foothill Zones to provide a fire buffer between continuous stands of chaparral fuel adjacent to the City boundary and more densely populated areas within the City. To be effective, efforts should be collaborative between County, City, and Montecito Fire Protection District.		
12.1	Continue to reduce invasive species in the Community Fuels Treatment Network (CFTN) areas in coordination with project biologists.	SBFD
12.2	Retain the CFTN identified in the 2004 Wildland Fire Plan. Revise the network boundary to remove overlap with adjacent VMU (see Figure 15) and make the overlapping area part of the adjacent VMU.	SBFD
12.3	Develop project standards for each CFTN based on vegetation type, slope, aspect, biological concerns, and erosion potential. See Appendix E, Vegetation Management Standards and Techniques, for specific details on vegetation management standards to be implemented for the CFTNs.	SBFD

6.2.7 Public Education

Table 19 outlines policies and actions to reduce wildfire hazards that are related to public education.

Table 19. Policies and Actions Related to Public Education

Action Number	Description	Responsible Party
Policy 13. Increase the community's knowledge and awareness of wildland fire and develop training and education programs to prepare, motivate, and educate the community.		
13.1	Continue to work with businesses, schools, skilled nursing facilities, board and care homes, and assembly occupancies in the High Fire Hazard Area to develop evacuation preplans and preparedness for wildfire.	SBFD, Public Health
13.2	Continue to work with the Santa Barbara County Fire Safe Council on public education projects to increase wildland fire public awareness and preparedness.	SBFD
13.3	Work with communities, neighborhoods, and individuals to get the message across that reducing the wildland fire threat requires them to take personal responsibility for preparedness, evacuation, defensible space, driveways, and roadways, and community cooperation.	SBFD
13.4	To reduce impacts to water availability and pressure during wildfire events, work with property owners to educate them not to use sprinkler systems to water down roofs during wildfires.	SBFD
13.5	Update the City's fire landscaping brochure with all City departments to educate the public on fire safe landscaping, power line hazards, and wildland fire safety. The brochure should include fire safe landscaping, native landscaping, water conservation, soil stabilization, creek restoration, and non-invasive plant species concerns.	SBFD
13.6	Develop a bilingual public information strategy to educate Santa Barbara residents on wildland fire that is also culturally relevant. Topics to include defensible space, fire landscaping, road access, Red Flag Warning, wildfire ignition risks, resource concerns, and evacuation. Engage other local entities (e.g., non-profit groups, UCSB), departments, and programs where feasible. Incorporate video and other visual engagement strategies where feasible.	SBFD
13.7	Develop a wildfire module for the City's Community Emergency Response Team (CERT) program focused on wildland fire.	SBFD
13.8	Develop educational material for the public to eradicate and reduce the potential for the expansion of invasive species that has the potential to occur from defensible space projects.	Creeks Division
13.9	Involve Creeks Advisory Committee and Creeks Division in public education events related to vegetation management projects.	SBFD, Creeks Advisory Committee, Creeks Division

Table 19. Policies and Actions Related to Public Education

Action Number	Description	Responsible Party
13.10	Routinely update the City's Ready! Set! Go! Brochure to reflect changing conditions, policies, and best practices and make available in both English and Spanish.	SBFD
13.11	Conduct outreach with the real estate community to work though upcoming Assembly Bill 38 requirements associated with wildfire-related real estate disclosures and to coordinate delivery of the High Fire Hazard Landscape Guidelines and Defensible Space Requirements documents to home buyers in the High Fire Hazard Area.	SBFD
13.12	Coordinate with the Santa Barbara County Air Pollution Control District to disseminate information related to air quality and wildfire smoke impacts.	SBFD
13.13	Continue to work with other agencies through the readysbc.org platform to disseminate pertinent information regarding wildfire emergencies.	SBFD
Policy 14. Work with all City departments and staff to increase their knowledge, awareness, prevention, and preparedness for wildland fire.		
14.1	Continue to work with the Planning Commission and Design Review Boards to ensure a clear understanding of landscape design, defensible space requirements, and vegetation management issues related to visual impacts.	SBFD
14.2	Develop annual City staff training on wildland fire safety to train City staff working in the High Fire Hazard Area. Training should include the Red Flag Warning program, process for fire complaints, fire reporting procedures, fire prevention, and defensible space requirements.	SBFD
14.3	Coordinate with City Departments (Parks, Public Works, etc.) during planning, vegetation management, and other CWPP implementation tasks to streamline efforts and maximize the use of available City resources.	SBFD
Policy 15. Work cooperatively with federal, state, and local jurisdictions to provide the highest level of fire protection, prevention, and mitigation projects and programs in the City's Wildland-Urban Interface area.		
15.1	Continue to work with cooperating agencies on suppression, training, prevention, evacuation, and public education in the High Fire Hazard Area that benefit the entire community.	SBFD
15.2	Support collaborative vegetation management projects between the City and surrounding jurisdictions that reduce fire hazard and protect natural resources.	SBFD
15.3	Ensure that the City and surrounding jurisdictions and agencies work cooperatively to address fire hazard and environmental impacts.	SBFD
15.4	Coordinate vegetation management actions where needed with Santa Barbara County Flood Control.	SBFD

Table 19. Policies and Actions Related to Public Education

Action Number	Description	Responsible Party
15.5	Coordinate with stakeholders (CAL FIRE, Santa Barbara County Fire Department, Montecito Fire Protection District, U.S. Forest Service, Santa Barbara County Fire Safe Council, Southern California Edison, and others) to facilitate information and data sharing, resource sharing, coordination of management activities, facilitating property access, grant funding, and cost-sharing opportunities.	SBFD

7 CWPP Authorization

The City of Santa Barbara CWPP was collaboratively developed. Interested parties, and local, state, and federal agencies managing land within or adjacent to the at-risk communities were consulted. This document identifies and prioritizes areas for hazardous fuel reduction treatments, provides recommendations for the types and methods of treatment that will protect the at-risk communities in the City, and recommends measures to reduce the ignitability of structures within the WUI areas. This CWPP is intended to better protect the community from the threat of wildfires by promoting community-level fuel reduction projects.

The following entities mutually agree with the contents of the City of Santa Barbara Community Wildfire Protection Plan:

_____

Cathy Murillo, Mayor
City of Santa Barbara

_____

Chris Mailes, Interim Fire Chief
Santa Barbara City Fire Department

_____

John Owens, Interim San Luis Obispo Unit Chief
California Department of Forestry and Fire Protection

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Appendix A

Wildland Fire Evacuation Procedure Analysis Recommendations (Dudek 2014)

To improve upon the existing evacuation plans for the City, the 2014 Wildland Fire Evacuation Procedures Analysis report (Dudek 2014) put forward wildfire evacuation recommendations based on analysis of the fire environment, the road network, fire behavior modeling, traffic modeling, the existing evacuation planning procedures, anticipated public response, fire department input, and available evacuation plans and data. The analysis also identified areas that require future consideration, additional analysis needs, and implementation constraints. Local officials would determine which recommendations to pursue and on what timeframe they would be implemented. Both the City and County decision-makers would cooperate to decide on which recommendations to prioritize. However, the City of Santa Barbara officials would ultimately determine which recommendations can be implemented within the City's jurisdiction. Consideration for adjacent jurisdictions and their evacuation plans would also be a component of the decision making progress. Table A-1 provides a summary of recommendations that are the result of the analysis presented in the 2014 Wildland Fire Evacuation Procedures Analysis report.

Table A-1. Summary of Santa Barbara Wildland Fire Evacuation Procedures Analysis

Recommendation	Description
Existing Evacuation Block	• Maintain Existing Evacuation Blocks. • Prepare scenario-based sub-block phone tree lists to evacuate the most vulnerable properties immediately and the remainder of the block as dictated by fire behavior. • Evacuation Blocks should be updated as necessary based on post-fire studies, actual evacuation events, changing populations, or technological advances.
Coordination and Cooperation	• Improve coordination/cooperation among agencies. • Ensure evacuation planning is coordinated between Law/Fire. • Law enforcement officers are not properly trained or equipped with safety equipment necessary to carry out their critical function so providing that equipment and knowledge will be important to future evacuations.
Community Planning and Safety Zones	• Community planning should play a critical role in provisions for firefighter safety zones. • City Planning Department work with the SBFD to facilitate improvements to areas that could meet the definition of a safety zone with certain enhancements. • Planners should work with Fire Department to look at permitting enhancements, possible funding for enhancements through project development fire mitigation fees, and direct projects to consider safety zones in design.
Traffic Flow	• Control Intersections – may require additional law enforcement agencies/personnel to increase success. • Utilize Roadblocks and Barricades – less effective than officer at intersections, but can be used as last resort. • Electronic Signage – may be useful in Santa Barbara Foothill and Extreme area evacuations because of the large number of visitors who may not be familiar with the roadway. • Where opportunity exists, look at the feasibility of Lane Expansions. • Contraflow – providing additional evacuation lanes would increase the number of cars that can be moved out of vulnerable areas, but must be implemented with caution and controls.

Table A-1. Summary of Santa Barbara Wildland Fire Evacuation Procedures Analysis

Recommendation	Description
Law Enforcement	• Additional officers may be required in large evacuation events to control intersections. • Training, protective clothing, equipment and resources should be required for law enforcement officers who are responsible for controlling intersections.
Civilian Evacuation Contingency Planning	• Contingency planning for civilian safety when evacuation is not possible – develop checklists/matrix for civilian evacuation contingency planning.
Enhanced Temporary Firefighter Refuge Areas	• In addition to typical Temporary Refuge Areas (TRAs), enhanced TRAs should be created as a pre-planned effort to provide contingency evacuation options when evacuation is considered too dangerous.
Santa Barbara Fire Department	• Complete City Wildfire Pre-Plans consistent with SB County Pre-Plans and share information with surrounding agencies. • Conduct joint, scenario-based, real-time field training exercises with all local fire and law enforcement agencies. • Test the evacuation plan periodically in real time simulations using the public in actual movement, including support systems such as Reverse 911. Activate the EOC and any department level Operating Centers to be sure they are coordinated and work correctly. • Conduct additional FARSITE wildfire scenario modeling exercises throughout the City's fire hazard areas to help refine pre-plans, establish immediate evacuation zones, as educational tools for public awareness, and to establish decision points, as appropriate. • Conduct joint scenario-based field training exercises with all local responding Fire and law Enforcement Agencies. Exercises should include actual movement of apparatus, establishment of ICP, communications, mobilization of law enforcement etc. Some of these exercises should also include the residents from time to time. The best way to test a system to be sure it will work is by ongoing exercises. • Test the Reverse 911 and other community notification systems on a regular basis. Preface any announcements with "this is a test only." • Develop evacuation contingency plans including the utilization of buildings designed to provide safe refuge as an alternate to evacuation. • Develop a decision flow chart to evaluate evacuation contingencies. • Training and familiarity with evacuation plans, vulnerable areas, live training on infield decision making regarding temporary refuge areas vs. evacuation to safety. • Provide Pre-Plans in engines with iPad or similar device provided to each crew (hard copy and electronic) – focus on BC levels, but available to all. • Develop Shelter in Place/Evacuation decision flow chart for use by the Incident Command team. • Work with County dispatchers so they are trained in how to activate, focus and put a customized message on the system in pre-planned zones based on fire scenario modeling conducted herein by SBFD over time. • Evaluate the recommendations provided in this WEPA and implement them in a coordinated fashion with other fire and law enforcement agencies.

Table A-1. Summary of Santa Barbara Wildland Fire Evacuation Procedures Analysis

Recommendation	Description
	• Seek grant funding for implementing roadway improvements and to support acquisition of equipment and technological recommendations detailed in this WEPA. • Consider cross-training a member of the police department and a member of the fire department to focus on updating evacuation information, providing training, and coordinating communications between agencies pre- and post-fires. • Evaluate cost-benefit of specialized Compressed Air Foam System equipped engines for pre-treating structures or other refuge areas for the possibilities when evacuation is not possible.
Citizen Re-entry and Recovery	• Develop a citizen re-entry and recovery plan.
Technological Advancements	• Implement technological advances in all aspects of early fire detection, traffic planning and road improvements, evacuation, and contingency sheltering as they develop.
Special Needs Populations	• The City of Santa Barbara is a member of the Coalition through the Office of Emergency Services Division of the Fire Department. Therefore, any evacuations of Access and Functional Needs and Disabilities (AFN/D) population that include the City of Santa Barbara Fire Department, prior to and during evacuations, is coordinated with the County Office of Emergency Management and the County Public Health Department's Emergency Medical Services Division.
Animal Evacuation	• Develop and coordinate with local animal evacuation organizations to ensure small and large pets/livestock are addressed.
Public Outreach	• Public Outreach focused on evacuation block areas that is consistent and year-round helps create an informed population that leads to fewer issues during actual evacuation events.

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Appendix B

Access and Hydrant Standards

Santa Barbara City Fire Department
925 Chapala Street
(805) 564-5702

City of Santa Barbara

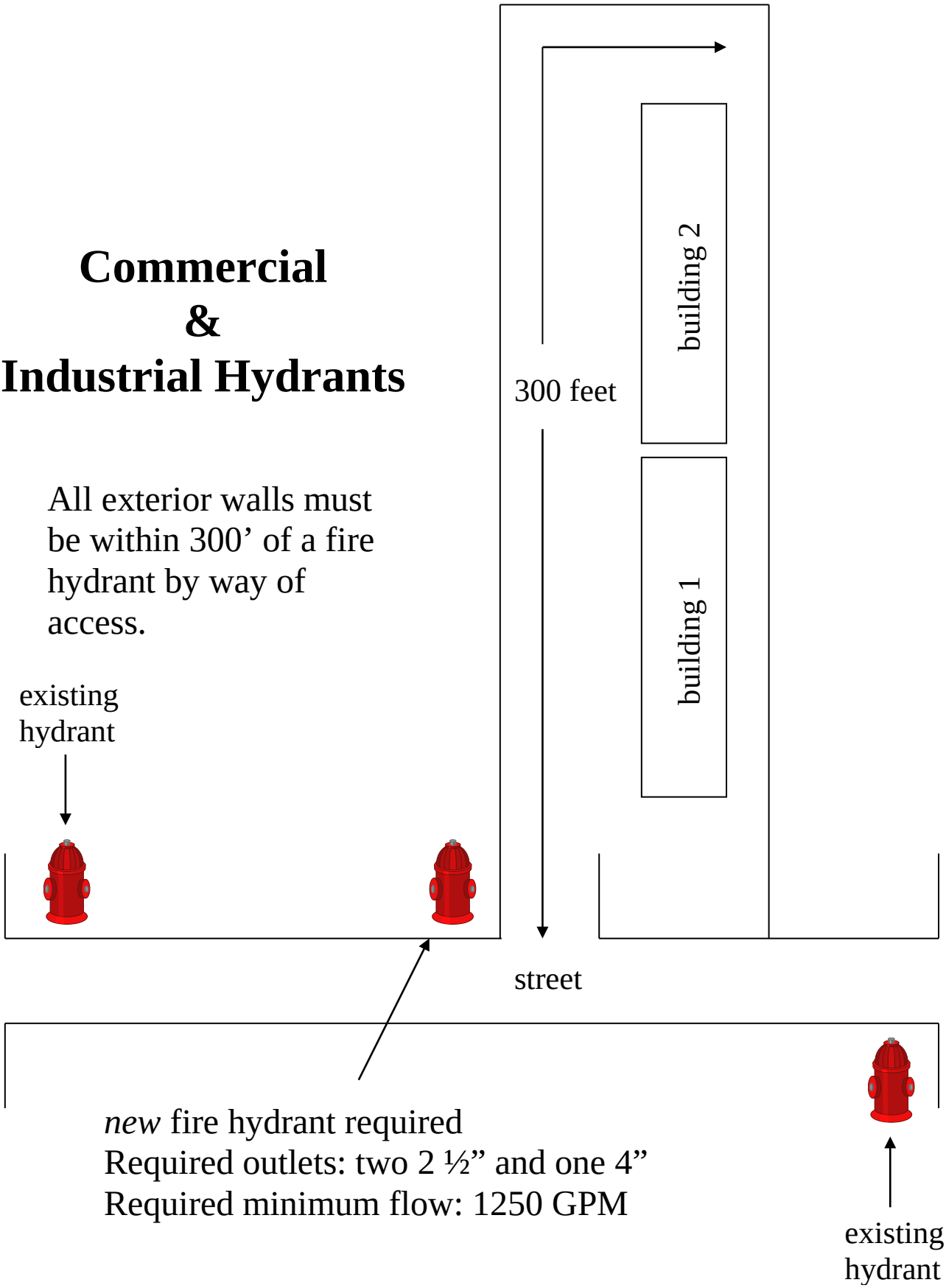
Fire Prevention Bureau

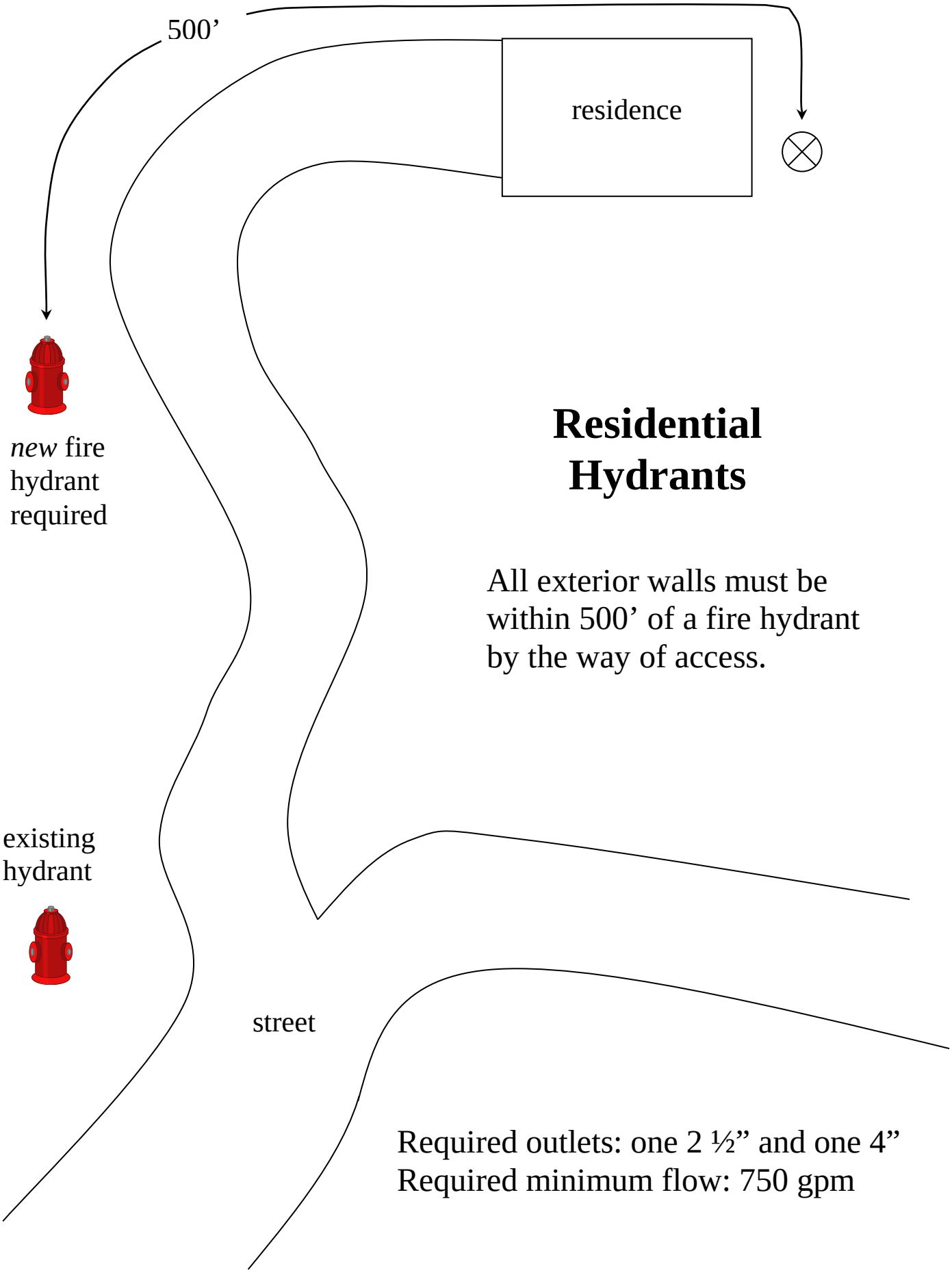
Access & Hydrant Information

Page Number

Commercial & Industrial Hydrants

All exterior walls must be within 300’ of a fire hydrant by way of access.





Residential Hydrants

All exterior walls must be within 500’ of a fire hydrant by the way of access.

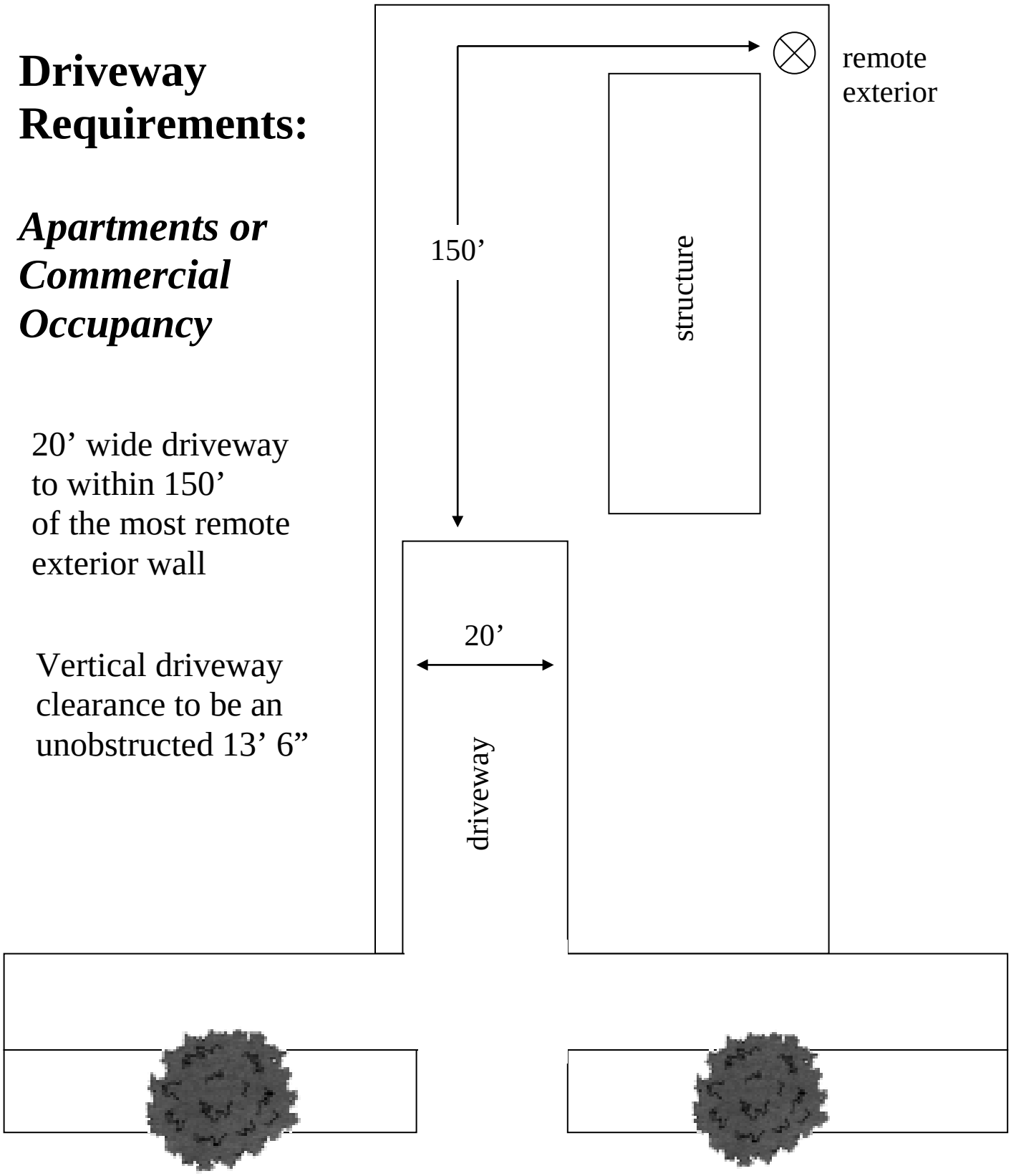
Required outlets: one 2 ½” and one 4”
Required minimum flow: 750 gpm

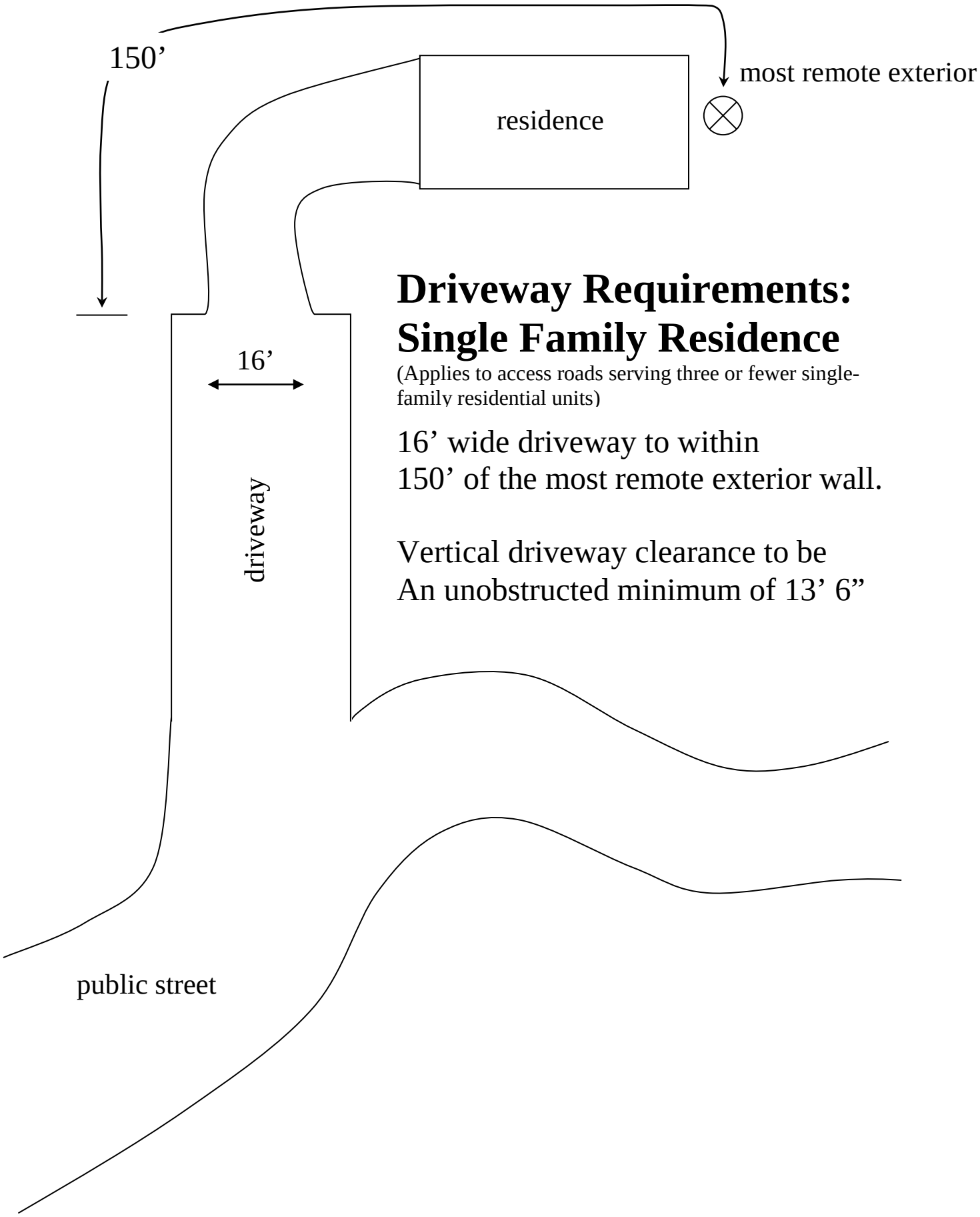
Driveway Requirements:

Apartments or Commercial Occupancy

20’ wide driveway to within 150’ of the most remote exterior wall

Vertical driveway clearance to be an unobstructed 13’ 6”



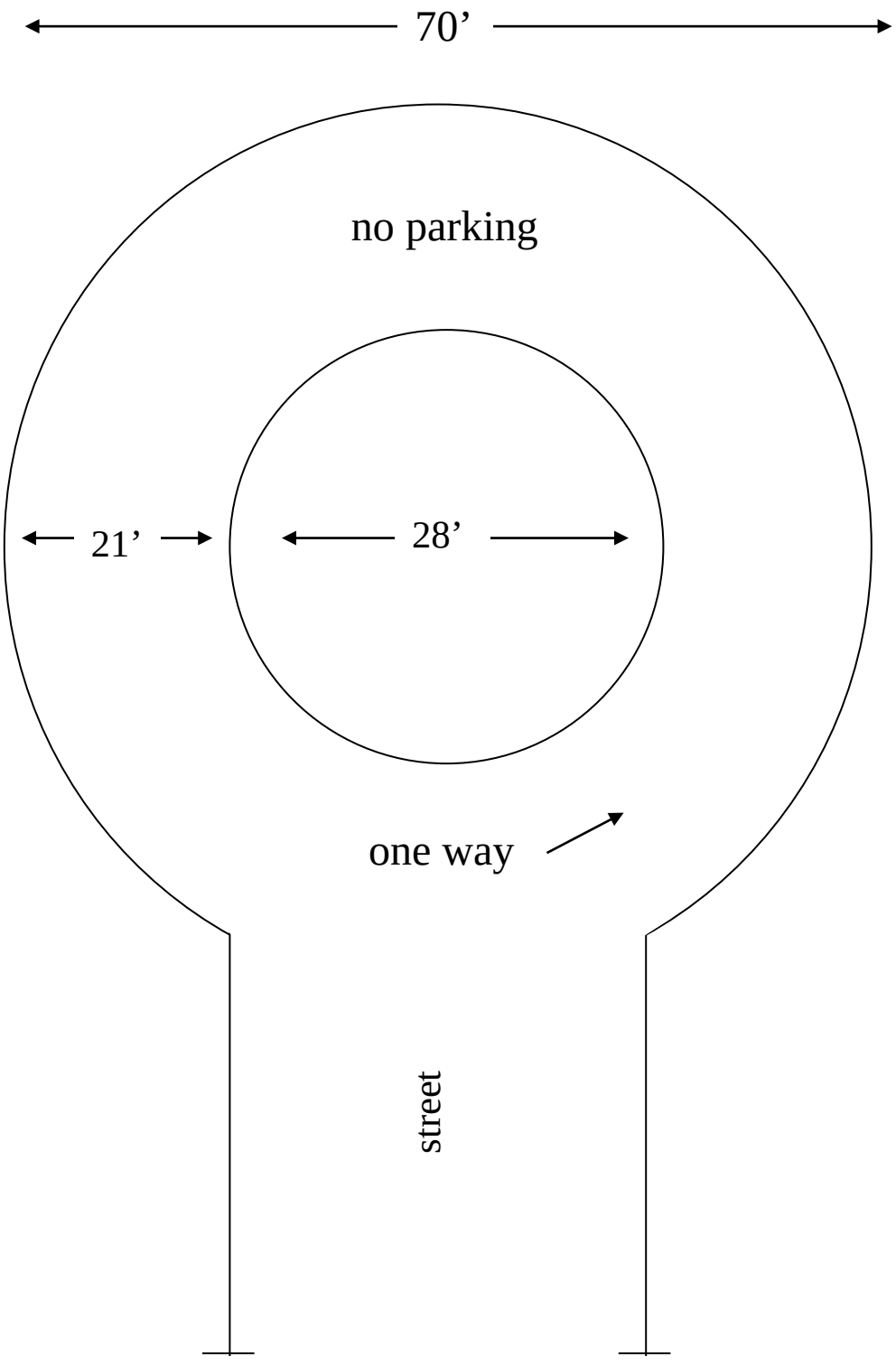


Driveway Requirements: Single Family Residence

(Applies to access roads serving three or fewer single-family residential units)

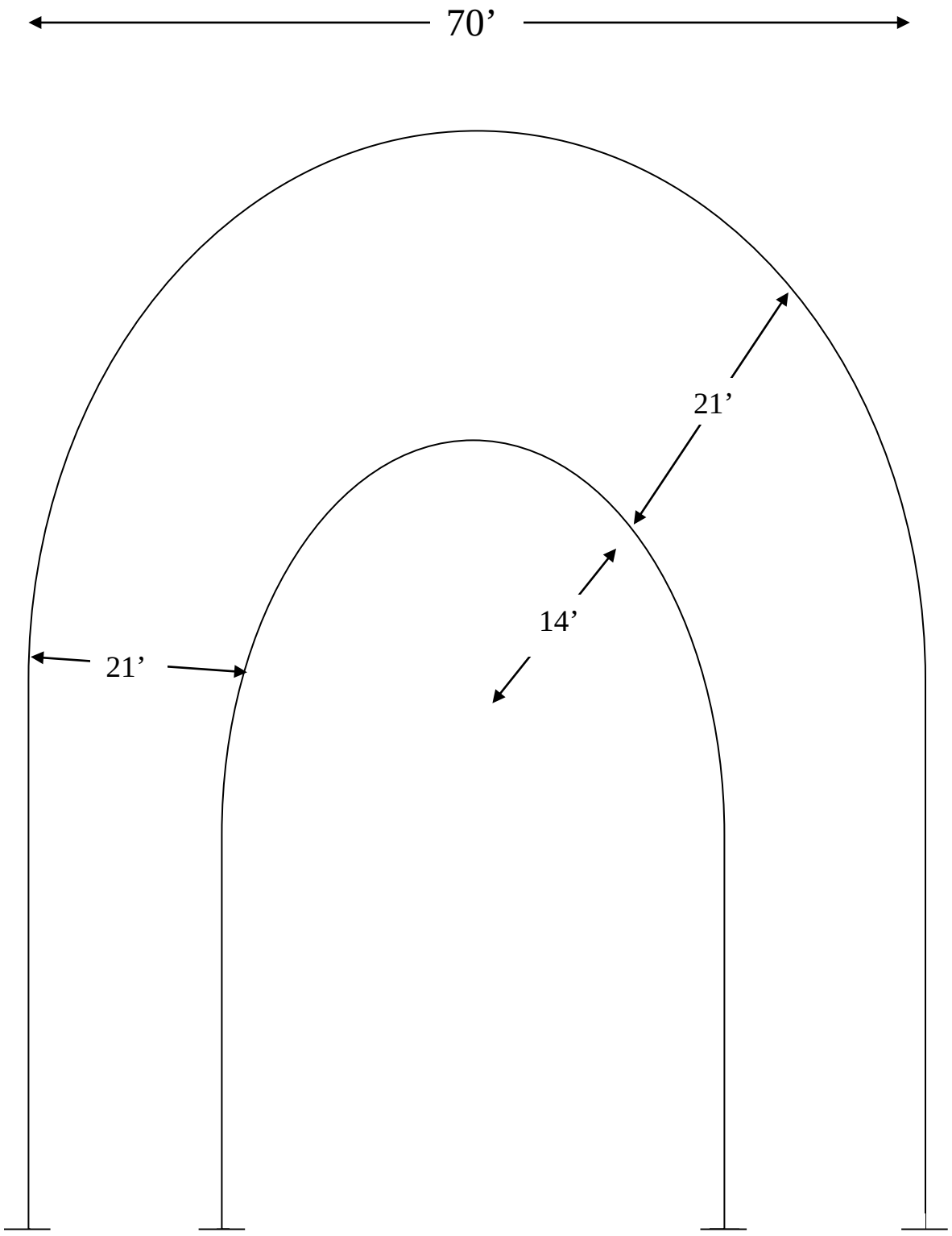
16’ wide driveway to within 150’ of the most remote exterior wall.

Vertical driveway clearance to be An unobstructed minimum of 13’ 6”



Minimum Cul de Sac Requirements

(maximum planter shown)

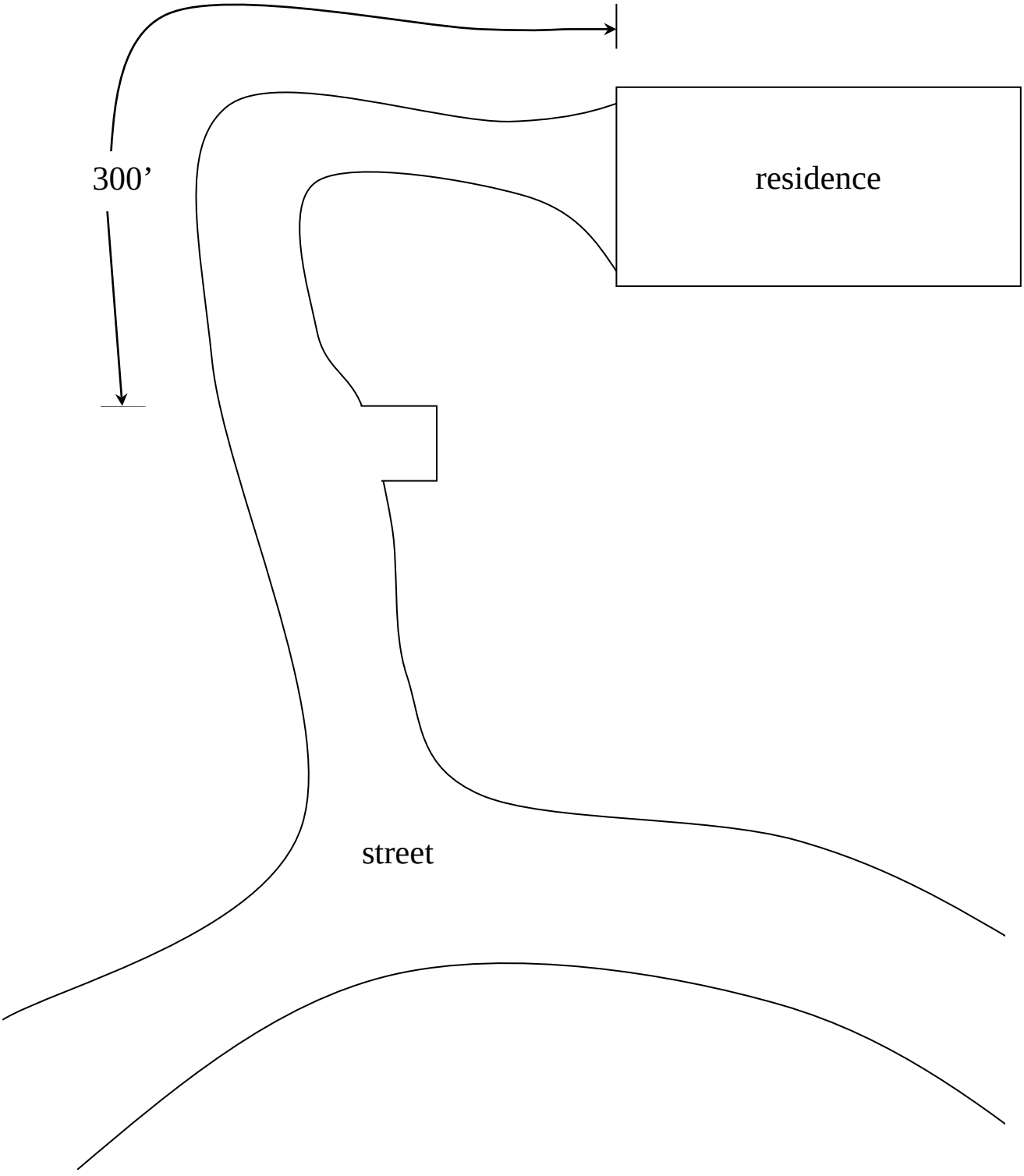


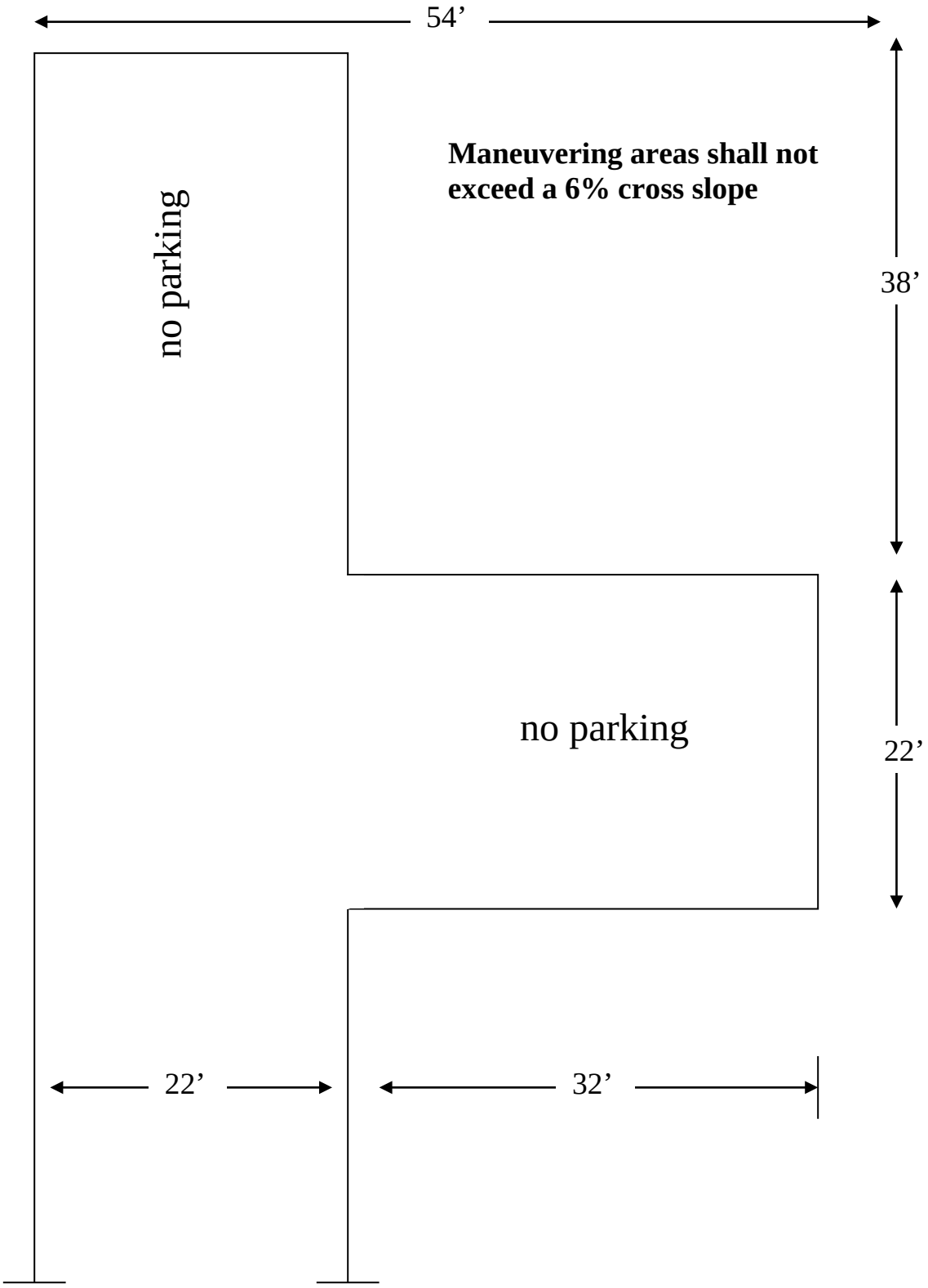
Minimum Turning Radius

(switchbacks)

Hammerhead Turnaround Location

Required when driveway exceeds 300’

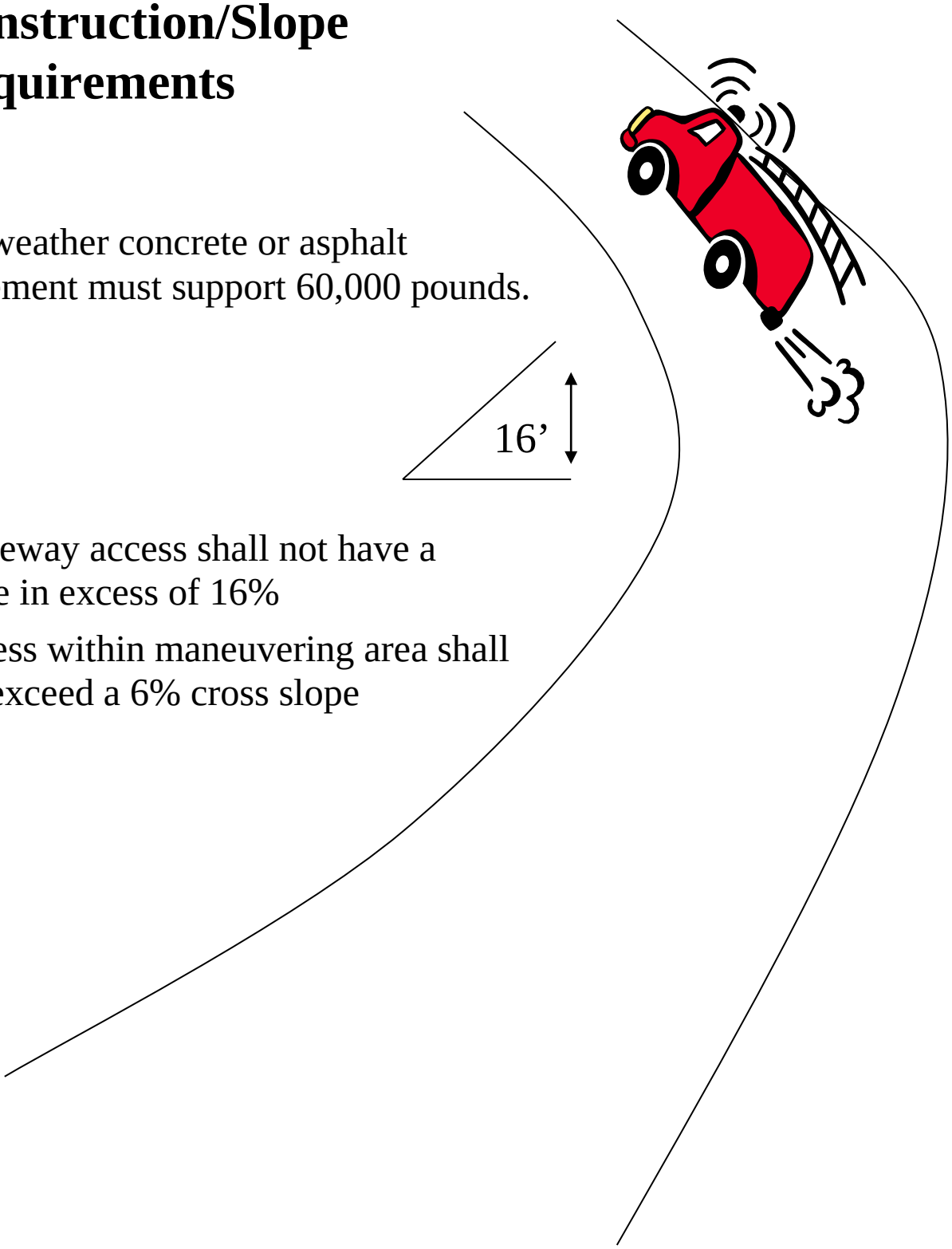




Minimum Hammerhead Turnaround Requirements

Access/Driveway Construction/Slope Requirements

All weather concrete or asphalt pavement must support 60,000 pounds.



Driveway access shall not have a slope in excess of 16%

Access within maneuvering area shall not exceed a 6% cross slope

Appendix C

Fire Hazard Policies of the General Plan and Local Coastal Program

General Plan Policies

Land Use Element

LG6.5 High Fire Areas. Limit new residential development in the High Fire Areas by offering incentives and/or an option for property owners to transfer development rights from the High Fire Area to the High Density residential land use designations.

Housing Element

H15. Secondary Dwelling Units. Further encouraging second units (granny units) in single family zones shall be pursued with neighborhood input to gauge level of support, but prohibited in the High Fire Hazard Zones to the extent allowed by the State laws applicable to second units. Second units may be most appropriate within a short walking distance from a main transit corridor and bus stop.

Safety Element

S33. Fire Hazard Programs. The City shall continue to implement programs that reduce the risk of wildland and structure fires, and that minimize the short- and long-term effects of fires.

a. Wildfire Risk Reduction. Continue to implement risk reduction measures identified by the Wildland Fire Plan, such as vegetation fuels management and vegetation chipping.

b. Limit Residential Development in High Fire Hazard Areas. Land use map designations limit residential density in High Fire Hazard Areas.

c. Wildland Fire Suppression Assessment District. Continue to implement wildfire risk reduction programs facilitated by the Wildland Fire Suppression Assessment District, such as vegetation management and homeowner education and assistance programs.

d. Coordination. Continue to coordinate fire risk prevention, management, response, recovery, and public education programs with the County of Santa Barbara, Montecito Fire Protection District, U.S. Forest Service, California Emergency Management Agency, CAL FIRE, Federal Emergency Management Agency and other agencies.

Possible Implementation Actions to be Considered

S33.1. Offer incentives and/or an option for property owners to transfer development rights from the High Fire Hazard Area to the High Density residential land use designations.

S34. Evacuation Routes. Development projects located in the Extreme Foothill and Foothill High Fire Hazard Zones shall be evaluated to determine if the project would have the potential to substantially affect emergency evacuation. A project would result in a substantial effect on evacuation if it would result in either of the following conditions:

a. Physically interfere with evacuation capabilities. A project could physically interfere with evacuation capabilities if it would reduce evacuation capacity by substantially decreasing the width of road or other access way, or result in the closure of a road or access way.

b. Add substantial additional evacuees to routes with limited capacity. A project could substantially reduce evacuation capacity if it would add a considerable amount of traffic to probable evacuation routes that do not meet current Fire Department roadway or access standards; or add a considerable amount of traffic to probable evacuation routes in relation to roadway capacity and evacuation traffic volumes reasonably expected to be generated by existing development in the project area.

S35. Evacuation Route Evaluation. The Fire Department shall periodically evaluate the effectiveness of existing and proposed fire emergency evacuation routes, and develop standards or conditions that can be applied to projects to assure that adequate evacuation capacity is provided and maintained.

S36. Fire Department Tactical Areas. To increase fire fighter safety during wildfire emergencies, new development and major redevelopment proposals located in designated high fire hazard areas shall be reviewed to assess the potential for the project to provide on-site fire suppression tactical areas, such as staging areas, operational safety zones, and escape routes. Fire suppression tactical areas should be provided consistent with criteria provided by the Fire Department.

S37. Fire Hazard Reduction Design Requirements. Project designs shall adequately address fire hazard, providing for appropriate site layout; building design and materials; fire detection and suppression equipment; landscaping and maintenance; road access and fire vehicle turnaround; road capacity for evacuation; and water supply.

S38. Fire Education and Training. The Fire Department shall continue working with the Planning Commission, Design Review Boards, development review staff and the public to enhance understanding and appropriate application of measures to reduce fire hazard.

S39. Defensible Space. Require that defensible space be provided around existing and proposed development projects located in high fire hazard areas in accordance with the Wildland Fire Plan, or as recommended by the Fire Department.

S40. Vegetation Management. Vegetation management programs to reduce fire fuel loads, as well as project-related landscape and maintenance plans, shall protect and preserve environmentally sensitive habitat areas (ESHAs) and balance fire risk reduction benefits with possible aesthetic, habitat, and erosion impacts. Potential effects resulting from fuel management activities shall be avoided or reduced as feasible.

S41. Fire Prevention and Creek Restoration. Coordinate fire prevention and vegetation management activities with creek and riparian resource protection by developing and implementing Best Management Practices for vegetation/fuel management operations conducted within and adjacent to creek corridors.

Possible Implementation Actions to be Considered

S41.1 Vegetation Management Practices. Develop guidelines for conducting fuel management activities in creek areas. The guidelines should include the following parameters:

a. Describe conditions that may warrant vegetation management activities within or adjacent to creek banks.
b. Establish requirements to prepare site-specific vegetation management evaluations. Avoid fuel management operations within or adjacent to sensitive habitat areas.

c. Delineate requirements regarding when a Streambed Alteration Agreement (Fish and Game Code 1601) from the California Department of Fish and Wildlife and a Coastal Development Permit are required prior to the implementation of the vegetation management work.

d. Identify standard approaches and measures to be implemented to protect biological and water resources if planned vegetation management operations have the potential to result in substantial direct or indirect effects to sensitive habitat, species, erosion, or water quality.

   Avoid impacts to nests of migratory birds and special-status species. Develop standards for when vegetation management operations may be conducted to minimize the potential for impacts to nesting birds and sensitive species.

   If, after careful consideration of need and environmental effects including biological, erosion, and water quality impacts, clearing may be necessary in or near creeks and habitats, hand clearing shall be utilized to the greatest extent feasible.

S42. Post Fire Recovery. Rebuilding that occurs in designated high fire hazard areas shall incorporate all applicable design measures that reduce the risk of future fire-related impacts. Expedited project review and permitting shall occur as determined by the Community Development Director.

S43. Building Code Updates. Periodically adopt amendments or updated provisions of the California Building Code to implement new building design measures that reduce fire risks.

S44. Public Water System Improvements for Fire Fighting. Continue to periodically evaluate the potential for additional water system improvements to assist in emergency preparedness and incorporate feasible measures into the City Capital Improvement Plan.

S45. Private Water Supplies for Fire Fighting. Encourage and assist homeowners in High Fire Hazard Areas to install their own emergency water supplies to support fire fighting operations.

Possible Implementation Action to be Considered

S45.1 Consider implementing an expedited permit review process for emergency water supply installations.

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Local Coastal Program Land Use Plan Policies

Portions of Biological Resources Policies Regarding Fuel Modification and Defensible Space

Policy 4.1-6 Allowed Uses in Terrestrial ESHAs.

G. Fuel modification required by the Fire Department to meet the Fire Code Defensible Space Requirements for existing development in High Fire Hazard Areas.

Policy 4.1-17 Development Within Habitat Buffer Areas. New development and substantial redevelopment shall only be allowed in ESHA, wetland, and creek habitat buffers if it does not significantly disrupt the habitat values of ESHAs, wetlands, or creeks and may include:

viii. Fuel modification required by the Fire Department to meet the Fire Code Defensible Space Requirements for existing development in High Fire Hazard Areas.

xi. The following uses may be allowed where the encroachment into the habitat buffer is minimized to the extent feasible, where all feasible mitigation measures have been provided to minimize adverse environmental effects, and the maximum feasible habitat buffer between the development and the habitat is provided:

c. Fuel modification only when required by the City Fire Department to meet the Fire Code Defensible Space Requirements for a new or substantially redeveloped primary structure in a High Fire Hazard Area. New and substantially redeveloped accessory structures shall be sited to ensure that vegetation management necessary to meet City Fire Code Defensible Space Requirements does not occur within habitat buffers to ESHAs, wetlands, or creeks;

Policy 4.1-21 Vegetation Management for Fire Hazard Reduction.

A. Vegetation management programs to reduce fire fuel loads, as well as project-related landscape and maintenance plans, shall protect and preserve ESHAs, wetlands, and creeks and balance fire risk reduction benefits with possible aesthetic, habitat, and erosion impacts to the extent feasible. Potential adverse environmental impacts resulting from fuel management activities shall be avoided or minimized as feasible.

B. Where vegetation management in ESHAs, wetlands, creeks, and required habitat buffers is required by the City Fire Department to meet City Fire Code Defensible Space Requirements for existing structures in High Fire Hazard Areas, the vegetation management shall be the minimum necessary to meet the City Fire Department requirements and shall be designed to minimize erosion and impacts on habitat values.

C. New development and substantial redevelopment shall be sited to ensure that vegetation management to reduce fire risks (including clearing, landscaping, irrigating, and thinning) does not intrude within any ESHAs, wetlands, or creeks. Vegetation management necessary to meet City Fire Code Defensible Space Requirements for a new or substantially redeveloped primary structure may occur within habitat buffers to ESHAs, wetlands, or creeks, only when all of the following criteria is met:

- There is no feasible alternative to site and design the primary structure such that fuel modification is located completely outside of the required habitat buffer;

- Encroachment into the habitat buffer is minimized to the extent feasible through siting and design of structures;
- Thinning and clearing are the minimum necessary to meet the City Fire Department requirements; and
- The vegetation management is designed to avoid habitat and erosion impacts.

D. New and substantially redeveloped accessory structures shall be sited to ensure that vegetation management necessary to meet City Fire Code Defensible Space Requirements does not occur within habitat buffers to ESHAs, wetland, or creeks.

E. Applications for new development or substantial redevelopment near or adjacent to ESHAs, wetlands, and creeks in High Fire Hazard Areas shall include a landscaping and vegetation management plan demonstrating compliance with this policy for review by the City's Fire Department and the Environmental Analyst.

Coastal Hazards Policies

Policy 5.1-4 Fire Hazard Risk Reduction Programs. Continue to implement programs that reduce the risk of wildland and structure fires, and that minimize the short- and long-term effects of fires consistent with the policies of this Coastal LUP.

A. *Wildfire Risk Reduction*. Continue to implement risk reduction measures such as vegetation fuels management and vegetation chipping through City operations, inter-agency programs, and programs for private property.

B. *Limit Residential Development in High Fire Hazard Areas*. Continue land use map designations that limit residential density in High Fire Hazard Areas.

C. *Wildland Fire Suppression Assessment District*. Continue to implement wildfire risk reduction programs facilitated by the Wildland Fire Suppression Assessment District, such as vegetation management, and homeowner education and assistance programs.

D. *Coordination*. Continue to coordinate fire risk prevention, management, response, recovery, and public education programs with the County of Santa Barbara, Montecito Fire Protection District, U.S. Forest Service, California Emergency Management Agency, CAL FIRE, Federal Emergency Management Agency, and other agencies.

Policy 5.1-5 Evacuation Route Evaluation. Periodically evaluate the effectiveness of existing and proposed fire emergency evacuation routes, and develop standards or conditions that can be applied to projects to assure that adequate evacuation routes are provided and maintained, where feasible.

Policy 5.1-6 Public Water System Improvements for Fire Fighting. Continue to periodically evaluate the potential for additional water system improvements to assist in emergency preparedness and incorporate feasible measures that are consistent with the policies of this Coastal LUP into the City Capital Improvement Plan and development standards and conditions.

Policy 5.1-7 Private Water Supplies for Fire Fighting. Encourage and assist homeowners in High Fire Hazard Areas to install their own emergency water supplies to support firefighting operations provided that procurement of such supplies and related development is consistent with the policies of this Coastal LUP.

Policy 5.1-26 Avoid or Minimize the Effects of High Fire Hazard. New development and substantial redevelopment shall provide appropriate site layout, structure design and materials, fire detection and suppression equipment, landscaping and maintenance including defensible space requirement, road access and fire vehicle turnaround, road capacity for evacuation (if new roads are proposed), and water supply to avoid or minimize risks to life and property. Any requirements for fire protection shall be considered as part of any Coastal Development Permit application review to ensure that adverse impacts to coastal resources are avoided or minimized consistent with the policies of this Coastal LUP.

Policy 5.1-27 Defensible Space Requirements. Existing structures, new development, and substantial redevelopment in high fire hazard areas shall provide defensible space as required by the Fire Department. Within defensible space vegetation (native or otherwise) must be maintained to create an effective fuel break by thinning dense vegetation and removing dry brush, flammable vegetation, and combustible growth. Fuel modification and brush clearance techniques shall minimize impacts to native vegetation, protect ESHAs consistent with the policies of Chapter 4.1 Biological Resources, and minimize erosion, runoff, and sedimentation, to the maximum feasible extent.

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Appendix D

FlamMap Modeling Analysis

FlamMap Fire Behavior Modeling

The FlamMap software package (Finney et al. 2015) was used to evaluate fire hazard in the City. The FlamMap software package is a publicly available resource available through the Fire, Fuel, and Smoke Science Program of the U.S. Forest Service. FlamMap uses the same fire spread equations built into the BehavePlus software package, but allows for a geographical presentation of fire behavior outputs as it applies the calculations to each pixel in an associated geographic information system (GIS) landscape (Finney 1998). FlamMap is a GIS-based software package that models potential fire behavior for constant weather conditions (wind and fuel moisture) and generates map files of potential fire behavior characteristics (e.g., flame length, crown fire activity). FlamMap outputs represent fire behavior calculated for each pixel within the analysis area independently and does not calculate fire spread across a landscape. The software requires a minimum of five input variables, including elevation, slope, aspect, fuel model, and canopy cover. To use the crown fire activity model for forested land cover types, additional input variables are necessary, including stand height, canopy base height, and canopy bulk density. Wind and weather data are also critical components to FlamMap modeling efforts. The following sections present a background on fire behavior modeling and present the methods and data sources used in performing the FlamMap fire behavior modeling analysis for this CWPP.

Fire Behavior Modeling Background

Predicting wildland fire behavior is not an exact science due to the many variables that must be considered. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather, the limits of weather forecasting, and the weather that is often created by firestorms. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire information (Rothermel 1993). To be used effectively, the basic assumptions and limitations of fire behavior modeling applications must be understood.

- First, it must be realized that the fire model describes fire behavior only in the flaming front. The primary driving force in the predictive calculations is dead fuel less than 0.25 inches in diameter. These are the fine fuels that carry fire. Fuels greater than 1 inch in diameter have little effect, while fuels greater than 3 inches in diameter have no effect on fire behavior.
- Second, the model bases surface fire calculations and descriptions on a wildfire spreading through fuels that are within 6 feet of the ground and contiguous to the ground. Surface fuels are classified as grass, grass/shrub, shrub, timber litter, timber understory, or slash.
- Third, the software assumes that weather is uniform. However, because wildfires almost always burn under non-uniform conditions, creating their own weather, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, fire behavior computer modeling systems are not intended for determining sufficient fuel modification zone/defensible space widths. However, results can provide the average length of the flames, which is a key element for determining defensible space distances for minimizing structure ignition.

FlamMap can provide valuable fire behavior predictions, which can be used as a tool in the decision-making process. In order to make reliable estimates of fire behavior, one must understand the relationship of fuels to the fire environment and be able to recognize the variations in these fuels. Fuels are made up of the various components of vegetation, both live and dead, that occur in a particular landscape. The type and quantity will depend upon soil, climate, terrain, and management and disturbance (e.g., fire) history. The major fuel groups of grass, grass/shrub, shrub, trees, tree litter, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.

The 7 principal fuel characteristics help define the 13 standard fire behavior fuel models (Anderson 1982). According to the model classifications, fuel models used for fire behavior modeling (BehavePlus, FlamMap, FARSITE) have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface area-to-volume ratio. Observation of the fuels in the field determines which fuel models should be applied in modeling efforts. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models:

- Grasses – fuel models 1 through 3
- Brush – fuel models 4 through 7
- Timber – fuel models 8 through 10
- Logging slash – fuel models 11 through 13

In addition, the aforementioned fuel characteristics were utilized in the development of 40 newer fire behavior fuel models (plus 5 non-burnable models) (Scott and Burgan 2005) developed for use in the BehavePlus, FlamMap, and FARSITE modeling systems. These newer models attempt to improve the accuracy of the 13 standard fuel models and to allow for the simulation of fuel treatment prescriptions. The following describes the distribution of fuel models among general vegetation types for the 40 newer fuel models:

- Non-burnable – models NB1, NB2, NB3, NB8, NB9
- Grass – models GR1 through GR9
- Grass shrub – models GS1 through GS4
- Shrub – models SH1 through SH9
- Timber understory – models TU1 through TU5
- Timber litter – models TL1 through TL9
- Slash blowdown – models SB1 through SB4.

FlamMap Analysis

Base Mapping Data

FlamMap (version 6.0) was used for the modeling analysis. The base data for the modeling analysis was obtained from the LANDFIRE (Landscape Fire and Resource Management Planning Tools) data distribution site (LANDFIRE 2019). LANDFIRE is shared program between the wildland fire management programs of the U.S. Forest Service and U.S. Department of the Interior and provides landscape-scale GIS data layers. LANDFIRE Remap (LF 2.0.0) data file was obtained and used for the model base data set. The LF Remap represents circa 2016 ground conditions and has a data resolution of 30 meters. The LANDFIRE data was obtained in a Landscape file format, which is a composite GIS file that includes the following layers:

- **Elevation:** Necessary for adiabatic adjustment of temperature and humidity and for conversion of fire spread between horizontal and slope distances.
- **Slope:** Necessary for computing slope effects on fire spread and solar radiance.
- **Aspect:** Important in determining the solar exposure of grid cells.
- **Fuel Model:** A numerical assignment of vegetation/fuels that represent distinct distributions of fuel loadings found among surface fuel components (live and dead), size classes, and fuel types. The fuel models are described by the most common fire carrying fuel type (grass, brush, timber (tree) litter or timber understory), loading and surface area-to-volume ratio by size class and component, fuelbed depth, and moisture of extinction. The fuel model set used for this analysis was the 40 fuel model set from Scott and Burgan (2005). The models included in the analysis are summarized in Table D-1. A map depicting the fuel models in the analysis area is presented in Figure D-1.

Table D-1. Fuel Models in Modeling Area

Fuel Model	Description
GR1 (101)	Short, Sparse Dry Climate Grass
GR2 (102)	Low Load, Dry Climate Grass
GR3 (103)	Low Load, Very Coarse, Humid Climate Grass
GS1 (121)	Low load, Dry Climate Grass-Shrub
GS2 (122)	Moderate Load, Dry Climate Grass-Shrub
SH1 (141)	Low Load, Dry Climate Shrub
SH2 (142)	Moderate Load Dry Climate Shrub
SH5 (145)	High Load, Dry Climate Shrub
SH7 (147)	Very High Load Dry Climate Shrub
TU1 (161)	Low Load, Dry Climate Timber-Grass-Shrub
TU2 (162)	Moderate Load, Humid Climate Timber-Shrub
TU3 (163)	Moderate Load, Humid Climate Timber-Grass-Shrub
TU5 (165)	Very High Load, Dry Climate Timber-Shrub

Table D-1. Fuel Models in Modeling Area

Fuel Model	Description
TL1 (181)	Low Load Compact Conifer Litter
TL2 (182)	Low Load Broadleaf Litter
TL3 (183)	Moderate Load Conifer Litter
TL4 (184)	Small Downed Logs
TL5 (185)	High Load Conifer Litter
TL6 (186)	Moderate Load Broadleaf Litter
TL7 (187)	Large Downed Logs
TL8 (188)	Long Needle Litter
TL9 (189)	Very High Load Broadleaf Litter
NB1 (91)	Urbane/Developed
NB3 (93)	Agricultural
NB8 (98)	Open Water
NB9 (99)	Bare Ground

- **Canopy Cover:** Necessary for computing shading and wind reduction factors for all fuel models. Canopy cover is measured as the horizontal fraction of the ground that is covered directly overhead by tree canopy.
- **Stand Height:** The representation of the average height of dominant and co-dominant trees in a stand (not the tallest height or average height of all trees). Stand height is used in FlamMap for computing wind reduction to midflame height and spotting distances from torching trees. Stand height is a necessary dataset for utilizing the torching, spotting, and crown fire model in FlamMap.
- **Canopy Base Height:** A variable used for determining transition from surface fire to crown fire; represents the height to the bottom of the live tree crown. Canopy base height is a necessary dataset for utilizing the torching, spotting, and crown fire model in FlamMap.
- **Canopy Bulk Density:** Used to determine the characteristics of crown fires and describes the density of available canopy fuel in a stand. It is defined as the mass of available canopy fuel per canopy volume unit. Canopy bulk density is a necessary data set for utilizing the torching, spotting, and crown fire model in FlamMap.

The FlamMap analysis area encompassed the City of Santa Barbara (excluding the airport property) plus a buffer of approximately 5 miles. LANDFIRE data layers were projected to the NAD 83, California State Plane, Zone 5 coordinate system. In addition to the Landscape file, wind and weather data were incorporated into the model inputs, as described below.

Wind and Fuel Moisture

In order to utilize weather and fuel moisture variables for the fire behavior modeling area, data from the Montecito Remote Automated Weather Station (RAWS) was analyzed. Utilization of RAWS data is necessary for fire behavior modeling as it includes data for fuel moisture, temperature, relative humidity, and wind speed. The Montecito RAWS is located approximately 2.5 miles to the northeast of the City. The following summarizes the location and available data ranges for the Montecito RAWS:

Latitude: 34.46139
Longitude: -119.64889
Elevation: 1,619 feet
Data years: 1996 to 2018

Wind and weather data are a required component to fire behavior modeling efforts. The Montecito RAWS data was processed with the FireFamily Plus version 5.0 (FireFamily Plus 2019) software package to determine weather conditions to be incorporated into modeling efforts. The selected weather scenario used 97th percentile conditions to mimic a fire event during Sundowner wind conditions. The analysis period for weather data analysis was May 1–December 31.

These weather values were incorporated into the Initial Fuel Moisture file used as an input in FlamMap. Wind direction and wind speed values for the FlamMap run were manually entered during the data input phase. Table D-2 presents the wind and weather values used in the FlamMap fire behavior modeling runs conducted in support of this CWPP.

Table D-2. FlamMap Weather Input Variables

Model Variable	Value
1-hour fuel moisture	2%
10-hour fuel moisture	3%
100-hour fuel moisture	5%
Live herbaceous moisture*	30%
Live woody moisture	59%
20-foot wind speed (mph)	60 mph (maximum speed)
Wind direction	20 degrees (Sundowner)

Note:
* Live herbaceous moisture values were lower than 30% so the herbaceous fuels are considered fully cured (Scott and Burgan 2005).

Finally, wind vectors were modeled within the FlamMap runs using the WindNinja tool embedded in the FlamMap software. WindNinja models the effect of topography on wind speed and direction and generates wind vector files for use in the modeling runs. The grid resolution for the WindNinja analysis was set at 60 meters.

Model Outputs

Three output grid files were generated for the FlamMap run and represent flame length, crown fire activity, and spotting potential. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews et al. 2008). It is a somewhat subjective and non-scientific measure of fire behavior, but is extremely important to fireline personnel in evaluating fireline intensity and is worth considering as an important fire variable (Rothermel 1993). Flame length values in the resulting grid file are in feet. Table D-3 presents an interpretation of flame length and its relationship to fireline intensity. Fireline intensity is a measure of heat output from the flaming front and also affects the potential for a surface fire to transition to a crown fire.

Table D-3. Fire Suppression Interpretation

Flame Length	Fireline Intensity	Interpretations
Under 4 feet	Under 100 BTU/ft/s	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 feet to 8 feet	100–500 BTU/ft/s	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 feet to 11 feet	500–1,000 BTU/ft/s	Fires may present serious control problems—torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11 feet	Over 1,000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Note: BTU/ft/s = British thermal units per foot per second.
Source: Roussopoulos and Johnson 1975.

Model outputs for crown fire activity include three potential options: surface fire, passive crown fire (torching), or active crown fire. Surface fires may transition to crown fire, depending on surface fire intensity and crown characteristics. Ladder fuels facilitate ignition of crown fuels by the surface fire and then transition to some form of crown fire (Seli et al. 2015). As presented in Table D-3, crown fires present significant resistance to control and are a characteristic of extreme fire behavior.

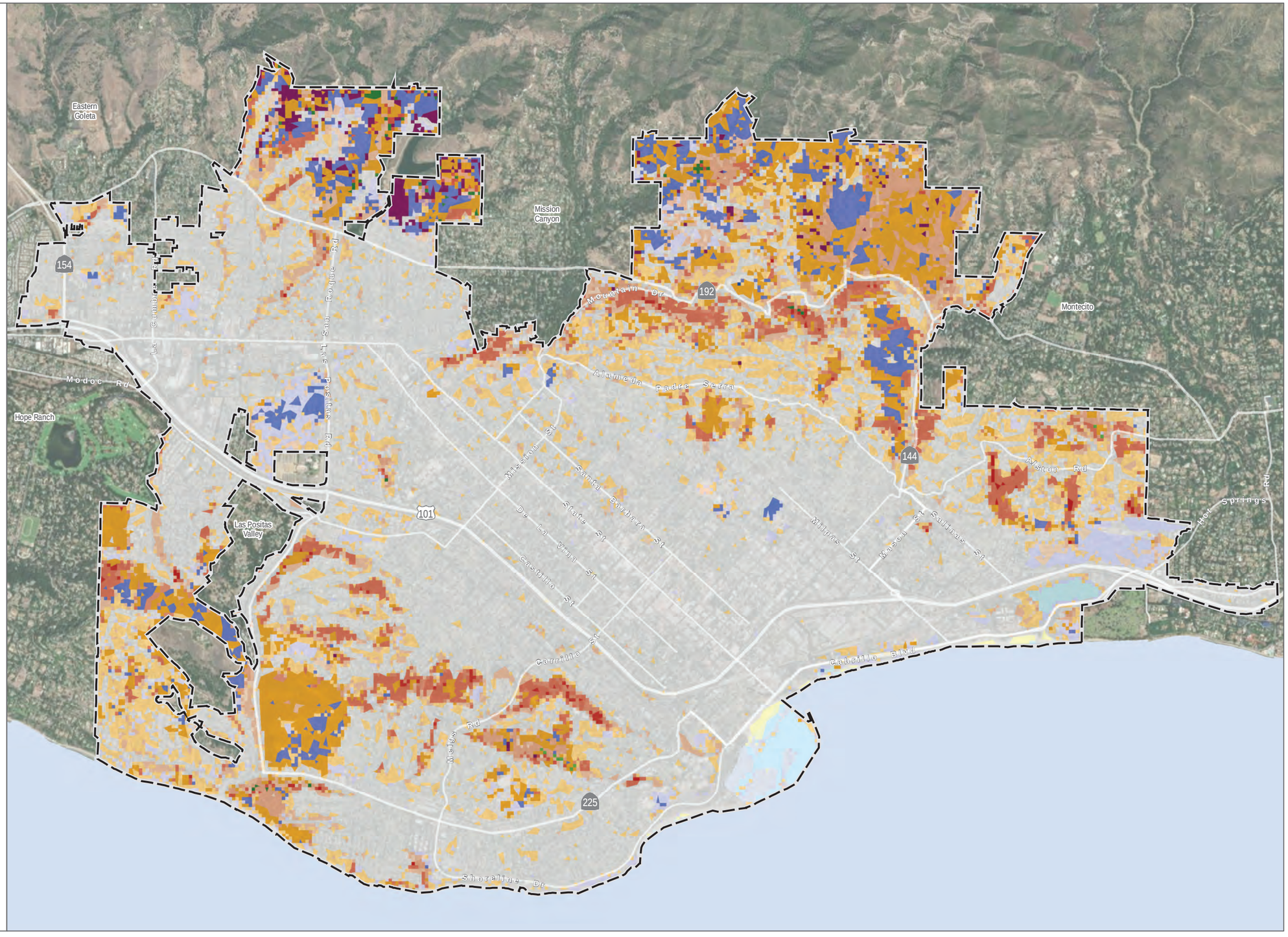
Model outputs for spotting are the maximum spotting distance (in meters) from a crown fire. FlamMap only generates spotting potential where crown fires occur (e.g., in oak woodlands), so this analysis does not account for spotting generated in a fire burning in chaparral vegetation. FlamMap outputs generate point data set coded with the maximum spotting distance. This data set was then buffered to create a spotting potential layer, where the buffer radius equaled the maximum spotting distance. The buffering exercise represented a circular area around each spotting point, which is not an accurate representation of upwind spotting distances (as the modeling scenario utilized a Sundowner wind event). However, this analysis does give an estimate of potential fire hazard associated with spotting (embers) in the downwind area of the City.

Maps depicting flame length values, crown fire activity, and spotting potential are presented in Figures D-2 through D-4, respectively.

City of Santa Barbara / CWPP Area

Fuel Models

- GR1 (101) - Short, Sparse Dry Climate Grass
- GR2 (102) - Low Load, Dry Climate Grass
- GR3 (103) - Low Load, Very Coarse, Humid Climate Grass
- GS1 (121) - Low load, Dry Climate Grass-Shrub
- GS2 (122) - Moderate Load, Dry Climate Grass-Shrub
- SH1 (141) - Low Load, Dry Climate Shrub
- SH2 (142) - Moderate Load Dry Climate Shrub
- SH5 (145) - High Load, Dry Climate Shrub
- SH7 (147) - Very High Load Dry Climate Shrub
- TL1 (181) - Low Load Compact Conifer Litter
- TL2 (182) - Low Load Broadleaf Litter
- TL3 (183) - Moderate Load Conifer Litter
- TL4 (184) - Small Downed Logs
- TL5 (185) - High Load Conifer Litter
- TL6 (186) - Moderate Load Broadleaf Litter
- TL7 (187) - Large Downed Logs
- TL8 (188) - Long Needle Litter
- TL9 (189) - Very High Load Broadleaf Litter
- TU1 (161) - Low Load, Dry Climate Timber-Grass-Shrub
- TU2 (162) - Moderate Load, Humid Climate Timber-Shrub
- TU3 (163) - Moderate Load, Humid Climate Timber-Grass-Shrub
- TU5 (165) - Very High Load, Dry Climate Timber-Shrub
- NB1 (91) - Urban/Developed
- NB3 (93) - Agricultural
- NB8 (98) - Open Water
- NB9 (99) - Bare Ground



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

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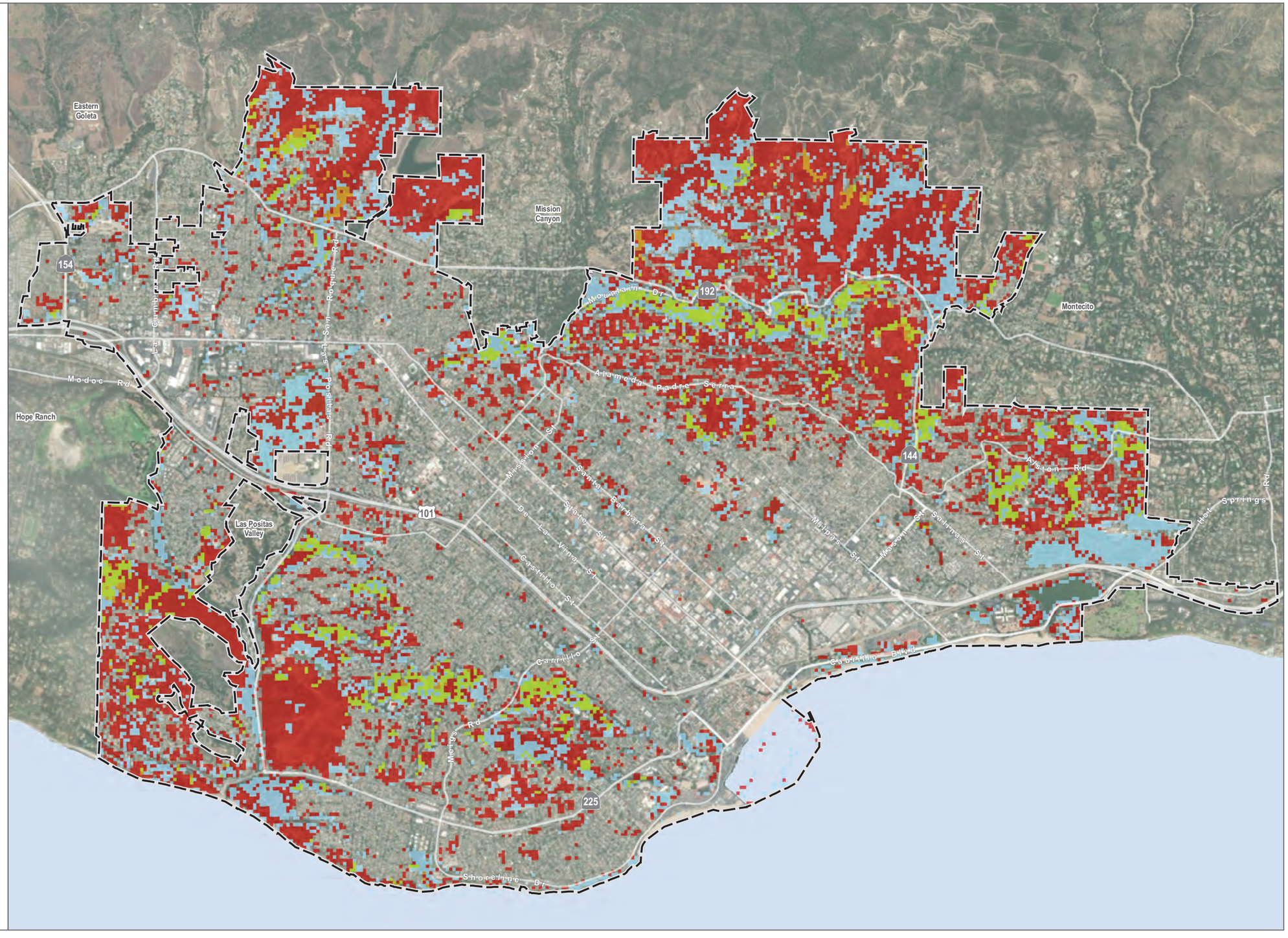
City of Santa Barbara / CWPP Area

Fire Behavior Modeling Results

Flame Length (feet)

- 0 - 0.1
- 0.1 - 4
- 4 - 8
- 8 - 11
- 11+



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

COMMUNITYWILDFIRE CITY OF SANTA BARBARA PROTECTION PLAN

DUDEK

FIGURE D-2

Fire Behavior (Flame Length)

City of Santa Barbara Community Wildfire Protection Plan

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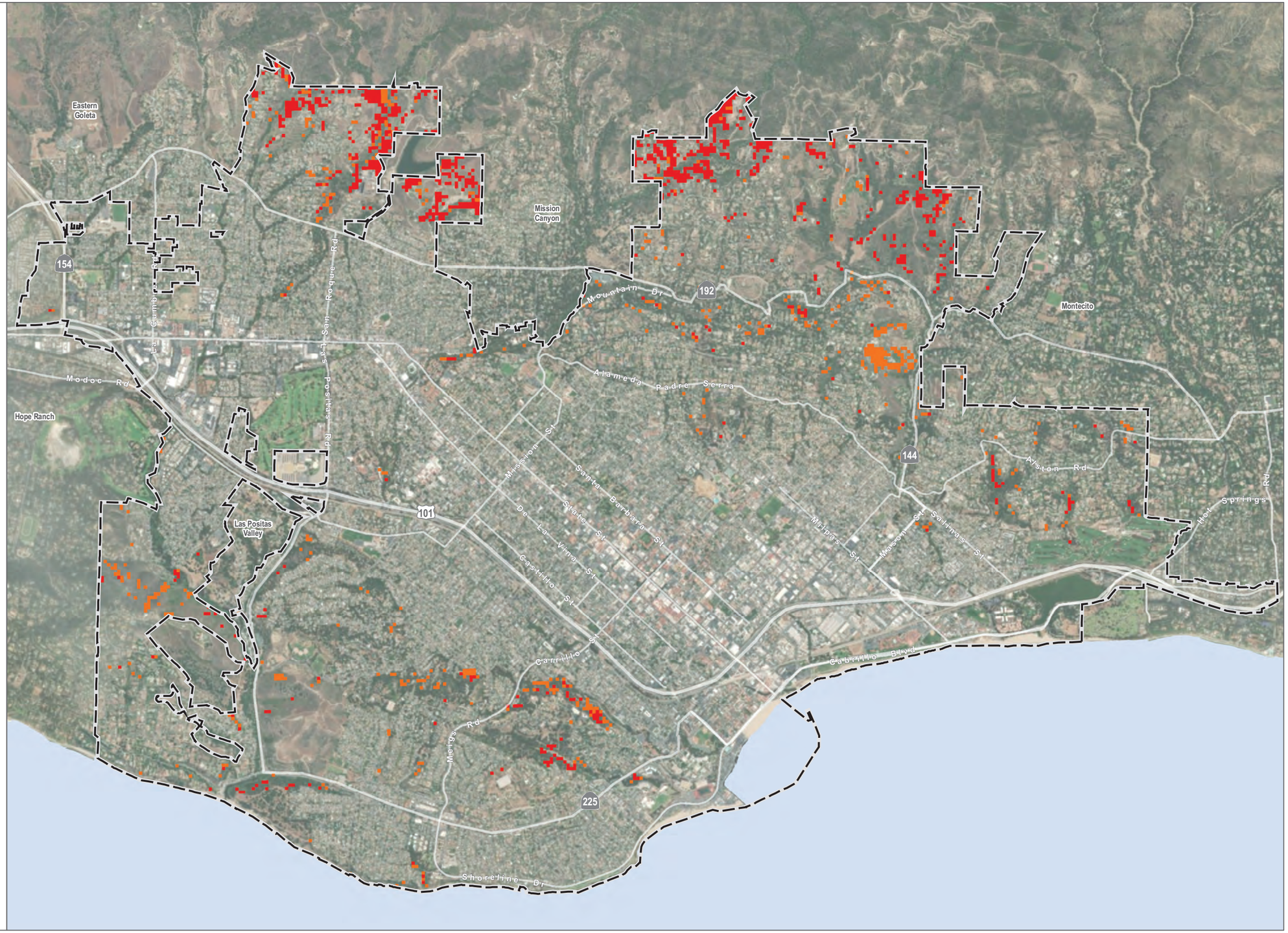
City of Santa Barbara / CWPP Area

Fire Behavior Modeling Results

Crown Fire

- Surface or Passive
- Active
- Independent



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

COMMUNITYWILDFIRE PROTECTION PLAN
CITY OF SANTA BARBARA

DUDEK

FIGURE D-3

Fire Behavior (Crown Fire)

City of Santa Barbara Community Wildfire Protection Plan

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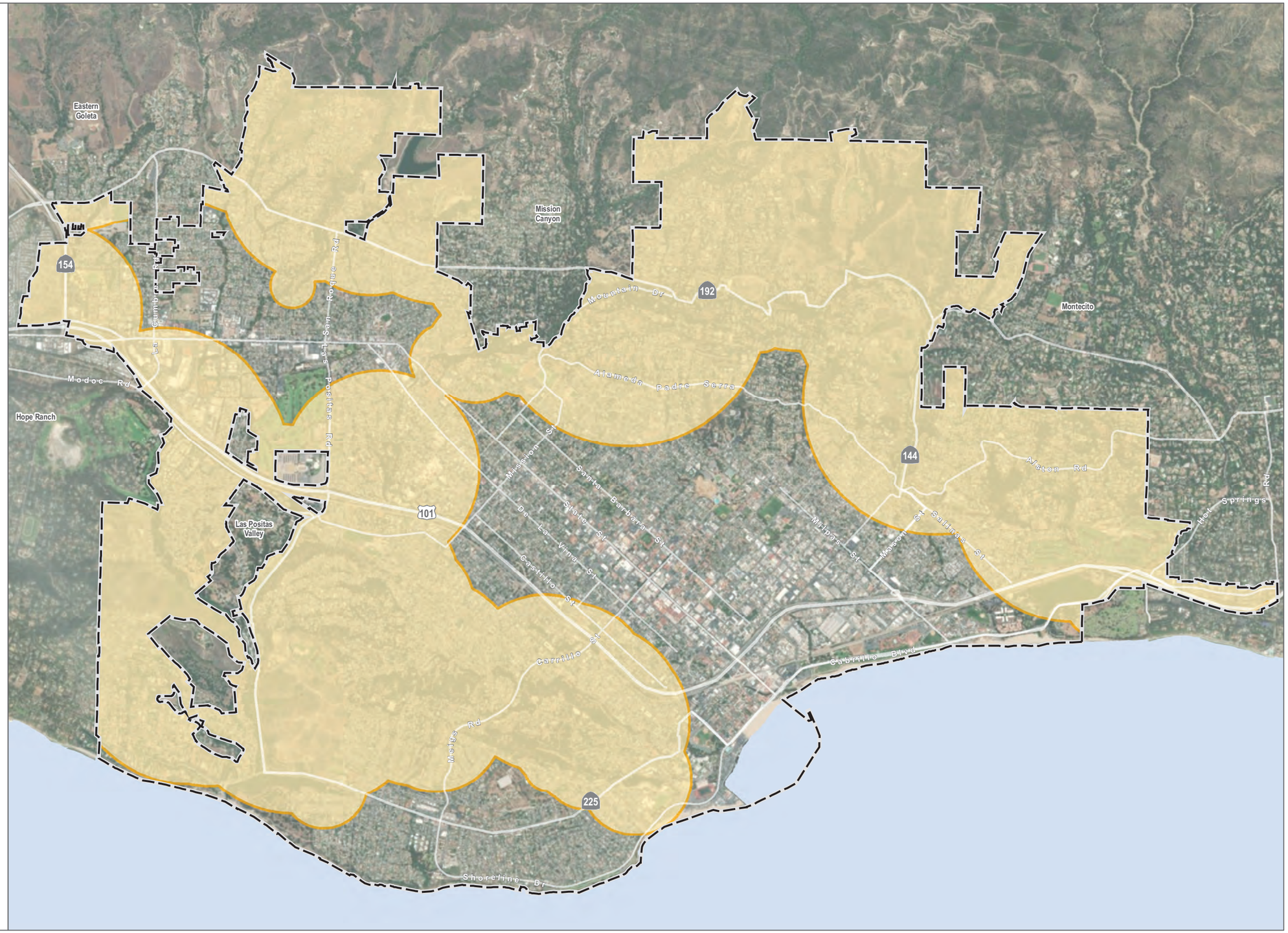
City of Santa Barbara / CWPP

Fire Behavior Modeling Results

Spot Fire Area



0 1,000 2,000 Feet

SOURCE: City of Santa Barbara

COMMUNITYWILDFIRE CITY OF SANTA BARBARA PROTECTION PLAN

DUDEK

FIGURE D-4

Fire Behavior (Spotting)

City of Santa Barbara Community Wildfire Protection Plan

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Appendix E

Vegetation Management Standards and Techniques

Vegetation Management Standards and Techniques

This appendix outlines vegetation management and maintenance standards and techniques that may be implemented within Vegetation Management Units, the Community Fuels Treatment Network, or along roadways to reduce fuel loads, minimize ignition potential, and reduce the potential for extreme fire behavior. This appendix also identifies best management practices (BMPs) to reduce or avoid impacts to natural resources during vegetation management activities.

Vegetation management activities will generally involve reducing the amount of flammable vegetation within the treatment area by approximately 30% to 50%. Vegetation management will occur outside of the City's required defensible space areas and may occur on private, City-owned, or other publicly owned land. Vegetation management will target the treatment or removal of flammable vegetation (e.g., grass, brush and understory plants) by removing/treating dead vegetation; trimming/mowing readily ignitable fuels (e.g., grasses, weeds); selectively removing exotic or invasive plant species; thinning, pruning, and limbing of vegetation to remove fire ladders; limbing up of oak overstory (canopies); pruning out dead material; and thinning continuous stands of brush to create a mosaic pattern that provides horizontal spacing between retained shrubs. The City currently implements a vegetation treatment hierarchy during vegetation management activities where vegetation treatment/removal is prioritized in the following order: dead plant material, dying plant material, invasive species, and native species. Continuation of this treatment approach is recommended.

Roadside vegetation management will occur within 10 feet of the edge of the public roadway and will provide no less than 13.5 feet of vertical clearance above the road surface to facilitate emergency vehicle traffic. Roadside vegetation management will be conducted to meet currently applicable SBFD requirements for roadway clearance.

In areas where City-owned land is in close proximity to structures on adjacent private properties and within the structures defensible space requirement area, the focus of vegetation management will be to meet the City's currently applicable defensible space requirements.

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1 Vegetation Management Standards

1.1 Principles of Vegetation Management to Reduce Fire Hazard

The vegetation management and maintenance standards presented in this appendix are intended to reduce fire hazard by rearranging and maintaining the spatial distribution of fuels. As noted by Reinhardt et al. (2008), all vegetation will burn, given the right conditions. Therefore, the goal of fuel treatment is not to remove all vegetation, but to minimize the potential for ignitions, crown fires, and extreme fire behavior by reducing fuel loads and altering the structure, composition, and spacing (horizontal and vertical) of retained vegetation. To achieve this, a combination of methods is necessary and dependent on vegetation type, structure, and condition.

In grass-dominated vegetation types, management is intended to reduce vegetation height (e.g., mowing, grazing) resulting in a shorter and more compact surface fuel layer that is less ignitable and less likely to sustain fire spread. Implemented beneath shrub or tree canopies, such treatments also minimize the potential for surface-to-crown fire transition. Management is also intended to maintain low fuel volumes in the land areas between shrub- and tree-dominated vegetation types.

In shrub-dominated vegetation types, management is intended to reduce surface fuel loading and flame lengths and slow fire spread by increasing the horizontal spacing between retained shrubs. In areas beneath trees, management is also intended to increase the vertical spacing between shrub and tree canopies to reduce the potential for surface to crown fire transition. Removal or treatment (e.g., chipping) of dead material from shrub-dominated types also reduces dead fuels loads, can assist in reaching spacing standards, and helps minimize the growth of highly ignitable grass/herbaceous vegetation.

In tree-dominated vegetation types, specifically oak and riparian woodlands, management is intended to remove fuel ladders by increasing the vertical spacing between surface fuels (shrubs, grasses) and tree canopies to reduce the potential for surface to crown fire transition. Creating more fire-resilient woodlands involves reducing surface fuels and ladder fuels (i.e., fuel that can facilitate fire spread from ground fuels into tree crowns). As noted by Nunamaker et al. (2007), surface and ladder fuels should have the highest priority for management to reduce fire intensity, rate of spread, and crown fire potential. Active crown fires are initiated with torching, but are ultimately sustained by the density of the overstory crowns. Reduction in potential surface fire behavior plus an increase in canopy base height minimizes torching potential (Agee and Skinner 2005).

In areas where eucalyptus is present, management is also intended to increase the horizontal spacing between retained trees to reduce the potential for crown fire spread. Canopy thinning via selective removal of trees within a stand can achieve desired horizontal spacing between retained tree canopies to minimize potential crown fire spread. Thinning from below, a technique in which trees are removed from the lower forest/stand canopy, can reduce the severity and intensity of wildfires by reducing crown bulk density and increasing crown base height (Graham et al. 1999). Thinning or removal of overstory trees can result in higher mid-flame wind speeds and decreased fine fuel moisture, which can increase surface flame lengths, resulting in crown fires and increased fire intensities. However, sufficient treatment of surface fuels (understory, slash, and ladder fuels) results in a reduction in fire behavior sufficient to outweigh these effects (Graham et al. 1999; Agee and Skinner 2005). Table E-1 summarizes the effects and advantages associated with fuel management in tree-dominated vegetation types.

Table E-1. Principles of Fire Resistance to Tree-Dominated Vegetation Types

Principle	Effect	Advantage	Concerns
Reduce surface fuels	Reduces potential flame length	Control easier; less torching	Surface disturbance less with fire than other techniques
Increase height to live crown	Requires longer flame length to begin torching	Less torching	Opens understory; may allow surface wind to increase
Decrease crown density	Makes tree-to-tree crown fire less probable	Reduces crown fire potential	Surface wind may increase and surface fuels may be drier
Keep big trees of resistant species	Less mortality for same fire intensity	Generally restores historic structure	Less economical; may keep trees at risk of insect attack

Source: Agee and Skinner 2005.

Another important factor in any vegetation management plan is the lifespan of fuel treatments (Reinhardt et al. 2008). Given the dynamic nature of vegetation, maintenance of treated areas is a critical component for managing wildfire hazard. The vegetation management and maintenance standards outlined in this appendix are intended to be applicable over the life of this CWPP.

1.2 Grass/Herbaceous

This section outlines management and maintenance standards for grasses; other light, flashy fuels; and surface fuels capable of igniting and carrying fire. Grass/herbaceous fuels in the City are represented by the California annual grassland and coastal perennial grassland vegetation types and are found primarily in the southern, coastal area of the City, although smaller areas exist in the foothills along the City's northern boundary. Grass, other light, flashy, or surface fuels may be found within other mapped vegetation types and should be treated to the standards outlined in this section. The following management standards apply to grass/herbaceous fuels:

- Treat grasses (annual and perennial), weeds, and thistles such that heights do not exceed 4 inches. Avoid removal to the mineral soil to minimize erosion.
- Retain oak saplings and seedlings where they occur in the treatment area.
- Cut grass may be left on the ground surface to protect soil as long as it does not exceed 4 inches in height.
- All dead or dying ground cover, vines, or other surface vegetation should be removed or chipped and spread on site.
- All dead twigs, branches, or limbs from overstory shrubs and/or trees should be removed or treated (e.g., chipped) and spread as a ground cover (mulch) on site.
- All mulch or chipped material should be spread to a depth not to exceed 6 inches.
- All material removed from the site should be properly disposed of per City standards.

1.3 Brush/Scrub

This section outlines management and maintenance standards for brush/scrub vegetation. Brush/scrub fuels in the City are represented by the chaparral and coastal sage scrub vegetation types. Brush/scrub types may include scattered and widely spaced trees, small patches of grass/herbaceous vegetation, or grass herbaceous vegetation occurring beneath shrub canopies, although shrubs are the dominant cover type. Chaparral is found primarily in the foothills along the City's northern boundary, while coastal sage scrub is distributed evenly between

the southern, coastal area of the City and the foothills along the City's northern boundary. The following management standards apply to brush/scrub fuels:

- Remove or treat dead, dying, and prohibited plants.
- Retain oak saplings and seedlings where they occur in the treatment area.
- Individual shrub crowns should be horizontally separated from adjacent shrubs, shrub groupings, or trees by at least two times the height of the shrub crown. Groupings of shrubs should not exceed 8 feet in diameter.
- Where brush/scrub is located within the dripline of an individual, isolated tree or small tree grouping, the vertical separation between the top of the shrub and the lowest tree branch should be at least three times the height of the shrub crown or 8 feet, whichever is greater.
- To minimize soil erosion potential, removed shrubs should be cut at or near the ground surface and root systems left intact.
- All vegetative material from brush/scrub treatment should be removed or treated (e.g., chipped) and spread on site.
- All chipped material should be spread to a depth no greater than 6 inches.
- Multi-cut vegetation should be treated such that it does not exceed inches in depth.
- All material removed from the site should be properly disposed of per City standards.

1.4 Tree/Woodland

This section outlines management and maintenance standards for tree-dominated vegetation types. Tree/woodland fuels in the City are represented by the southern oak woodland and riparian woodland vegetation types. Also, while not mapped as a vegetation type, eucalyptus is included in this section due to its prevalence in the City. Tree/woodland types may also include scattered shrubs or shrub groupings, small patches of grass/herbaceous vegetation, or shrub and grass herbaceous vegetation occurring beneath tree canopies, although trees are the dominant cover type. Oak woodlands are found in the City's drainages and canyons and along north-facing slopes throughout the foothills and southern, coastal area. Riparian woodlands are concentrated in narrow corridors primarily along San Roque Creek, Mission Creek, Sycamore Creek, and Arroyo Burro Creek.

The general management standards outlined below apply to oak woodlands and riparian woodlands, where management activity is applicable. The shade of the retained canopy helps reduce the potential for rapid re-growth of surface vegetation and can reduce erosion (CAL FIRE 2019b). The following management standards apply to oak and riparian woodlands:

- Remove or treat dead, dying, and prohibited trees.
- Do not remove coast live oak trees measuring 4-inches and greater in trunk diameter at 4-feet 6-inches in height above grade).
- Protect oak saplings (measuring less than 4-inches in trunk diameter at 4-feet 6-inches in height above grade) during vegetation management activities.
- Prioritize retention of other healthy native understory components (e.g., toyon, lemonadeberry, currant), as long as they do not create fire ladders.
- Trees should be pruned to remove limbs located less than 6 feet above the ground surface.

- Where brush/scrub is located within the dripline of a tree, the vertical separation between the top of the retained shrubs and the lowest tree branch should be at least three times the height of the retained shrub crown or 8 feet, whichever is greater.
- Pruned oak limbs shall be clean-cut, using the best industry standard practices.
- All chipped material should be spread to a depth no greater than 6 inches. Keep chip piles at least 5 feet from oak tree trunks.
- Multi-cut vegetation should be treated such that it does not exceed 12 inches in depth.
- To minimize soil erosion potential, stumps from removed trees should be left intact, with stump heights not exceeding 6 inches (as measured from the uphill side).
- Where slopes exceed 30% and the surface vegetation is reduced to approximately 50% or greater of cover (compared to bare ground), the City project manager shall consult with the Building and Safety Division and/or project biologist as necessary to determine if additional soil erosion retention measures are necessary to prevent erosion.
- Native vegetative material from tree removal or trimming should be removed or treated (e.g., chipped) and spread on site (where necessary for erosion control, logs no smaller than 8 inches in diameter [small end] may be retained on the soil surface).
- All material removed from the site should be properly disposed of per City standards.

The following management standards apply to areas dominated by eucalyptus trees:

- Thin eucalyptus stands to reach an average density of 10 to 16 trees per 1,000 square feet. Prioritize retention of healthy trees and remove trees with trunk diameters measuring less than 8 inches.
- Where small trees, shrubs, or grasses exist beneath tree canopies (surface fuels), the vertical separation between the top of surface fuels and the lowest tree branch should be at least three times the height of the surface fuels or 8 feet, whichever is greater. Where duff, mulch, or bare soil exists beneath tree canopies, provide at least 8 feet of vertical clearance between the lowest tree branch and the duff/mulch/soil surface.
- Remove loose/stringy bark from retained individual eucalyptus trees up to a height of 8 feet to minimize crown fire transition.
- Implement treatment techniques to control sprout growth from cut stumps.
- Maintain duff layer at a depth no greater than 6 inches.
- Eucalyptus debris (e.g., chips, branches, and leaves) should be kept out of native vegetation types.
- Large eucalyptus branches or logs (no smaller than 8 inches in diameter [small end]) may be retained on the soil surface for erosion control purposes, provided they are placed outside the drip line of retained trees; do not result in a heavy accumulation of logs on site; will not roll down slopes into drainages; and do not pose a safety or fire hazard.
- All material removed from the site should be properly disposed of per City standards.

2 Vegetation Management Techniques

Vegetation management for fire hazard mitigation is the practice of thinning, pruning, removing, or otherwise altering vegetation in order to reduce the potential for ignitions and modify fire behavior. Different vegetation management techniques can be utilized, depending on vegetation type, location, condition, and configuration. Given the dynamic nature of vegetation, a single treatment technique or management prescription may not be appropriate for one site over time. Therefore, an adaptive approach that allows for selection of management techniques is needed to achieve the vegetation management standards outlined in this appendix. Vegetation management techniques will be identified by SBFD personnel during project development and will be dictated by site-specific conditions and effort needed to meet identified vegetation management standards.

In general, vegetation management techniques can be classified into four categories:

- manual (e.g., hand pulling, cutting, planting)
- mechanical (e.g., mowing, masticating, felling, yarding)
- biological (e.g., grazing)
- prescribed fire (e.g., burn piles, broadcast burning)

Herbicide can also be used to manage vegetation for wildfire hazard mitigation purposes, and is typically applied to control re-sprouting of cut vegetation or to control undesirable plant species. Historically, the City has not used herbicide during implementation of vegetation management projects in Vegetation Management Units or in the Community Fuels Treatment Network. The City's Integrated Pest Management Strategy also seeks reduce or eliminate the use of chemicals in treating vegetation. Herbicide use is therefore not proposed as a vegetation treatment technique in this CWPP.

The following sections present a discussion of each of the vegetation management techniques that may be implemented, including information regarding equipment, application, timing, limiting factors, special considerations, and BMPs. Selection of a qualified and trained contractor, appropriate training, scheduling, and supervision to carry out vegetation management treatments and any associated BMPs are also key components of an effective vegetation management program. Preparation of the appropriate planning documents, obtaining necessary permits, and adherence to these standards will be necessary.

2.1 Manual

Hand labor involves pruning, cutting or removal of trees or other vegetation by hand or using hand-held equipment. Other hand labor treatments involve removing dead wood, piling material, and spreading chips/mulch. Hand labor is most effective in small treatment areas or areas with difficult access where the use of heavy equipment is infeasible. Hand labor also allows for selective management or removal of targeted vegetation and is typically used in conjunction with other techniques. Manual treatment may also include multi-cutting. Multi-cutting involves cutting vegetation (using hand tools, chainsaws, weed whips, and mowers) and cut vegetation is then reduced in size by cutting into lengths no longer than 6 inches long. The multi-cut vegetation is then left on the ground within the project area no greater than 12 inches in depth. Minimal ground disturbance results using this method since the root structure of vegetation is left intact and biomass generated from vegetation treatment is left on site.

Proper training and supervision of hand labor forces is necessary to reduce the dangers to workers using sharp tools on steep and/or unstable terrain, or where other environmental hazards exist. Hand tools include, but are not limited to, shovels, Pulaski hoes, McLeod fire tools, line trimmers, weed wrenches, chain saws, pruning shears, and loppers. Personal protection equipment typically includes long pants and long-sleeved shirts, gloves, safety goggles, hard hats, chaps, and sturdy boots.

2.2 Mechanical

Mechanical practices include all methods that employ motorized heavy equipment to remove or alter vegetation. Mechanical practices rearrange vegetation structures, compact or chip material, and move material to landings, staging areas, or burn piles. Mechanical equipment is usually equipped with either rubber tires or tracks, although skids and cables are also used. In some instances, two or more pieces of heavy equipment will work in concert to achieve a management standard. Mechanical equipment includes, but is not limited to, masticators, tractors, and chippers. Chippers are moved around as work occurs and placement is dependent on the ability to minimize the distance vegetation must be hauled to the chipper.

Constraints to mechanical equipment use include steep slopes, dense tree cover that prohibits travel, saturated soils, and dry, high fire hazard weather conditions where equipment use could result in ignition. Use of mechanical equipment may also result in damage to retained vegetation. Use of mechanical equipment should consider the terrain, access, vegetation type, and treatment recommendation to effectively treat vegetation and minimize impact potential. Supervision and specialized training are also necessary. The use of mechanical equipment is often done in conjunction with other treatment techniques, particularly hand labor (prior to mechanical treatment) and prescribed fire (following mechanical treatment.)

2.3 Biological

Biological management includes using grazing as a method to treat grasses, shrubs, and small trees. Grazing is an effective management tool for maintaining areas previously treated with hand labor or mechanical practices. Livestock each have different grazing habits and not all livestock are ideally suited for grazing treatments in all areas. Goats are an effective option as they will consume live or dead, tough, woody plant material.

Grazing is typically conducted in the late spring, when growth of annual grasses has slowed, and continues through the summer to reduce fine fuels prior to the onset of peak fire season. Development of site-specific grazing management plans should be completed for proposed grazing treatments. Management plans should identify goals and implementation techniques to ensure that grazing treatments meet vegetation management standards and to minimize impacts to natural resources. Grazing management plans should also identify the optimal stocking rate and grazing duration, typically measured in pounds per acre of residual dry matter. Control of livestock movements and preventing overgrazing is also important for successful implementation.

2.4 Prescribed Fire

Prescribed fire can be used to burn piles of cut vegetation (pile burns) or over a designated prepared area (broadcast burn). Broadcast and pile burning are often implemented in conjunction with hand labor and mechanical treatment methods as a means of treating residual materials. Prescribed burning also serves to rapidly break down vegetative material and convert it to soil nutrients, reduce brood material for pests and pathogens, control invasive species, and reduce surface fuel buildup and the threat of severe wildfires. All burning activities should adhere to the standards outlined by the Santa Barbara County Air Pollution Control District.

Small pile burning is typically conducted at or near the treatment area. Piles should be constructed by hand and should be free of dirt, debris, and stumps. Material should be piled soon after cutting with the butt end of branches and limbs toward the outside of the pile so that branches are overlapping and forming a series of dense layers. Piles shall be no greater than 5 x 5 x 5 feet and no more than 22 piles shall be burned in any one day. The top of the pile should be covered with a small sheet of heavy paper (e.g., butcher paper) to keep the pile interior dry. One or two limbs should be placed atop the paper to keep it in place. The dry interior portion of the pile should be ignited at the appropriate time using a weed burner or other igniting tool. Alternatively, tractors or hand crews can create piles of material on flat or gently-sloping ground that can be burned during wet conditions (pile burn), although the volume of fuel in the piles can produce localized heat, which may impact adjacent retained vegetation.

An alternative to pile burning is utilization of an air curtain burner. Air curtain burners allow for more complete combustion of wood waste and were developed to reduce the particulate matter (PM), or smoke, which results from burning. Using a technology called an "air curtain," the smoke particles are trapped and reburned, resulting in a cleaner (less PM) burn. Where feasible, the use of an air curtain burner is recommended to dispose of wood waste. Air curtain burners may be available as a shared resource between City and other local municipal or land management agencies and can be temporarily sited at work locations to facilitate wood waste treatment.

Broadcast burns are usually done where a maximum amount of fuel treatment can take place and can be used to control invasive species and treat cut material (slash) on the ground surface, or reduce surface and/or ladder fuels beneath tree canopies in shaded fuel breaks. Treatment boundaries are often roads, trails, or other nonburnable features, reducing the number of firebreaks that need to be created. Treatment area is typically less than 1 acre in size. This approach reduces labor costs and preparation time, and minimizes soil disturbance and the potential for soil erosion. Broadcast burns can be used in all forest types, where conditions allow for effective control.

Broadcast burning may occur throughout the year; however, it is usually conducted during the late spring months when the ground is still wet or during fall or winter after plants have completed their yearly growth cycle and their moisture content has declined. Fall burns are more closely aligned with the natural fire cycle found in California. Piles of vegetation may be burned any time after the vegetation has dried. Hand-held tools, such as drip torches, propane torches, and flares, may be used for igniting prescribed fires.

Broadcast burns must be conducted by trained fire protection personnel. Timing is critical to the use of this treatment technique due to variances in weather conditions and the necessity to time treatments to minimize impacts to plant and animal species. Fuel moisture content must be determined to assess if the treatment area is safe to burn. There are typically more appropriate burn days in the spring and early summer months when there is a greater chance of atmospheric conditions conducive to smoke dilution and dispersion.

All prescribed burning would be conducted under safe burning conditions outside of the SBFD's designated fire season and will require a California Air Resources Board-designated burn day and the development of a burn plan that will be approved by the fire chief and Santa Barbara County Air Pollution Control District. The District's Prescribed Burn Program (www.ourair.org/prescribed-burning) outlines burn requirements and the need for land managers to contact the District to acquire access to the Prescribe Fire Incident Reporting System (PFIRS) for the purpose of submitting Smoke Management Plans. A pile burn plan will outline weather, topography, and fuel within the project area; the prescribed burn objectives; the required fire organization and resources needed to control the fire; and the weather parameters under which the burn can be conducted safely and with minimal smoke disturbance.

Prescribed burning of cut vegetation would result in minimal ground disturbance. Hand tools (Pulaskis, McLeod's, shovels) would be used to clear a shallow trench or line no more than 2 inches in depth around each pile, group of piles, or broadcast burn area to confine the fire and catch any burned materials that may roll downhill during burning.

3 Best Management Practices and Mitigation Measures

The Program Environmental Impact Report (PEIR) prepared for this CWPP identifies mitigation measures (MMs) and Project Design Features/best management practices (PDFs/BMPs) that shall be implemented via its Mitigation Monitoring and Reporting Program (MMRP). The City of Santa Barbara Fire Department (SBFD) is responsible for implementing these MMs, PDFs, and BMPs through all phases of CWPP implementation. Tables E-2 (PDFs/BMPs) and E-3 (MMs) below identify all measures included in the PEIR.

Table E-2. Project Design Features and Best Management Practices

CWPP Project Design Features and Best Management Practices	Responsible Party	Timing of Implementation
Air Quality		
• One to three days prior to the commencement of prescribed burning operations, the project proponent would: (1) Post signs along the closest public roadway to the treatment area describing the activity and timing, and requesting persons in the area to contact a designated representative of the project proponent (contact information will be provided with the notice) if they have questions or smoke concerns. (2) Publish a public interest notification in a local newspapers or other widely distributed media source describing the activity, timing, and contact information. (3) Send the local county supervisor and county administrative officer (or equivalent official responsible for distribution of public information) a notification letter describing the activity, its necessity, timing, and measures being taken to protect the environment and prevent prescribed burn escape. This PDF applies only to prescribed burn treatment activities and all treatment types, including treatment maintenance.	SBFD	1 to 3 days prior to prescribed burn
• The project proponent would comply with the applicable air quality requirements of the SBCAPCD as set forth in Rule 401. This PDF applies only to prescribed burning treatment activities and all treatment types, including treatment maintenance.	SBFD	Prior to initiation of project activity
• The project proponent would submit a smoke management plan for all prescribed burns, in accordance with SBCAPCD rules and regulations, and in accordance with 17 CCR Section 80160. Burning will only be conducted in compliance with the burn authorization program of the SBCAPCD. This PDF applies only to prescribed burning treatment activities and all treatment types, including treatment maintenance.	SBFD	Prior to initiation of project activity
• The project proponent would create a burn plan using the CAL FIRE burn plan template for all prescribed burns. The burn plan will include a fire behavior model output of First Order Fire Effects Model and BEHAVE or other fire behavior modeling simulation and that is performed by a qualified fire behavior technical specialist that predicts fire behavior and calculates consumption of fuels, tree mortality, predicted emissions, greenhouse gas emissions, and soil heating. The project proponent would minimize soil burn severity from broadcast burning to reduce the potential for runoff and soil erosion. The burn plan would be created with input from a qualified technician or certified state burn boss. This PDF applies only to prescribed burning treatment activities and all treatment types, including treatment maintenance.	SBFD	Prior to initiation of project activity

Table E-2. Project Design Features and Best Management Practices

CWPP Project Design Features and Best Management Practices	Responsible Party	Timing of Implementation
• The project proponent would avoid ground-disturbing treatment activities in areas identified as likely to contain naturally occurring asbestos (NOA) per maps and guidance published by the California Geological Survey, unless an Asbestos Dust Control Plan (17 CCR Section 93105) is prepared and approved by the SBCAPCD. Any NOA-related guidance provided by the SBCAPCD will be followed. This PDF applies to all treatment activities and treatment types, including treatment maintenance.	SBFD	Prior to initiation of project activity
• Prescribed burns planned and managed by non-CAL FIRE crews would follow all safety procedures required of CAL FIRE crew, including the implementation of an approved Incident Action Plan (IAP). The IAP would include the burn dates, burn hours, weather limitations, the specific burn prescription, a communications plan, a medical plan, a traffic plan, and special instructions such as minimizing smoke impacts to specific local roadways. The IAP would also assign responsibilities for coordination with the appropriate air district, such as conducting on-site briefings, posting notifications, weather monitoring during burning, and other burn-related preparations. This PDF applies only to prescribed burning treatment activities and all treatment types, including treatment maintenance.	SBFD	Prior to initiation of project activity
Biological Resources		
• SBFD will perform a site-specific biological evaluation including a reconnaissance site visit by a City qualified biologist not more than two weeks prior to operations. When mature trees may be affected, a City qualified arborist may also be consulted. The evaluation will address the occurrence or potential occurrence of sensitive vegetation communities, special-status species, aquatic resources, and nesting birds. If any creeks occur within the work area, the biologist will map the top of bank.	SBFD	Two weeks prior to initiation of activities unless additional species specific surveys are identified.
• SBFD will develop a site specific Work Plan that will incorporate the results of the biological evaluation. The Work Plan shall be finalized not more than five days prior to the start of operations. The Work Plan may include measures related to special status species avoidance, additional site surveys/documentation and minimizing impacts to riparian habitat and sensitive vegetation communities. The SBFD will perform an after-action report documenting the site conditions after work is complete. The after action report will be maintained in a publicly accessible database. Information from the database shall be evaluated annually to determine native and nonnative vegetation regrowth and measures that have the strongest success in reducing nonnative plant regrowth to help inform future SBFD activities.	SBFD	Work plan finalization 5 days prior to the start of operation. After-action report within 30 days of completing activities unless the biological resources evaluation and Work Plan identify longer-term monitoring and reporting requirements.

Table E-2. Project Design Features and Best Management Practices

CWPP Project Design Features and Best Management Practices	Responsible Party	Timing of Implementation
• During the site-specific biological evaluation, the SBFD would identify invasive exotic plants (such as Pampas Grass [*Cortaderia* sp.]) for removal consistent with the City's Integrated Pest Management Plan and the 2004 Wildland Fire Plan. To the extent feasible, the vegetation management would preferentially remove exotic plants that pose a fire hazard, and generally remove exotic plants in the work area as the opportunity arises	SBFD	To be incorporated into the Work Plan
• Vegetation management work would be completed outside of the defined nesting season for birds (i.e., before ~~February 1~~ January and after August 31) unless vegetation management work must occur within the project areas during the breeding season (April 1 to July 30). If so, a site survey would be conducted by a qualified wildlife biologist to determine any presence of nesting birds. • The qualified biologist will establish a no-disturbance buffer around any nest located during the survey. The extent of the buffer will be determined based on the natural history traits of the nesting species, at the biologist's discretion. Vegetation management activities will not occur within the buffer while the nest remains active.	SBFD	Nest buffers to be established based on the biological resources evaluation and as needed nesting bird survey
• Vegetation management within 50 feet from the outer edge of the tree canopy would be the minimum necessary to meet SBFD requirements and would be designed to minimize erosion and impacts on habitat values. • No coast live oak trees with one trunk larger than 4 inches in diameter at 4 feet, 6 inches in height above grade will be removed. • Oak saplings less than 4 inches in diameter at 4 feet, 6 inches in height above grade will be protected from damage or cutting during the work. • To the extent feasible, other healthy native understory components such as toyon, lemonade berry and currant will be retained within oak woodlands, as long as they do not create fire ladders. • Lower oak branches (up to 6 feet above grade in height) of oaks should be thinned to eliminate potential fire ladders. • Dried non-native grasses, dead branches, and non-native resinous woody species should be removed in oak tree understory. • Wood chips should not be spread more than 6 to 8 inches in depth, and all chip piles shall be kept at least 5 feet from the outer edge of the tree canopy. • Removed oak limbs should be clean-cut, using the best industry standard practices.	SBFD	During project activities

Table E-2. Project Design Features and Best Management Practices

CWPP Project Design Features and Best Management Practices	Responsible Party	Timing of Implementation
• Within the Coastal Zone, vegetation treatment within environmentally sensitive habitat areas (ESHAs), wetlands, and creeks, and within ESHA, wetland, and creek buffers shall be avoided, and where full avoidance is not possible, shall minimize impacts to ESHAs to the extent feasible consistent with Policy 4.1-21 of the Coastal Land Use Plan. • Vegetation treatment within City-designated creek channels outside of the Coastal Zone should be limited to the removal of dead brush that is easily accessible and the removal of exotic or invasive species within a 50-foot buffer along the top of banks, as long as the work does not cause damage to the bank structure. • As a component of the site-specific work plan, for work within a creek channel (both Coastal Zone and non-Coastal Zone areas), a vegetation management plan should be prepared by a qualified biologist and peer reviewed by the City Parks Division. • No placement of cut vegetation should occur within a 50-foot buffer along the top of banks. The top of bank should be defined by the first bank out from the present, active stream channel (denoted by an incised bank and cobble bed). The 50-foot buffer should be measured out from the top of bank, marked in the field by an approved biologist and the City project manager prior to any vegetation management work occurring in drainage areas. • Equipment should not be placed within sensitive habitat areas. • Vehicles and equipment should arrive at the treatment area clean and weed-free as verified by the SBFD. • Trees should be pruned according to International Society of Arboriculture and American National Standards Institute A300 standards. • Retained trees and vegetation should be protected from tool and equipment damage. • Tools should be serviced and fueled only in areas that will not allow grease, oil, fuel, or other hazardous materials to pass into streams or retained vegetation. • All refuse, litter, trash, and non-vegetative debris resulting from vegetation treatment operations, and other activity in connection with vegetation treatment operations should be removed from the treatment area and properly disposed of. • Chipped material should not be placed or deposited into any streambeds. • Prior to turn-out, streams and watercourses in potential grazing areas should be identified and assessed, and exclusionary fencing should be installed where necessary. • Grazing activities should be monitored in riparian areas to minimize the potential for stream bank damage, soil compaction, and soil deposition into streams and watercourses.	SBFD	During project activities

Table E-2. Project Design Features and Best Management Practices

CWPP Project Design Features and Best Management Practices	Responsible Party	Timing of Implementation
• Prior to grazing in riparian areas, thresholds should be identified that would trigger a cessation of grazing activity. • Grazing in unstable slope areas or implement measures should be avoided to minimize impacts to slope stability (e.g., reducing herd size to retain vegetation, avoiding grazing where saturated soil conditions exist). • The timing and level of grazing practices should be considered to promote plant recruitment (e.g., timing prior to seed set of annual grasses to promote perennial species establishment). • The spread of invasive plants and pathogens should be minimized through the use of quarantine periods; holding areas; clean stock water; and personnel, equipment, and vehicle sanitation. • Retained trees and vegetation should be protected from tool and equipment damage.		
• The SBFD shall perform work within 50-feet of the top of bank of a creek in accordance with the CDFW approved Lake and Streambed Alteration Agreement Notification No. 1600-2014-0160-R5	SBFD	During project activities
• Identify and assess streams and watercourses in potential grazing areas prior to turn-out and install exclusionary fencing where necessary. • Routinely monitor grazing activities in riparian areas to minimize the potential for stream bank damage, soil compaction, and soil deposition into streams and watercourses. • Prior to grazing in riparian areas, identify thresholds that would trigger a cessation of grazing activity. • Avoid grazing in unstable slope areas or implement measures to minimize impacts to slope stability (e.g., reducing herd size to retain vegetation, avoiding grazing where saturated soil conditions exist). • Consider the timing and level of grazing practices to promote plant recruitment (e.g., timing prior to seed set of annual grasses to promote perennial species establishment). • Minimize the spread of invasive plants and pathogens through the use of quarantine periods; holding areas; clean stock water; and personnel, equipment, and vehicle sanitation.	SBFD	During project activities
• Equipment operators and project personnel should have appropriate personal protective equipment and be properly trained in equipment use. • As necessary, tools should be sanitized between project areas to prevent the spread of pathogens.	SBFD	Ongoing to inform SBFD field crews

Table E-2. Project Design Features and Best Management Practices

CWPP Project Design Features and Best Management Practices	Responsible Party	Timing of Implementation
• The SBFD will incorporate environmental awareness training for SBFD field crews that contains these PDFs/BMPs.		
• Work would include weekdays between the hours of 8:00 a.m. to 5:00 p.m. No work will be completed on weekends or designated holidays unless fire conditions (e.g., red flag warning) dictate immediate action.	SBFD	During project activities
• Haul trucks entering or exiting public streets shall yield to the public traffic at all times. • All project-related staging of vehicles should be kept out of the adjacent public roadways and should occur on site or within other off-street areas. • Traffic control and associated Traffic Control Plans should be prepared for any lane closure, detour, or other disruption to traffic circulation, including bicycle and pedestrian trails. Bicycle and pedestrian trails should remain open, to the greatest extent possible, during vegetation management activities or re-routed to ensure continued connectivity. • Bus route and/or a bus stop access impacts associated with vegetation management activities would be coordinated with the Santa Barbara MTD.	SBFD	During project activities
• All refuse, litter, trash, and non-vegetative debris resulting from vegetation treatment operations, and other activity in connection with vegetation treatment operations should be removed from the treatment area and properly disposed of. • Tools should be serviced and fueled only in areas that will not allow grease, oil, fuel, or other hazardous materials to pass into streams or retained vegetation.	SBFD	During project activities
• Appropriate fire safety measures should be implemented. • For safety purposes, necessary signage alerting the public to active operations should be provided.	SBFD	During project activities
• The SBFD will evaluate an action proposed under the CWPP for feasibility at such time as the action is contemplated. Feasibility will be determined based on the ability of the SBFD to accomplish the action in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.	SBFD	During the development of the project specific work plan

Table E-3. Mitigation Measures

Aesthetics			
MM-AES-1	The following measures shall be implemented when conducting vegetation management on private and public parcels to the extent feasible: • Straight line boundaries and other strong linear configurations that tend to detract from the natural appearance of the landscape shall be avoided. • Vegetation removal or thinning shall follow natural or existing landscape features such as stream courses, vegetation type lines, ridgetops, and existing roads. • Vegetation removal or thinning shall be feathered into the natural landscape, with brush cuttings used to disguise the lines and maintain a natural appearance.	Private owners/SBFD	Prior to project activities
Air Quality			
MM-AQ-1	**Prescribed Burning.** The City shall not exceed a hand-built burn pile size of 5 feet x 5 feet x 5 feet and burn in excess of 22 piles of this size in any one day.	SBFD	Prior to project activities
MM-AQ-2	**Air Curtain Burner.** The City shall implement the following measures prior to the use of an air curtain burner. The City shall coordinate with the Santa Barbara County Air Pollution Control District (SBCAPCD) during the air curtain burner planning process to address any health risk concerns and properly mitigated in coordination with the SBCAPCD, as necessary. The City shall obtain the necessary operating permits (i.e., Title V/Part 70 of the Clean Air Act) with the SBCAPCD for the use of an air curtain burner, when applicable. If the City is using an air curtain burner from another agency or rental company, the City shall ensure that the air curtain burner has air operating permits in place acceptable to the SBCAPCD prior to use.	SBFD	After approval by the SBCAPCD
MM-AQ-3	**Covers.** Trucks transporting cut vegetation material shall be covered from the point of origin.	SBFD	During project activities
MM-AQ-4	**Haul Route Approval.** The haul route(s) for all construction-related trucks, three tons or more, entering or exiting the sites, shall be approved by the transportation engineer.	SBFD	After approval by the City Public Works Department
MM-AQ-5	**Disturbed Soil.** After clearing, grading, earth moving, or excavation is completed, the entire area of disturbed soil shall be treated to prevent wind pickup of soil. This may be accomplished by seeding and watering until vegetative cover is grown, spreading soil binders, sufficiently wetting the area down to form a crust on the surface with repeated	SBFD	After approval by the SBCAPCD

Table E-3. Mitigation Measures

	soakings as necessary to maintain the crust and prevent dust pickup by the wind, or other methods approved in advance by the Santa Barbara County Air Pollution Control District.		
Biological Resources			
MM-BIO-1	**Special-Status Species Surveys and Mitigation**. For any program-level projects identified in this program environmental impact report (PEIR) that may result in a significant impact to a special-status species, a biological reconnaissance of the project site will be conducted by a City qualified biologist within ten days prior to the start of activities to determine if suitable habitat for special-status species occurs on the project site. If suitable habitat is present on or within the immediate vicinity (100–500 feet) of the project site, additional focused surveys and subsequent mitigation measures will be required as described below. These measures shall be implemented prior to performing a project-specific CEQA review. The following species-specific measures will be implemented for projects identified with a potential to contain suitable habitat for special-status species. A. *Southern Steelhead (Oncorhynchus mykiss)*. If the biological survey identifies the potential for southern steelhead to occur, coordinate with the National Marine Fisheries Service to confirm whether vegetation management has the potential to result in take of that species. As part of future projects that require work within 50-feet of City creeks with potential steelhead habitat or their riparian areas, all such work shall be conducted between June 15 and October 15 or as approved by a City qualified biologist in coordination as required with USACE, NMFS, and CDFW. *B.* *California Red-Legged Frog (Rana draytonii)*. For program-level projects that occur within suitable California red legged frog habitat, specifically projects within riparian corridors, , surveys shall be conducted by a permitted 10(a)(1)(A) biologist is required (refer to introduction section for information on how to apply for a section 10(a)(1)(A) permit This Guidance recommends a total of up to eight (8) surveys to determine the presence of CRF at or near a project site. Two (2) day surveys and four (4) night surveys are recommended during the breeding season; one (1) day and one (1) night survey is recommended during the non-breeding season. Each survey must take place at least seven (7) days apart. At least one	SBFD	Contingent on results of the biological resources evaluation and, if determined to be necessary, after species specific protocol level surveys are completed

survey must be conducted prior to August 15th. The survey period must be over a minimum period of 6 weeks (i.e., the time between the first and last survey must be at least 6 weeks). Throughout the species' range, the non-breeding season is defined as between July 1 and September 30. If the species is observed at any time, no additional surveys shall be conducted in the area. If California red legged frog are found and cannot be avoided by the project, additional mitigation will be required to comply with the Endangered Species Act and California Endangered Species Act, such as applying for an Incidental Take Permit prior to project implementation. C. *Crotch Bumblebee*. 1. If the project-specific biological resources evaluation indicates potential presence of Crotch bumblebee, a qualified entomologist familiar with the species behavior and life history shall conduct surveys to determine the presence/absence of Crotch's bumble bee. Surveys shall be conducted during flying season when the species is most likely to be detected above ground, between March 1 to September. If "take" or adverse impacts to Crotch's bumble bee cannot be avoided either during project activities or over the life of the project, SBFD must consult CDFW to determine if a CESA incidental take permit is required (pursuant to Fish and Game Code Section 2080 et seq.). 2. If the SBFD will perform mowing activities within habitat that has been identified by the project-specific biological resources evaluation to be suitable for the Crotch bumblebee, mowing shall occur outside of Crotch bumble bee flight season (March 1 through September 1). Mowing activities should be completed at the highest cutting height possible, or at a minimum of 12 inches, to prevent disturbance of established nests or overwintering queen hibernacula. 3. Within identified Crotch bumblebee habitat, the SBFD shall maintain a sustained nectar source for foraging bees. The SBFD shall maintain one or more patches (as large as possible) of meadow, lawn, or edge habitat		

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unmowed for the entire year in order to create a mosaic of patches with structurally different vegetation. *D. Special Status Plants*. 1. In order to adequately address special-status plant species, prior to implementation of project activities in site-specific location and based upon the recommendations of the site-specific biological resources evaluation, a qualified biologist should conduct botanical surveys for special-status plant species, including those listed by the California Native Plant Society (http://www.cnps.org/cnps/rareplants/inventory/), during the blooming period for all sensitive plant species potentially occurring within the project area. Table 4.3-5 of the CWPP PEIR shall be used as a list of potential special-status plant species that may be present in the project area. 2. If special-status plant species are identified within or adjacent to the project area, species specific avoidance and minimization measures shall be developed to avoid impacts to special-status plants. Avoidance and minimization measures may include measures such as seasonal work periods to avoid blooming season, use of hand tools to avoid soil compaction from heavy machinery, flagging of no-work buffers of an appropriate distance to avoid impacts to a specific population or individual, and maintaining a biological monitor on site to ensure that design elements are effective at providing the intended protection. If state or federally listed plant species are identified, consultation with the relevant agency to ensure full avoidance or mitigation shall occur. 3. If avoidance is not feasible, a mitigation ratio shall be developed that is roughly proportionate to the level of impact and with input from the respective wildlife agencies. Measurable success criteria shall be included for any mitigation area required to be established and submitted to the wildlife agencies. 4. For species that are determined to be present and unavoidable in a project work site, a Documented Conservation Seed Collection of the impacted rare		

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	plant species shall be deposited at either the Santa Barbara Botanic Garden or the California Botanic Garden (formerly known as Rancho Santa Ana Botanic Garden).		
MM-BIO-2	**Riparian Protection.** Prior to conducting work in a creek, or within 50 feet of the top of bank, the SBFD shall consult with a City qualified biologist during the preparation of the site-specific Work Plan to identify methods to achieve the vegetation management without significant impacts to riparian resources. Based on this consultation, the SBFD shall develop site-specific measures to avoid or reduce impacts to riparian resources. These measures shall include (among others) the following: a) To the extent feasible, all work near a creek shall be conducted when surface water is absent. b) Vegetation shall not be thinned, removed, or pruned, nor shall dead wood be removed, within 50 feet of a creek channel when flowing water is present. c) The only plants that can be removed from a creek bed (that is, below the line of the ordinary high water mark) are live or dead eucalyptus trees and dead native shrubs/trees that are deemed to be a fire hazard, and invasive exotics (including, but not limited to giant reed). d) Cut stems, tree trunks or other vegetative debris shall not be dragged across a creek bed that contains riparian vegetation, wetlands, or surface water. e) No trees shall be felled across a creek while there is flowing water. f) No eucalyptus chipping or cut stems shall be left on the creek banks or any upper stream terrace, when present. g) Chipped native vegetation shall not be placed on creek banks, unless a qualified biologist determines that placement of the chipping would provide needed erosion protection without an adverse impact on aquatic habitats and water quality in the creek. Native plant chippings can be spread outside the top of bank. h) Entities performing vegetation management activities within a stream shall notify the California Department of Fish and Wildlife (CDFW) pursuant to Fish and Game Code Section 1600 et seq. and shall obtain a Lake and Streambed	SBFD	After completion of site-specific biological resource evaluation, and, if determined to be necessary, after species-specific protocol-level surveys are completed and jurisdictional delineation is completed

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	Alteration Agreement if determined to be necessary prior to initiating work within CDFW's jurisdiction.		
MM-BIO-3	**Property Owner Educational Material.** Defensible space management by property owners could potentially cause inadvertent impacts to sensitive plant and wildlife species, especially near creeks. The SBFD shall create property owner educational material in consultation with a City qualified biologist that will be available at the SBFD website and in a printable brochure that advises property owners about regulatory obligations with defensible space and specifying measures that owners can take, such as avoiding bird nests, when performing vegetation management. The SBFD shall also make available biological resource evaluations associated with CWPP activities, whether performed for private or public projects, on the SBFD website.	SBFD	Within 6 months of City Council certification of the Final PEIR
MM-BIO-4	**Nesting Bird Avoidance.** Construction activities for project-level and program-level projects shall avoid the migratory bird nesting season (typically January through September), to reduce any potential significant impact to birds that may be nesting within 500 feet of project sites. If construction activities must occur during the migratory bird nesting season, an avian nesting survey of the project site and suitable habitat within 500 feet of the site shall be conducted for protected migratory birds and active nests. The avian nesting survey shall be performed by a qualified biologist meeting the standards in the field within 72 hours prior to the start of construction in accordance with the Migratory Bird Treaty Act (16 USC 703–712) and California Fish and Game Code, Sections 3503, 3503.5, and 3513. If an active bird nest is found, the nest shall be flagged and an appropriate buffer established around the nest. Buffers around nests should be set at 300 feet for passerines and 500 feet for raptors, unless greater or lesser distances are deemed appropriate by a qualified biologist. The nest area shall be avoided until the nest is vacated and the juveniles have fledged. No project activities may encroach into the buffer until a qualified biologist has determined that the nestlings have fledged, and the nest is no longer active.	SBFD	After completion of the site-specific biological resource evaluation and completion of nesting bird surveys
MM-BIO-5	**Jurisdictional Waters and Wetlands.** Direct impacts to jurisdictional waters that may occur through program-level activities, shall be addressed during project-level California Environmental Quality Act review of the project prior to implementation through first a biological reconnaissance conducted by a City qualified biologist, and a delineation of waters and wetlands to determine potential regulatory agency jurisdiction. If the reconnaissance and delineation determine potentially jurisdictional waters or wetlands occur and may be impacted by the project, mitigation to reduce impacts will be determined through the regulatory application process to implement Clean Water Act	SBFD	After completion of site-specific biological resource evaluation, and, if determined to be necessary, after species-specific protocol-level surveys are completed

Table E-3. Mitigation Measures

	Section 401 and Section 404, the Porter-Cologne Water Quality Act, and California Fish and Game Code Section 1602.		and jurisdictional delineation is completed
MM-BIO-6	**CWPP Appendix E Update**. The Community Wildfire Protection Plan Appendix E shall be updated with the mitigation measures contained in this Program Environmental Impact Report. Appendix E shall be updated in the Final CWPP prior to consideration by City County and CAL FIRE.	SBFD	Appendix E shall be updated in the Final CWPP prior to consideration by the City Council and CAL FIRE
Cultural Resources			
MM-CUL-1	**Cultural Resource Treatment Plan**. Potential impacts to cultural resources shall be either minimized or eliminated through development of protocols for practical adherence of mitigation measures MM-CUL-2 and MM-CUL-3 prior to and after the occurrence of vegetation management activities within Community Wildfire Protection Plan (CWPP) Cultural Resource Sensitivity Zones. These protocols shall be outlined in a Cultural Resource Treatment Plan (CRTP). The CRTP shall be developed by a City-qualified archaeologist, meeting the Secretary of Interior Standards (SOI), prior to the implementation of any CWPP ground disturbing activities and include wording of each mitigation measure MM-CUL-2 through MM-CUL-4, specific and detailed explanation for implementation of each mitigation measure and contact protocol. The CRTP shall be provided to all agency personnel, consulting tribes, contractors and archaeological personnel. The existence and necessity for adherence to the CRTP shall be noted on all plans, handbooks, or the like associated with tasks that may incur ground disturbance either intentionally or inadvertently.	SBFD	Prior to the implementation of any CWPP ground-disturbing activities
MM-CUL-2	**Workers Environmental Awareness Program (WEAP) Training**. All personnel participating in tasks that may incur ground disturbance either intentionally or inadvertently shall be briefed regarding unanticipated discoveries prior to the start of said activities. A basic presentation shall be prepared by a City-qualified archaeologist, meeting the Secretary of the Interior (SOI) Professional Qualification Standards to inform all City-retained personnel working on the project about the archaeological sensitivity of proposed project areas located within Community Wildfire Protection Plan Cultural Resource Sensitivity Zones. The purpose of the WEAP training is to provide specific details on the kinds of archaeological materials that may be identified during project activities and explain the importance of and legal basis for the protection of cultural resources. Each personnel shall also be instructed the proper procedures to follow in the event that cultural resources or human remains are encountered. These procedures include work	SBFD	Prior to the start of project activities

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	curtailment or redirection, and the immediate contact of the site supervisor, SOI- and City-qualified archaeologist, and if human remains are encountered, the County Coroner.		
MM-CUL-3	**Archaeological Construction Monitoring.** Archaeological monitoring shall be conducted during all ground disturbance activities within public space, and when possible private properties, existent within the Community Wildfire Protection Plan Cultural Resource Sensitivity Zone B and during all activities that have the potential to disturb the ground including vegetation removal by hand and mechanical removal when such activity is within or near to a known site. A Secretary of the Interior (SOI)- and City-qualified archaeologist shall be retained to oversee and adjust monitoring efforts as needed (increase, decrease, or discontinue monitoring frequency) based on the observed potential for vegetation management activities to encounter cultural deposits or material. The archaeological monitor shall have the authority to halt all ground-disturbing activities until discovered cultural material can be properly assessed. The archaeological monitor shall be responsible for maintaining daily monitoring logs and immediately contacting the project archaeologist upon discovery of cultural material. If the project archaeologist determines the discovery to be of a nature requiring further evaluation, the project archaeologist shall contact the City as soon as possible and at least within the same working day. Further treatment of cultural material may include redirection or discontinuing ground-disturbing tasks, subsurface testing and/or evaluation and/or data recovery and/or temporary/permanent avoidance. Following the completion of ground disturbing activities, the SOI- and City-qualified archaeologist shall provide an archaeological monitoring report memo to the agency. The project archaeologist shall also submit the same memo to the Central Coastal Information Center for inclusion in the California Historical Research Information System database.	Private Property Owners/SBFD	Archaeological monitoring shall be conducted during all ground disturbance activities within public space, and when possible within private properties, existent within the Community Wildfire Protection Plan Cultural Resource Sensitivity Zone B and during all activities that have the potential to disturb the ground, including vegetation removal by hand and mechanical removal when such activity is within or near to a known site
MM-CUL-4	**Intensive Archaeological Pedestrian Surveys of Community Wildfire Protection Plan (CWPP) Cultural Resource Sensitivity Zone.** An intensive Pedestrian survey shall be conducted prior to the initial implementation of all CWPP ground disturbance activities within public space, and when possible private properties, existent within the CWPP Cultural Resource Sensitivity Zone B. Initial implementation of all CWPP ground disturbance activities is defined as the first occurrence of vegetation removal after approval of the CWPP. No additional archaeological pedestrian surveys shall be required once the initial survey of the area has been conducted except any circumstance that is subject to other mitigation measure outlined therein. If necessary and depending on the vegetation condition within the "CWPP Cultural Resource Sensitivity Zone" areas (where ground surface visibility is limited such that the survey would results would not be reliable), the survey may be conducted concurrently or immediately subsequent to	Private Property Owners/SBFD	An intensive pedestrian survey shall be conducted prior to the initial implementation of all CWPP ground disturbance activities within public space, and when possible within private properties, existent within the CWPP Cultural Resource Sensitivity Zone B

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	vegetation removal. The City shall retain a Secretary of the Interior (SOI)- and City-qualified archaeologist/s to conduct Phase I archaeological survey studies within the CWPP Cultural Resource Sensitivity Zone B; the result of which will be a Phase I Archaeological Resources Report consistent with the California Environmental Quality Act and City Master Environmental Assessment guidelines. The report will include methodology, background research, survey results, interpretation and recommendations. Background research shall start with a review of the City's archaeological database created as a result of this study, but may, if determined necessary by the SOI- and City-qualified archaeologist, include a California Historical Research Information System (CHRIS) records search. Additional records search should be authorized by the City first. Upon completion, the Phase I Archaeological Resources Report shall be submitted to the Central Coastal Information Center for inclusion in the CHRIS database.		
MM-CUL-5	**Inadvertent Discovery of Archaeological Resources.** In the event that archaeological resources (sites, features, or artifacts) are exposed during ground disturbing activities within the proposed project areas (within or outside the Community Wildfire Protection Plan Cultural Resource Sensitivity Zones A and B), all construction work occurring within 50 feet of the discovery shall immediately stop until a Secretary of the Interior (SOI)- and City-qualified archaeologist can evaluate the nature and significance of the find and determine whether or not additional study is warranted. Depending upon the significance of the find under the California Environmental Quality Act (14 CCR 15064.5(f); California Public Resources Code Section 21082), the archaeologist may simply record the find and allow work to continue. If the discovery proves significant under CEQA, additional work, such as preparation of an archaeological treatment plan, testing, or data recovery, may be warranted. If the discovery is Native American in nature, consultation with and/or monitoring by a tribal monitor ancestrally affiliated with the area and, if possible, included in the most current City Barbareño Chumash Archaeological Site Monitors List, may be necessary.	Private Property Owners/SBFD	During project activities
MM-CUL-6	**Inadvertent Discovery of Human Remains.** In the event an inadvertent discovery consists of possible human remains, the Santa Barbara County Coroner shall be contacted immediately as well as the City's Environmental Analyst and a Secretary of the Interior (SOI)- and City-qualified archaeologist. If the Coroner determines that the remains are Native American, the Coroner shall contact the California Native American Heritage Commission. (NAHC) who will provide the name and contact information for the Most Likely Descendent (MLD). Treatment of the discovery shall be decided in consultation with the MLD provided by the NAHC. Additionally, an SOI- and City-qualified archaeologist	Private Property Owners/SBFD	Contact the County Coroner immediately upon discovery

Table E-3. Mitigation Measures

	and tribal monitor ancestrally affiliated with the area and, if possible, included in the most current City Barbareño Chumash Archaeological Site Monitors List, shall be retained to monitor all further subsurface disturbance in the area of the find. Work in the area may only proceed after the Environmental Analyst grants authorization.		
MM-CUL-7	**Post-Fire Management Assessment.** In the event that a fire occurs within public space, and when possible private properties, existent within the Community Wildfire Protection Plan Cultural Resource Sensitivity Zones A and B, a Secretary of the Interior (SOI)- and City-qualified archaeologist shall be retained to assess the effects of the fire and/or fire management on known and unknown cultural resources. The retained SOI- and City-qualified archaeologist shall provide to the City, a brief memo outlining the results of the assessment and recommendation for further treatment if necessary. Any exposure of cultural material, change in the nature of a cultural resource, or new information resulting from the fire or fire management, shall be recorded in a site record update. Based on the recommendations provided in the memo, the City may retain a SOI and City-qualified archaeologist to conduct the recommended study or measures. All reports, memos, and site records resulting from post-fire management assessments shall be submitted to the Central Coastal Information Center for inclusion in the California Historical Research Information System database.	Private Property Owners/SBFD	After a wildfire occurs
Geology and Soils			
MM-GEO-1	**Erosion Control.** The Santa Barbara Fire Department (SBFD) shall implement the following Best Management Practices when conducting vegetation management on slopes greater than 10%: • To the extent feasible, field crews shall not create footpaths to and from the work areas that remove leaf litter and expose mineral soils to potential future erosion. If crews must use a single path that becomes worn and vulnerable, the path shall be rehabilitated after vegetation management to reduce erosion potential. Rehabilitation would include replacement of leaf litter and chippings on the path, and piling dirt and organic matter at periodic intervals along the path to act as water bars and prevent the concentration of flows. • Crews shall avoid stripping the leaf litter from slopes or creek banks when dragging vegetation from the cutting location to the chipper. If the removal of vegetation and leaf litter is unavoidable, the SBFD shall restore the affected areas by spreading leaf litter and chippings back over the stripped areas.	SBFD	During project activities

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	• If the SBFD field supervisor determines that an erosion potential has been created due to vegetation reduction work, and that the spreading of leaf litter and chippings is insufficient protection from future winter rains, the SBFD shall consider temporary biodegradable erosion control blankets and barriers, such as coconut fiber blankets and straw wattles. These materials shall be placed strategically to reduce the amount and velocity of flow over the affected areas, to prevent gullying and soil loss by water erosion, and to facilitate the natural regeneration and colonization by native plants.		
Hazards and Hazardous Materials			
MM-HAZ-1	**Non-interference.** Vegetation management activities at Elings Park will be coordinated so that they do not interfere with enforced monitoring and reporting activities on the former Las Positas Landfill as described in Enforcement Order R3-2004-0006.	SBFD	Prior to performing work within Elings Park
Hydrology and Water Quality			
MM-HYDRO-1	**Sedimentation Control**. The Santa Barbara Fire Department (SBFD) shall implement the following when conducting vegetation management on slopes greater than 10%, within 25 feet of the top of a creek, or within a creek: The SBFD shall prepare an erosion control plan that evaluates the potential for erosion from vegetation management actions and identifies Best Management Practices to avoid significant erosion impacts through modifying vegetation removal methods, utilizing alternative access methods, and/or rehabilitating affected areas after the work. If the SBFD field supervisor determines that an erosion potential has been created due to vegetation reduction work, and that the spreading of leaf litter and chippings is insufficient protection from future winter rains, the SBFD shall consider temporary biodegradable erosion control blankets and barriers, such as coconut fiber blankets and logs. These materials shall be placed strategically to reduce the amount and velocity of flow over the affected areas, to prevent gullying and soil loss by water erosion, and to facilitate natural regeneration and colonization by native plants.	SBFD	During project activities
Noise			
MM-NOI-1	**Equipment Maintenance.** All construction equipment, including trucks, shall be professionally maintained and fitted with standard manufacturers' muffler and silencing devices.	SBFD	Prior to and during project activities

Table E-3. Mitigation Measures

MM-NOI-2	**Hearing Protection.** All workers using or within close proximity to operating chain saws, chippers, and other noisy equipment shall utilize noise protection (ear plugs) consistent with Cal OSHA and Federal OSHA requirements and other legal workplace requirements.	SBFD	During project activities
Recreation			
MM-REC-1	The Santa Barbara Fire Department shall consult with the Parks and Recreation Department prior to the commencement of vegetation management in parks, open space areas, and public recreational spaces to ensure that recreational opportunities are not precluded simultaneously in several parks in the same portion of the City.	SBFD	Prior to working in City Parks
Tribal Cultural Resources			
MM-TCR-1	**Pre-Fire and Vegetation Management Assessment.** The City shall notify all consulting Tribes prior to conducting Intensive Archaeological Pedestrian Surveys of Community Wildfire Protection Plan Cultural Resource Sensitivity Zones (MM-CUL-4). Upon request, Tribes will be provided contact information for the Secretary of the Interior (SOI)- and City-qualified archaeologist retained to conduct the surveys as well as logistical information regarding the surveys. Tribes shall be invited, but are not required, to accompany the SOI- and City-qualified archaeologist during the surveys. No survey shall be delayed or aborted due to the absence of Tribal representatives.	SBFD	Prior to conducting intensive archaeological pedestrian surveys of Community Wildfire Protection Plan Cultural Resource Sensitivity Zones
MM-TCR-2	**Native American Construction Monitoring.** Native American monitoring shall be conducted during all pre-planned ground disturbance activities within known prehistoric archaeological sites or historic archaeological sites identified as associated with Native American history. A Native American monitor ancestrally affiliated with the area and, if possible, included in the most current City Barbareño Chumash Archaeological Site Monitors List, shall be retained by the City prior to the commencement of all pre-planned ground-disturbance activities. The Native American monitor shall have the authority to halt all ground-disturbing activities until discovered tribal cultural resource (TCR) material can be properly assessed. The Native American monitor shall be responsible for reporting any discovered TCR material to the Secretary of the Interior- and City-qualified archaeologist retained to monitor the same pre-planned ground-disturbance activities.	SBFD	Native American monitoring shall be retained by the City prior to the commencement of all pre-planned ground-disturbance activities
MM-TCR-3	**Post-Fire Management Assessment.** The Santa Barbara Fire Department shall meet with the Chumash Fire Department at least biannually (i.e., every other year) to discuss ongoing fire management planning and practices within the City to avoid potential impacts to tribal cultural resources. Due to the sensitive nature of certain Native American resources, meeting minutes shall be prepared and maintained by the City and	SBFD	Biannually

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	provided upon request to the Chumash Fire Department and the Santa Ynez Band of Chumash Indians Cultural Resources Manager.		
Wildfire			
MM-WLD-1	**Erosion Control**. Revise City Ordinance No. 5290 (High Fire Hazard Area Landscape Requirements) to require that landscape plans for defensible space areas on slopes exceeding 10% gradient incorporate erosion control techniques and/or best management practices to minimize erosion potential resulting from vegetation management and maintenance activities.	SBFD	As funding is available
MM-WLD-2	**Post-fire Assessment**. Following any wildfire that burns into the Community Wildfire Protection Plan area, a post-fire field assessment shall be conducted by an engineering geologist to identify any areas that may be subject to increased risk of post-fire flooding, landslide or erosion. Any recommendations identified by the geologist to mitigate such risk shall be implemented by the City.	SBFD	Following a wildfire

Appendix F

Glossary of Terms

BehavePlus: Fire behavior prediction and fuel modeling computer program designed to model fire behavior characteristics based on fuel, weather, and topographic inputs. Model outputs include flame length values, fire spotting potential, and rate of fire spread.

Biomass: Any plant material that can be used as an alternative energy source. Some plant materials used for biomass are wood wastes from forestry practices or brush from vegetation management projects.

Broadcast Burn: A prescribed burn method where fire is ignited to a defined project area. Vegetation in this method of burning is not piled but broadcast throughout the project area. Vegetation burned can either be cut or standing.

Brush: A collective term that refers to stands of vegetation dominated by shrubby, woody plants or low-growing trees; usually of a vegetation type undesirable for livestock or timber management.

Brush Fire: A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Burning Conditions: The state of the combined factors of the environment that affect fire behavior in a specified fuel type.

Canopy: The forest cover of branches and foliage formed by tree crowns. The stratum containing the crowns of the tallest vegetation present (living or dead), usually above 20 feet.

Chipping: Using a mechanical chipper to chip cut vegetation into small chips.

Closure: Legal restriction, but not necessarily elimination, of specified activities such as smoking, camping, or entry that might cause fires in a given area.

Combustible: Any material that, in the form in which it is used and under the conditions anticipated, will ignite and burn.

Conflagration: A raging, destructive fire. Often used to describe a fire burning under extreme fire weather. The term is also used when a wildland fire burns into a WUI, destroying structures.

Crown Fire: A fire that advances from top-to-top of trees or shrubs more or less independent of a surface fire.

Cured: The stage when herbaceous fuel moisture falls to 30% or less.

Defensible Space: An area either natural or man-made where material capable of allowing a fire to spread unchecked has been treated, cleared, or modified to slow the rate and intensity of advancing wildfire. This will create an area for housing increased emergency fire equipment, for evacuating or sheltering civilians in place, and a point for fire suppression to occur.

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles and leaves and immediately above the mineral soil.

Exotic Pest Plant: A non-indigenous plant species, or one introduced to this state that either purposefully or accidentally escapes into the wild where it reproduces on its own either sexually or asexually.

Exposure: (1) Property that may be endangered by a fire burning in another structure or by a wildfire; (2) direction in which a slope faces, usually with respect to cardinal directions; (3) the general surroundings of a site with special reference to its openness to winds.

Extreme Fire Behavior: A level of fire behavior characteristics that ordinarily precludes methods of direct control. One or more of the following is usually involved: high rates of spread, prolific crowning and/or spotting, presence of fire whirls, a strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environments and behave erratically, sometimes dangerously.

Fine Fuels: Fast-drying dead fuels that are less than 0.25-inch in diameter and are generally characterized by a comparatively high surface area to volume ratio. These fuels (grass, leaves, needles, etc.) ignite readily and are consumed rapidly by fire when dry.

Fire Behavior: The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Department: Any regularly organized fire department, fire protection district or fire company regularly charged with the responsibility of providing fire protection to the jurisdiction.

Fire Front: That part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, it is assumed to be the leading edge of the fire perimeter.

Fire Hazard: A fuel complex, defined by volume, type condition, arrangement, and location that determines the degree of ease of ignition and of resistance to control.

Fire Hydrant: A valved connection on a piped water supply system having one or more outlets that is used to supply hose and fire department pumpers with water.

Fire Ladders: Areas where vegetation allows fire to quickly transmit from grass to brush and then to the canopy of trees, producing a high intensity fire with less potential for fire control.

Fire Prevention: Activities, including education, engineering, enforcement, and administration that are directed at reducing the number of wildfires, the costs of suppression, and fire-caused damage to resources and property.

Fire Protection: The actions taken to limit the adverse environmental, social, political, and economic effects of fire. Protection is relative, not absolute.

Fire Regime: Periodicity and pattern of naturally occurring fires in a particular area or vegetative type, described in terms of frequency, biological severity, and area of extent.

Fire Retardant: Any substance, except plain water, that by chemical or physical action reduces flammability of fuels or slows their rate of combustion.

Fire Season: (1) Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management activities; (2) a legally enacted time during which burning activities are regulated by state or local authority.

Fire Triangle: Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

Fire Weather: Weather conditions which influence fire starts, fire behavior, or fire suppression.

Firebrand: Any source of heat, natural or human made, capable of igniting wildland fuels. Flaming or glowing fuel particles that can be carried naturally by wind, convection currents, or gravity into unburned fuels. Examples include leaves, pine cones, glowing charcoal, and sparks.

Firebreak: A natural or constructed barrier used to stop or check fires that may occur or to provide a control line from which to work.

Firefighter: A person who is trained and proficient in the components of structural or wildland fire.

Fireline: That portion of the fire upon which resources are deployed and actively engaged in suppression action. In a general sense, the working area around a fire.

Flame: A mass of gas undergoing rapid combustion, generally accompanied by evolution of sensible heat and incandescence.

Flammability: The relative ease with which fuels ignite and burn regardless of the quantity of the fuels.

Fuel Break: An area, strategically located for fighting anticipated fires, where the previously-occurring vegetation has been permanently modified or replaced so that fires burning into it can be more easily controlled. Fuel breaks divide fire-prone areas into smaller areas for easier fire control and to provide access for firefighting.

Fuel Loading: The volume of fuel in a given area generally expressed in tons per acre.

Fuel Model: Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

Fuel Modification: Any manipulation or removal of fuels to reduce the likelihood of ignition or the resistance to fire control.

Fuels: All combustible material within the WUI or intermix, including vegetation and structures.

Hazard: The degree of flammability of the fuels once a fire starts. This includes the fuel (type, arrangement, volume, and condition), topography, and weather.

High Value Resource: High Value Resources are natural or man-made resources, including plant and animal species, cultural resources, and residences that form the basis for fire management planning on the Property.

Ignition Time: Time between application of an ignition source and self-sustained combustion of fuel.

Invasive Plant Species: A plant species that is not native to the region and has demonstrated the ability to aggressively outcompete native plant species that would normally colonize a given area.

Ladder Fuels: Fuels that provide vertical continuity allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease.

Limbing: To remove the lower branches from trees, brush or shrubs in an area to reduce fire ladders. The root structure of the plants is not disturbed.

McLeod: A firefighting tool used for scraping soil and small roots, and grasses to construct fire line. The tool head is a large hoe approximately 12 inches wide, with one side a solid scraping blade for scraping soil and the other side with metal fingers for scraping vegetation but leaving soil.

Mosaic: To reduce the total volume of vegetation within an area by removing vegetation in a cluster or mosaic pattern.

Multicutting: A vegetation management method where cut vegetation is reduced in size by cutting vegetation into lengths no longer than 6 inches on length. Multicut vegetation is then left on site no greater than 12 inches in depth.

Overstory: That portion of the trees in a forest that forms the upper or uppermost layer.

Peak Fire Season: That period of the year during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

Pile Burn: A prescribed burn method where fire is ignited to individual piles within a project area. Vegetation in this method of burning is cut and piled into stacks within the project area and then burned.

Prescribed Burn: A wildland fire tool that uses the knowledgeable application of fire to a specific unit of land to meet predetermined fire and resource management objectives. Specific prescriptions for burning vegetation are developed for each area based on weather, topography, and fuel type.

Prescribed Fire: A fire burning within prescription. This fire may result from either planned or unplanned ignitions.

Protected Species: State- and federally-listed Endangered or Threated species of flora or fauna, and non-listed species otherwise protected by state and/or federal statutes.

Pruning: To selectively cut dead or live branches from trees, brush, or shrubs to reduce the total volume of flammable vegetation from a plant.

Pulaski: A firefighting tool used for digging out roots and soil to construct fire line. The head has one side with an axe blade and the other side with a hoe blade.

Rate of Spread (ROS): The speed at which a fire extends its horizontal dimensions, expressed in terms of distance per unit area of time. Generally thought of in terms of a fire's forward movement or head fire rate of spread.

Remote Automatic Weather Station (RAWS): A weather station at which the services of an observer are not required. A RAWS unit measures selected weather elements automatically and is equipped with telemetry apparatus for transmitting the electronically recorded data via radio, satellite or by a landline communication system at predetermined times on a user-requested basis.

Red Flag Warning Conditions: A **Red Flag Warning** is a forecast warning issued by the United States National Weather Service to inform area firefighting and land management agencies that conditions are ideal for wildland fire ignition and propagation. After drought conditions, and when humidity is very low, and especially when high or erratic winds that may include lightning are a factor, the Red Flag Warning becomes a critical statement for firefighting agencies, which often alter their staffing and equipment resources dramatically to accommodate the forecast risk.

Responsibility Area: That area for which a particular fire protection organization has the primary responsibility for attacking an uncontrolled fire and for directing the suppression action. Such responsibility may develop through law, contract, or personal interest of the fire protection agent. Several agencies or entities may have some basic responsibilities without being known as the fire organization having direct protection responsibility.

Riparian: An area of land adjacent to a stream, river, lake or wetland that contains vegetation that, due to the presence of water, is distinctly different from the vegetation of adjacent upland areas.

Sensitive Species: A plant or animal species with a special status listing from federal, state, or local regulatory agencies.

Slope: The variation of terrain from the horizontal; the number of feet rise or fall per 100 feet measured horizontally, expressed as a percentage.

Smoke: (1) The visible products of combustion rising above a fire; (2) term used when reporting a fire or probable fire in its initial stages.

Spotting: The ignition of unburned fuels ahead of the fire front as a result of ignition by firebrands. Spotting enhances the spread of wildfires.

Structure: A constructed object, usually a free-standing building above ground.

Structure Fire: Fire originating in and burning any part of all of any building, shelter, or other structure.

Suppression: The most aggressive fire protection strategy, it leads to the total extinguishment of a fire.

Surface Fuel: Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants.

Thinning: To reduce the total volume of trees, brush or shrubs within an area by completely cutting out dead and live plants from the area or to reduce the size or volume of an individual plant by cutting out dead and live branches.

Tree Crown: The primary and secondary branches growing out from the main stem, together with twigs and foliage.

Uncontrolled Fire: Any fire that threatens to destroy life, property, or natural resources and that (a) is not burning within the confines of firebreaks or (b) is burning with such intensity that it could not be readily extinguished with ordinary, commonly available tools.

Understory: Low-growing vegetation (herbaceous, brush or reproduction) growing under a stand of trees. Also, that portion of trees in a forest stand below the overstory.

Vegetation Management: The practice of reducing and/or rearranging both the green and dead biomass (vegetation) to reduce fire hazard, to reduce the potential damage associated with wildfire, and to improve environmental habitat. Vegetation management is synonymous with the term “vegetation or fuel reduction”. Many different vegetation management methods may be used to reduce and/or rearrange both green and dead biomass.

Vegetation Management Unit: Delineated property unit based on parcel, topography, vegetation or other features used for vegetation management planning.

Weed: A plant species that interferes with a desired management objective. This term does not denote the native or non-native status of a plant species. Both native and non-native plants have the ability to interfere, depending on the objective.

Wildfire/Wildland Fire: A fire occurring that burns through vegetation, either in the urban interface or undeveloped areas

Wildland: An area in which development is essentially nonexistent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

Wildland Urban Interface (WUI): The area where structures and other human developments meet or intermingle with undeveloped wildland.

Source: www.firewise.org, City of Santa Barbara 2004, NWCG 2020