DRAFT

Fire Protection Plan

Wine Country Specific Plan

NOVEMBER 2023

Prepared for:

CITY OF YUCAIPA
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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AMSL	Above Mean Sea Level
APN	Assessor's Parcel Number
BTU	British Thermal Unit
CAL FIRE	California Department of Forestry and Fire Protection
CBC	California Building Code
CFC	California Fire Code
CFPP	Construction Fire Prevention Plan
FAHJ	Fire Authority Having Jurisdiction
FMZ	Fuel Modification Zone
FPP	Fire Protection Plan
FRA	Federal Responsibility Area
FRAP	Fire and Resource Assessment Program
GIS	Geographic Information Systems
ISO	Insurance Service Office
YFD	Yucaipa Fire Department
MARB	March Air Reserve Base
MPH	miles per hour
NFPA	National Fire Protection Association
Project	Wine Country Specific Plan Project
SRA	State Responsibility Area
USGS	United States Geological Survey
VHFHSZ	Very High Fire Hazard Severity Zone
WRCC	Western Regional Climate Center
WUI	Wildland Urban Interface
YVWD	Yucaipa Valley Water District

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Executive Summary

This Fire Protection Plan (FPP) has been prepared for the Wine Country Specific Plan Project (Project), which proposes the development of home and estate lots and nonresidential areas for vineyards, trails, and open space. The Project site located in the City of Yucaipa, San Bernadino County, California.

The approximately 1,108-acre Project site is located in the northeastern portion of the City, which is located in southwestern San Bernardino County. The Project site is located at the base of the San Bernardino National Forest, north of Oak Glen Road and east of Fremont Street. The Project site is intersected by Jefferson Street running north to south, by Ivy Avenue and Carter Street in the northern portion of the Project site, and Fir Avenue in the southern portion of the Project site, all three of which run east to west. The proposed development will be situated on 75 parcels and will have multiple primary access points, including Jefferson Street, Ivy Avenue, and Carter Street in the northern portion of the Project site and Fir Avenue in the southern portion of the Project site.

The Project site is designated as a Very High Fire Hazard Severity Zone (VHFHSZ) by the California Department of Forestry and Fire Protection (CAL FIRE) (CAL FIRE 2007). Fire Hazard Severity Zones (FHSZ) designations are based on topography, vegetation, and weather, amongst other factors. The Project site is currently undeveloped, and predominantly comprised of non-native grasslands. Site elevations range from approximately 2,930 and 3,600 and gently slopes from the northern and eastern sides to the west. The Project area, like all of Southern California and San Bernardino County, is subject to seasonal weather conditions that can heighten the likelihood of fire ignition and spread, and, considering the site's terrain and vegetation, may result in a fast-moving and intense wildfire.

The FPP evaluates and identifies the potential fire risk associated with the Project's land uses and identifies requirements and recommendations for water supply, fuel modification and defensible space, access, building ignition and fire resistance, and fire protection systems, among other pertinent fire protection criteria. The purpose of this FPP is to generate and memorialize the fire safety requirements and standards of the Yucaipa Fire Department (YFD) along with Project-specific measures based on the Project site, its intended use, and its fire environment.

Fire service would be provided by the (YFD). As the Project has a 20 year buildout horizon, only the Project's Phase I population and number of calculated emergency calls were evaluated for their potential to impact YFD's response capabilities from its nearest existing stations. The addition of approximately 541 calls per year to YFD Station 1's 2,814 call volume is not anticipated to impact the existing fire stations to a point they could not meet demand. Although the closest existing fire station's response time would not conform to internal response time standards for all structures within the Project site, given the Project's fire safety features, including full NFPA 13 fire sprinklers, per code and the flexibility allowed by the response time 90 percent achievement rate, the response time is considered to be adequate.

As determined during the analysis of the Project site and its fire environment, in its current condition, the Project site may include characteristics that, under favorable weather conditions, could have the potential to facilitate fire spread. Under extreme conditions, wind-driven wildfires from the east/northeast may cast burning embers onto the property. Once the Project is built, the onsite fire potential will be lower than its current condition due to the conversion of ignitable fuels to ignition resistant landscapes and fire safety requirements that will be implemented. The proposed structures would be built using applicable ignition-resistant materials and construction methods

pursuant to the current code requirements at the time of construction, which are currently the locally amended 2022 California Fire Code and 2022 California Building Code. This would be complemented by:

- Ignition resistant landscapes,
- Perimeter fuel modification zone,
- Improved water availability, capacity, and delivery system,
- Project area firefighting resources,
- Fire department access throughout the developed areas,
- Monitored defensible space/fuel modification,
- Interior, automatic fire sprinkler systems in all structures,
- Monitored interior sprinklers in applicable structures,
- Fire response travel times based on County response guidelines, and
- Other components that would provide properly equipped and maintained structures with a high level of fire ignition resistance.

Post-wildfire assessments of saves and losses have revealed specifics of how structures and landscapes can be constructed and maintained to minimize their vulnerability to wildfire. Among the findings were:

- How construction materials and methods protect homes;
- How fire and embers contributed to ignition of structures;
- What effects fuel modification had on structure ignition;
- The benefits of fast firefighter response; and
- How much (and how reliable) water is available

These and other site-specific features were critically important to structure survivability. Following these findings over the last 20 years and continuing on an ongoing basis, the Fire and Building codes are revised, appropriately. The City of Yucaipa has adopted codes that focus on preventing structure ignition from heat, flame, and burning embers.

Fire risk analysis conducted for the Project resulted in the determination that wildfire has occurred and will likely occur near the Project area again, but the Project would provide ignition-resistant landscapes (drought-tolerant and low-fuel-volume plants) and ignition-resistant structures, along with defensible space as defined in this FPP. Based on modeling and analysis of the Project area to assess its unique fire risk and fire behavior, it was determined that the standard of 100-foot-wide fuel modification zones (FMZs) would help considerably to set the Project's structures back from adjacent fuels. Where the Project is unable to meet the full 100-foot FMZ, there will be enhanced construction features, as describe in detail in this FPP. The Project's FMZs would be maintained in perpetuity by the owners of each lot, the respective community HOA, or similarly responsible entity.

This FPP provides a detailed analysis of the Project, the potential wildfire risk, and potential impacts on the YFD, as well as analysis on meeting or exceeding City requirements. Further, this FPP provides requirements, recommendations, and measures to reduce the risk and potential impacts to acceptable levels.

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1 Introduction

The Fire Protection Plan (FPP) has been prepared for the proposed Wine Country Specific Plan Project (Project) in City of Yucaipa, San Bernardino County, California. The purpose of the FPP is to evaluate the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those risks to a level consistent with City of Yucaipa (City) thresholds. Additionally, this FPP establishes and memorialize the fire safety requirements of the Fire Authority Having Jurisdiction (FAHJ), which is the City of Yucaipa Fire Department (YFD). Requirements and recommendations detailed in the FPP are based on Project site-specific characteristics, applicable code requirements, and input from the Project's applicant, planners, engineers, and architects, as well as the FAHJ.

As part of the assessment, the FPP has considered the fire risk presented by the Project site including the property location and its topography, geology, surrounding combustible vegetation (fuel types), climatic conditions, fire history, and the proposed land use. The FPP addresses: water supply, access, structural ignitability, ignition resistive building features, fire protection systems, equipment, impacts to existing emergency services, defensible space, and vegetation management. The FPP also identifies fuel modification zones and recommends the types and methods of treatment that, when implemented and maintained, are designed to protect the Project's built assets and population. The FPP also recommends measures that the developer/builders will take to reduce the probability of structural and vegetation ignition.

The Project is located within the boundaries of the YFD and thus the FPP addresses YFD's response capabilities and response travel time within the Project area, along with projected funding for facility improvements and fire service maintenance.

The following tasks were performed during completion of this FPP:

- Gather site-specific climate, terrain, and fuel data;
- Collect site photographs[1];
- Process and analyze the data using the latest geographic information system (GIS) technology;
- Predict fire behavior using scientifically based fire behavior models, comparisons with actual wildfires in similar terrain and fuels, and experienced judgment;
- Analyze and guide the design of proposed infrastructure;
- Analyze the existing emergency response capabilities;
- Assess the risk associated with the Project site;
- Evaluate nearby firefighting and emergency medical response resources; and
- Prepare the FPP detailing how fire risk will be mitigated through a system of fuel modification, structural ignition resistance enhancements, and fire protection delivery system upgrades.

[1] Field observations were used to augment existing digital site data in generating the fire behavior models and formulating the recommendations presented in the FPP. Refer to Appendix A, Representative Site Photographs, for site photographs of existing site conditions.

1.1 Applicable Codes and Existing Regulations

The FPP demonstrates that the Wine Country Specific Plan Project will comply with applicable portions of Yucaipa Municipal Code, Section 15.04.115 and Ordinance 417, as amended, and adopted by reference the 2022 edition of the California Fire Code (CFC) (or current edition at the time of Project approval). Section 15.04.115 is hereafter referred to as the Yucaipa Fire Code. The Project will also be consistent with the 2022 California Building Code (CBC), Chapter 7A; 2022 edition of the California Fire Code (CFC), Chapter 49; and the 2018 edition of the International Fire Code (IFC), as amended. Further, the Project will comply with the 2019 California Residential Code, Section 327, and would also be subject to the provisions of Section 4291 of the Public Resources Code; Chapter 12-7A of the CA Reference Standards Code, Title 14, Division 1.5, Chapter 7, Subsection 2, Articles 1-5 and Title 14, Division 1.5, Chapter 7, Subsection 3, Section 1299 of the CA Code of Regulations; Title 19, Division 1, Chapter 7, Subchapter 1, Section 3.07 of the CA Code of Regulations; and Sections 51175-511829 of the CA Government Code. Additionally, based on the mitigation measures in the Wine Country Specific Plan Project EIR and Project design features, including this FPP, the Project is consistent with the October 2022 California Office of the Attorney General's "Best Practices for Analyzing and Mitigating Wildfire Impacts of Development Projects Under the California Environmental Quality Act.

Chapter 7A of the CBC addresses structural ignition resistance and reducing ember penetration into homes, a leading cause of structure loss from wildfires (California Building Standards Commission 2019). Thus, code compliance is an important component of the requirements of this FPP, given the Project's wildland-urban interface (WUI) location that is within an area statutorily designated as a Very High Fire Hazard Severity Zone (VHFHSZ) within a Local Responsibility Zone (LRA) by the California Department of Forestry and Fire Protection (CAL FIRE) (FRAP 2007), as depicted in Figure 1. The City's General Plan also includes the Project site as part of the Fire Safety Overlay Districts, as depicted in Figure 2.

Fire hazard designations are based on topography, vegetation, and weather, among other factors with more hazardous sites, including steep terrain, unmaintained fuels/vegetation, and WUI locations. Projects situated in VHFHSZ require fire hazard analysis and the application of fire protection measures to create ignition-resistant structures and defensible communities within these WUI locations. VHFHSZ designations do not, in and of themselves, indicate that it is unsafe to build in these areas. As described in the FPP, the Project would meet applicable code requirements for building in these higher fire hazard areas. These codes have been developed through decades of wildfire structure save and loss evaluations to determine the causes of building losses and saves during wildfires. The resulting fire codes now focus on mitigating former structural vulnerabilities through construction techniques and materials so that the buildings are resistant to ignitions from direct flames, heat, and embers, as indicated in the 2019 California Building Code (Chapter 7-A, Section 701A Scope, Purpose, and Application) (California Building Standards Commission 2019).

1.2 Project Summary

1.2.1 Location

The approximately 1,108-acre Project site is located in the northeastern portion of the City, which is located in southwestern San Bernardino County (Figure 3). The Project site is located at the base of the San Bernardino National Forest, north of Oak Glen Road and east of Fremont Street. The Project site is intersected by Jefferson Street running north to south, by Ivy Avenue and Carter Street in the northern portion of the Project site, and Fir Avenue in the southern portion of the Project site, all three of which run east to west. The Project site consists of

75 Assessor's Parcel Numbers and rights-of-way, as listed in Table 1. Specifically, the Project site is located in Sections 19, 20, 29, and 30, Township 1 South, Range 1 West, as depicted on the U.S. Geological Survey Yucaipa and Forest Falls, California 7.5-minute topographic quadrangle maps. Regional access to the Project site is provided via Oak Glen Road, Carter Street, and Jefferson Street.

Table 1. Project Site Assessor's Parcel Numbers

Accessor's Parcel Number						
032023101	032025119	032025135	032103112	032103139	032104110	032109103
032023102	032025120	032025136	032103114	032103144	032104111	032109104
032023103	032025121	032025137	032103115	032103149	032104112	032109105
032023109	032025123	032025138	032103116	032103150	032104113	032109106
032023110	032025124	032025156	032103118	032103151	032104114	032110101
032024103	032025125	032025157	032103120	032103152	032104115	032110102
032024104	032025130	032025158	032103121	032103153	032108113	032110112
032024112	032025131	032103102	032103124	032104105	032108114	032110125
032024113	032025132	032103107	032103126	032104107	032108115	032110126
032025106	032025133	032103108	032103128	032104108	032108214	-
032025108	032025134	032103111	032103130	032104109	032109101	-

1.2.2 Project Description

The proposed Project would subdivide the Project site into home and estate lots and nonresidential areas for vineyards, trails, and open space.

As shown in Figure 2A, Land Use Plan I, and Figure 2B, Land Use Plan II, approximately half of the site is proposed for residential uses (547.4 acres) and half of the site is proposed for non-residential uses (546.2 acres). The proposed nonresidential land use designations include agricultural use (465.5 acres), avoided open space (73.6 acres), and public service use by Yucaipa Valley Water District (7.1 acres). The Project will be built in five phases, as shown in Figure 2C, Project Phases. For the purposes of this report, analysis is discussed by phase number in relation to the Wilson Creek Estates – Wine Country, which occupies most of Phase 1 of the proposed Project.

Residential Use

The Project would allow maximum of 1,091 residential units, which is the same total units permitted under the existing General Plan. The residential units are classified as either "Villas" or "Estates." The Villas would comprise 629 lots with a maximum buildout density of approximately 4.6 dwelling units per acre and a net loss size of 10,000 square feet. The maximum building footprint permitted is 50% of the lot area. The Villas would be within the interior of the Specific Plan area, connected by trails and open space areas separating the residences from vineyards. The Estates would consist of 462 half-acre lots with a maximum buildout density of 2 dwelling units per acre. The maximum building footprint permitted is 40% of the lot area. The maximum allowed building height for Villas and Estates is 35 feet, not exceeding two stories, consistent with existing land use designation.

Agricultural Use

The land designated for agriculture would be used for vineyards and wineries. It is anticipated that 346 acres would be used for vineyards that have no on-site wine production, and 120 acres would be for wineries that include ancillary production and commercial uses that support the vineyards. The Project anticipates a total of 26 wineries varying in sizes and on-site accessory buildings. For each category of winery, the accessory buildings and accessory uses would not occupy more than 25% of the gross lot area, with a minimum of 75% of the lot used for vineyards.

Public Service Use

The land designated for public service use consists of property owned by Yucaipa Valley Water District. Permitted land uses within this area include natural channels, levees, spreading grounds, detention basins, roads, trails, culverts, and diversion drainages; natural preserves and mitigation areas, including habitat restoration; and wildlife nature preserves, water bodies, general recreation, leisure, and ornamental parks open to the general public. The land also has a conditional use permit for public utilities and public services or use structures.

Avoided Open Space

In addition to the wineries and vineyards, the Project includes a 73.6-acre open space area along Wilson Creek that would provide recreational activities and passive open space. Preservation of this open space would require dedication of property to the City. Dedication would allow the City to maintain and preserve these areas. Permitted land uses within this area include publicly owned restroom and parking areas; natural channels, levees, spreading grounds, detention basins, roads, trails, culverts, and diversion drainages; and wildlife nature preserves, water bodies, general recreation, leisure, and ornamental parks open to the general public.

Circulation Plan

Oak Glen Road and Jefferson Street would continue to provide connectivity to the Project site. Development in the area would also continue to be supported by Ivy Avenue and Carter Street; new connections from all existing streets would create a complete roadway network supporting both neighborhoods and wineries. The goal is to maintain modest roadways with low traffic volumes and leisurely traffic speeds that allow travelers to enjoy the scenic, rural setting of the Project site and minimize chances of vehicle collisions with local wildlife.

Oak Glen Road is a two-lane city-designated scenic corridor that would serve as the primary access to the Project site. Oak Glen Road would accommodate two car lanes and a Class II bike lane. A 150-foot setback would be required along that roadway for any structure on an agriculture/winery property that has frontage to Oak Glen Road. Oak Glen Road is also a City-designated truck route that delivers goods and materials to and from Yucaipa.

Jefferson Street is an existing unpaved rural road. Roadway widening and improvement would be necessary for buildout of the Project site. Jefferson Street would be developed as a two-lane road with Class III bike access. A 100-foot setback would be required for any structure on an agriculture/winery property adjacent to Jefferson Street.

Carter Street is a paved one-lane rural roadway that provides east to west access between Bryant Street and the Bears Den Ranch. It would be developed as a two-lane roadway with Class III bike access. A 100-foot setback would be required for any structure on an agriculture/winery property adjacent to Carter Street.

Residential streets would provide direct access to future neighborhoods and individual properties. A typical street section consists of two drive lanes with a 55-foot right-of-way. At a minimum, the street would have a 5-foot sidewalk on one side. To maintain the rural character of the roadways, curbs and gutters are generally discouraged. The exact location of future residential streets would be determined during the tentative tract map phase of development.

Trails

The Project proposes 12-foot-wide multipurpose trails along Oak Glen Road, Jefferson Street, Carter Street, and Wilson Creek within the avoided open space. The multipurpose trails provide connectivity within the plan area and between the plan area and the adjacent residential neighborhoods. Neighborhoods with direct access to the proposed trails would provide at least one point of public access to the trails. Trails will correspond with existing pathways that intersect the Project site. The new trail connections would also provide connections to existing park facilities, including El Dorado Ranch Park, Yucaipa Regional Park, Yucaipa Community Park, and Wildwood Canyon State Park.

Landscaping

Landscaping is a critical component of developing an appealing community and can enhance curb appeal by introducing variations of color and texture to lawn areas, conserve water, provide shade to help cool down the ambient temperature, and reduce noise and improve the overall safety of roadways by providing tree-lined streets. Design considerations include the following:

- The use of drought tolerant plant material and water conservation elements such as on-site water retention
- Planted areas that include a mixture of colors from flowering and showy plants and shrubs, as well as similar trees used as accents
- Deciduous street trees intermixed with evergreen trees, such as pine and cedars consistent with those found in the Yucaipa foothills, complementing the fall colors of vineyards
- New landscaping that enhances the Deodar cedar (*Cedrus deodara*) trees, which are a defining feature of the area
- Detention basins within neighborhoods that integrate into the overall grading and are designed to appear as a natural drainage channel, with surrounding landscaping that ties into the neighborhood design

Lighting

The following lighting considerations are included in the design guidelines for the Project:

- Cutoff lighting fixtures shall be mounted parallel to the ground and located, aimed, and shielded to direct light only onto buildings or walkways and not toward adjacent roads or residences.
- Light fixtures shall be architecturally compatible with the building design.
- Building lighting should be used to help accentuate the building design at night, highlighting any key architectural details on the building façade.
- If Project elements, such as signs, walls, and trees, are lit, downlighting is encouraged. Lighting sources should be hidden unless the sources are an integral part of the design.
- Exterior lighting that has a color temperature of no more than 3000 Kelvin is encouraged to limit potential nighttime glare.
- Lighting should be used to enhance the safety of pedestrians and others using the Project trails.
- Outdoor security lighting shall not project above the roofline of the building on which is it mounted.

- Where applicable, time-control and other energy-saving devices should be used with exterior lighting.

Utilities and Infrastructure

The proposed Project will include potable water, sewer, and stormwater infrastructure, as well as other future public utilities.

Construction and Project Phasing

An approximate 20-year development schedule is anticipated for the 1,091 homes to proceed in five phases: (1) 313 dwelling units, (2) 37 dwelling units, (3) 316 dwelling units, (4) 197 dwelling units, and (5) 228 dwelling units. The Project would strive for a 50/50 split of vineyards and open space (nonresidential) to residential land per phase. Development is recommended to begin in areas closest to Oak Glen Road in year one, followed by sequential areas, as shown in Figure 2C.

Wilson Creek Estates Residential Subdivision Project In 2016 the City of Yucaipa City Council approved the Wilson Creek Estates Residential Subdivision Project, a Phased Tentative Tract Map (TTM 19974) to subdivide approximately 236 gross acres into 184 single-family lots each with a minimum lot size of 1 gross acre, with two additional "Not A Part" lots for an existing private residence (Casa Blanca Ranch) and water tank/pump station site owned and operated by the Yucaipa Valley Water District. The Final EIR was certified in 2016 (AECOM 2016) and therefore is considered a part of the environmental baseline of this document.

Since certification, a revised tentative tract map has been submitted to the City that is expected to be consistent with the proposed Project. The revised tentative tract map is depicted in Figure 2D and includes a manufactured lake, a water quality control basin, lots for future agricultural use, improvements to Jefferson Street, and trails through open space that line up with existing trails on the Project site. The revised tentative tract map partially overlaps Phase 1 of the proposed Project and will be referred to as "Wilson Creek Estates – Wine Country" or "the Wilson Creek Estates – Wine Country area" within this document.

1.2.3 Current Land Use

The Project area sits at the foothills of the San Bernardino National Forest and predominantly encompasses undeveloped open space that is intersected by incised drainages and numerous dirt roads. The northern, western, and southern portions of the Project area abut residential and commercial development. To the east is El Dorado Ranch Park, and active agricultural operations occur to the west of the Project area. Most of the study area burned in 2020 during the El Dorado Fire and vegetation is still recovering. The fire burned much of the native vegetation throughout the Project site. This has led to a dominance of non-native herbaceous species and allowed for other fire-following species to colonize the Project site.

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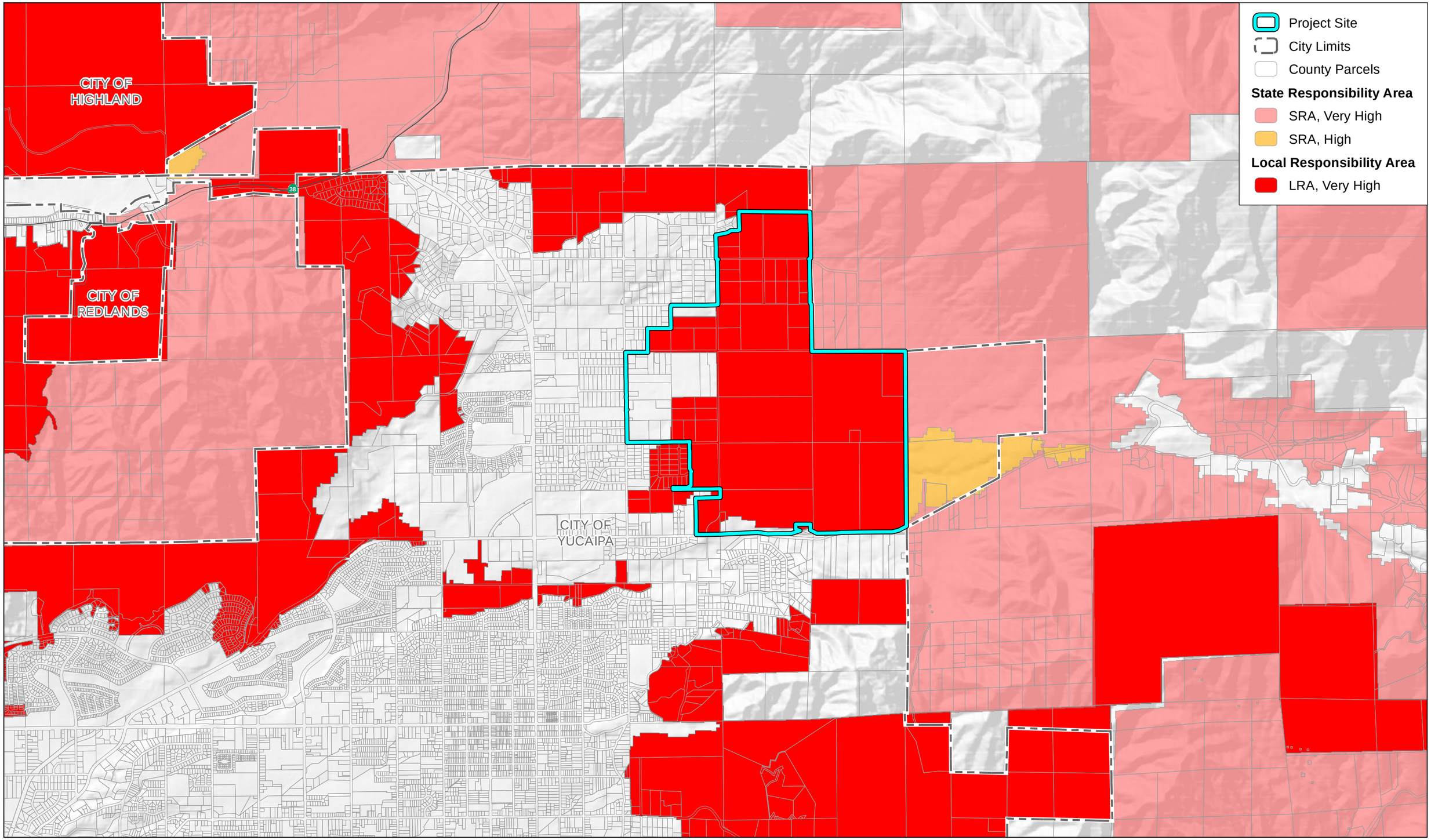

Document Path: Z:\Projects\Yucaipa_WineCountrySpecificPlan\MAPDOC\DOCUMENT\FRE\Figure 4 CALFIRE Fire Hazard Severity Zone.mxd

SOURCE: PARCELS- RIVERSIDE COUNTY GIS; FIRE DATA- CALFIRE

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0 2,000 4,000 Feet

FIGURE 4

Fire Hazard Severity Zones - CAL FIRE

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

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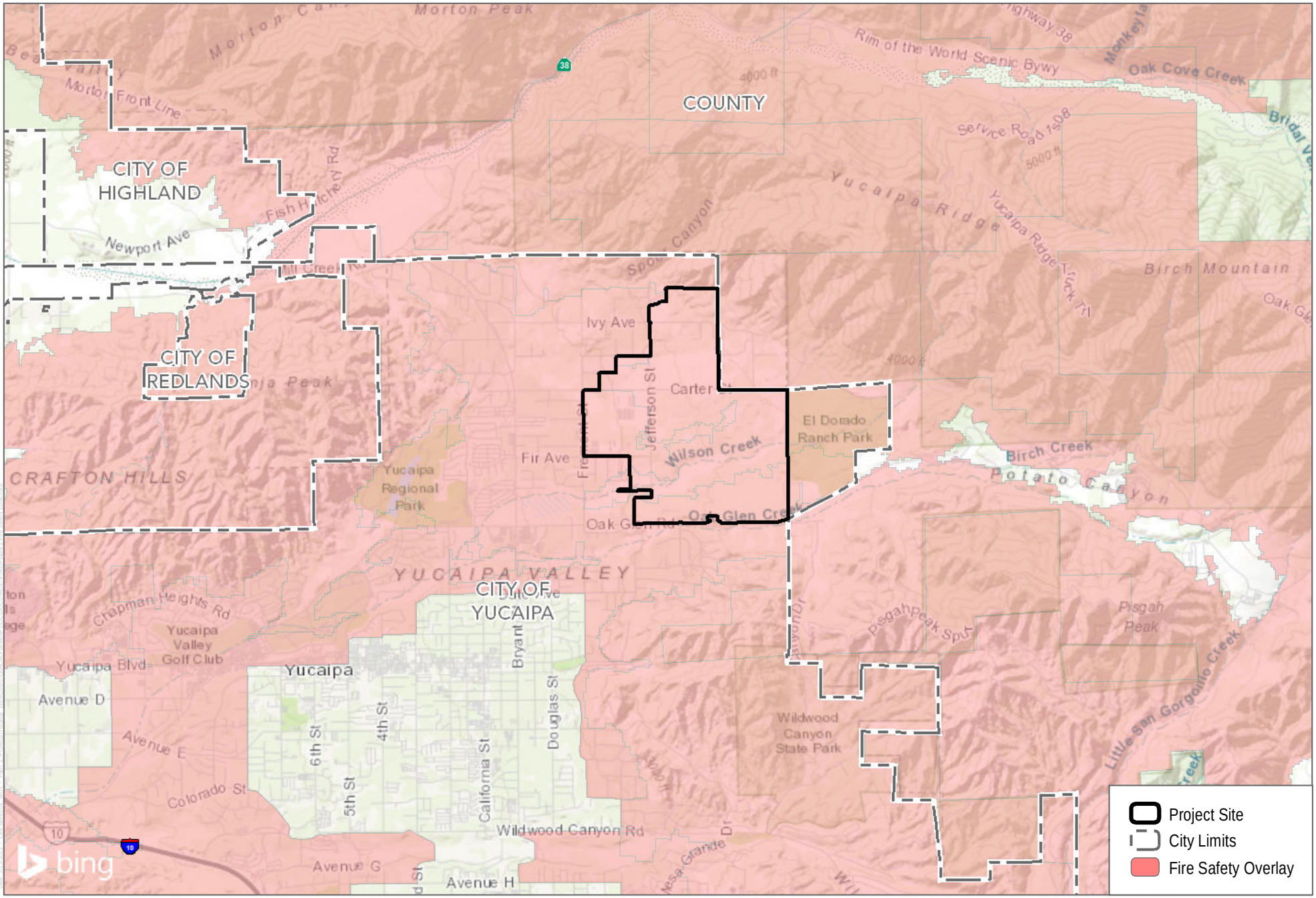

SOURCE: ESRI; County of San Bernardino; City of Yucaipa

FIGURE 2

Fire Safety Overlay

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

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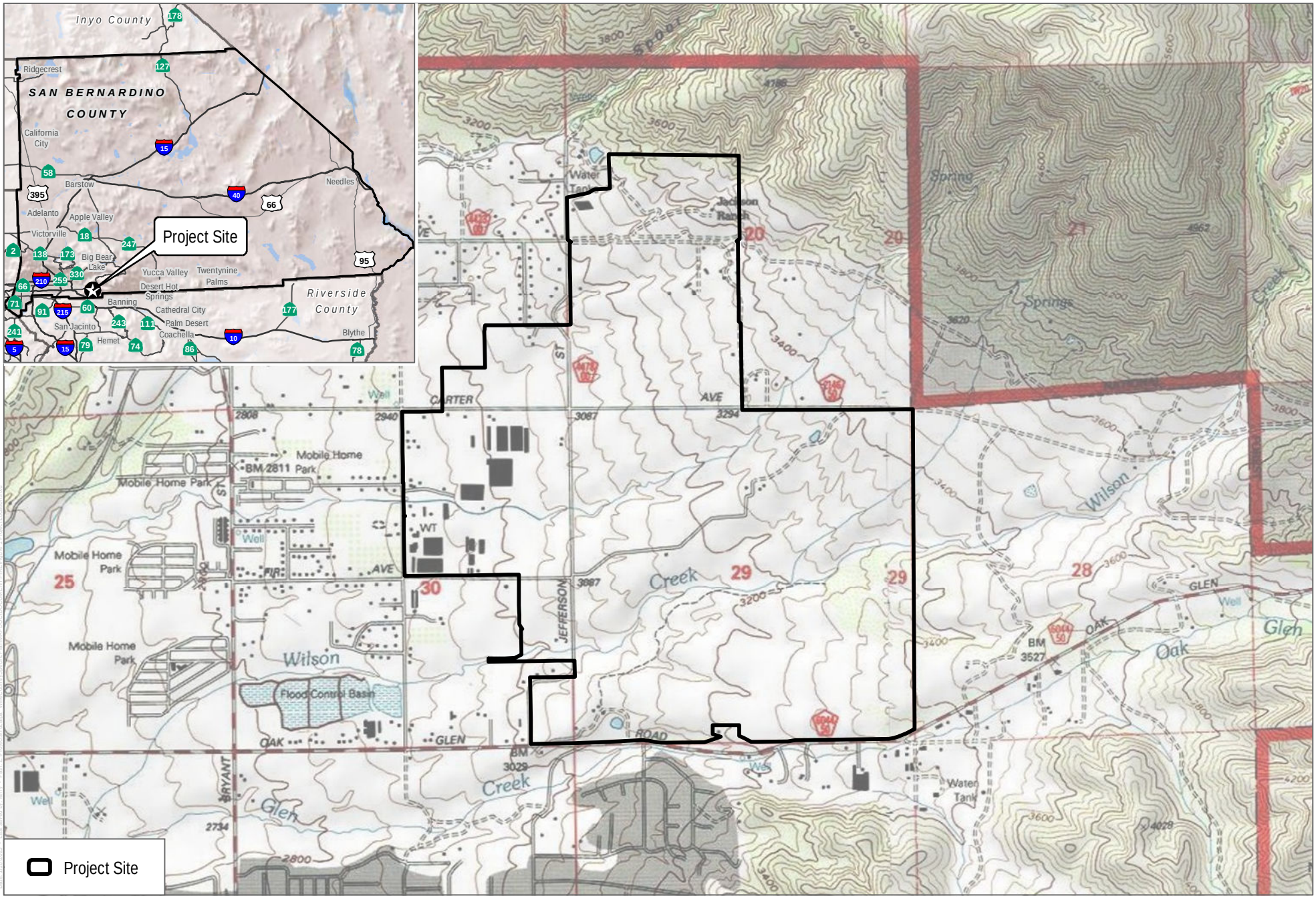

SOURCE: USA Topo Maps 7.5 Minute Series Yucaipa and Forest Falls Quadrangle
Township 1S; Range 1W; Section 19-21, 28-32

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FIGURE 1

Project Location

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

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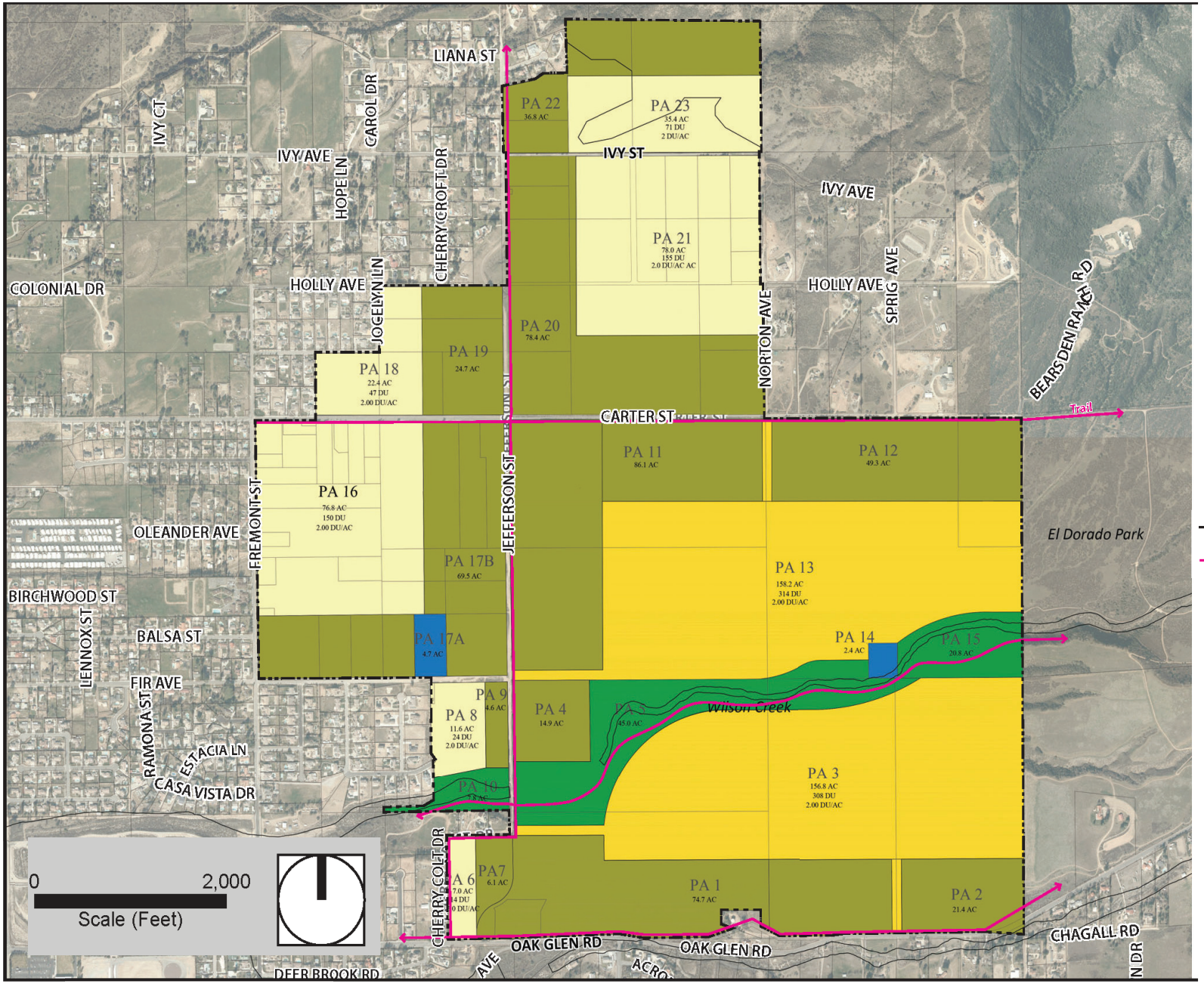

Color	Land Use	Acres
	Agriculture	465.5
	Riparian Area	73.6
	Water District	7.1
	Estates	232.4
	Villas	315.0
	Total	1093.6

Land Use	Acres
Residential Total	547.4
Non-Residential Total	546.2
Grand Total	**1093.6**

SOURCE: Placeworks 2022

FIGURE 2A

Land Use Plan I

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SOURCE: Placeworks 2022

FIGURE 2B

Land Use Plan II

Yucaipa Valley Wine Country Specific Plan Biological Resources Technical Report

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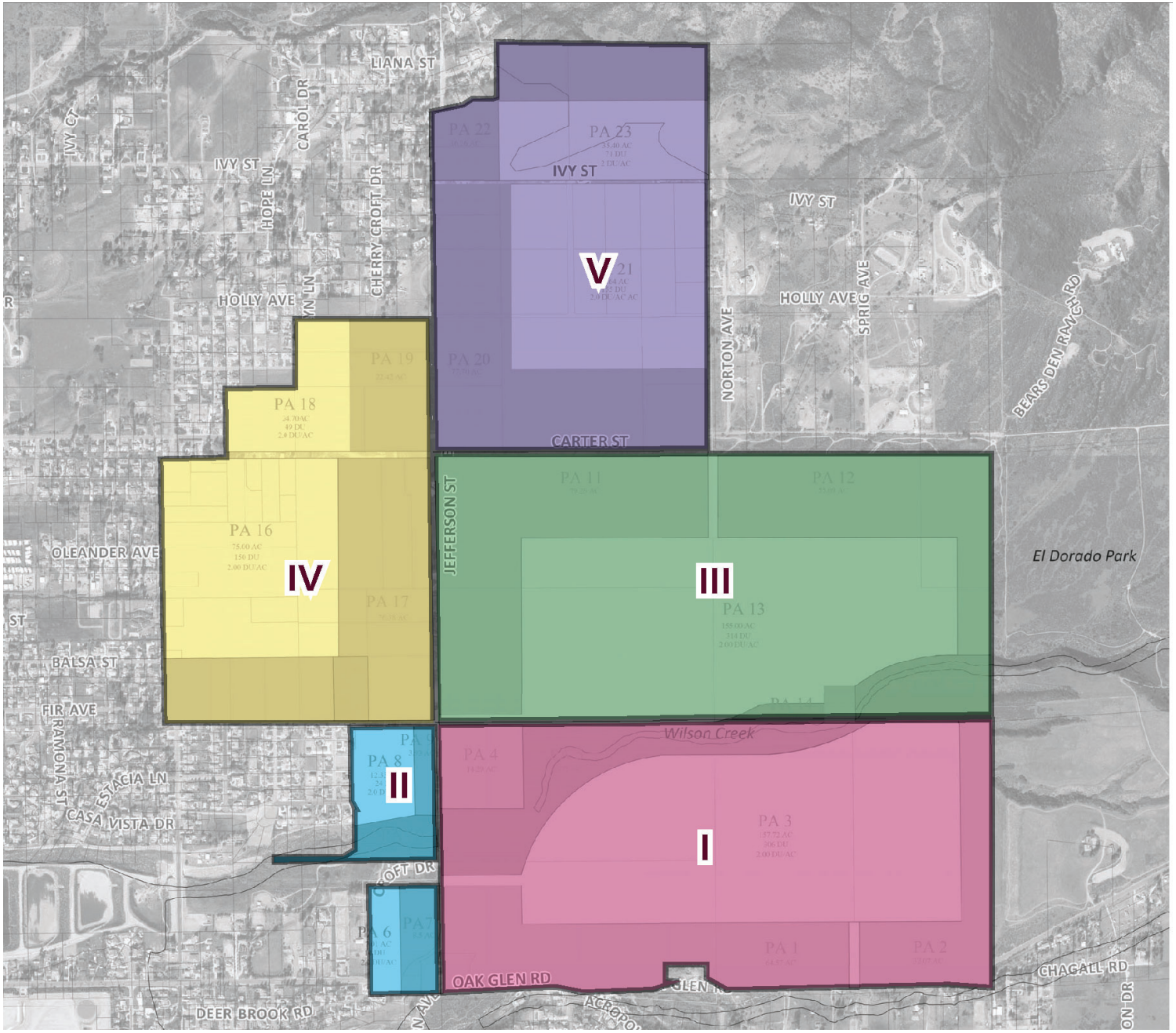

SOURCE: Placeworks 2022

FIGURE 3

Project Phases

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

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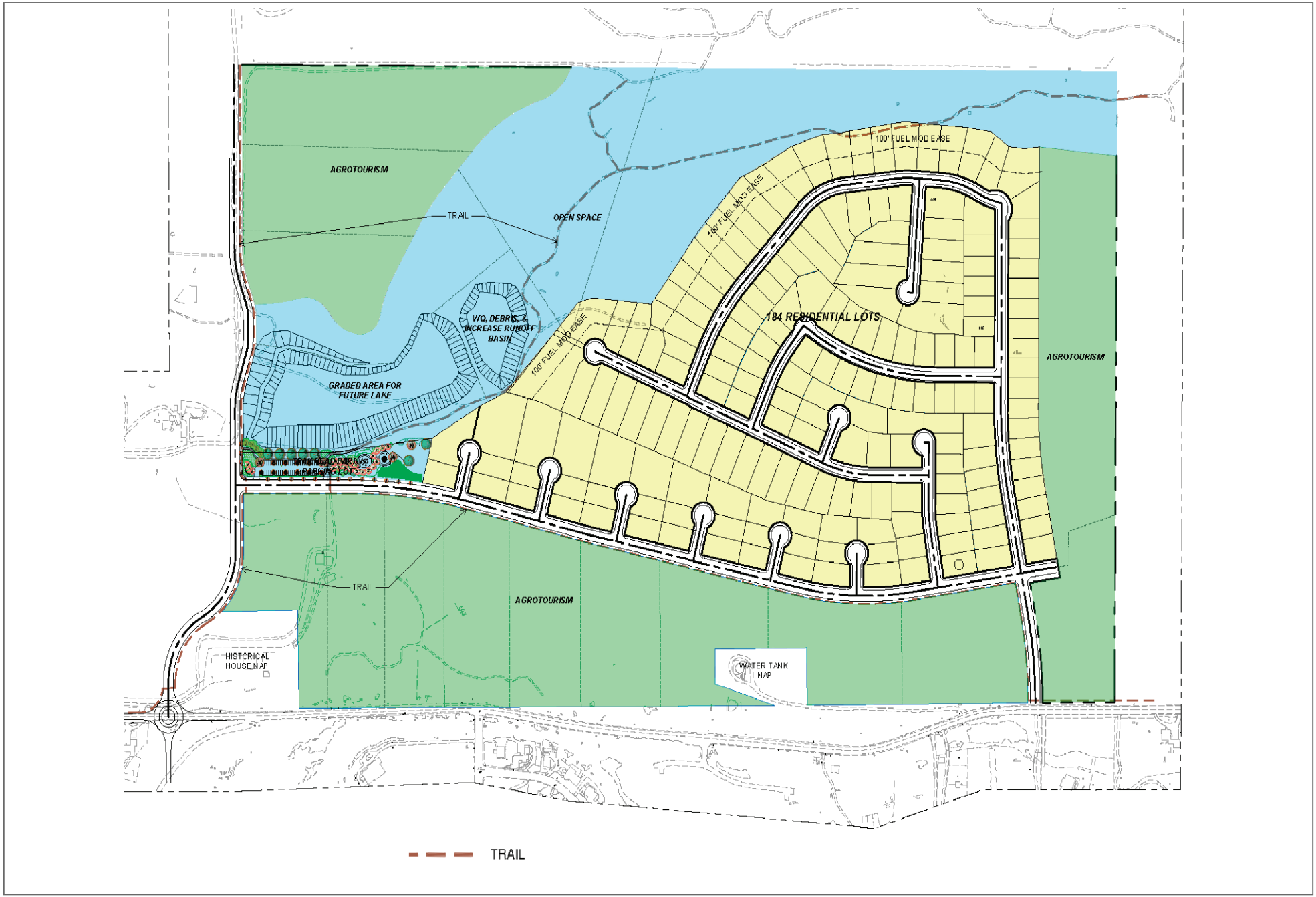

SOURCE: Epic Engineers 2022

FIGURE 2A

Wilson Creek Estates Site Plan

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

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2 Project Site Risk Analysis

2.1 Environmental Setting and Field Assessment

After review of available digital Study Area information, including topography, vegetation types, fire history, and the Project's Development Footprint, a Dudek Fire Protection Planner conducted a Project site evaluation on August 19, 2022, in order to confirm/acquire Project site information, document existing site conditions, and to determine potential actions for addressing the protection of the Project's structures. While on-site, Dudek's Fire Planner assessed the area's topography, natural vegetation, and fuel loading, surrounding land use, and general susceptibility to wildfire. Among the field tasks that were completed included:

- Topography evaluation;
- Vegetation/fuel assessments;
- Photograph documentation of the existing condition;
- Confirmation/verification of hazard assumptions;
- Off-site, adjacent property fuel and topography conditions;
- Surrounding land use confirmations;
- Necessary fire behavior modeling data collection;
- Ingress/egress documentation;
- Nearby Fire Station reconnaissance.

Study Area photographs were collected (refer to Appendix A, *Representative Site Photographs*), and fuel conditions were mapped using aerial images. Field observations were utilized to augment existing site data in generating the fire behavior models and formulating the requirements and recommendations detailed in the FPP.

2.2 Site Characteristics and Fire Environment

Fire environments are dynamic systems and include many types of environmental factors and site characteristics. Fires can occur in any environment where conditions are conducive to ignition and fire movement. Areas of naturally vegetated open space are typically comprised of conditions that may be favorable to wildfire spread. The three major components of the fire environment are topography, vegetation (fuels), and climate. The state of each of these components and their interactions with each other determines the potential characteristics and behavior of a fire at any given moment. It is important to note that wildland fire may transition to urban fire if structures are receptive to ignition. Structure ignition depends on a variety of factors and can be prevented through a layered system of protective features including fire-resistive landscapes directly adjacent to the structure(s), application of known ignition resistive building materials and methods, and suitable infrastructure for firefighting purposes. Understanding the existing wildland vegetation and urban fuel conditions on and adjacent to the site is necessary to understand the potential for fire within and around the Project site.

The following sections discuss the characteristics of the Project area and the surrounding region. The intent of evaluating conditions at a macro-scale provides a better understanding of the regional fire environment, which is not constrained by property boundary delineations.

2.2.1 Topography

Topography influences fire risk by affecting fire spread rates. Typically, steep terrain results in faster fire spread up-slope and slower spread down-slope. Terrain that forms a funneling effect, such as chimneys, chutes, or saddles on the landscape can result in especially intense fire behavior. Conversely, flat terrain tends to have little effect on fire spread, resulting in fires that are driven by vegetation and wind.

The foothills of the San Bernardino National Forest lie to the north and east of the Project area. West and south of the Project area is comprised of the City. The Project area's surface elevation ranges between approximately 2,930 and 3,600 feet above mean sea level (amsl) and gently slopes from the northern and eastern sides to the west. Drainages concentrated within the study area follow this pattern.

Topographic features that may facilitate fire spread are the slope and canyon alignments, which may serve to funnel or channel winds, thus increasing their velocity and potential for influencing wildfire behavior. From a regional perspective, the alignment of tributary canyons and dominant ridges is conducive to channeling and funneling wind, thereby increasing the potential for more extreme wildfire behavior in the region.

2.2.2 Climate

The Project area, like much of Southern California, is influenced by the Pacific Ocean and a seasonal, migratory subtropical high-pressure cell known as the "Pacific High." Wet winters and dry summers with mild seasonal changes characterize the Southern California climate. This climate pattern is occasionally interrupted by extreme periods of hot weather, winter storms, or dry, easterly Santa Ana winds. The average high temperature for the Project area is approximately 75.6°F, with an average temperature in the summer and early fall months (June-September) of 86°F. July and August are typically considered the hottest months of the year. The area is considered to be a semi-arid climate. Annual precipitation typically averages approximately 8 inches annually with the wettest months being January and February (Weather Spark, 2022).

From a regional perspective, the fire risk in southern California can be divided into three distinct "seasons" (Nichols et al. 2011, Baltar et al 2014). The first season, the most active season and occurring during the summer months, extends from late May to late September. This is followed by an intense fall season characterized by fewer but larger fires. This season begins in late September and continues until early November. The remaining months, November to late May occur during the mostly dormant, winter season. Mensing et al. (1999) and Keeley and Zedler (2009) found that large fires in the region consistently occur at the end of wet periods and the beginning of droughts. Typically, the highest fire danger in southern California coincides with Santa Ana winds. The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis near the end of fire season during late summer and early fall. They are dry, warm winds that flow from the higher desert elevations in the east through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Localized wind patterns on the Project site are strongly affected by both regional and local topography.

2.2.3 Vegetation

The Project site is currently undeveloped, and due to historical agricultural activities and the El Dorado Fire in the Project area, grass- and herb-dominated vegetation communities are predominate. The remaining vegetation includes burned communities in post-fire recovery and special-status vegetation communities. These communities

include Palmer's goldenbush scrub, white sage scrub, California sycamore woodlands, basket bush–river hawthorne–desert olive patches, and scale broom scrub. The vegetation cover types were assigned a corresponding fuel model for use during site fire behavior modeling. Section 3.0 describes the fire modeling conducted for the Project area.

Extensive vegetation type mapping is useful for fire planning because it enables each vegetation community to be assigned a fuel model, which is used to predict fire behavior characteristics, as discussed in Section 3.1, Fire Behavior Modeling. The Project site surface conditions generally consist of unimproved earthen terrain, with mostly low-load native grasses and grass-shrub vegetation communities. The area proposed for development and within the Project grading limits will be converted to ignition resistant landscapes, roads, structures, and landscaped vegetation following Project completion. Vegetative fuels within proposed fuel modification zones will be removed or structurally modified as a result of development, altering their current structure and species composition, irrigation and maintenance levels, resulting in a perimeter wildfire buffer.

Post-development vegetation composition proximate to the Project footprint is expected to be significantly different than current conditions. Following build-out, irrigated and thinned landscape vegetation associated with fuel modification zones (FMZ) A, B and C would be located in the immediate area surrounding the Project Site, extending up to 100 horizontal feet from each of the structures. Typical FMZ is 100 feet wide; however, it is possible that some portions of the Project site may not meet the full 100-foot FMZ, and structures in these areas will receive code-exceeding, structural ignition resistive enhancements. Native and naturalized vegetation occurring within FMZ Zone C is not expected to be irrigated, although overall fuel volumes will be reduced by removing dead and dying plants, non-natives, and highly flammable species, along with thinning the remaining plants so they would not readily facilitate fire spread. To comply with YFD requirements, the designated FMZ areas along with the site-wide landscaped areas, will be maintained on an ongoing basis.

2.2.3.1 Vegetative Fuel Dynamics

The vegetation characteristics described above are used to model fire behavior, discussed in Section 3.0 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species express increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (bark thickness, leaf size, branching patterns), and overall fuel loading. For example, non-native grass-dominated plant communities become seasonally prone to ignition and produce lower intensity, higher spread rate fires. In comparison, sage scrub can produce higher heat intensity and higher flame lengths under strong, dry wind patterns, but does not typically ignite or spread as quickly as light, flashy grass fuels.

As described, vegetation plays a significant role in fire behavior, and is an important component of fire behavior models discussed in the report. A critical factor to consider is the dynamic nature of vegetation communities. Fire presence and absence at varying cycles or regimes disrupts plant succession, setting plant communities to an earlier state where less fuel is present for a period of time as the plant community re-initiates its succession process. In summary, high-frequency fires tend to convert shrublands to grasslands or maintain grasslands, while fire exclusion tends to convert grasslands to shrublands, over time. In general, biomass and associated fuel loading will increase over time, assuming that disturbance (fire, or grading) or fuel reduction efforts are not diligently implemented. It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed fuel modification zones on-site. The Project's FMZs will consist of irrigated and maintained landscapes as well as thinned native fuel zones that will be subject to regular "disturbance" in the form of maintenance and will not be allowed to accumulate

excessive biomass over time, which results in reduced fire ignition, spread rates, and intensity. Vineyards are one example of this type of landscape that with proper maintenance can act as a fuel break given the limited understory growth of vegetation both under and between the rows of vines. Conditions adjacent to the Project's footprint (outside the fuel modification zones), where the wildfire threat will exist post-development, are classified as low to moderate fuel loads. Vegetation distribution throughout the Project site varies by location and topography. Areas, where the Project's Development Footprint is located, are primarily surrounded by low flame length producing grasslands.

It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed FMZs for the Project site. The FMZs will consist of irrigated and maintained landscapes that will be subject to regular "disturbance" in the form of maintenance and will not be allowed to accumulate excessive biomass over time, which results in reduced fire ignition, spread rates, and intensity.

2.2.4 Fire History

Fire history is an important component of a site-specific FPP. Fire history data provides valuable information regarding fire spread, fire frequency, ignition sources, and vegetation/fuel mosaics across a given landscape. One important use for this information is as a tool for pre-planning. It is advantageous to know which areas may have burned recently and therefore may provide a tactical defense position, what type of fire burned on the Project site, and how a fire may spread.

Fire history represented in the FPP uses the California Department of Forestry and Fire Protection (CAL FIRE) Fire and Resource Assessment Program (FRAP) database. FRAP summarizes fire perimeter data dating to the late 1800s, but which is incomplete due to the fact that it typically only includes fires over 10 acres in size and has incomplete perimeter data, especially for the first half of the 20th century (Syphard and Keeley 2016). However, the data does provide a summary of recorded fires and can be used to show whether large fires have occurred in the Project area, which indicates whether they may be possible in the future.

According to available data from the CAL FIRE in the FRAP database, one hundred and thirteen (113) fires have burned within 5 miles of the Project site since the beginning of the historical fire data record (CAL FIRE 2021). Recorded wildfires within 5 miles range from approximately 6 acres to approximately 51,655 acres (1970 Bear Fire) and the average fire size is approximately 1,648 acres. The 2020 Apple Fire (approximately 33,236 acres) and 2020 El Dorado Fire (approximately 22,504 acres) are the most recent fires within a 5 -mile radius of the Project site. Six fires have burned on the Project site, which include the 1924 Unnamed Fire, 1948 Unnamed Fire, 1950 Unnamed Fire, 1988 Unnamed Fire, 1992 Unnamed Fire, and the most recent 2020 El Dorado Fire. Yucaipa Fire Department or San Bernardino County Fire Department may have data regarding additional smaller fires (less than 10 acres) that have occurred on-site that have not been included herein. Fire history for the general vicinity of the Project site is illustrated in Appendix B, Fire History Map.

Based on an analysis of the fire history data set, specifically, the years in which the fires burned, the average interval between wildfires within 5 miles of the Project site was calculated to be one year with intervals ranging between 0 (multiple fires in the same year) to 13 years. Based on the analysis, it is expected that there will be wildland fires within 5 miles of the Project site at least every 13 years, and on average every one years, as observed in the fire history record. Based on fire history, wildfire risk for the Project site is associated primarily with a Santa Ana wind-driven wildfire burning or spotting on-site from the north or east, although a fire approaching from the south during more typical on-shore weather patterns is possible.

2.2.5 Fire Protection Features' Beneficial Effect on Wildfire Ignition Risk Reduction

Each of the fire protection features provided as part of the code requirements or customized for this Project are based on the FPP's evaluation results. These features also have a similar positive impact on the minimization of the potential for wildfire ignitions caused by the Project and its employees and visitors to spread off-site into preserved areas by providing:

1. Ignition resistant, planned and maintained landscape – all Project site landscaping of common areas and fuel modification zones will be subject to strict plant types that are lower ignition plants with those closest to structures requiring irrigation to maintain high plant moistures which equates to difficult ignition. These areas are closest to structures, where ignitions would be expected to be highest, but will be prevented through these ongoing maintenance efforts.
2. Fuel Modification Zone – the FMZ, which would be 100 feet includes specifically selected plant species, very low fuel densities (only 30% retention of native plants in outer zones and irrigated inner zones), and ongoing maintenance, resulting in a wide buffer between the developed areas and the off-site native fuels.
3. Annual FMZ inspections – the developer shall have a contracted, 3rd party, YFD-approved FMZ inspector perform two inspections per year to ensure that FMZs are maintained in a condition that is consistent to the County's and FPP's requirements and would provide a benefit of a wide barrier separating wildland fuels from on-site ignitions.
4. Ignition resistant structures – all structures will be built to the Chapter 7A (CBC) ignition resistant requirements that have been developed and codified as a direct result of after fire save and loss assessments. These measures result in structures that are designed, built and maintained to withstand fire and embers associated with wildfires. It must be noted that the wide FMZs would not result in wildfire directly next to these structures. Structures can be built in the HFHSZs and WUI areas when they are part of an overall approach that contemplates wildfire and provides design features that address the related risk. A structure within a HFHSZ that is built to these specifications can be at lower risk than an older structure in a non-fire hazard severity zone. The ignition resistance of on-site structures would result in a low incidence of structural fires, further minimizing potential for Project-related wildfires.
5. Interior fire sprinklers – commercial sprinklers are designed to provide additional time for occupants to escape the structures. Sprinklers in commercial structures are also designed to provide structural protection. The common benefit of fire sprinklers is that they are very successful at assisting responding firefighters by either extinguishing a structural fire or at least, containing the fire to the room of origin and delaying flash over. This benefit also reduces the potential for an open space vegetation ignition by minimizing the possibility for structure fires to grow large and uncontrollable, resulting in embers that are blown into wildland areas. This is not the case with older existing structures in the area that do not include interior sprinklers.
6. Fire access roads – roads provide access for firefighting apparatus. Project roads provide code-consistent access throughout the community, including at least two points of ingress/egress. Better access to wildland areas may result in faster wildfire response and continuation of the fire agencies' successful control of wildfires at small sizes.
7. Water – providing firefighting water throughout the Project with fire hydrants accessible by fire engines is a critical component of both structural and vegetation fires. The Project provides firefighting water volume, availability, and sustained pressures to the satisfaction of YFD. Water accessibility helps firefighters control structural fires and helps protect structures from and extinguish wildfires.

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3 Anticipated Fire Behavior

3.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of fires that would be expected adjacent to the Project site given characteristic features such as topography, vegetation, and weather. Dudek utilized BehavePlus software package version 6 (Andrews, Bevins, and Seli 2008) to analyze potential fire behavior[2].

3.2 Fire Behavior Modeling Analysis

An analysis was conducted to evaluate fire behavior variables and to objectively predict flame lengths, intensities, and spread rates for five fire scenarios were evaluated, including two summer, onshore weather condition (northwest and southwest of the Project Site) and three extreme fall, Santa Ana wind weather condition (north/northeast, east, and south/southeast of the Project Site). These fire scenarios incorporated observed fuel types representing the dominant vegetation on the site and adjacent land along with site slope gradients, wind, and fuel moisture values. Modeling scenario locations were selected to better understand different fire behavior that may be experienced on or adjacent to the Project site.

Vegetation types, which were derived from the site field assessment, were classified into fuel models. Fuel models are selected by their vegetation characteristics, fuel stratum most likely to carry the fire, and depth and compactness of the fuels. Fire behavior modeling was conducted for vegetative types that are both on and adjacent to the proposed development as these are the fuels that would potentially be available to fire. Fuel models were also assigned to illustrate post-Project landscape changes. Fuel models were selected from Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model (Scott and Burgan 2005).

Based on the site visit and the anticipated pre- and post- Project vegetation conditions, five different fuel models were used in the fire behavior modeling effort to represent the current and post-construction vegetation conditions throughout the Project site, as presented herein. Fuel model attributes for existing conditions and post-construction conditions are summarized in Table 2. Existing fuel beds, including the low- to- moderate load grass fuels (Gr1 and Gr2) and low- to- high-load shrub and grass-shrub fuels (Fuel Models Gs1, Gs2, Sh2, and Sh5) found throughout the interior portion of the Project site, as well as in the adjacent areas to the north, south, and east. For modeling of post-development conditions, fuel model assignments were re-classified to FMZs 0 and 1 (Fuel Model FM8/Gr1) and FMZ 2 (Gs1/Gs2), which account for the establishment of irrigated and thinned zones on the periphery of the new residential structures.

[2] A discussion of fire behavior modeling is presented in Appendix C, Fire Behavior Modeling.

Table 2. Fuel Models Used for Fire Behavior Modeling

Fuel Model	Description	Location of Fuel Models	Fuel Bed Depth (Feet)
Existing Conditions			
Gr2	Low-load, Dry climate grasses	Represents the maintained grass areas throughout the Project area.	<1.0 ft.
Gs1	Low-load, Dry climate grass-shrubs	Represents the grass-shrub vegetation located throughout and adjacent to the Project without maintenance.	<2.0 ft.
Gs2	Moderate-load, Dry climate grass-shrubs	Represents the grass-shrub vegetation located throughout and adjacent to the Project without maintenance.	<2.0 ft.
Sh2	Moderate-load, Dry Climate Shrubs	Represents the shrubs/chaparral vegetation located in the northeast/east portions of the project and adjacent to the Project without maintenance.	<2.0 ft.
Sh5	High-load, Dry Climate Shrubs	Represents the shrubs/chaparral vegetation located in the northeast/east portions of the project and adjacent to the Project without maintenance.	>4.0 ft.
Post-Development Conditions			
Gs1	Low Load, Dry Climate Grass-Shrub	Fuel type will occur post development within Zone B - Irrigated zone.	<2.0 ft.
Gs2	Moderate load, Dry Climate Grass-Shrub	Fuel type throughout and adjacent to the Project boundary; also will occur post development within Zone C - 50% thinning zone.	<3.0 ft.

Table 3 summarizes the weather and wind input variables used in the BehavePlus modeling process.

Table 3. Fuel Moisture and Wind Inputs

Model Variable	Summer Weather Condition (50th Percentile)	Peak Fall Weather Condition (97th Percentile)
Fuel Models	Gr1 (Post), Gr2, and Gs1	Gr1 (Post), Gr2, Gs2, Sh2, and Sh5
1 hr. Moisture	4%	1%
10 hr. Moisture	6%	2%
100 hr. Moisture	10%	5%
Live Herbaceous Moisture	39%	30%
Live Woody Moisture	78%	60%
20-foot Wind Speed (mph)	15 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	235 and 310	40, 100, and 170
Wind adjustment factor	0.4	0.4
Slope (uphill)	4 to 7%	9% to 35%

3.3 Fire Behavior Modeling Results

The results of fire behavior modeling analysis for pre- and post-Project conditions are presented in Tables 4 and 5, respectively. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 8, BehavePlus Fire Behavior Analysis.

As presented, in the Fire Behavior Analysis (Appendix C), wildfire behavior on the Project site is expected to be primarily of moderate to high intensity throughout the non-maintained surface grass-shrub/shrub-chaparral dominated fuels directly adjacent to the Project site. Five focused analyses were completed for both the existing and the post-Project conditions, each assuming worst-case fire weather conditions for a fire approaching the Project site from the north, northwest, northeast, east, south, and southwest. The results of the modeling effort included anticipated values for surface fires (flame length (feet), rate of spread (mph), fireline intensity (Btu/ft/s), and spotting distance (miles). The fire behavior variables are an important 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, Bevins, and Seli 2008).

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.

Fire spread rate - represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983).

Spotting distance - is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds. Three fire modeling scenario locations were selected to better understand the different fire behavior that may be experienced on or adjacent the site based on slope and fuel conditions; these three fire scenarios are explained in more detail below:

- Scenario 1: A summer, on-shore fire (50th percentile weather condition) burning through low-load grass/grass-shrub and chaparral dominated vegetation northwest of the development area. The terrain is flat (approximately 4% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the north/northwest/west or within the naturally-vegetated areas farther to the north/northwest of the Project site.
- Scenario 2: A fall, extreme off-shore fire (97th percentile weather condition) burning through moderate- to-high-load shrub and chaparral dominated vegetation directly north/northeast of the development area. The terrain is relatively steep (approximately up to 35% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the north Project site or within the naturally-vegetated areas farther north/northeast of the development. This type of fire would typically spread through the shrub and chaparral dominated vegetation relatively moderately towards the north and east portions of the development site, pre-development.
- Scenario 3: A fall, extreme off-shore fire (97th percentile weather condition) burning through low- to-moderate-load grass/grass-shrub and chaparral dominated vegetation directly east of the development area. The terrain is relatively flat (approximately up to 9% slope) with potential ignition sources from a car fire originating along Oak Glen Road or within the naturally-vegetated areas farther east/southeast of the development. This type of fire would typically spread through the grass/grass-shrub and chaparral dominated vegetation relatively moderately fast towards the east and south portions of the development site, pre-development.

- **Scenario 4:** A fall, extreme off-shore fire (97th percentile weather condition) burning through moderate- to-high-load shrub and chaparral dominated vegetation further south of the development area (across Oak Glen Road). The terrain is relatively steep (approximately up to 30% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the south Project site or within the naturally-vegetated areas farther south/southeast of the development. This type of fire could create embers from the shrub and chaparral dominated vegetation that could be blown towards the development site, pre-development.
- **Scenario 5:** A summer, on-shore fire (50th percentile weather condition) burning through low-load grass/grass-shrub and chaparral dominated vegetation in the southwest portion of the development area. The terrain is flat (approximately 7% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the south and/or west of the development.

The results presented in Tables 3 and 4 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. 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.

3.3.1 Existing Conditions

Based on the BehavePlus analysis (Table 4), wildfire behavior adjacent to the Project site is expected to be primarily of moderate to high intensity through the non-maintained surface grass-shrub/shrub-chaparral dominated fuels directly adjacent to the Project site. Worst-case fire behavior under peak weather conditions (represented by Fall Weather, Scenario 2) is anticipated to be a wind-driven fire from the east/northeast during the fall. Under such conditions, expected surface flame length are expected to reach approximately 44 feet with wind speeds of 50+ mph. Under this scenario, fireline intensities reach 21,327 BTU/feet/second with moderate spread rates of 6.6 mph and could have a spotting distance up to 2.4 miles away.

Table 4. RAWS BehavePlus Fire Behavior Modeling Results – Existing Conditions

Fire Scenarios	Flame Length[1] (feet)	Fireline Intensity[1] (BTU/feet/second)	Spread Rate[1] (mph[2])	Spotting Distance[1] (miles)
Scenario 1: 4% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (NW of Project site)				
Low-load grasses (Gr2)	6.5’	327	0.9	0.3
Low-load grass-shrub (Gs1)	4.6’	155	0.3	0.2
Scenario 2: 35% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (N/NE of Project site)				
Moderate-load shrubs (Sh2)	8.0’ (15.7’)[3]	515 (2,261)	0.2 (1.0)[3]	0.4 (1.2)[3]
High-load shrubs (Sh5)	24.6’ (44.1’)[3]	5,975 (21,327)	1.8 (6.6)[3]	0.8 (2.4)[3]
Scenario 3: 9% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (E of Project site)				
Moderate-load grass (Gr2)	10.5’ (18.0’)[3]	937 (3,037)	1.9 (6.2)[3]	0.4 (1.3)[3]
Moderate-load grass-shrub (Gs2)	10.4’ (20.5’)[3]	924 (4,033)	1.0 (4.2)[3]	0.4 (1.4)[3]
Moderate-load shrubs (Sh2)	8.4’ (15.9’)[3]	582 (2,328)	0.2 (1.0)[3]	0.4 (1.2)[3]
Scenario 4: 30% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (S of Project site)				

Table 4. RAWS BehavePlus Fire Behavior Modeling Results – Existing Conditions

Fire Scenarios	Flame Length[1] (feet)	Fireline Intensity[1] (BTU/feet/second)	Spread Rate[1] (mph[2])	Spotting Distance[1] (miles)
Moderate-load grass-shrub (Gs2)	10.2' (20.4')[3]	884 (3,991)	0.9 (4.2)[3]	0.4 (1.4)[3]
Moderate-load shrubs (Sh2)	8.2' (15.8')[3]	554 (2,298)	0.2 (1.0)[3]	0.4 (1.2)[3]
High-load shrubs (Sh5)	25.2' (44.4')[3]	6,337 (21,681)	2.0 (6.7)[3]	0.8 (2.4)[3]
Scenario 5: 7% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (SW of Project site)				
Low-load grasses (Gr2)	6.4'	325	0.9	0.3
Moderate-load grass-shrub (Gs2)	4.6'	154	0.3	0.2

Notes:
1 Wind-driven surface fire.
2 MPH=miles per hour.
3 Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

3.3.2 Post-Development Conditions

As previously mentioned, Dudek conducted modeling of the Project site for post-fuel modification zones. Fuel modification zones for the Project include a 5-foot noncombustible zone (Zone A), 45-foot irrigated zone (Zone B) and a 50-foot thinning zone (Zone C) beginning at the structure and moving outward toward open space. For modeling the post-FMZ treatment condition, the fuel model assignment for non-native grasslands was re-classified according to the specific fuels management (e.g., irrigated, fire resistive landscaping and 50% thinning) treatment.

Based on the BehavePlus analysis (Table 5), post development fire behavior expected in the irrigated and replanted with plants that are acceptable with the Yucaipa Fire Department/Cal Fire (FMZ Zones 0 and 1 – Gr1) under peak weather conditions experience a significant reduction in flame length and intensity. Fuel modification would result in a reduction to approximately 4.0 feet by the time the interior irrigated landscapes of the FMZ (Zones 0 and 1) are reached. During on-shore weather conditions, a fire approaching from the west/southwest towards the development footprint would have low fire intensity and spotting distances due to the higher live and dead fuel moisture contents. These reduction of flame lengths and intensities are assumed to occur within the 100 feet of fuel modification that is achieved for most of the. Therefore, the FMZs proposed for the Project are approximately 2.5-times the flame length of the worst-case fire scenario under peak weather conditions in the hillsides east/northeast of the Project site and approximately 8-times the flame lengths within the development footprint and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

Table 5. RAWS BehavePlus Fire Behavior Modeling Results – Post-Project Conditions

Fire Scenarios	Flame Length[1] (feet)	Fireline Intensity[1] (BTU/feet/second)	Spread Rate[1] (mph[2])	Spotting Distance[1] (miles)
Scenario 1: 4% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (NW of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.3'	33	0.3	0.1
Fuel modification zone 2 (Gs1)	4.6'	155	0.3	0.2
Scenario 2: 35% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (N/NE of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.1 (3.1)[3]	27 (63)	0.1 (0.2)	0.2 (0.4)

Table 5. RAWS BehavePlus Fire Behavior Modeling Results – Post-Project Conditions

Fire Scenarios	Flame Length[1] (feet)	Fireline Intensity[1] (BTU/feet/second)	Spread Rate[1] (mph[2])	Spotting Distance[1] (miles)
Fuel modification zone 2 (Gs1)	6.8 (14.0)	371 (1,763)	0.6 (3.0)	0.3 (1.1)
Scenario 3: 9% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (E of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.0 (3.0)[3]	27 (63)	0.1 (0.2)	0.1 (0.4)
Fuel modification zone 2 (Gs1)	7.2 (14.0)	413 (1,763)	0.7 (3.0)	0.3 (1.1)
Scenario 4: 30% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (S of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.0 (3.0)[3]	27 (63)	0.1 (0.2)	0.1 (0.4)
Fuel modification zone 2 (Gs1)	7.2 (14.0)	416 (1,763)	0.7 (3.0)	0.3 (1.1)
Scenario 5: 7% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (SW of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.3’	33	0.3	0.1
Fuel modification zone 2 (Gs1)	4.6’	154	0.3	0.2

Notes:
1 Wind-driven surface fire.
2 MPH=miles per hour
3 Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph

Surface Fire:

- **Flame Length (feet):** The flame length 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.
- **Fireline Intensity (Btu/ft/s):** Fireline intensity is the heat energy release per unit time from a one-foot-wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function of rate of spread and heat per unit area and is directly related to flame length. Fireline intensity and the flame length are related to the heat felt by a person standing next to the flames.
- **Surface Rate of Spread (mph):** Surface rate of spread is the "speed" the fire travels through the surface fuels. Surface fuels include the litter, grass, brush and other dead and live vegetation within about 6 feet of the ground.

The information in Table 6 presents an interpretation of the outputs for five fire behavior variables as related to fire suppression efforts.

Table 6. Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	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 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 to 11 feet	500-1000 BTU/ft/s	Fires may present serious control problems -- torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.

Table 6. Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
Over 11 feet	Over 1000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

3.4 Project Area Fire Risk Assessment

Wildland fires are a common natural hazard in most of southern California with a long and extensive history. Southern California landscapes include a diverse range of plant communities, including vast tracts of grasslands, like those found on and adjacent to the Project site. Wildfire in this Mediterranean-type ecosystem ultimately affects the structure and functions of vegetation communities (Keeley 1984) and will continue to have a substantial and recurring role (Keeley and Fotheringham 2003). Supporting this are the facts that 1) native landscapes, from forest to grasslands, become highly flammable each fall and 2) the climate of southern California has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with high winds (Santa Ana) occurring during autumn after a six-month drought period each year. Based on this research, the anticipated growing population expanding into WUI areas, and the regions' fire history, it can be anticipated that periodic wildfires may start on, burn onto or spot onto the Project site. The most common type of fire anticipated in the vicinity of the Project area is a wind-driven fire from the east/northeast, moving through the grasslands on the and around the Project site.

With the conversion of the landscape to ignition-resistant development, wildfires may still encroach upon and drop embers on the Project site but would not be expected to burn through the site or produce sustainable spot fires due to the lack of available fuels. Studies indicate that even with older developments that lacked the fire protections provided by the Project, wildfires declined steadily over time (Syphard, et. al., 2007 and 2013) and further, the acreage burned remained relatively constant, even though the number of ignitions temporarily increased. This is due to the conversion of landscapes to ignition resistant, maintained areas, more humans monitoring areas resulting in early fire detection and discouragement of arson, and fast response from the fire suppression resources that are located within these developing areas.

Therefore, it will be important that the latest fire protection technologies, developed through intensive research and real-world wildfire observations and findings by fire professionals, for both ignition resistant construction and for creating defensible space in the WUI areas are implemented and enforced. The Project, once developed, would not facilitate wildfire spread and would reduce projected flame lengths to levels that would be manageable by firefighting resources for protecting the Project site's structures, especially given the ignition resistance of the structures and the planned ongoing maintenance of the entire site landscape and FMZs. The Project will implement the latest fire protection measures, including fuel modification along the perimeter edges of the development. In addition, the 100-foot FMZ proposed for the Project are approximately 2.5-times the flame length of the worst-case fire scenario under peak weather conditions in the hillsides east/northeast of the Project site and approximately 8-times the flame lengths within the development footprint and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

Given the climatic, vegetative, topographic characteristics, and local fire history of the area, the Project Site, once developed, is determined to be subject to periodic wildfires that may start on, burn toward, or spot onto the site. The potential for off-site wildfire encroaching on, or showering embers on the site is considered moderate, but the

risk of ignition from such encroachments or ember showers is considered low based on the type of ignition resistant landscapes and construction and fire protection features that will be provided for the structures.

The Project will include a robust fire protection system, which provides protections from on-site fire spreading to off-site vegetation. Accidental fires within the Project's landscapes or structures will have limited ability to spread. The landscape throughout the Project and on its perimeter will be highly maintained and much of it irrigated, which further reduces its ignition potential. Structures will be highly ignition resistant on the exterior and the interiors will be protected with automatic sprinkler systems, which have a very high success rate for containing fires, if not extinguishing them.

3.4.1 Analysis of Wildfire Risk from Adding New Residents

Humans (i.e., human related activities or human created features, services, or processes) are responsible for the majority of California wildfires (Syphard et al. 2007, 2008; Romero-Calcerrada et al. 2008). Certain human activities result in sparks, flames, or heat that may ignite vegetative fuels without proper prevention measures in place. These ignitions predominantly occur as accidents, but may also be purposeful, such as in the case of arson. Roadways are a particularly high source for wildfire ignitions due to high usage and vehicle caused fires (catalytic converter failure, overheated brakes, dragging chains, tossed cigarette, and others) (Romero-Calcerrada et al 2008)). In Southern California, the population living at, working in, or traveling through the wildland urban interface is vast and provides a significant opportunity for ignitions every day. However, it is a relatively rare event when a wildfire occurs, and an even rarer event when a wildfire escapes initial containment efforts. Approximately 90 to 95 percent of wildfires are controlled below 10 acres (CAL FIRE 2019; Santa Barbara County Fire Department 2019).

Research indicates that the type of dense, clustered and full landscape conversion projects, like the Wine Country Specific Plan, are not associated with increased vegetation ignitions. Syphard and Keeley (2015) summarize all wildfire ignitions included in the CAL FIRE Fire and Resource Assessment Program (FRAP) database – dating back over 100 years. For example, they found that in San Diego County, which is similar to most of southern California, equipment-caused fires were by far the most numerous, and these also accounted for most of the area burned, followed closely by the area burned by power line fires. Ignitions classified as equipment caused frequently resulted from exhaust or sparks from power saws or other equipment with gas or electrical motors, such as lawn mowers, trimmers or tractors and associated with lower density housing. Ignitions were more likely to occur close to roads and structures, and at intermediate structure densities.

As Figures 6 through 8 illustrate, building density directly influences susceptibility to fire because in higher density developments, there is one interface (the community perimeter) with the wildlands whereas lower density development creates more structural exposure to wildlands, less or no ongoing landscape maintenance (an intermix rather than interface), and consequently more difficulty for limited fire resources to protect well-spaced structures. The intermix includes housing amongst the unmaintained fuels whereas the proposed Project converts all fuels within the footprint and provides a wide, managed fuel modification zone separating homes and structures from unmaintained fuel and creating a condition that makes defense easier. Syphard and Keeley go on to state that, "the WUI, where housing density is low to intermediate is an apparent influence in most ignition maps "further enforcing the conclusion that lower density development poses a higher ignition risk than higher density development." They also state that "Development of low-density, exurban housing may also lead to more homes being destroyed by fire" (Syphard et al. 2013). A wildland urban interface already exists in the area adjacent to the Project, dominated by older, more fire-vulnerable structures, constructed before stringent fire code requirements were imposed on residential development, with varying levels of maintained fuel modification buffers. As discussed

in detail throughout this FPP, the Project would construct ignition resistant homes and structures designed to include professionally managed and maintained fire protection components, modern fire code compliant safety features and specific measures provided where ignitions are most likely to occur (such as roadways). Therefore, the development of the Project would not be expected to materially increase the risk of vegetation ignitions.

Figure 4. Example higher density development that is ignition resistant and excludes readily ignitable vegetative fuels throughout and provides a perimeter fuel modification zone. This type of new development requires fewer fire resources to defend and can minimize the likelihood of on-site fires spreading off-site.

Figure 5. Example of moderate density development. Structures are located on larger properties and include varying levels of ignition resistance and landscape / fuel modification provision and maintenance. This type of development results in a higher wildland exposure level for all homes and does not provide the same buffers from wildfire encroaching onto the site, or starting at a structure and moving into the wildlands as a higher density project.

Figure 6. Example of "lower density" development where structures are interspersed amongst wildland fuels, are of varying ages, and include varying levels of fuel modification zone setbacks. Homes are exposed on most or all sides by flammable vegetation and properties rely solely on owners for maintenance, are often far distances from the nearest fire station, and have minimal buffer from on-site fire spreading to wildlands.

Moreover, frequent fires and lower density housing growth may lead to the expansion of highly flammable exotic grasses that can further increase the probability of ignitions (Keeley et al. 2012). This is not the case with the proposed project as the landscapes are managed and maintained to remove exotic fuels that may establish over time.

As discussed above, research indicates that it is less likely for higher density developments to be impacted by wildfires than lower density developments. The same protections that starve wildfire of fuels and minimize or prevent wildfire from transitioning into a higher density development like the Project's also serve to minimize or prevent on-site fires from transitioning into the wildlands. Further, the requirement that all structures will include interior fire sprinklers that are structure protection rated, significantly reduces the likelihood that a building fire spreads to the point of flashover, where a structure will burn beyond control and produce embers. Interior sprinklers are very efficient, keeping fires to the room of origin, or extinguishing the fire before the responding firefighters arrive. Similarly, the irrigated fuel modification zones are positioned throughout the development areas as well as the first zones on the perimeter of the project and masonry walls adjacent the conserved open space. Irrigated zones include plants with high internal moisture and spacing between plants and plant groups that 1) make it difficult to ignite and 2) make it difficult for fire to spread plant to plant.

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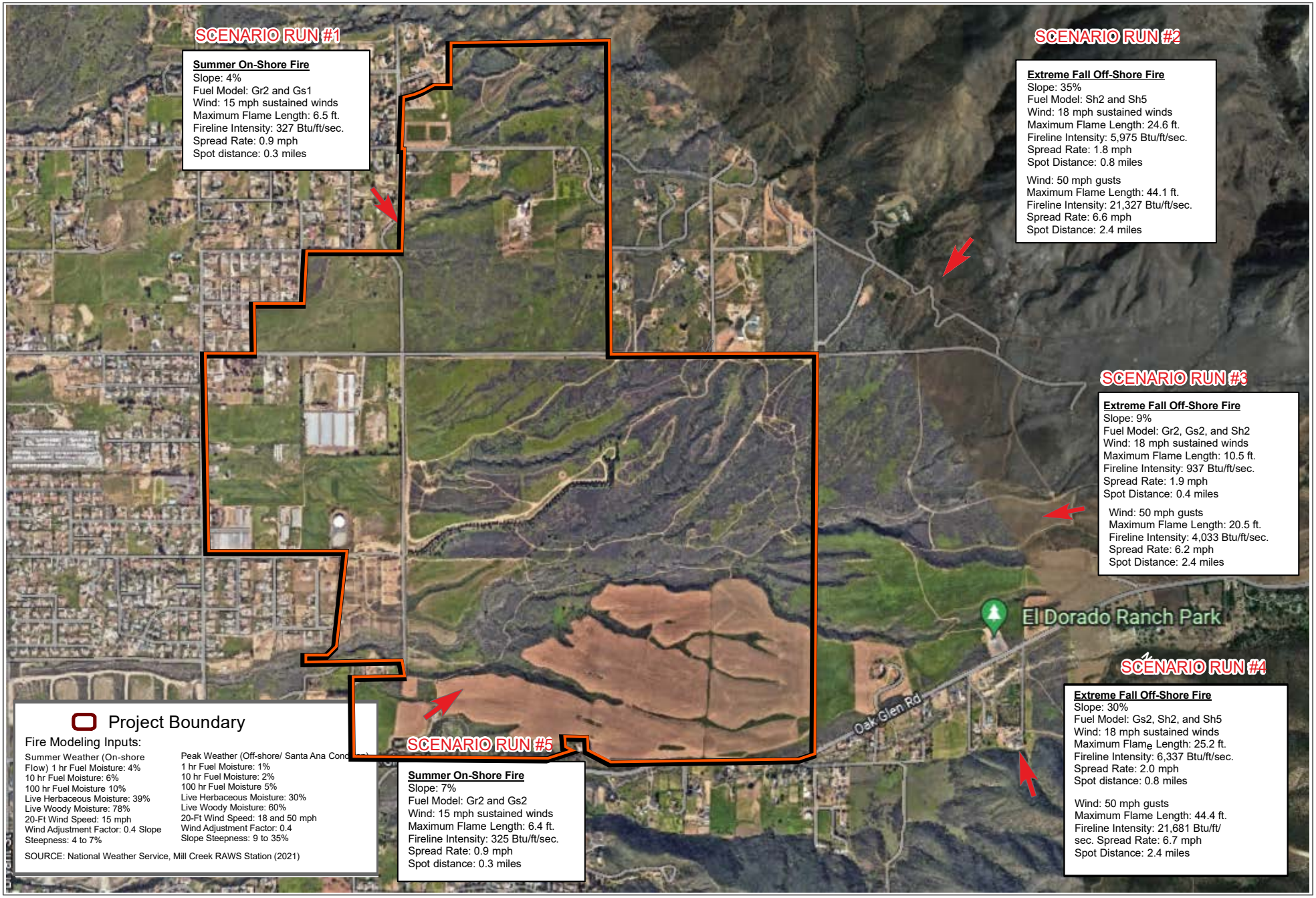

SOURCE: Google Easrth Aerial image, 2022

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0 1,000 2,000 Feet

FIGURE 5

BehavePlus Fire Behavior Analysis Map

Yucaipa Valley Wine Country Specific Plan Project - Fire Protection Plan

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4 Emergency Response Service

4.1 Emergency Response Fire Facilities

The Project site is located within Yucaipa Fire Department (YFD) response area. Fire protection and paramedic services are provided by the Yucaipa Fire Department through a staffing agreement with CAL FIRE. The closest fire station to the Project site is YFD Station 1, as depicted in Figure 9. Table 7, Closest Responding Fire Stations Summary, presents a summary of the location, equipment, staffing levels, maximum travel distance, and travel time for the three closest, existing fire stations responding to the Project site. Travel distances are derived from Google Road data while travel times are calculated applying the nationally recognized Insurance Services Office (ISO) Public Protection Classification Program's Response Time Standard formula (T=0.65 + 1.7 D, where T= time and D = distance). The ISO response travel time formula discounts speed for intersections, vehicle deceleration and acceleration, and does not include turnout time. Additionally, there are mutual aid agreements in place with neighboring fire agencies so that the closest available unit is dispatched, regardless of jurisdiction. These interdependencies often exist among fire protection agencies for structural and medical responses associated with the peripheral "edges" of each agency's boundary. The following sections analyze the Project in terms of current YFD fire service capabilities and resources to provide Fire Protection and Emergency Services.

Table 7. Closest Responding Stations Summary

Station	Location	Equipment	Staffing*	Maximum Travel Distance**	Travel time**
YFD Station 1	11416 Bryant St, Yucaipa, CA	Medic Engine 551 CAL FIRE Engine 3553 Two Type III Wildland Engines Type 6 Engine Type 2 Tactical Water Tender CAL FIRE Engine 3569	One captain, one engineer, and one firefighter/paramedic During declared fire season each Type III staffed with 3 person engine company	3.5 miles	6 minutes, 36 seconds
YFD Station 3	34259 Wildwood Canyon Rd, Yucaipa, CA	Medic Engine 552 Brush Engine 552 Reserve Engine 552A Command vehicle Utility truck	One captain, one engineer, and one firefighter/paramedic One Battalion Chief	6.4 miles	11 minutes, 32 seconds
YFD Station 2	32664 Yucaipa Blvd, Yucaipa, CA	Battalion 3513 Medic Engine 553 Reserve Engine 553A Utility 553	One captain, one engineer, and one firefighter/paramedic	6.8 miles	12 minutes, 13 seconds

Notes:
* Staffing levels from 2019 Yucaipa Fire Department Annual Report
** Assumes travel distance and time to the furthest development in the northeastern portion of the Project site, north of Ivy Avenue.

YFD Station 1, which would provide initial response, is located at 11416 Bryant Street in Yucaipa and staffed 24/7 with career firefighters. YFD Station 1 has one Medic Engine staffed with three firefighter personnel. YFD Station 1 will be capable of responding within 8 minutes and 36 seconds, which equates to roughly a 6 minute 36 second travel time to the furthest development within the Project site. Secondary response would be provided from YFD Station 3, which is located at 34259 Wildwood Canyon Road in Yucaipa and can respond within 13 minutes and 32 seconds, which equates to roughly a 11 minute 32 second travel time to the furthest development within the Project site. YFD Station 3 has one Medic Engine staffed with three firefighter personnel. YFD Station 2 has a 3-person Medic Engine and would also be able to respond to the Project site in 14 minutes and 13 seconds, which equates to roughly a 12 minute 13 second travel time to the furthest development within the Project site.

Within the area's emergency services system, fire and emergency medical services are also provided by other fire departments. Generally, each agency is responsible for structural fire protection and wildland fire protection within their area of responsibility. However, mutual aid agreements enable non-lead fire agencies to respond to fire emergencies outside their district boundaries. In the Project area, fire agencies cooperate under a statewide master mutual aid agreement for wildland fires.

Per the City's General Plan, the Yucaipa Fire Department strives to meet the NFPA standards for responding to fire and other emergencies. The NFPA recommends that first responders arrive at the fire scene in under five minutes or less at least 90% of the time. As of 2019, the YFD average response time was 6 minutes and 10 seconds, which increased approximately 42 seconds from the previous year. As previously mentioned, response to the Project site from the closest existing Fire Station (YFD Station 1) would achieve an 6 minute and 36 second travel time to the furthest area of the Project site in the northeast, with a 8 minute 36 second response time. Although this response time is beyond the five-minute response standard, given the Project's fire safety features, including full NFPA 13 fire sprinklers, per code and the flexibility allowed by the response time 90 percent achievement rate, the response time is considered to be adequate.

4.2 Estimated Calls and Demand for Service

The following estimated annual emergency call volume generated by the Project is based upon per capita data for 2019 from YFD calls within their jurisdiction[3].

- Total population served by: 54,483 (as of 2019, YFD Annual Report)
- Total annual calls: 8,297. Per capita call generation: 0.15
- Total annual fire calls, including structure, vegetation, vehicle fires, and other fire calls (6% of total calls): 500. Per capita call generation: 0.009
- Total annual Emergency Medical Services (71% of total calls): 5,865. Per capita call generation: 0.11
- Total other calls (Rescue, Traffic Collisions, Hazardous Materials, Public Service, etc.; 23.2% of total calls): 1,927. Per capita call generation: 0.035

Using the data above, the estimated annual emergency call volume for the Project site was calculated. The Project proposes the development of up to 1,091 residential units as well as up to 26 wineries. The residential uses would generate approximately 3,230 new residents, and approximately 280 employees[4] of the wineries. The total maximum

[3] 2019 Yucaipa Fire Department Annual Report
[4] Per Wine Country Specific Plan

estimated total population of the Project site, is projected to be 3,510 persons. Based on this population estimate, the calculated call volumes by type of call are provided in Table 8.

Table 8. Calculated Call Volume (Conceptual Based on 3,510 Persons)

Type of Call	Per Capita Call Generation Factor	Number of Estimated Annual Calls
Total Other Calls	0.035	123
Total Fires	0.009	32
Total EMS Calls	0.11	386
Total Calls	0.15	541

As mentioned, the Project will increase the call volume at a rate of a conservatively calculated (the actual number of calls may be lower than this estimate) up to 541 calls per year (45 calls per month or 1.5 calls per day). YFD Fire Station 1 emergency response in 2019 totaled 2,814 calls per year, or 7.7 calls per day. YFD Station 3 emergency responses in 2019 totaled 3,567 calls per year, or 9.77 calls per day. The level of service demand for the Project raises overall call volume for YFD Station 1, and based only on the increase of calls, would not be anticipated to impact the existing fire stations to a point that they cannot meet the demand, as YFD Station 1 would be averaging the same number of calls with the addition of the Project as YFD Station 3 under existing conditions. For perspective, five calls per day are typical in an urban or suburban area. A busy fire station company would be one with 10 to 15 or more calls per day. When the Project site is built out, Fire YFD Station 1 could potentially respond to an additional 10.5 calls per week on average, although the number will likely be lower than that based on the conservative nature of the population and calls per capita data used in this estimate.

However, there are additional considerations that factor into YFD's ability to best service the Project. According to YFD, Station 3 is currently underserved due to other factors besides a high call volume, including high time on task efforts as well as geographic location delays to local emergency rooms which are outside of the City's limits. The Yucaipa Fire Department provides primary paramedic service for the citizens and must provide a full continuum of care to local emergency rooms on critical calls or in the event of BLS ambulance responding to incidents, which all combined results in frequent delays and creates an impact on the readiness of staff for other incidents. To accommodate those delays, Station 1's Type 1 apparatus Yucaipa Fire Department Engine is frequently pulled into area 3, (over 10% of call volume above an already anticipated 10% citywide multi-unit out of primary area responses) to provide the necessary response to those calls.

To provide the coverage needed throughout the community and address these staff resource needs, the net result is a department wide response time of almost seven minutes. However, a delayed EMS response time has a direct correlation to decreased patient survival probabilities, and the average response is deemed unacceptable by YFD standards which would be exacerbated by additional calls for service following the development of the WCSP and other areas of the City without additional resources made available.

YFD indicates that there is a significant need for additional staffing and resources to better respond to the volume and types of calls for service in the City (such as medical aid, which make up a majority of the calls for service). YFD indicates that, to address the needs of the WCSP, a Type 6 Medic Patrol or Medic Squad is needed at Station 3, which would help to offload the calls of service for Station 1 and allow those resources to serve the plan area. For the projected citywide growth (including the WCSP and Freeway Corridor SP), an additional Type 1 engine would

also be needed to meet fire department response needs within the southern portion of the City; YFD is determining if a separate fire station to serve that geographical area is also needed.

However, efforts to increase funding and staffing since 2019 have failed following the rejection of Measure E by the voters. The Project would generate revenues for the Fire Department through Development Impact Fees, but it may not be sufficient to offset the current need. Sales tax revenue will also occur through the development of wineries, although there will be delay from when grapes are planted to when bottles of wine are actually sold. In order for the Project to minimize its potential impacts on the YFD, a Fire Service Agreement or Community Facilities District between the Project Owner and the YFD is recommended to provide funding that is acceptable to both parties. In addition, the Type 6 Medic Patrol or Medic Squad should be programmed to ensure Station 1 availability as development occurs.

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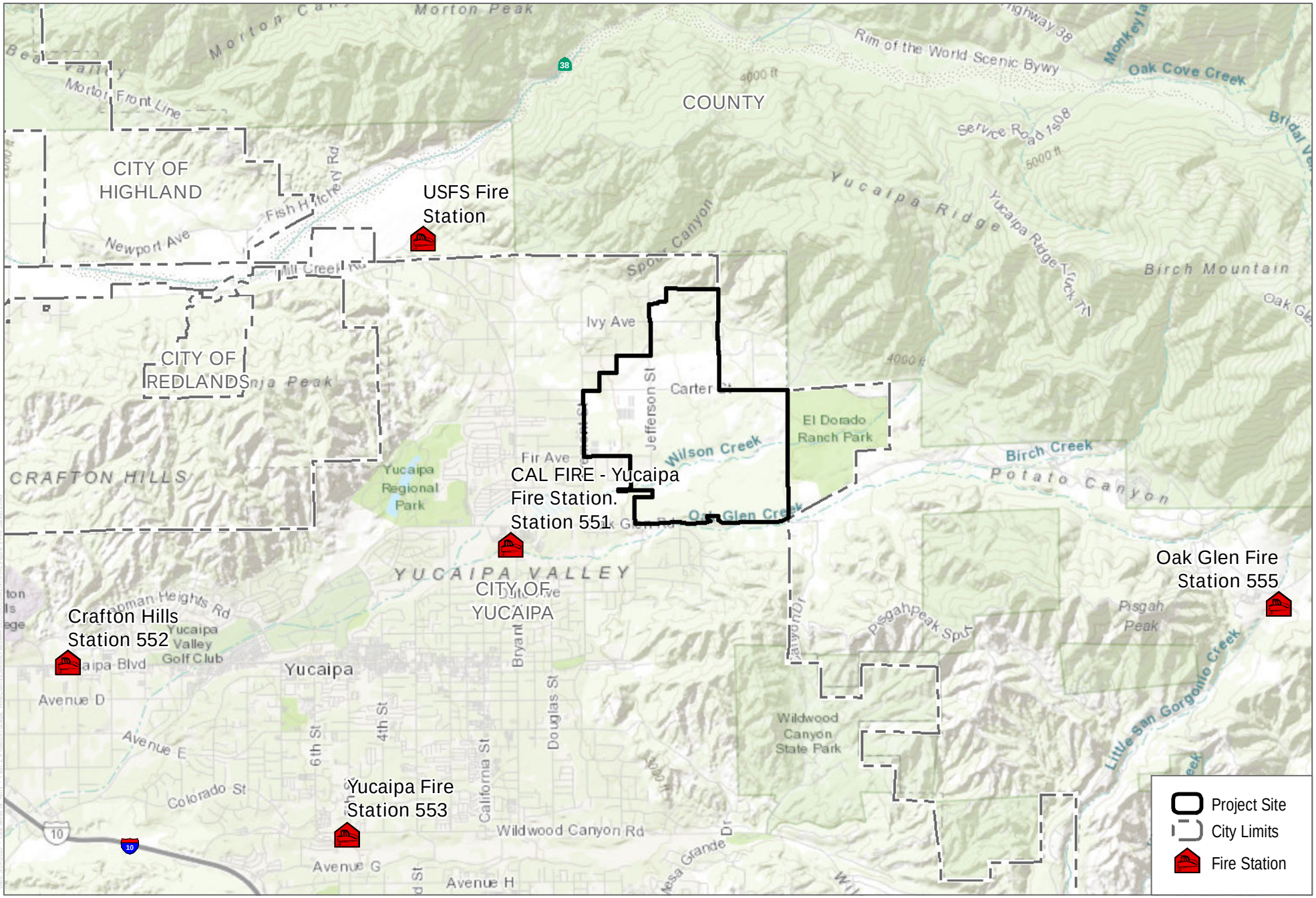

SOURCE: ESRI; County of San Bernardino

FIGURE 5

Fire Station Locations

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

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5 Buildings, Infrastructure and Defensible Space

The City of Yucaipa Fire Code and 2022 CFC and 2022 CBC adopted by reference (with several modifications) governs the building, infrastructure, and defensible space requirements detailed in this FPP. As the Project is located within areas designated as High and Very High FHSZ, the Project is required to comply with codes governing development within areas (e.g. Chapter 7A) at the time the Project is submitted to the building and fire department for review and approval, or will provide alternative materials and/or methods, if warranted. The following summaries highlight important fire protection features.

A response map update, including roads and fire hydrant locations, in a format compatible with current YFD mapping shall be provided to YFD.

5.1 Fire Apparatus Access

5.1.1 Access Roads

The Project would involve the construction of new structures, roadways, and would generate new trips to and from the Project site. Project site access, including road widths and connectivity, will comply with the requirements of the City. Additionally, an adequate water supply and approved paved access roadways shall be installed prior to any combustibles being brought onsite during each phase and will include:

- Primary access to the Project site is provided via Oak Glen Road and Jefferson Street. Development in the area would also continue to be supported by Ivy Avenue and Carter Street; new connections from all existing streets would create a complete roadway network supporting both neighborhoods and wineries.
- All roads comply with access road standards of not less than 20 feet, unobstructed width and are capable of supporting an imposed load of at least 75,000 pounds.
- Typical, interior Project roads, including collector and local roads, will be constructed to minimum 20-foot, unobstructed widths and shall be improved with aggregate cement or asphalt paving materials.
- The gradient for a fire apparatus access road grade shall not exceed the maximum 12% unless approved by the Chief.
- Private and public streets for each phase shall meet all Project approved fire code requirements, paving, and fuel management prior to combustible materials being brought to the Project site.
- Vertical clearance of vegetation (lowest-hanging tree limbs), along roadways will be maintained at clearances of 13 feet, 6 inches to allow fire apparatus passage.
- Cul-de-sacs and fire apparatus turnarounds will meet requirements and YFD Fire Department Standards.
- Any roads that have traffic lights shall have approved traffic pre-emption devices (Opticom) compatible with devices on the Fire Apparatus.
- Roadways and/or driveways will provide fire department access to within 150 feet of all portions of the exterior walls of the first floor of each structure.

- Roadway design features (e.g., speed bumps, humps, speed control dips, planters, and fountains) that could interfere with emergency apparatus response speeds and required unobstructed access road widths will not be installed or allowed to remain on roadways.
- Access roads shall be usable by fire apparatus to the approval of YFD prior to lumber drop onsite. Developer will provide information illustrating the new roads, in a format acceptable to the YFD for updating of Fire Department response maps.

5.1.2 Dead-End Roads

- Each planning area varies in the number of ingress/egress roads or streets. Dead end streets in excess of 150 feet in length shall have approved provisions for fire apparatus turnaround.

5.1.3 Gates

Gates on private roads are permitted, but subject to Fire Code requirements and standards, including:

- Gates shall be equipped with conforming sensors for detecting emergency vehicle "Opticom" strobe lights from any direction of approach, if required.
- All entrance gates will be equipped with a key switch, which overrides all command functions and opens the gate.
- Gate activation devices will be equipped with a battery backup or manual mechanical disconnect in case of power failure.
- Further, gates will be:
  - Minimum 20 feet wide of clearance for one-way traffic when fully open at entrance.
  - Minimum of two feet wider than road width at exit.
  - Constructed from non-combustible or exterior fire-rated treated wood materials.
  - Inclusive of provisions for manual operation from both sides, if power fails. Gates will have the capability of manual activation from the development side or a vehicle (including a vehicle detection loop).

5.1.4 Premise Identification

Identification of roads and structures will comply with City of Yucaipa Fire Code, as follows:

- Approved numbers or addresses shall be placed on all new and existing buildings in such a position as to be plainly visible and legible from the street or road fronting the property. Said numbers shall contrast with their background.
- All residential addresses shall be posted with a minimum of 4-inch numbers, visible from the street, and during the hours of darkness the numbers shall be low voltage, internally electrically illuminated. Posted numbers shall contrast with their background and be legible from the street. Where building setbacks exceed 100 feet from the roadway or where the addresses are not visible from the roadway, additional non-illuminated contrasting 4-inch numbers shall be displayed at the property entrance
- All non-residential structures shall be posted with a minimum of 8-inch numbers, visible from the street, and during the hours of darkness shall be electrically illuminated. Where the building setback exceeds 200

feet from the roadway or where the addresses are not visible from the roadway, additional non-illuminated contrasting 6-inch numbers shall be displayed at the property entrance. Commercial occupancies with multiple tenants shall be posted with a minimum of 3-inch contrasting numbers displayed on the rear doors of the tenant spaces.

- Proposed private and public streets within the development will be named, with the proper signage installed at intersections to satisfaction of the Department of Public Works.
- Streets and roads shall be identified with approved signs, Temporary signs shall be installed at each street intersection when construction of new roadways allows passage by vehicle. Signs shall be of an approved size, weather resistant and maintained until replace by permanent signs.
- Temporary street signs shall be installed on all street corners within the Project prior to the placing of combustible materials on-site. Permanent signs shall be installed prior to occupancy of buildings.

5.1.5 On-going Infrastructure Maintenance

Project Owner shall be responsible for long term funding and maintenance of internal private roads.

5.1.6 Pre-Construction Requirements

It is the recommendation of this FPP, prior to bringing lumber or combustible materials onto the Project site, improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, temporary roadway surface, and construction phase fuel modification zones established. These features will be approved by the fire department or their designee prior to combustibles being brought on-site.

5.2 Ignition Resistant Construction and Fire Protection

All new structures within the Project site will be constructed to Fire Code standards. Each of the proposed buildings will comply with the enhanced ignition-resistant construction standards of the 2022 CBC (Chapter 7A). These requirements address roofs, eaves, exterior walls, vents, appendages, windows, and doors and result in hardened structures that have been proven to perform at high levels (resist ignition) during the typically short duration of exposure to burning vegetation from wildfires.

While these standards will provide a high level of protection to structures in this development, there is no guarantee that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

5.3 Infrastructure and Fire Protection Systems Requirements

5.3.1 Water Supply

Water service for Project site will be provided by Yucaipa Valley Water District (YVWD). All water storage and hydrant locations, mains, and water pressures would be designed to fully comply with Yucaipa Fire Code Fire Flow Requirements.

The Project will be consistent Yucaipa Fire Code and California Fire Code Section 903 and Appendices B and C for fire flow and fire hydrant requirements within a HFHSZ. These internal waterlines will also supply sufficient fire flows and pressure to meet the demands for required onsite fire hydrants and interior fire sprinkler systems for all structures. Water supply must meet a 2-hour fire flow requirement of 2,500 gpm, which must be over and above the daily maximum water requirements for this development. Water utilities will be connected prior to any construction. Historically in the North Bench area YVWD is unable to supply water during large emergency incidents such as the Apple and El Dorado fires where water supply for firefighting equipment had to be obtained west of Bryant at the direction of the water district. To that end, the water system proposed for the Project will be reviewed by YFD and is subject to their acceptance. Additional efforts between the YVWD and YFD should also occur to increase the overall reserve water capacity to address any significant wildfire activity in the areas beyond the WCSP area.

5.3.2 Fire Hydrants

Fire Hydrants shall be located along fire access roadways on the street side of buildings or facing approved fire apparatus access roads, as determined by the Yucaipa Fire Marshal and current fire code requirements to meet operational needs. Fire Hydrants will be consistent with applicable Design Standards.

5.3.3 Automatic Fire Sprinkler Systems

All structures, of any occupancy type, will be protected by an automatic, internal fire sprinkler system. Fire sprinklers systems shall be in accordance with YFD, and National Fire Protection Association (NFPA) Standards 13. Fire sprinkler plans for each structure will be submitted and reviewed by YFD for compliance with the applicable fire and life safety regulations, codes, and ordinances.

5.4 Defensible Space and Vegetation Management

5.4.1 Defensible Space and Fuel Modification Zone (FMZ) Requirements

An important component of a fire protection system for the Project is the provision for fire-resistant landscapes and modified vegetation buffers. FMZs are designed to provide vegetation buffers that gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones, restricted vegetation zones, and irrigated zones adjacent to each other on the perimeter of the exposed structures outward toward areas of open space.

Perimeter structures will be located adjacent to FMZ areas that separate the Project from naturally vegetated open space areas. Based on the modeled extreme weather flame lengths for the Project site, wildfire flame lengths are projected to be approximately between 2.0 to 18 feet high in areas of the Project site adjacent grassland fuels. The fire behavior modeling system used to predict these flame lengths was not intended to determine sufficient FMZ widths, but it does provide the average predicted length of the flames, which is a key element for determining “defensible space” distances for providing firefighters with room to work and minimizing structure ignition. For the Project site the FMZ widths between the naturally vegetated open space areas and structures are proposed to be 100 feet (where achievable), up to 8 times the modeled flame lengths based on the fuel type represented adjacent

to the proposed development. The FMZs will be constructed from the structure outwards towards undeveloped areas.

The Wine Country Specific Plan will be constructed in five phases over 20-years, each phase should prepare a subsequent streamlined FPP to ensure compliance with the most current fire and building code requirements. Figure 10 illustrates the FMZ Plan proposed for Phase 1, which includes Wilson Creek Estates. The FMZ includes a minimum 5-foot-wide non-combustible Zone A, a 45-foot-wide irrigated Zone B, and a 50-foot wide thinning Zone C. Additionally, a fire access road zone shall provide 10-feet of horizontal clearance on each side and 20-feet of vertical clearance along all fire access roads. In areas that are unable to achieve 100 feet of FMZ, the incorporation of enhanced construction features, such as a 6-foot heat deflecting wall constructed of concrete masonry units (CMUs) between on-site structures and unmaintained open space shall be used to provide a functional equivalency for a full fuel modification zone, see Section 6, Alternative Materials and Methods, for additional details regarding enhanced construction features for reduced FMZ.

Although FMZs are very important for setting back structures from adjacent unmaintained fuels, the highest concern is considered to be from firebrands or embers as a principal ignition factor on this site. To that end, the Project site, based on its location and ember potential, is recommended to include the latest ignition and ember resistant construction materials and methods for roof assemblies, walls, vents, windows, and appendages, as mandated by the City of Yucaipa's Fire and Building Codes (e.g., Chapter 7A).

Fuel Modification Zone Standards

An FMZ is a strip of land where combustible vegetation has been removed and/or modified and partially or completely replaced with more adequately spaced, drought-tolerant, fire-resistant plants in order to provide a reasonable level of protection to structures from wildland fire. The purpose of the section is to document YFD's standards and make them available for reference. However, we are proposing a site-specific fuel modification zone program with additional measures that are consistent with the intent of the standards. The Yucaipa Fire Code (Chapter 15.04.115) is consistent with the 2022 California Fire Code (Section 4907 — Defensible Space), Government Code 51175 – 51189, and Public Resources Code 4291, which require that fuel modification zones be provided around every building that is designed primarily for human habitation or use within a HFHSZ.

A typical landscape/fuel modification installation per Yucaipa Fire Code consists of a 50-foot-wide Zone A and a 50-foot-wide Zone B for a total of 100-feet in width. However, the Project will consist of a 5-foot-wide non-combustible Zone A, 45-foot wide irrigated Zone B and a 50-foot wide thinning Zone C. The Fuel Modification Plan herein and all subsequent Fuel Modification Plans prepared for the Project shall be reviewed and approved by the YFD for consistency with defensible space and fire safety guidelines. Figure 10 displays conceptual FMZs for Phase 1 of the Project.

To ensure long-term identification and maintenance, a fuel modification area shall be identified by a permanent zone marker meeting the approval of YFD. All markers will be located along the perimeter of the fuel modification area at a minimum of 500-feet apart or at any direction change of the fuel modification zone boundary. FMZs will be maintained on at least an annual basis or more often as needed to maintain the fuel modification buffer function.

An on-site inspection will be conducted by the YFD upon completion of landscape install before a certificate of occupancy being granted by the City's building code official.

Project Fuel Modification Zone Treatments

Zone A: Non-Combustible Zone

Zone A extends 5-feet from buildings and structures.

The ember-resistant zone includes the area under and around all attached decks and requires the most stringent wildfire fuel reduction. The ember-resistant zone is designed to keep fire or embers from igniting materials that can spread the fire to Project structures. The following provides guidance for this zone, which may change based on the regulation developed by the Board of Forestry and Fire Protection.

- Use hardscape like gravel, pavers, concrete and other noncombustible mulch materials. No combustible bark or mulch.
- Remove all dead and dying weeds, grass, plants, shrubs, trees, branches and vegetative debris (leaves, needles, cones, bark, etc.); Check roofs, gutters, stairways, etc.
- Remove all branches within 10 feet of any chimney or stovepipe outlet
- Limit plants in this area to low growing, nonwoody, properly watered and maintained plants
- Remove vegetation and items that could catch fire from around and under decks, balconies and stairs.
- Relocate firewood and lumber to Zone C.
- Replace combustible fencing, gates, and arbors attach to structures with noncombustible alternatives.
- Remove or prune flammable plants and shrubs near windows.
- Consider relocating garbage and recycling containers outside this zone.
- Consider relocating boats, RVs, vehicles and other combustible items outside this zone.

Zone B: Paved/Irrigated Zone

Zone B extends from Zone A up to 50 feet from buildings and structures.

- Remove all dead plants, grass and weeds (vegetation).
- Remove dead or dry leaves and pine needles from your yard, roof and rain gutters.
- Remove branches that hang over your roof and keep dead branches 10 feet away from your chimney.
- Trim trees regularly to keep branches a minimum of 10 feet from other trees.
- Relocate wood piles to Zone C.
- Remove or prune flammable plants and shrubs near windows.
- Remove vegetation and items that could catch fire from around and under decks, balconies and stairs.
- Create a separation between trees, shrubs and items that could catch fire, such as patio furniture, wood piles, swing sets, etc.

Zone C: Thinning Zone

Zone C extends from Zone B up to 100 feet from buildings and structures

- Cut or mow annual grass down to a maximum height of 4 inches.
- Create horizontal space between shrubs and trees.

- Create vertical space between grass, shrubs and trees.
- Remove fallen leaves, needles, twigs, bark, cones, and small branches. However, they may be permitted to a depth of 3 inches.
- All exposed wood piles must have a minimum of 10 feet of clearance, down to bare mineral soil, in all directions.

Fire Access Road Zone

Extends a minimum of 10 feet from the edge of any public or private roadway that may be used as access for fire-fighting apparatus or resources adjacent to open space. Clear and remove flammable growth for a minimum of 10 feet on each side of the access roads. Additional clearance beyond 10 feet may be required upon inspection.

1. Required clearance extends a minimum of 10 feet from the edge of any public or private roadway as well as an unobstructed vertical clearance of 20-feet.
2. Landscaping and native plants shall be appropriately spaced and maintained.
3. Trees found in Appendix D can be planted, if they are far enough from structures and Fire Department accesses, and do not overhang any structures or access at maturity.

Roadside fuel modification for the Project consists of maintaining ornamental landscapes, including trees, clear of dead and dying plant materials. Roadside fuel modification shall be maintained by the Project.

Pre-Construction Requirements

- Perimeter fuel modification areas must be implemented and approved by the YFD before combustible materials are brought on site.
- Existing flammable vegetation shall be reduced by 50% on vacant lots upon commencement of construction.
- Dead fuel, ladder fuel (fuel which can spread fire from the ground to trees), and downed fuel shall be removed, and trees/shrubs shall be properly limbed, pruned, and spaced per the plan.

Undesirable Plants

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be physical (structure promotes ignition or combustible) or chemical (volatile chemicals increase flammability or combustion characteristics). The plants included in the FMZ Undesirable Plan List (refer to Appendix D) are unacceptable from a fire safety standpoint and shall not be planted or allowed to establish opportunistically within the FMZs or landscape areas.

5.4.2 Vegetation Management Maintenance

Vegetation management, i.e., assessment of the fuel modification zone and fuel modification area's condition and removal of dead and dying and undesirable species; as well as thinning as necessary to maintain specified plant spacing and fuel densities, shall be completed annually by May 1 of each year, and more often as needed for fire safety, as determined by the YFD. The vegetation management will be funded by the Project and shall be conducted by their contractor(s). The Project shall be responsible for all vegetation management throughout the development, in compliance with the Project FPP that is consistent with requirements.

The permanent fuel maintenance zones required for the Project will be maintained by the applicant during construction, and by the owner of each lot, which will be responsible for vegetation management once the Project is built out and the adjacent areas are developed. The respective HOA will be responsible for streetscape and vegetation management in perpetuity.

On-going/as-needed fuel modification maintenance during the interim period while the Project is built out and adjacent parcels are developed, which may be one or more years, will include necessary measures for consistency with the FPP, including:

- Regular Maintenance of dedicated Open Space.
- Removal or thinning of undesirable combustible vegetation and replacement of dead or dying landscaping.
- Maintaining ground cover at a height not to exceed 18 inches. Annual grasses and weeds shall be maintained at a height not to exceed three inches.
- Removing accumulated plant litter and dead wood. Debris and trimmings produced by thinning and pruning should be removed from the Project site or chipped and evenly dispersed in the same area to a maximum depth of 4 inches.
- Maintaining manual and automatic irrigation systems for operational integrity and programming. Effectiveness should be regularly evaluated to avoid over or under-watering.
- Complying with these FPP requirements on a year-round basis. Annual inspections are conducted following the natural drying of grasses and fine fuels, between the months of May and June, depending on precipitation during the winter and spring months.

5.4.3 Environmentally Sensitive Areas/Open Space

There should not be a need to modify the FMZ as it is planned to meet the fuel management needs of the Project site and comply with the fire code. However, if unforeseen circumstances were to arise that require hazard reduction within an area considered environmentally sensitive or part of the area designated Open Space Conservation, it may require approval from the City and the appropriate resource agencies (California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers) prior to any vegetation management activities occurring within those areas.

5.4.4 Undesirable Plants List

Certain plants are considered prohibited in the landscape due to characteristics that make them highly flammable. These characteristics can be physical (structure promotes ignition or combustion) or chemical (volatile chemicals increase flammability or combustion characteristics). The plants included in the Undesirable Plant List (Appendix D) are unacceptable from a fire safety standpoint. However, in the case where some of these plant species will be used, they will be isolate individuals with high level of ongoing maintenance as described in the landscape plan, and shall not be planted on the site or allowed to establish opportunistically within fuel modification or landscaped areas.

5.4.5 Construction Phase Vegetation Management

Vegetation management requirements shall be implemented at commencement and throughout the construction phase. Vegetation management for the Project area shall be performed pursuant to the FPP and YFD requirements on all building locations prior to the start of work and prior to any import of combustible construction materials. Adequate fuel breaks shall be created around all grading, site work, and other construction activities in areas where there is flammable vegetation. Combustible materials will not be brought on-site without prior fire department approval.

In addition to the requirements outlined above, the Project will comply with the following important risk-reducing vegetation management guidelines:

- All-new power lines shall be installed underground for fire safety purposes. Temporary construction power lines may be allowed in areas that have been cleared of combustible vegetation.
- Caution must be used not to cause erosion or ground (including slope) instability or water runoff due to vegetation removal, vegetation management, maintenance, landscaping, or irrigation.

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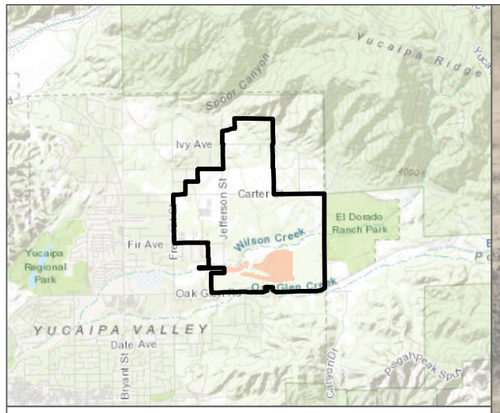

Wilson Creek Estates Project Site

Fuel Modification Zone

- Zone A (0-5ft) and Zone B (5-50ft) - irrigated
- Zone C (50-100ft) - thinning

Land Use

- Development

SOURCE: AERIAL-BING MAPPING SERVICE 2022; DEVELOPMENT-LACO ASSOCIATES 2022

DUDEK

0 175 350 Feet

FIGURE 5

Fuel Modification Plan

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

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6 Alternative Materials and Methods

As previously mentioned, Wine Country Specific Plan Project will be constructed in five phases over 20-years, as the Project is a Specific Plan, it is unknown at this time if the full recommended FMZ will be achievable in all areas of the Project, which will depend on lots and final location of structures. As such, this FPP incorporates the use of additional fire protection measures customized for the Project site based on the results of this analysis and focus on providing functional equivalency as a 100 feet wide fuel modification zone adjacent to open space areas. Additionally, based on fire behavior analysis, fuels within the open space areas are not expected to pose a significant threat to Project structures.

Research has indicated that the closer a fire is to a structure, the higher the level of heat exposure (Cohen 2000). However, studies indicate that given certain assumptions (e.g., 10 meters of low fuel landscape, no open windows), wildfire does not spread to homes unless the fuel and heat requirements (of the home) are sufficient for ignition and continued combustion (Cohen 1995, Alexander et al. 1998). Construction materials and methods can prevent or minimize ignitions. Similar case studies indicate that with nonflammable roofs and vegetation modification from 10–18 meters (roughly 32–60 feet) in southern California fires, 85–95% of the homes survived (Howard et al. 1973, Foote and Gilless 1996). Similarly, San Diego County after fire assessments indicate strongly that the building codes are working in preventing home loss: of 15,000 structures within the 2003 fire perimeter, 17% (1,050) were damaged or destroyed. However, of the 400 structures built to the 2001 codes (the most recent at the time), only 4% (16) were damaged or destroyed. Further, of the 8,300 homes that were within the 2007 fire perimeter, 17% were damaged or destroyed. A much smaller percentage (3%) of the 789 homes that were built to 2001 codes were impacted and an even smaller percentage (2%) of the 1,218 structures built to the 2004 Codes were impacted (IBHS 2008). Damage to the structures built to the latest codes is likely from flammable landscape plantings or objects next to structures or open windows or doors (Hunter 2008).

Obstacles, including non-combustible walls can block or deflect all or part of the radiation and heat, thus making narrower fuel modification distances possible. Fire behavior modeling conducted for the Project indicates that fires in the open space area would result in roughly 5-foot flame lengths under summer conditions. Extreme conditions may result in longer flame lengths approaching 18 feet.

As indicated in this report, the FMZs and additional fire protection measures proposed for the Project provides an equivalent wildfire buffer for structures adjacent to open space land where the full FMZ is not achievable. These recommendations are based on a variety of analysis criteria including predicted flame length, fire intensity (Btu), Project site topography and vegetation, extreme and typical weather, position of structures on pads, position of roadways, adjacent fuels, fire history, current vs. proposed land use, neighboring communities relative to the Project, and type of construction. The fire intensity research conducted by Cohen (1995), Cohen and Butler (1996), and Cohen and Saveland (1997) and Tran et al. (1992) supports the fuel modification alternative proposed for the Project.

6.1 Additional Structural Protection Measures

The following additional measures will be implemented to reduce potential structure fire exposure related to the reduced FMZs. These measures are customized for the Project site, its unique topographical and vegetative conditions, and focus on providing functional equivalency as a full fuel modification zone. As detailed in Section 5.4, the FMZ for the Project would include a minimum 5-foot non-combustible zone, 45-foot-wide irrigated zone,

and a 50-foot-wide thinning zone. In order to provide compensating structural protection in the absence of a 100-foot wide FMZ, and in addition to the structures being built to the latest ignition resistant codes, structures within the Project site that are unable to achieve the full 100-foot FMZ will also include the following features for additional fire prevention, protection, and suppression:

1. Windows will be upgraded on the preserved vegetation side of the structures subject to FMZ less than 100 feet to include dual pane, both panes tempered, exceeding the code requirement.
2. Minimum 1-hour fire rated exterior walls and doors (including roll up doors); one layer of 5/8-inch type X gypsum sheathing applied behind the exterior covering or cladding on the exterior side of the framing, from the foundation to the roof, for all exterior walls of each building facing the open space areas.
3. The vents will be ember-resistant for (recommend BrandGuard, O'Hagin, or similar vents). All vents used for this Project will be approved by YFD.
4. A 6-foot heat deflecting wall will be constructed of concrete masonry units (CMUs) between on-site structures and unmaintained open space.
5. Annually hire a 3rd party inspector to evaluate FMZ areas site wide to confirm they meet the requirements of this FPP and YFD.

Implementation of these additional fire protection features would justify a reduced FMZ. The information provided herein supports the ability of the proposed structures and FMZs to withstand the predicted short duration, low to moderate intensity wildfire, and ember shower that would be expected from a wildfire burning in the vicinity of the Project site or within the Project site's landscape.

7 Wildfire Education Program

Early evacuation for any type of wildfire emergency at the Project site is the preferred method of providing for resident safety, consistent with the YFD and CAL FIRE's current approach within the City of Yucaipa and San Bernardino County. As such, the Project's Homeowner's Association would formally adopt, practice, and implement a "Ready, Set, Go!" approach to evacuation. The "Ready, Set, Go!" concept is widely known and encouraged by the State of California and most fire agencies. Pre-planning for emergencies, including wildfire emergencies, focuses on being prepared, having a well-defined plan, minimizing the potential for errors, maintaining the Project site's fire protection systems, and implementing a conservative (evacuate as early as possible) approach to evacuation and Project area activities during periods of fire weather extremes.

Project residents and occupants would be provided ongoing education regarding wildfires and the FPP's requirements. The educational information must include maintaining the landscape and structural components according to the appropriate standards designed for the community. Informational handouts, community website pages, mailers, fire-safe council participation, inspections, and seasonal reminders are some methods that would be used to disseminate wildfire and relocation awareness information. YFD should review and approve all wildfire educational material/programs before printing and distribution.

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8 Conclusion

The requirements and recommendations set forth in this FPP meet fire safety, building design element, infrastructure, fuel management/modification, and landscaping recommendations of codes governing development in High and Very High FHSZ and WUI. The recommendations provided in the FPP have also been designed specifically for the proposed construction of structures within areas designated as FHSZ and/or WUI. When properly implemented on an ongoing basis, the fire protection strategies proposed in this FPP should significantly reduce the potential fire threat to vegetation on the community and its structures, as well as assist YFD in responding to emergencies within the Project site. The fire protection system provided for the Project site includes a redundant layering of code-compliant, fire-resistant construction materials and methods that have been shown through post-fire damage assessments to reduce the risk of structural ignition. Additionally, modern infrastructure would be provided, and all structures are required to include interior, automatic fire sprinklers consistent with the City's regulatory standards. Further, the proposed fuel modification for structures adjacent to the open space areas would provide a buffer between fuels in the open space and structures within the Project site.

The requirements and recommendations provided in this FPP have been designed specifically for the Project. This analysis and its fire protection justifications are supported by fire science research, results from previous wildfire incidents, and fire agencies that have approved these concepts. Where 100-foot FMZ is not achievable, the Project design features, asphalt roads, and irrigated landscape, would provide a level of safety equal to a 100-foot wide FMZ.

Based on the results of this FPP's analysis and findings, the FPP implementation measures presented in Table 9 summarize code required measures while Table 10 summarizes measures offered that exceed Code requirements. With all of the features and measures in Tables 9 and 10, the project's impact on fire safety would be less than significant.

Table 9. Code Required Fire Safety Features

Feature No.	Features Description
1	**Required Wildland Urban Interface Fire Safety Features described in Section 2.2.5.** Numerous features that reduce a project's exposure to flame and embers are required for Project's developed in the wildland urban interface. The Wine Country Specific Plan Project would implement all of them.
2	**Ignition Resistant Construction.** Project buildings will be constructed of ignition resistant construction materials based on the latest Building and Fire Codes.
3	**Interior Fire Sprinklers.** All new structures will include interior fire sprinklers and the YFD will have the authority to grant exceptions for non-combustible, smaller buildings.
4	**Fuel Modification Zones.** Provided throughout the perimeter and interior of the site.
5	**Fire Apparatus Access.** Provided throughout the community and will vary in width and configuration but will all provide at least the minimum required unobstructed travel lanes, lengths, turnouts, turnarounds, and clearances required by the applicable code.
6	**Gates.** Gates on private roads in the project will comply with code requirements including being equipped with a key switch, have a backup battery or manual mechanical disconnect for power failure, and meet the minimum width, clearance, and material requirements.

Table 9. Code Required Fire Safety Features

Feature No.	Features Description
7	**Premise Identification.** All roads and structures within the project will comply with code requirements including, use of proper materials, proper sizing, and proper placement depending on the structure or road type.
8	**Fire Hydrants.** Provided along fire access roadways on the street side of buildings or facing approved fire apparatus access roads complaint with current code requirements.
9	**Firefighting Improvements.** Firefighting staging areas and temporary refuge areas are available throughout the Project's developed areas, and along roadways and site green spaces.
10	**Water Availability**. Water capacity and delivery will provide for a reliable water source for operations and during emergencies requiring extended fire flow.
11	**Pre-Construction:** The Wine Country Specific Plan Project will have active developments including utilities, operable fire hydrants, construction please fuel modification zones established before bringing lumber or combustible materials onto project site.
12	**Construction Procedures.** New powerlines will be installed underground for fire safety purposes.

Table 10. Code Exceeding, Recommendations, or Alternative Materials and Methods Fire Safety Measures

Measure No.	Feature/Description
1	**FMZ with an added noncombustible zone.** The Wine Country Specific Plan Project will provide and maintain 100 feet of FMZ where possible in the project including a 5-foot-wide non-combustible Zone A, 45-foot-wide irrigated Zone B and a 50-foot wide thinning Zone C.
2	**Advanced Protection Measures where 100-foot FMZ is not possible**. In areas of the project Where 100 foot of fuel modification is not possible from the structures, advanced protection features will be put in place including tempered dual pane windows, minimum 1 hour fire rate exterior walls and doors, gypsum sheathing behind exterior covering or framing for all exterior walls facing open space areas, ember resistant vents, and A 6-foot heat deflecting wall.
3	**FMZ Inspections.** HOA will hire a 3rd party, YFD-approved, FMZ inspector and landscape plan reviewer to provide twice a year certification that the HOA maintained properties including all FMZs and trail system meet the requirements of this FPP. FMZ inspections will occur in June and late September.
4	**HOA Wildfire Education and Outreach.** The Community HOA will include an outreach and educational role to coordinate with VFD, oversee landscape committee enforcement of fire safe landscaping, ensure fire safety measures detailed in this FPP have been implemented, and educate residents on and prepare facility-wide "Ready, Set, Go!" plans.

Ultimately, it is the intent of this FPP to guide the fire protection efforts for the Project in a comprehensive manner. Implementation of the measures detailed in this FPP will reduce the risk of wildfire at the Project site and will improve the ability of firefighters to fight fires on the properties and protect property and neighboring resources, irrespective of the cause or location of ignition.

It must be noted that during extreme fire conditions, there are no guarantees that a given structure will not burn. Precautions and minimizing actions identified in this report are designed to reduce the likelihood that fire will impinge upon the Project's residents or threaten its visitors. Additionally, there are no guarantees that fire will not occur in the area or that fire will not damage property or cause harm to persons or their property. Implementation of the required enhanced construction features provided by the applicable codes and the fuel modification requirements provided in this FPP will reduce the Project site's vulnerability to wildfire. It will also help accomplish the goal of this FPP to assist firefighters in their efforts to defend structures.

It is recommended that the Wine Country Specific Plan Project maintain a conservative approach to fire safety. This approach must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go!" stance on evacuation. The Project is not to be considered a shelter-in-place development. However, the fire agencies and/or law enforcement officials may, during an emergency, as they would for any new development providing the layers of fire protection as the Project, determine that it is safer to temporarily refuge residents, employees or visitors on the Project site. When an evacuation is ordered, it will occur according to pre-established evacuation decision points or as soon as notice to evacuate is received, which may vary depending on many environmental and other factors. Fire is a dynamic and somewhat unpredictable occurrence and it is important for anyone living at the WUI to educate themselves on practices that will improve safety.

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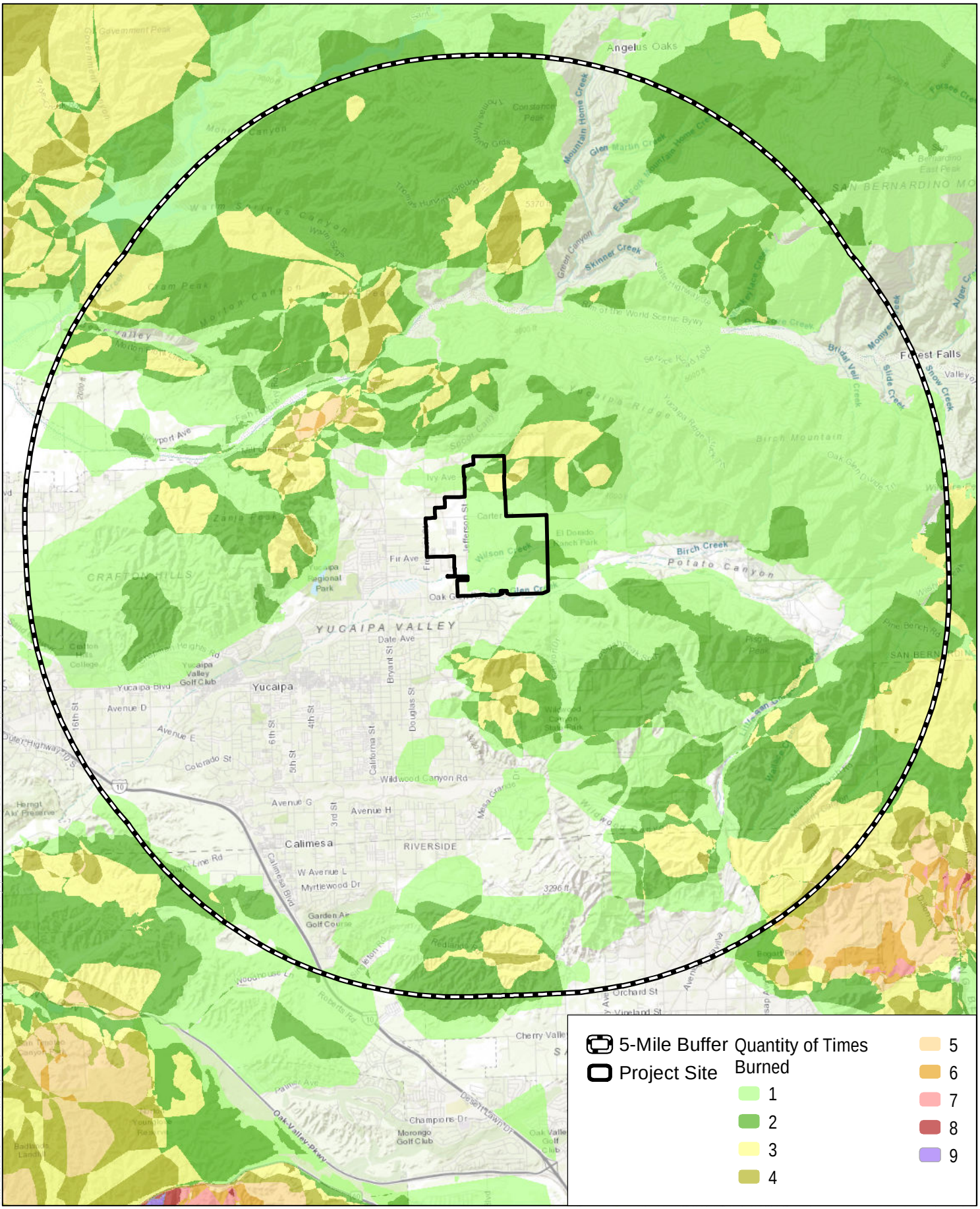
Appendix A
Photograph Log

Appendix B
Fire History



SOURCE: BASE MAP- ESRI MAPPING SERVICE; FIRE DATA-CALFIRE 2021

DUDEK

0 1 2 Miles

APPENDIX B

Fire History Map

Yucaipa Valley Wine Country Specific Plan - Fire Protection Plan

Appendix C
Fire Behavior Analysis

FIRE BEHAVIOR MODELING SUMMARY
YUCAIPA VALLEY WINE COUNTRY SPECIFIC PLAN PROJECT
YUCAIPA, CALIFORNIA

1 BehavePlus Fire Behavior Modeling History

Fire behavior modeling has been used by researchers for approximately 50+ years to predict how a fire will move through a given landscape (Linn 2003). The models have had varied complexities and applications throughout the years. One model has become the most widely used as the industry standard for predicting fire behavior on a given landscape. That model, known as "BEHAVE", was developed by the U. S. Government (USDA Forest Service, Rocky Mountain Research Station) and has been in use since 1984. Since that time, it has undergone continued research, improvements, and refinement. The current version, BehavePlus 6.0, includes the latest updates incorporating years of research and testing. Numerous studies have been completed testing the validity of the fire behavior models' ability to predict fire behavior given site specific inputs. One of the most successful ways the model has been improved has been through post-wildfire modeling (Brown 1972, Lawson 1972, Sneeuwjagt and Frandsen 1977, Andrews 1980, Brown 1982, Rothermel and Rinehart 1983, Bushey 1985, McAlpine and Xanthopoulos 1989, Grabner, et. al. 1994, Marsden-Smedley and Catchpole 1995, Grabner 1996, Alexander 1998, Grabner et al. 2001, Arca et al. 2005). In this type of study, Behave is used to model fire behavior based on pre-fire conditions in an area that recently burned. Real-world fire behavior, documented during the wildfire, can then be compared to the prediction results of Behave and refinements to the fuel models incorporated, retested, and so on.

Fire behavior modeling conducted on this site includes a relatively high-level of detail and analysis which results in reasonably accurate representations of how wildfire may move through available fuels on and adjacent the property. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, and fireline intensities, this analysis incorporated predominant fuel characteristics, slope percentages, and representative fuel models observed on site. The BehavePlus fire behavior modeling system was used to analyze anticipated fire behavior within and adjacent to key areas just outside of the proposed lots. Predicting wildland fire behavior is not an exact science. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather and the limits of weather forecasting. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire prevention planning information. To be used effectively, the basic assumptions and limitations of BehavePlus 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 fuels less than one-quarter inch in diameter. These are the fine fuels that carry fire. Fuels greater than one inch have little effect while fuels greater than three inches have no effect on fire behavior.
- Second, the model bases calculations and descriptions on a wildfire spreading through surface fuels that are within six feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.
- Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.

- Fourth, the BehavePlus fire behavior computer modeling system was not intended for determining sufficient fuel modification zone/defensible space widths. However, it does provide the average length of the flames, which is a key element for determining "defensible space" distances for minimizing structure ignition.

Although BehavePlus has some limitations, it can still 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. Natural fuels are made up of the various components of vegetation, both live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. The major fuel groups of grass, shrub, trees, 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 seven fuel characteristics help define the 13 standard fire behavior fuel models[1] and the five custom fuel models developed for Southern California[2]. According to the model classifications, fuel models used in BehavePlus have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Observation of the fuels in the field (on site) determines which fuel models should be applied in BehavePlus. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models and the custom Southern California fuel models:

- Grasses Fuel Models 1 through 3
- Brush Fuel Models 4 through 7, SCAL 14 through 18
- Timber Fuel Models 8 through 10
- Logging Slash Fuel Models 11 through 13

In addition, the aforementioned fuel characteristics were utilized in the recent development of 40 new fire behavior fuel models[3] developed for use in BehavePlus modeling efforts. These new models attempt to improve the accuracy of the standard 13 fuel models outside of severe fire season conditions, and to allow for the simulation of fuel treatment prescriptions. The following describes the distribution of fuel models among general vegetation types for the new 40 fuel models:

- Non-burnable Models NB1, NB2, NB3, NB8, NB9
- Grass Models GR1 through GR9
- Grass-shrub Models GS1 through GS4

1 Anderson, Hal E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service Gen. Tech. Report INT-122. Intermountain Forest and Range Experiment Station, Ogden, UT.

2 Weise, D.R. and J. Regelbrugge. 1997. Recent chaparral fuel modeling efforts. Prescribed Fire and Effects Research Unit, Riverside Fire Laboratory, Pacific Southwest Research Station. 5p.

3 Scott, Joe H. and Robert E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

- Shrub Models SH1 through SH9
- Timber-understory Models TU1 through TU5
- Timber litter Models TL1 through TL9
- Slash blowdown Models SB1 through SB4

BehavePlus software was used in the development of the Yucaipa Valley Wine Country Specific Plan Project (Proposed Project) Fire Protection Plan (FPP) Report in order to evaluate potential fire behavior for the Project site. Existing site conditions were evaluated, and local weather data was incorporated into the BehavePlus modeling runs.

2 Fuel Models

Dudek utilized the BehavePlus software package to analyze fire behavior potential for the Proposed Project site in Yucaipa, California. Refer to Figure 8, *Fire Behavior Modeling Map* for fire modeling scenario locations. As is customary for this type of analysis, five fire scenarios were evaluated, including two summer, onshore weather condition (northwest and southwest of the Project Site) and three extreme fall, Santa Ana wind weather condition (north/northeast, east, and south/southeast of the Project Site). The Project site is currently vacant and is surrounded by a variety of land uses including existing rural single-family residential developments directly to the northwest, west, and south; and El Dorado Ranch Park and naturally-vegetated open space land north, and east of the proposed project site. With that said, fuels and terrain within and adjacent to the Project development area could possibly produce flying embers that may affect the Project, but defenses have been built into the new Estate and Villa residential structures to prevent ember penetration and to extinguish fires that may result from ember penetration. It is the fuels directly adjacent to and within fuel modification zones that would have the potential to affect the Project's structures from a radiant and convective heat perspective as well as from direct flame impingement. The BehavePlus software requires site-specific variables for surface fire spread analysis, including fuel type, fuel moisture, wind speed, and slope data. The output variables used in this analysis include flame length (feet), rate of spread (feet/minute), fireline intensity (BTU/feet/second), and spotting distance (miles). The following provides a description of the input variables used in processing the BehavePlus models for the Proposed Project site. In addition, data sources are cited, and any assumptions made during the modeling process are described.

2.1 Vegetation (Fuels)

To support the fire behavior modeling efforts conducted for the Yucaipa Valley Wine Country Specific Plan Project, the different vegetation types observed within the Project areas and adjacent to the Project site were classified into the aforementioned numeric fuel models. As is customary for this type of analysis, the terrain and fuels within and adjacent to the project area were used for determining flame lengths and fire spread. It is these fuels that would have the potential to affect the Project's structure from a radiant and convective heat perspective as well as from direct flame impingement. Fuel beds, including the low- to- moderate load grass fuels (Gr1 and Gr2) and low- to-high-load shrub and grass-shrub fuels (Fuel Models Gs1, Gs2, Sh2, and Sh5) found throughout the interior portion of the Project site, as well as in the adjacent areas to the north, south, and east. These fuel types can produce flying embers that may affect the project, but defenses will be built into the structures to prevent ember penetration. Table 1 provides a description of the five existing fuel models observed in the vicinity of the site that were subsequently used in the analysis for this Project. A total of five fire modeling scenarios were completed for the

Project area. These modeling scenario locations were selected based on the probability of a fire approaching from these directions during a Santa Ana wind-driven fire event (fire scenarios 2, 3, and 4) and an on-shore weather pattern (fire scenarios 1 and 5). Dudek also conducted modeling of the site for post-Fuel Modification Zones' (FMZ) recommendations for this project (Refer to Table 2 for post-FMZ fuel model descriptions). Fuel modification includes the establishment of irrigated and thinned zones on the periphery of the new residential structures. For modeling the post-FMZ treatment condition, fuel model assignments were re-classified for the FMZs 0 and 1 (Fuel Model FM8/Gr1) and FMZ 2 (Gs1/Gs2).

Table 1. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
Gr2	Low-load, Dry climate grasses	Represents the maintained grass areas throughout the Project area.	<1.0 ft.
Gs1	Low-load, Dry climate grass-shrubs	Represents the grass-shrub vegetation located throughout and adjacent to the Project without maintenance.	<2.0 ft.
Gs2	Moderate-load, Dry climate grass-shrubs	Represents the grass-shrub vegetation located throughout and adjacent to the Project without maintenance.	<2.0 ft.
Sh2	Moderate-load, Dry Climate Shrubs	Represents the shrubs/chaparral vegetation located in the northeast/east portions of the project and adjacent to the Project without maintenance.	<2.0 ft.
Sh5	High-load, Dry Climate Shrubs	Represents the shrubs/chaparral vegetation located in the northeast/east portions of the project and adjacent to the Project without maintenance.	>4.0 ft.

Table 2. Post-development Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
Gr1	Short, sparse, dry climate grasses	Fuel Modification Zones 0 and 1: irrigated landscape throughout the Project site	<1.0 ft.
Gs1	Low-load, Dry climate grass-shrubs	Fuel Modification Zone 2: 50% thinning of brush around the perimeter of the structures	<2.0 ft.

2.2 Topography

Slope is a measure of angle in degrees from horizontal and can be presented in units of degrees or percent. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fire burning uphill spreads faster than those burning on flat terrain or downhill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. The Project site exhibits relatively flat terrain with natural slope values ranging from approximately 4% up to 35% on the periphery areas measured around the perimeter of the Project area from U.S. Geological Survey (USGS) topographic maps.

2.3 Weather Analysis

Historical weather data for the Wildomar region was utilized in determining appropriate fire behavior modeling inputs for the Project area. 50th and 97th percentile moisture values were derived from Remote Automated Weather Station (RAWS) and utilized in the fire behavior modeling efforts conducted in support of this report. Weather data sets from the Mill Creek RAWS (ID number 045109)[4] were utilized in the fire modeling runs.

RAWS fuel moisture and wind speed data were processed utilizing the Fire Family Plus software package to determine atypical (97th percentile) and typical (50th percentile) weather conditions. Data from the RAWS was evaluated from August 1 through November 30 for each year between 1961 and 2021 (extent of available data record) for 97th percentile weather conditions and from June 1 through September 30 for each year between 1961 and 2021 for 50th percentile weather conditions.

Following analysis in Fire Family Plus, fuel moisture information was incorporated into the Initial Fuel Moisture file used as an input in BehavePlus. Wind speed data resulting from the Fire Family Plus analysis was also determined. Initial wind direction and wind speed values for the two BehavePlus runs were manually entered during the data input phase. The input wind speed and direction is roughly an average surface wind at 20 feet above the vegetation over the analysis area. Table 3 summarizes the wind and weather input variables used in the Fire BehavePlus modeling efforts.

Table 3: Variables Used for Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Weather (97th Percentile)
Fuel Models	Gr1 (Post), Gr2, and Gs1	Gr1 (Post), Gr2, Gs2, Sh2, and Sh5
1 h fuel moisture	4%	1%
10 h fuel moisture	6%	2%
100 h fuel moisture	10%	5%
Live herbaceous moisture	39%	30%
Live woody moisture	78%	60%
20 ft. wind speed	15 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	235 and 310	40, 100, and 170
Wind adjustment factor	0.4	0.4
Slope (uphill)	4 to 7%	9% to 35%

3 Fire Behavior Modeling Efforts

As mentioned, the BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the Proposed Project site. Five focused analyses were completed for both the existing project site conditions and the post project conditions, each assuming worst-case fire weather conditions for a fire approaching the project site from the northwest, north/northeast, east, south, and southwest. The results of the

[4] Mills Creek RAWS Station Latitude and Longitude: 34.079856, -117.046761

modeling effort included anticipated values for surface fires flame length (feet), rate of spread (mph), fireline intensity (Btu/ft/s), and spotting distance (miles). The aforementioned fire behavior variables are an important 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, Bevins, and Seli 2008). 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. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds. Four fire modeling scenario locations were selected to better understand the different fire behavior that may be experienced on or adjacent the site based on slope and fuel conditions; these fire scenarios are explained in more detail below:

Fire Scenario Locations and Descriptions:

- **Scenario 1:** A summer, on-shore fire (50th percentile weather condition) burning through low-load grass/grass-shrub and chaparral dominated vegetation northwest of the development area. The terrain is flat (approximately 4% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the north/northwest/west or within the naturally-vegetated areas farther to the north/northwest of the Project site.
- **Scenario 2:** A fall, extreme off-shore fire (97th percentile weather condition) burning through moderate-to- high-load shrub and chaparral dominated vegetation directly north/northeast of the development area. The terrain is relatively steep (approximately up to 35% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the north Project site or within the naturally-vegetated areas farther north/northeast of the development. This type of fire would typically spread through the shrub and chaparral dominated vegetation relatively moderately towards the north and east portions of the development site, pre-development.
- **Scenario 3:** A fall, extreme off-shore fire (97th percentile weather condition) burning through low- to-moderate-load grass/grass-shrub and chaparral dominated vegetation directly east of the development area. The terrain is relatively flat (approximately up to 9% slope) with potential ignition sources from a car fire originating along Oak Glen Road or within the naturally-vegetated areas farther east/southeast of the development. This type of fire would typically spread through the grass/grass-shrub and chaparral dominated vegetation relatively moderately fast towards the east and south portions of the development site, pre-development.
- **Scenario 4:** A fall, extreme off-shore fire (97th percentile weather condition) burning through moderate-to- high-load shrub and chaparral dominated vegetation further south of the development area (across Oak Glen Road). The terrain is relatively steep (approximately up to 30% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the south Project site or within the naturally-vegetated areas farther south/southeast of the development. This type of fire could create embers from the shrub and chaparral dominated vegetation that could be blown towards the development site, pre-development.

- **Scenario 5:** A summer, on-shore fire (50th percentile weather condition) burning through low-load grass/grass-shrub and chaparral dominated vegetation in the southwest portion of the development area. The terrain is flat (approximately 7% slope) with potential ignition sources from a car and/or structure fire originating within the existing rural residential homes to the south and/or west of the development.

4 Fire Behavior Modeling Results

The results presented in Tables 4 and 5 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. 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.

As presented in Table 4, wildfire behavior adjacent to the Project site is expected to be primarily of moderate to high intensity through the non-maintained surface grass-shrub/shrub-chaparral dominated fuels directly adjacent to the Project site. Worst-case fire behavior under peak weather conditions (represented by Fall Weather, Scenario 2) is anticipated to be a wind-driven fire from the east/northeast during the fall. Under such conditions, expected surface flame length are expected to reach approximately 44 feet with wind speeds of 50+ mph. Under this scenario, fireline intensities reach 21,327 BTU/feet/second with moderate spread rates of 6.6 mph and could have a spotting distance up to 2.4 miles away.

Wildfire behavior through the non-maintained shrub-chaparral dominated fuels farther to the south being fanned by 16 mph sustained winds, from the northwest and pushed by on-shore ocean breezes typically exhibit less severe fire behavior due to lower wind speeds and higher humidity. Under typical onshore weather conditions, a surface vegetation fire could have flame lengths approaching 7 feet in height and spread rates of approximately 0.9 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, can originate approximately 0.3 miles away.

As depicted in Table 5, post development fire behavior expected in the irrigated and replanted with plants that are acceptable with the Riverside County Fire Department/Cal Fire (FMZ Zones 0 and 1 – Gr1) under peak weather conditions experience a significant reduction in flame length and intensity. Fuel modification would result in a reduction to approximately 4.0 feet by the time the interior irrigated landscapes of the FMZ (Zones 0 and 1) are reached. During on-shore weather conditions, a fire approaching from the west/southwest towards the development footprint would have low fire intensity and spotting distances due to the higher live and dead fuel moisture contents. These reduction of flame lengths and intensities are assumed to occur within the 100 feet of fuel modification that is achieved for most of the. Therefore, the FMZs proposed for the Project are approximately 2.5-times the flame length of the worst-case fire scenario under peak weather conditions in the hillsides east/northeast of the Project site and approximately 8-times the flame lengths within the development footprint and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

Table 4: RAWS BehavePlus Fire Behavior Model Results – Existing Conditions

Fire Scenarios	Flame Length[1] (feet)	Fireline Intensity[1] (BTU/feet/second)	Spread Rate[1] (mph[2])	Spotting Distance[1] (miles)
Scenario 1: 4% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (NW of Project site)				
Low-load grasses (Gr2)	6.5’	327	0.9	0.3
Low-load grass-shrub (Gs1)	4.6’	155	0.3	0.2
Scenario 2: 35% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (N/NE of Project site)				
Moderate-load shrubs (Sh2)	8.0’ (15.7’)[3]	515 (2,261)	0.2 (1.0)[3]	0.4 (1.2)[3]
High-load shrubs (Sh5)	24.6’ (44.1’)[3]	5,975 (21,327)	1.8 (6.6)[3]	0.8 (2.4)[3]
Scenario 3: 9% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (E of Project site)				
Moderate-load grass (Gr2)	10.5’ (18.0’)[3]	937 (3,037)	1.9 (6.2)[3]	0.4 (1.3)[3]
Moderate-load grass-shrub (Gs2)	10.4’ (20.5’)[3]	924 (4,033)	1.0 (4.2)[3]	0.4 (1.4)[3]
Moderate-load shrubs (Sh2)	8.4’ (15.9’)[3]	582 (2,328)	0.2 (1.0)[3]	0.4 (1.2)[3]
Scenario 4: 30% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (S of Project site)				
Moderate-load grass-shrub (Gs2)	10.2’ (20.4’)[3]	884 (3,991)	0.9 (4.2)[3]	0.4 (1.4)[3]
Moderate-load shrubs (Sh2)	8.2’ (15.8’)[3]	554 (2,298)	0.2 (1.0)[3]	0.4 (1.2)[3]
High-load shrubs (Sh5)	25.2’ (44.4’)[3]	6,337 (21,681)	2.0 (6.7)[3]	0.8 (2.4)[3]
Scenario 5: 7% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (SW of Project site)				
Low-load grasses (Gr2)	6.4’	325	0.9	0.3
Moderate-load grass-shrub (Gs2)	4.6’	154	0.3	0.2

Note:

1. Wind-driven surface fire.
2. MPH=miles per hour.
3. Flame length, spread rate, and spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

Table 5: RAWS BehavePlus Fire Behavior Model Results – Post Project Conditions

Fire Scenarios	Flame Length[1] (feet)	Fireline Intensity[1] (BTU/feet/second)	Spread Rate[1] (mph[2])	Spotting Distance[1] (miles)
Scenario 1: 4% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (NW of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.3'	33	0.3	0.1
Fuel modification zone 2 (Gs1)	4.6'	155	0.3	0.2
Scenario 2: 35% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (N/NE of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.1 (3.1)[3]	27 (63)	0.1 (0.2)	0.2 (0.4)
Fuel modification zone 2 (Gs1)	6.8 (14.0)	371 (1,763)	0.6 (3.0)	0.3 (1.1)
Scenario 3: 9% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (E of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.0 (3.0)[3]	27 (63)	0.1 (0.2)	0.1 (0.4)
Fuel modification zone 2 (Gs1)	7.2 (14.0)	413 (1,763)	0.7 (3.0)	0.3 (1.1)
Scenario 4: 30% slope; Fall, extreme Santa Ana winds (97th percentile) – Pre-FMZ (S of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.0 (3.0)[3]	27 (63)	0.1 (0.2)	0.1 (0.4)
Fuel modification zone 2 (Gs1)	7.2 (14.0)	416 (1,763)	0.7 (3.0)	0.3 (1.1)
Scenario 5: 7% slope; Summer on–shore winds (50th percentile) – Pre-FMZ (SW of Project site)				
Fuel modification zones 0 and 1 (Gr1)	2.3'	33	0.3	0.1
Fuel modification zone 2 (Gs1)	4.6'	154	0.3	0.2

Note:

1. Wind-driven surface fire.
2. MPH=miles per hour.
3. Flame length, spread rate, and spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph

The following describes the fire behavior variables (Heisch and Andrews 2010) as presented in Tables 4 and 5:

Surface Fire:

- Flame Length (feet): The flame length 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.
- Fireline Intensity (Btu/ft/s): Fireline intensity is the heat energy release per unit time from a one-foot wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function of rate of spread and heat per unit area, and is directly related to flame length. Fireline intensity and the flame length are related to the heat felt by a person standing next to the flames.
- Surface Rate of Spread (mph): Surface rate of spread is the "speed" the fire travels through the surface fuels. Surface fuels include the litter, grass, brush and other dead and live vegetation within about 6 feet of the ground.

The information in Table 6 presents an interpretation of the outputs for five fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Tables 4 and 5. Identification of modeling run locations is presented graphically in Figure 8 of the FPP Report.

Table 6: Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	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 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 to 11 feet	500-1000 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 1000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Appendix D
Undesirable Plant List

Botanical Name	Common Name	Comment*
Trees		
Abies species	Fir	F
Agonis juniperina	Juniper Myrtle	F
Casuarina cunninghamiana	River She-Oak	F
Chamaecyparis species (numerous)	False Cypress	F
Cryptomeria japonica	Japanese Cryptomeria	F
Cupressocyparis leylandii	Leyland Cypress	F
Cupressus species *(C. fobesii, C. glabra, C. sempervirens,)*	Cypress (Tecate, Arizona, Italian, others)	F
Eucalyptus species (numerous)	Eucalyptus	F, I
Juniperus species (numerous)	Juniper	F
Lithocarpus densiflorus	Tan Oak	F
Melaleuca species *(M. linariifolia, M. nesophila, M. quinquenervia)*	Melaleuca (Flaxleaf, Pink, Cajeput Tree)	F, I
Picea (numerous)	Spruce	F
Palm species (numerous)	Palm	F, I
Pinus species *(P. brutia, P. canariensis, P. b. eldarica, P. halepensis, P. pinea, P. radiata, numerous others)*	Pine (Calabrian, Canary Island, Mondell, Aleppo, Italian Stone, Monterey)	F
Platycladus orientalis	Oriental arborvitae	F
Pseudotsuga menziesii	Douglas Fir	F
Tamarix species *(T. africana, T. aphylla, T. chinensis, T. parviflora)*	Tamarix (Tamarisk, Athel Tree, Salt Cedar, Tamarisk)	F, I
Taxodium species *(T. ascendens, T. distichum, T. mucronatum)*	Cypress (Pond, Bald, Monarch, Montezuma)	F
Taxus species *(T. baccata, T. brevifolia, T. cuspidata)*	Yew (English, Western, Japanese)	F
Thuja species *(T. occidentalis, T. plicata)*	Arborvitae/Red Cedar	F
Groundcovers, Shrubs & Vines		
Acacia species	Acacia	F, I
Adenostoma fasciculatum	Chamise	F
Adenostoma sparsifolium	Red Shanks	F
Agropyron repens	Quackgrass	F, I
Anthemis cotula	Mayweed	F, I
Arctostaphylos species	Manzanita	F
Arundo donax	Giant Reed	F, I
Artemisia species *(A. abrotanium, A. absinthium, A. californica, A. caucasica, A. dracunculus, A. tridentata, A. pynocephala)*	Sagebrush (Southernwood, Wormwood, California, Silver, True tarragon, Big, Sandhill)	F
Atriplex species (numerous)	Saltbush	F, I
Avena fatua	Wild Oat	F
Baccharis pilularis	Coyote Bush	F
Bambusa species	Bamboo	F, I
Bougainvillea species	Bougainvillea	F, I
Brassica species *(B. campestris, B. nigra, B. rapa)*	Mustard (Field, Black, Yellow)	F, I

Botanical Name	Common Name	Comment*
Bromus rubens	Foxtail, Red brome	F, I
Castanopsis chrysophylla	Giant Chinquapin	F
Cardaria draba	Hoary Cress	I
Cirsium vulgare	Wild Artichoke	F,I
Conyza bonariensis	Horseweed	F
Coprosma pumila	Prostrate Coprosma	F
Cortaderia selloana	Pampas Grass	F, I
Cytisus scoparius	Scotch Broom	F, I
Eriogonum species *(E. fasciculatum)*	Buckwheat (California)	F
Fremontodendron species	Flannel Bush	F
Heterotheca grandiflora	Telegraph Plant	F
Hordeum leporinum	Wild barley	F, I
Juniperus species	Juniper	F
Lactuca serriola	Prickly Lettuce	I
Larrea tridentata	Creosote bush	F
Lolium multiflorum	Ryegrass	F, I
Lonicera japonica	Japanese Honeysuckle	F
Mimulus aurantiacus	Sticky Monkeyflower	F
Miscanthus species	Eulalie Grass	F
Muhlenbergia species	Deer Grass	F
Nicotiana species *(N. bigelovii, N. glauca)*	Tobacco (Indian, Tree)	F, I
Pennisetum setaceum	Fountain Grass	F, I
Perovskia atroplicifolia	Russian Sage	F
Phoradendron species	Mistletoe	F
Pickeringia montana	Chaparral Pea	F
Rhus (R. diversiloba, R. laurina, R. lentii)	Sumac (Poison oak, Laurel, Pink Flowering)	F
Ricinus communis	Castor Bean	F, I
Rhus Lentii	Pink Flowering Sumac	F
Salvia species (numerous)	Sage	F, I
Salsola australis	Russian Thistle	F, I
Solanum Xantii	Purple Nightshade (toxic)	I
Silybum marianum	Milk Thistle	F, I
Thuja species	Arborvitae	F
Urtica urens	Burning Nettle	F

*F = flammable, I = Invasive

Notes:

1. Plants on this list that are considered invasive are a partial list of commonly found plants. There are many other plants considered invasive that should not be planted in a fuel modification zone and they can be found on The California Invasive Plant Council's Website www.cal-ipc.org/ip/inventory/index.php. Other plants not considered invasive at this time may be determined to be invasive after further study.
2. For the purpose of using this list as a guide in selecting plant material, it is stipulated that all plant material will burn under various conditions.
3. The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
4. All vegetation used in Fuel Modification Zones and elsewhere in this development shall be subject to approval of the Fire Code Official.
5. Landscape architects may submit proposals for use of certain vegetation on a project specific basis. They shall also submit justifications as to the fire resistivity of the proposed vegetation.

SUGGESTED PLANT LIST FOR A DEFENSIBLE SPACE

BOTANICAL NAME	COMMON NAME	Climate Zone*
TREES		
Acer		
platanoides	Norway Maple	M
rubrum	Red Maple	M
saccharinum	Silver Maple	M
saccarum	Sugar Maple	M
macrophyllum	Big Leaf Maple	C/ (R)
Alnus rhombifolia	White Alder	C/I/M (R)
Arbutus		
unedo	Strawberry Tree	All zones
Archontophoenix		
cunninghamiana	King Palm	C
Arctostaphylos spp.**	Manzanita	C/I/D
Brahea		
armata	Blue Hesper Palm	C/D
edulis	Guadalupe Palm	C/D
Ceratonia siliqua	Carob	C/I/D
Cerdidium floridum	Blue Palo Verde	D
Cercis occidentalis**	Western Redbud	C/I/M
Cornus		
nuttallii	Mountain Dogwood	I/M
stolonifera	Redtwig Dogwood	I/M
Eriobotrya		C/I/D
japonica	Loquat	C
Erythrina caffra	Kaffirboom Coral Tree	I/M
Gingko biloba "Fairmount"	Fairmount Maidenhair Tree	I/D/M
Gleditisia triacanthos	Honey Locust	
Juglans		I
californica	California Walnut	C/I
hindsii	California Black Walnut	I/D/M
Lagerstroemia indica	Crape Myrtle	I
Ligustrum lucidum	Glossy Privet	C/I/M
Liquidambar styraciflua	Sweet Gum	I
Liriodendron tulipifera	Tulip Tree	
Lyonothamnus floribundus		C
ssp. Asplenifolius	Fernleaf Catalina Ironwood	C/I/D
Melaleuca spp.	Melaleuca	C/I
Parkinsonia aculeate	Mexican Palo Verde	
Pistacia	Chinese Pistache	
chinensis	Pistachio Nut	C/I/D

vera	Pistachio Nut	I
Pittosporum		
phillyraeoides	Willow Pittosporum	C/I/D
viridiflorum	Cape Pittosporum	C/I
Platanus		
acerifolia	London Plane Tree	All zones
racemosa**	California Sycamore	C/I/M
Populus		
alba fremontii**	White Poplar Western	D/M
trichocarpa	Cottonwood Black	I
Prunus	Cottonwood	I/M
xblireiana		
caroliniana	Flowering Plum Carolina	M
ilicifolia**	Laurel Cherry Hollyleaf	C
lyonii**	Cherry Catalina Cherry	C
serrulata ‘Kwanzan’	Flowering Cherry	C
yedoensis ‘Akebono’	Akebono Flowering Cherry	M
Quercus		M
agrifolia**	Coast Live Oak	
engelmannii	Engelmann Oak	C/I
** suber	Cork Oak	I
Rhus		C/I/D
lancea** Salix	African Sumac	
spp.**	Willow Brisbane	C/I/D
Tristania conferta	Box	All zones (R)
Ulmus		C/I
parvifolia	Chinese Elm Siberian	
pumila	Elm California Bay	I/D
Umbellularia californica**	Laurel	C/M
		C/I

SHRUBS		
Agave	Century Plant	D
americana	Century Plant	D
deserti	Shawis Century Plant	D
shawi**		
Amorpha fruticosa**	False Indigobush	I
Arbutus		
menziesii**	Madrone	C/I
Arctostaphylos spp.**	Manzanita	C/I/D
Atriplex**		
canescens	Hoary Saltbush	I
lentiformis	Quail Saltbush	D
Baccharis**		
glutinosa	Mule Fat	C/I
pilularis	Coyote Bush	C/I/D
Carissa grandiflora	Natal Plum	C/I
Ceanothus spp.**	California Lilac	C/I/M
Cistus spp.	Rockrose	C/I/D
Cneoridium dumosum**	Bushrue	C
Comarostaphylis**		
diversifolia	Summer Holly	C
Convolvulus cneorum	Bush Morning Glory	C/I/M
Dalea		
orcuttii	Orcutt's Delea	D
spinosa**	Smoke Tree	I/D
Elaeagnus		
pungens	Silverberry	C/I/M
Encelia**		
californica	Coast Sunflower	C/I
farinose	White Brittlebush	D/I
Eriobotrya		
deflexa	Bronze Loquat	C/I
Eriophyllum		
confertiflorum**	Golden Yarrow	C/I
staechadifolium	Lizard Tail	C
Escallonia spp.	Escallonia	C/I
Feijoa sellowiana	Pineapple Guava	C/I/D
Fouqueria splendens	Ocotillo	D
Fremontodendron**		
californicum	Flannelbush	I/M
mexicanum	Southern Flannelbush	I
Galvezia		
juncea	Baja Bush-Snapdragon	C
speciosa	Island Bush-Snapdragon	C
Garrya		
elliptica	Coast Silktassel	C/I
flavescens**	Ashy Silktassel	I/M

Heteromeles arbutifolia**	Ashy Silktassel	I/M
Lantana spp.	Toyon	C/I/M
Lotus scoparius	Lantana	C/I/D
Mahonia spp.	Deerweed	C/I
	Barberry	C/I/M
Malacothamnus		
clementinus		
	San Clemente Island Bush Mallow	C
fasciculatus**		
	Mesa Bushmallow	C/I
Melaleuca spp.		
Mimulus spp.**	Melaleuca	C/I/D
Nolina	Monkeyflower	C/I (R)
parryi		
parryi ssp. wolfii	Parry's Nolina	I
Photinia spp.	Wolf's Bear Grass	D
Pittosporum	Photinia	All Zones
crassifolium		
rhombifolium		CI/I
tobira 'Wheeleri'	Queensland Pittosporum	C/I
undulatum	Wheeler's Dwarf	C/I/D
viridiflorum	Victorian Box	C/I
Plumbago auriculata	Cape Pittosporum	C/I
Prunus	Cape Plumbago	C/I/D
caroliniana		
ilicifolia**	Carolina Laurel Cherry	C
lyonii**	Hollyleaf Cherry	C
Puncia granatum	Catalina Cherry	C
Pyracantha spp.	Pomegranate	C/I/D
Quercus	Firethorn	All Zones
dumosa**		
Rhamus	Scrub Oak	C/I
alaternus		
californica**	Italian Blackthorn	C/I
Rhaphiolepis spp.	Coffeeberry	C/I/M
Rhus	Rhaphiolepis	C/I/D
integrifolia**		
laurina	Lemonade Berry	C/I
lentii	Laurel Sumac	C/I
ovata**	Pink-Flowering Sumac	C/D
trilobata**	Sugarbush	I/M
Ribes	squawbush	I
viburnifolium		
speciosum**	Evergreen Currant	C/I
Romneya coulteri	Fuschia-Flowering Gooseberry	C/I/D
Rosa	Matilija Poppy	I
californica**		
minutifolia		

Salvia spp.**	California Wild Rose	C/I
Sambucus spp.**	Baja California Wild Rose	C/I
Symphoricarpos mollis**	Sage	All Zones
Syringa vulgaris	Elderberry	C/I/M
Tecomaria capensis	Creeping Snowberry	C/I
Teucrium fruticans	Lilac	M
Toxicodendron**	Cape Honeysuckle	C/I/D
diversilobum	Bush Germander	C/I
Verbena		
lilacina	Poison Oak	I/M
Xylosma congestum		
Yucca**	Lilac Verbena	C
schidigera	Shiny Xylosma	C/I
whipplei		
	Mojave Yucca	D
	Foothill Yucca	I

GROUNDCOVERS		
Achillea**	Yarrow	All Zones
Aptenia cordifolia	Apteria	C
Arctostaphylos spp.**	Manzanita	C/I/D
Baccharis**		
pilularis	Coyote Bush	C/I/D
Ceanothus spp.**	California Lilac	C/I/M
Cerastium tomentosum	Snow-in-Summer	All Zones
Coprosma kirkii	Creeping Coprosma	C/I/D
Cotoneaster spp.	Redberry	All Zones
Drosanthemum hispidum	Rosea Ice Plant	C/I
Dudleya		
brittonii	Brittonis Chalk Dudleya	C
pulverulenta**	Chalk Dudleya	C/I
virens	Island Live Fore-ever	C
Eschscholzia californica**	California Poppy	All Zones
Euonymus fortunei		
‘Carrierei’	Glossy Winter Creeper	M
‘Coloratus’	Purple-Leaf Winter Creeper	M
Ferocactus viridescens**	Coast Barrel Cactus	C
Gaillardia grandiflora	Blanket Flower	All Zones
Gazania spp.	Gazania	C/I
Helianthemum spp.**	Sunrose	All Zones
Lantana spp.	Lantana	C/I/D
Lasthenia		
californica**	Common Goldfields	I
glabrata	Coastal Goldfields	C
Lupinus spp.**	Lupine	C/I/M
Myoporum spp.	Myoporum	C/I
Pyracantha spp.	Firethorn	All zones
Rosmarinus officinalis	Rosemary	C/I/D
Santolina		
chamaecyparissus	Lavender Cotton	All Zones
virens	Santolina	All Zones
Trifolium frageriferum	O’Connor’s Legume	C/I
Verbena		
rigida	Verbena	All Zones
Viguiera laciniata**	San Diego Sunflower	C/I
Vinca		
minor	Dwarf Periwinkle	M

VINES		
Antigonon leptopus	San Miguel Coral Vine	C/I
Distictis buccinatoria	Blood-Red Trumpet Vine	C/I/D
Keckiella cordifolia**	Heart-Leaved Penstemon	C/I
Lonicera		
japonica 'Halliana'	Hall's Honeysuckle	All Zones
subspicata**	Chaparral Honeysuckle	C/I
Solanum		
jasminoides	Potato Vine	C/I/D
PERENNIALS		
Coreopsis		
gigantean	Giant Coreopsis	C
grandiflora	Coreopsis	All Zones
maritime	Sea Dahlia	C
verticillata	Coreopsis	C/I
Heuchera maxima	Island Coral Bells	C/I
Iris douglasiana**	Douglas Iris	C/M
Iva hayesiana**	Poverty Weed	C/I
Kniphofia uvaria	Red-Hot Poker	C/M
Lavandula spp.	Lavender	All Zones
Limonium californicum		
var. mexicanum	Coastal Statice	C
perezii	Sea Lavender	C/I
Oenothera spp.	Primrose	C/I/M
Penstemon spp.**	Penstemon	C/I/D
Satureja douglasii	Yerba Buena	C/I
Sisyrinchium		
bellum	Blue-Eyed Grass	C/I
californicum	Golden-Eyed Grass	C
Solanum		
xantii	Purple Nightshade	C/I
Zauschneria**		
californica	California Fuschia	C/I
cana	Hoary California Fuschia	C/I
'Catalina'	Catalina Fuschia	C/I
ANNUALS		
Lupinus spp.**	Lupine	C/I/M

*Climate Zones: C= Coast, D= Desert, I= Inland/Coastal, M= Mountain, R= best grown in riparian areas

** = San Diego County native or naturalizing plant species

Appendix E

Firewise Community Resources

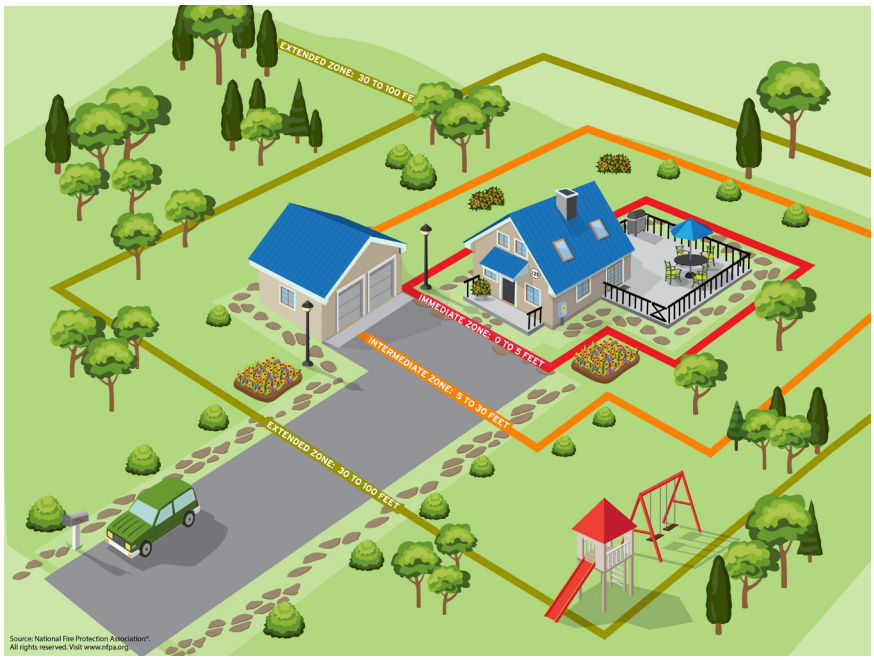
FIREWISE USA®
RESIDENTS REDUCING WILDFIRE RISKS

FIREWISE USA® RECOGNITION PROGRAM COMMUNITY WILDFIRE RISK ASSESSMENT

Firewise USA® and the US Wildfire Problem

Every year, devastating wildfires burn across the United States. At the same time, a growing number of people are living where wildfires are a real risk. While these fires will continue to happen, there are things you can do to help protect your home and neighborhood as well as your family's safety.

The NFPA Firewise USA® recognition program was designed to help people learn about wildfire and how they can make their homes and neighborhoods safer. It's based on research that shows how to prepare homes to withstand embers and prevent flames or surface fire from igniting the home and its immediate surroundings, by working in an area known as the home ignition zone (HIZ). This is the home and everything around it within 100 feet.



The community risk assessment should focus on the vulnerability of homes and surrounding home ignition zones to embers.

Red Boundary = Immediate Zone
Orange Boundary = Intermediate Zone
Green Boundary = Extended Zone

In many neighborhoods, home ignition zones often overlap onto adjacent properties—meaning that homes are closer than 100 feet to one another. This makes the conditions of neighboring homes and vegetation a part of the wildfire threat. It's extremely important that neighbors work collaboratively with each other—and talk with each other—to reduce their shared risk.

Using Firewise USA® to create ignition-resistant communities

Firewise USA® is a voluntary recognition program that provides a framework to help neighbors get organized, find direction, and take action to increase the ignition resistance of their homes and communities from wildfire.

There are several steps to take to become recognized as a Firewise USA® site:

- Organize — Create a **board or committee** of volunteers to represent your community, including residents and partners such as local forestry agencies or the fire department. Identify a **resident leader** who will be the program point of contact.
- Plan — The board or committee defines the boundaries of the site and obtains a **community wildfire risk assessment**. From the risk assessment, the board/committee creates a multi-year action plan to identify and prioritize actions to reduce ignition risk to homes.
- Do — Each year, neighbors complete educational and risk reduction **actions** identified in the plan.
- Tell — When the above criteria have been met, the Resident Leader **applies for recognition** through the **Firewise® Portal** (portal.firewise.org), describing educational and mitigation work in the site. Each year, **sites renew their status** by reporting their activity.

The community wildfire risk assessment is one of the most important steps in the process. It's a tool to help residents understand their wildfire risk and engage in risk reduction efforts.

There are many ways to assess risk from wildfires, using many different scales. The assessment is focused on the risk of home ignition from wildfires and will help guide residents on the most effective actions to prevent home ignitions that could result in wildfire disasters.

The recommendations provided by the completed assessment will be the board/committee's primary tool in determining the action priorities within the site's boundaries. The Firewise USA® program requires risk assessments be **updated at a minimum of every five years.**

HOW TO CONDUCT THE RISK ASSESSMENT

Each state may designate its own template and special requirements for Firewise USA® participation. **Before starting this assessment, please contact your state liaison to determine your state's process. The best assessments result from a collaboration between residents and their state forestry agency, local fire department, or another designated partner.**

The community wildfire risk assessment speaks to the general conditions of the overall Firewise USA® site and does not provide details on each individual dwelling.

The assessment should focus on:

- Vulnerability of homes to ember, surface fire, and crown fire
- Condition of the structures themselves
- Immediate hazards within the home ignition zone on individual properties
- Concerns presented by common/open space areas or adjacent public lands

It should also consider factors that impact risk and influence fire behavior or structure ignitability, such as:

- Structural characteristics (roofing, siding, decks)
- Vegetation types
- Slope and aspect (the direction a community faces—north, south, east, or west)
- Housing density

ASSESSMENT OVERVIEW

Features of a community risk assessment include:

- It can be completed in a variety of ways, including a walkthrough or a drive by, and does not require each individual dwelling unit to have a home risk assessment completed prior to the community assessment.
- It should focus on condition of vegetation within the participating site's boundary; general landscaping characteristics; home construction (materials used for roofs, siding, decks, etc.); and relationship of ignition potential of combustible materials on adjacent properties.
- It needs a logical recognized site boundary (HOA, defined neighborhood, street, etc.).

Assessment Participants

List the principal participants who assisted in data gathering and development of this assessment (include name, role/organization, phone and email). Participants can include your district forester, or Firewise® Board members for instance.

Participant 1				
Participant 2				
Participant 3				
Participant 4				
Participant 5				

DEFINING YOUR FIREWISE USA® SITE

If there is already a Community Wildfire Protection Plan that includes your site, it can be helpful to use in filling out this information. Ask your State Forestry representative if one exists.

General Site Description

Site name: _____

City: _____

County: _____

State: _____

Boundary description (this could be defined by your HOA, subdivision, defined neighborhood, street(s), etc.):

_____

Area (please indicate your unit of measurement) (OPTIONAL): _____

At the end of this document, please use the section provided to insert a map of your community's defined boundary.

General Site Information

Number of dwelling units – Firewise USA® participation requires a minimum of 8 individual dwelling units not to exceed 2,500 units within the site's identified boundary.

Contact **Firewise USA®** if you have questions about your area's eligibility, **visit our contact us** page.

Number of dwelling units: _____

Number of residents: _____

Description of Properties within the Boundary

Residential types in your site (check all that apply):

- ❑ Single family
- ❑ Duplex
- ❑ Townhomes
- ❑ Apartment
- ❑ Mobile
- ❑ Other: _____

Types of ownership (check all that apply):

- ❑ Private
- ❑ Common
- ❑ Public (county, state, or federal)

Lot sizes (check all that apply):

- ❑ Less than 0.10 acres or 4,356 square feet
- ❑ 0.10–0.50 acres or 4,356–21,780 square feet
- ❑ 0.51–1 acres or 22,215–43,560 square feet
- ❑ Greater than 1 acre or 43560 square feet

Other site information that you would like to provide (OPTIONAL): _____

_____

Description of local wildland fire characteristics:

Fire intensity and rate of spread depend on the vegetation type and condition (live/dead), topography, and typical weather patterns. This information can be obtained from your state forestry agency or local fire department.

Describe the common vegetation type(s) in your site (i.e., grasses, shrubs, and trees): _____

_____

Describe the topography within your site (include geographical features such as canyons, chimneys, steep slopes, indicate which direction slopes face, or note whether the area is flat): _____

_____

Severe wind exposure:

- ❑ Not in an area with regular exposure to winds
- ❑ Regularly exposed to winds
- ❑ Frequent severe winds

History of wildfire:

- ❑ Area with history of fire occurrence
- ❑ Area with no history of fire occurrence
- ❑ Unknown

FIREWISE USA® SITE OBSERVATIONS AND RECOMMENDATIONS

Use this section to record observations from within your site and recommendations for action that can be included in the site's action plan. Consider taking photos to keep in your site's files that illustrate successful risk reduction efforts and areas that need improvement.

Remember, this is a community-wide view and should report on the overall conditions of the entire site. Although individual home risk assessments are not required in this section, they may end up being a recommendation for the Action Plan.

Observations

The observation section is broken down by the characteristics of homes and the vegetation management within the home ignition zones and common areas. Mark the appropriate box for each category that best represents the conditions within your site.

HOME IGNITION ZONES

Home: General building construction. Are the homes made of ignition resistant building materials?

Roofing materials: composite shingles, metal, cement tile and clay

- ❑ Greater than 75% of homes have metal, tile, or Class A asphalt or fiberglass shingles
- ❑ 50–75% of homes have metal, tile, or Class A asphalt or fiberglass shingles
- ❑ 25–50% of homes have metal, tile, or Class A asphalt or fiberglass shingles
- ❑ Less than 25% of homes have metal, tile, or Class A asphalt or fiberglass shingles

Soffit vents: a screened vent on the underside component of the eaves that allows air to flow to the attic or the space below roof sheathing

- ❑ Greater than 75% of homes have non-combustible soffit vents with mesh or screening
- ❑ 50–74% of homes have non-combustible soffit vents with mesh or screening
- ❑ 25–50% of homes have non-combustible soffit vents with mesh or screening
- ❑ Less than 25% of homes have non-combustible soffit vents with mesh or screening
- ❑ Unknown

Siding: stucco, masonry products, plaster, and cement

- ❑ Greater than 75% of homes have non-combustible siding
- ❑ 50–74% of homes have non-combustible siding
- ❑ 25–50% of homes have non-combustible siding
- ❑ Less than 25% of homes have non-combustible siding

Skirting: material used around the bottom of homes and sometimes decks to protect the underside from exposure

- ❑ Greater than 75% of homes have skirting underneath raised floors/decks
- ❑ 50–74% of homes have skirting underneath
- ❑ 25–50% of homes have skirting underneath
- ❑ Less than 25% of homes have skirting underneath

Attachments: wood vs. non-combustible materials. (Examples of non-combustible materials include decks made with wood-plastic composites, higher density tropical hardwood, or fire retardant treated decking materials, and fences that use metal or masonry where attached directly to the siding of a home.)

- ❑ Greater than 75% of homes have NO wooden attachments
- ❑ 50–74% of homes have NO wooden attachments
- ❑ 25–50% of homes have NO wooden attachments
- ❑ Less than 25% of homes have NO wooden attachments

Windows

- ❑ Greater than 75% of homes have multi-paned windows
- ❑ 50–74% of homes have multi-paned windows
- ❑ 25–50% of homes have multi-paned windows
- ❑ Less than 25% of homes have multi-paned windows
- ❑ Unknown what type of window exist (single pane vs. multi-pane)

Roof/gutter debris (leaf litter, pine needles, etc.)

- ❑ Greater than 75% of homes have cleaned and maintained their roof and gutters
- ❑ 50–74% of homes have cleaned and maintained their roof and gutters
- ❑ 25–50% of homes have cleaned and maintained their roof and gutters
- ❑ Less than 25% of homes have cleaned and maintained their roof and gutters

Gutter type

- ❑ Greater than 75% of homes have metal gutters
- ❑ 50–74% of homes have non-combustible gutters
- ❑ 25–50% of homes have non-combustible gutters
- ❑ Less than 25% of homes have non-combustible gutters

Immediate Zone: 0–5 feet from the furthest attached point of homes. This area addresses the immediate vegetation and materials, creating a combustible-free area.
Items to consider:

- Is there dead vegetation, dried leaves, pine needles, and ground debris near foundations?
- Has hardscaping been used around perimeters to keep them free of litter/debris? Are there concrete, stone, or gravel walkways?
- Have wood mulch products been replaced with non-combustible alternatives, such as crushed stone/gravel options?
- Are there trees/shrubs next to the home? Are there branches overhanging the roof or within 10 feet of chimneys?

- ❑ Greater than 75% of homes have treated vegetation and created a combustible-free area
- ❑ 50–74% of homes have treated vegetation and created a combustible-free area
- ❑ 25–50% of homes have treated vegetation and created a combustible-free area
- ❑ Less than 25% of homes have treated vegetation and created a combustible-free area

Intermediate Zone: 5–30 feet from the furthest exterior point of the home. This area uses landscaping and breaks (areas of non-combustible materials such as dirt, cement, or rock) to help influence and decrease fire behavior. Items to consider:

- Are there fuel breaks such as driveways, walkways/paths, patios, and decks?
- Are lawns and native grasses maintained? General recommendation is a height of 4 inches.
- Is vegetation in this area spread out? It is recommended that trees and shrubs should be limited to small clusters of a few each to break up continuity; trees should be spaced to a minimum of 18 feet between crowns.
- Have ladder fuels (vegetation under trees) been removed so a surface fire cannot reach the crowns? Have trees been pruned? General recommendations are up to 6 to 10 feet from the ground; for shorter trees, do not exceed 1/3 of the overall tree height.
- Are plants, trees, and lawns watered to keep them from becoming dry?

❑ Greater than 75% of homes have treated vegetation
❑ 50–74% of homes have treated vegetation
❑ 25–50% of homes have treated vegetation
❑ Less than 25% of homes have treated vegetation

Extended Zone: 30–100 feet, out to 200 feet (where applicable). Generally, this area focuses on landscaping—managing the vegetation to influence fire behavior and spread. The goal here is not to eliminate fire but to interrupt fire's path and keep flames smaller and on the ground. At these distances, property lines may overlap, presenting the opportunity and need to work collaboratively with neighbors. Items to consider:

- Are there heavy accumulations of ground litter/debris?
- Is there dead plant and tree material that should be removed?
- Are storage sheds and/or other outbuildings in this zone clear of vegetation?
- Do mature trees have small conifers and brush growing between them or is the space maintained?
- Do trees 30–60 feet from the home have at least 12 feet between canopy tops? Is there at least 6 feet between canopy tops of trees located 60–100 feet from the home?

❑ Greater than 75% of homes have treated vegetation
❑ 50–74% of homes have treated vegetation
❑ 25–50% of homes have treated vegetation
❑ Less than 25% of homes have treated vegetation

Common areas or adjacent public lands: (community owned/managed)

❑ Not adjacent to wildlands with accumulated fuels
❑ Adjacent to wildlands with accumulated fuels

Is there a management plan for these fuels? If so, please describe: _____

_____

Additional comments or observations regarding site conditions: _____

_____

Summary

Use this section to summarize findings in observations. The percentages captured will help you briefly explain a snapshot of your community's current status and areas for successful focus. List areas where there is significant success and areas where improvements could be made, especially at low cost with sweat equity/volunteer labor. Of the three home ignition zones, emphasis should be on the immediate zone.

Example: Greater than 75% of homes observed have non-combustible roofs; however, there were several noted with wood shake shingles.

Recommendations

Using the findings from the observation phase, identify actions and steps that can be taken to reduce the site's risk from wildfire. Prioritize recommendations based on the potential fire threat to homes. It's recommended that residents address hazards at the home first and work their way out into the three home ignition zones. Remember, small things can have a huge impact on home survivability. Use these recommendations to create your site's action plan.

Examples:

- Less than 75% of homes observed had a roof free of leaf litter, pine needles, and other debris. Encourage residents to remove the debris and keep those areas clean to work towards greater than 75% compliance.
- Bark mulch is widely used within the immediate area. Recommend removing bark mulch and replacing with an ignition-resistant material, such as crushed stone or gravel.
- Work with residents to improve the number of homes that have removed flammable materials 0–5 feet from the home.

NEXT STEPS

The information you have collected during the assessment process will help you develop recommendations that can be applied to your site's action plan. Action plans are a prioritized list of risk reduction projects and the related investments needed to achieve them for the site. Action plans also highlight suggested homeowner actions and education activities that participants will strive to complete annually, or over a period of multiple years. Action plans should be **updated at a minimum of at least every three years.**

Visit, **How to Become a Firewise USA site,** to view the full list of required criteria needed to complete the Firewise USA® recognition program's application process. Or **visit the Program Management portal** to start your application.

Although not required, you may also consider adding addenda that cover the following community/fire safety issues:

- Hydrant locations
- Ingress/egress routes for the community
- Location of fire district and its capabilities
- Street signs and address numbers
- Water supply for fire response

We recommend reaching out to your local fire department for assistance in determining what other safety issues to address.

See next page to insert a map of your community's defined boundary.

MAP OF YOUR COMMUNITY'S DEFINED BOUNDARY

Click in the box to insert your image.

Appendix/Definitions

These resources will additionally provide aid in understanding the interaction between wildfire behavior and the home ignition zone:

- E-learning: Understanding the Wildfire Threat to Homes, **visit our online courses.**
- Preparing Homes for Wildfire: Actions that reduce risk – tips and resources, **visit our page Preparing Homes for Wildfire.**

Dwelling Unit: Household/residence built for occupancy by one person, a family, or roommates, including mobile homes and cabins, and for multi-family residential occupancies (i.e. duplexes, and other types of attached housing). An apartment building with 10 units would be considered 10 dwelling units.

Home Ignition Zone: The home and everything around it out to 100 feet. The condition of the home and surrounding landscape within 100 feet will influence the ignitability of the structure.

Firewise USA® Action Plan: A prioritized list of risk reduction projects/investments for the participating site, along with suggested homeowner actions and education activities that participants will strive to complete annually, or over a period of multiple years. The submitted action plan should be broken down by year and reflect those goals (with examples attached). This document is required to be updated at least **every three years**. As circumstances change (e.g., completing activities, experiencing a fire or a natural disaster, new construction in community, etc.), the action plan may need to be updated more frequently.

Firewise USA® Community Wildfire Risk Assessment: An assessment that focuses on the risk of home ignition from wildfires by looking at the conditions of the homes and surrounding home ignition zones. It is used to help guide residents on the most effective actions to prevent home ignitions and wildfire disasters. This document is required to be updated at least **every five years.**

Firewise® Board or Committee: A group comprised of residents and other applicable stakeholders. Consider inviting the local fire department, state forestry agency, elected officials, emergency manager, and, if applicable, the property management company to participate. The board/committee will guide the efforts of the Firewise USA® site, using the risk assessment to identify and prioritize activities in the action plan.

Firewise® Resident Leader: A member of the community that is designated as the lead for a Firewise USA® site and is a part of the Firewise® board or committee. They are the primary contact between the community and the program, responsible for completing the initial recognition application and annual renewal application via the online management portal (Firewise® Portal). A site may have more than one designated resident leader assigned in the Firewise® Portal.

State Liaison: Typically, the employee of the organization that hosts the official state forester. This person is designated by the state forester, is responsible for setting the direction of Firewise USA® implementation in the state, and is the state's main contact to the national program. They are also responsible for reviewing and approving new site applications and may choose to review annual renewal applications. A list of state liaisons can be found on NFPA's website so, you can **contact your state liason.**

Voluntary Recognition Program: Firewise USA® is a volunteer program that provides a set of criteria that residents choose to work towards. It is not required for individuals in wildfire prone areas to participate in or be a part of in order to take risk reduction actions.

Firewise USA® was loosely modeled after the Arbor Day Foundation's Tree City USA program, enabling residents to come together voluntarily to meet a set of criteria that qualify them for national recognition. This means that residents choose to be involved and determine their site's boundaries. When they meet the Firewise USA® criteria, they earn national recognition for doing so. Each year, when verifying they are continuing to reduce wildfire risks in the community, they continue to enjoy national recognition and remain in good standing by continuing to meet the criteria. Recognition comes in the form of signage and publicity on the Firewise.org website, at a minimum.

Firewise® Portal: Online community/Firewise USA® site management system. All new and renewal applications for recognition are completed via the portal.

Application for Recognition: In order to be a recognized participant in the Firewise USA® program, a site must meet program criteria and the online application found in the Firewise® portal must be filled out. There are eight steps to the application:

- Step 1: Overview — This includes the basic community information (contacts, size, location).
- Step 2: Risk Assessment — The wildfire community risk assessment must be uploaded into the application. It carries over each year until the five-year update cycle is reached.
- Step 3: Board/Committee — A site must acknowledge that they have a board/committee and may choose to share committee member names and email addresses. This provides NFPA with backup contacts in case the resident leader is unreachable.
- Step 4: Action Plan — The developed action plan must be uploaded to the application; it carries over each year until the three-year update cycle is reached.
- Step 5: Educational Outreach — Each participating site is required to hold a minimum of one wildfire risk reduction educational outreach event or activity annually. Examples of acceptable events can be found in that section of the application.
- Step 6: Vegetation Removal — A major component of wildfire risk reduction is the removal of vegetation (shrubs, brush, limbs, trees, etc.) from individual properties and common-area property. Tracking vegetation removal provides forestry and fire agencies with information on the quantity of potential wildfire fuel that's been eliminated from the area(s). This section provides tools to help a community estimate its vegetation removal in cubic yards.
- Step 7: Investment — Investing the equivalent of one volunteer hour (valued at $25.43) per residential dwelling unit within the site's boundary in annual wildfire risk reduction actions is a requirement of the national recognition program's criteria for maintaining an "In Good Standing" status. Annual investment information can be reported in hours worked or money spent.
- Step 8: Review — Verify that each component of the application has been filled out correctly before submitting the application.

Annual Renewal: In order to remain "In Good Standing" in the program participating sites will need to complete an annual renewal application. This application is typically due mid-November. Requirements are similar to the initial application for recognition. More information can be found online, by visiting our Annual Renewal Information page.

Certificate of Recognition: Sites that successfully meet the participation requirements are provided a "Certificate of Recognition." This is provided upon approval of the initial application for recognition and on an annual basis upon approval of the renewal application. The certificate can be accessed from the community's dashboard on the Firewise® Portal.

Certified vs. Recognized: As described in the definition of Voluntary Recognition Program, Firewise USA® sites meet a set of criteria to earn national recognition, and continue to meet specific criteria annually to remain in good standing with the program. The words "certified" and "certification" are not affiliated with the Firewise USA® program. To be "certified" implies that an individual has demonstrated specific competency in a job role or skill set. An example would be a certified electrical safety technician. Organizations can also be certified, generally meaning they meet qualifications that give them access to specific benefits or resources. An example would be the Women's Business Enterprise National Council (WBENC) certification that validates that a business is 51 percent owned, controlled, operated, and managed by a woman or women. Firewise USA® sites are not certified, and neither do individuals nor their properties within site boundaries receive certification.