Fire Protection Plan
Lone Oak Road Project

Prepared for:

The County of San Diego
Department of Planning and Land Use
5510 Overland Drive
San Diego, California 92123

Project Applicant:

Marker Lone Oak LLC
427 South Cedros Avenue, Suite 201
Solana Beach, California 92075

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024
Contact: Michael Huff, Project Manager

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EXECUTIVE SUMMARY

The Lone Oak Road Project is a proposed private residential development located on two parcels encompassing 14.2 acres within unincorporated San Diego County, California, southeast of the City of Vista. The project proposes a Vesting Tentative Map and Major Use Permit with the development of a total 24 residential lots. The project is further divided into one private drive lot, one HOA access lot, two water quality/detention basin lots, one HOA open space lot and one HOA biological open space lot. The project is located north of Highway 78, generally, 0.6 miles southeast of Vista, 1.4 miles northeast of Highway 78, and roughly 0.9 miles northwest of San Marcos. The entrance to the Lone Oak Road project site will be located off of Lone Oak Road, approximately 0.1 miles south of its intersection with Buena Creek Road. The proposed development will include:

- A total of 24 single-family home lots
- Residential streets, driveways, fire hydrants, and associated infrastructure
- A biological open space lot including a County Resource Protection Ordinance (RPO) wetland and a 50-foot oak woodland buffer
- Primary ingress/egress off of Lone Oak Road with secondary ingress/egress off Cleveland Trail
- Fuel Modification adjacent lots next to open space areas and the project perimeter.

The Lone Oak Road property lies within an area statutorily designated a State Responsibility Area (SRA) “Very High Fire Hazard Severity Zone,” by CAL FIRE. Fire hazard designations are based on topography, vegetation, and weather, amongst other factors with more hazardous sites including steep terrain, unmaintained fuels/vegetation, and wildland urban interface (WUI) locations. The nearest open space areas that include very high fire hazard severity designation occur northeast and east of the site towards San Marcos.

The site is surrounded on the south, east, and west by existing rural residential development and to the north by a coast live oak riparian forest and undeveloped hillsides. The site is currently partially developed (one single family residence and one large garage/storage building), disturbed and dominated by active agricultural activities. The terrain on, and within the vicinity of the project, is characterized by gentle to moderately steep slopes on site and steeper terrain to the north associated with a drainage that flows southward to Buena Creek. The area, like all of San Diego County, is subject to seasonal weather conditions that can heighten the likelihood of fire ignition and spread, however, considering the site’s terrain and vegetation, would be expected to result in primarily a low- to moderate-intensity wildfire.

Based upon field investigations, the project site contains disturbed Southern Live Oak Riparian Forest (dSCLO) in the northwestern portion of the property that has been classified as County Resources Protection Ordinance (RPO) wetlands. This dSCLO area will have a 50-foot wide RPO buffer zone along its southeastern boundary next to adjacent fuel modification zones (FMZs). Additionally, all FMZs will be outside of proposed Biological Open Space Lot #30, which contains the RPO and associated buffer. The project site is within the jurisdiction of the Vista Fire Protection District (VFPD) and the closest fire station is in the City of Vista (Station #2), located approximately 1.7 miles from the. The VFPD operates at least two fire stations that could respond to an incident on the site under 4 minutes travel time. In addition, automatic/mutual aid agreements are in place with neighboring fire agencies to augment response, especially at the fringe area of VFPD's jurisdiction.

The project will be constructed to the ignition resistant code requirements of the 2013 California Fire and Building (Chapter 7A) Codes as amended by the VFPD (Ordinance No. 2013-23). Construction shall include enhanced ignition resistant features, automatic interior sprinklers, appropriate fire flow and water capacity, roads, and supporting infrastructure, and fuel modification areas, as well as measures above and beyond the requirements where they are expected to compensate for modified fuel management areas. The identified non-conformities related to fuel modification are provided alternative materials and/or methods for consistency with the currently adopted codes/requirements.

1 INTRODUCTION

This Fire Protection Plan (FPP) has been prepared for the proposed Lone Oak Road Project (project) in an unincorporated area of Vista, San Diego County, California (Figure 1 and Figure 2). The purpose of the FPP is to assess the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those impacts. As part of the assessment, this plan has considered the fire risk presented by the site including: property location and topography, terrain (slope, elevation, and aspect), combustible vegetation (fuel types), climatic conditions, fire history and the proposed land use and configuration. This FPP addresses water supply, access (including secondary access), structural ignitability and ignition resistive building features, fire protection systems and equipment, impacts to existing emergency services, defensible space, and vegetation management. The plan identifies fuel modification/ management zones and recommends the types and methods of treatment that will protect this project and its essential infrastructure. The FPP recommends measures that property owners will take to reduce the probability of structural ignition throughout the project.

The FPP is consistent with the Vista Fire Protection District (VFPD) Ordinance No. 2013-23 and the 2014 San Diego County Consolidated Fire Code. Furthermore, it is consistent with the California Code of Regulations Titles 14 and 24 and State Fire and Building Codes (2013). The purpose of this plan is to generate and memorialize the fire safety requirements of the Fire Authority Having Jurisdiction (FAHJ), namely the San Diego County Fire Authority and the VFPD. Requirements are based on site-specific characteristics and incorporate input from the project landowner, project planners, engineers, and architects.

1.1 Project Summary

1.1.1 Location

The project is located within an unincorporated portion of southeastern Vista in the North County Metropolitan Subregional Planning Area of the County's General Plan (Figure 2), which is generally 1.3 miles east of the Vista city limits, 1.4 miles northeast of Highway 78, and roughly 1.0 mile northwest of the San Marco City Limits. More specifically, the project site is located at 1535 Lone Oak Road, immediately south of Buena Creek Road between Lone Oak Road and Cleveland Trail.

The project site is located in Sections 28 and 33 of Township 11 South, Range 3 West on the U.S. Geographical Survey (USGS), 7.5-minute San Marcos quadrangle map. The project is located within Assessor Parcel Numbers (APN) 184-080-01 and 181-162-06. The property lies within State Responsibility Area (SRA) and a Very High Fire Hazard Severity Zone (VHFHSZ), as statutorily designated by CAL FIRE (CAL FIRE 2014).

1.1.2 Project Description

The project site consists of two individual legal parcels. The northerly parcel (APN 181-162-06) is currently vacant. This parcel abuts Buena Creek Road and contains Buena Creek, which extends across the entire site from Lone Oak Road to Cleveland Trail. The southerly parcel (APN 184-080-01) forms the southern half of the project site and currently has two structures on it. One structure is a single-family residence and the other structure is a large garage/storage building. Both structures will be removed as part of the proposed project.

The entire property is located within the North County Metropolitan Subregional Planning Area of the County's General Plan. The project site is located within the Village Regional Category of the General Plan Land Use Element and is designated VR-2 (Village Residential 2), allowing a density of two dwelling units per gross acre. The northerly parcel (APN 181-162-06) is currently zoned A70 (Limited Agriculture) and the southerly parcel (APN 184-080-01) is zoned RR (Rural Residential).

The project proposes a Vesting Tentative Map and Major Use Permit (PRD Site Plan) with the development of a total 24 residential lots (Lots #1-24, approximate average lot size of 10,500 square feet). The project is further divided into one private drive lots (Lot #25), one access lots (#26 (along Cleveland Trail)), one homeowners' association (HOA) open space lot (Lot #27), two water quality/detention basin lots (Lots #28 and 29), and one HOA biological open space lot (Lot #30). The biological open space lot includes a County Resource Protection Ordinance (RPO) wetland and a 50-foot oak woodland buffer along the northwest side of the project site. Residential structures will be required to be set back an additional 50 feet from this buffer. All grading for the project will occur outside the existing 100-year floodway.

The primary project access is off of Lone Oak Road through a proposed gated entrance. Secondary access is provided through connection to the existing Cleveland Trail Drive, which connects to Buena Creek Road. Additional asphalt concrete pavement will be added to the existing pavement to provide a 24-foot-wide emergency access drive. The existing creek crossing (dip section) will remain unchanged. Appendix A provides photographs of the site in its current, undeveloped condition as well as the off-site land uses.

1.1.3 Environmental Setting

Dudek conducted a site evaluation on March 27, 2014. The site inspection included documentation of the site's topography, on- and off-site vegetation/fuels assessment, existing infrastructure evaluations, documentation of existing condition, surrounding land use confirmations, and necessary fire behavior modeling data collection.

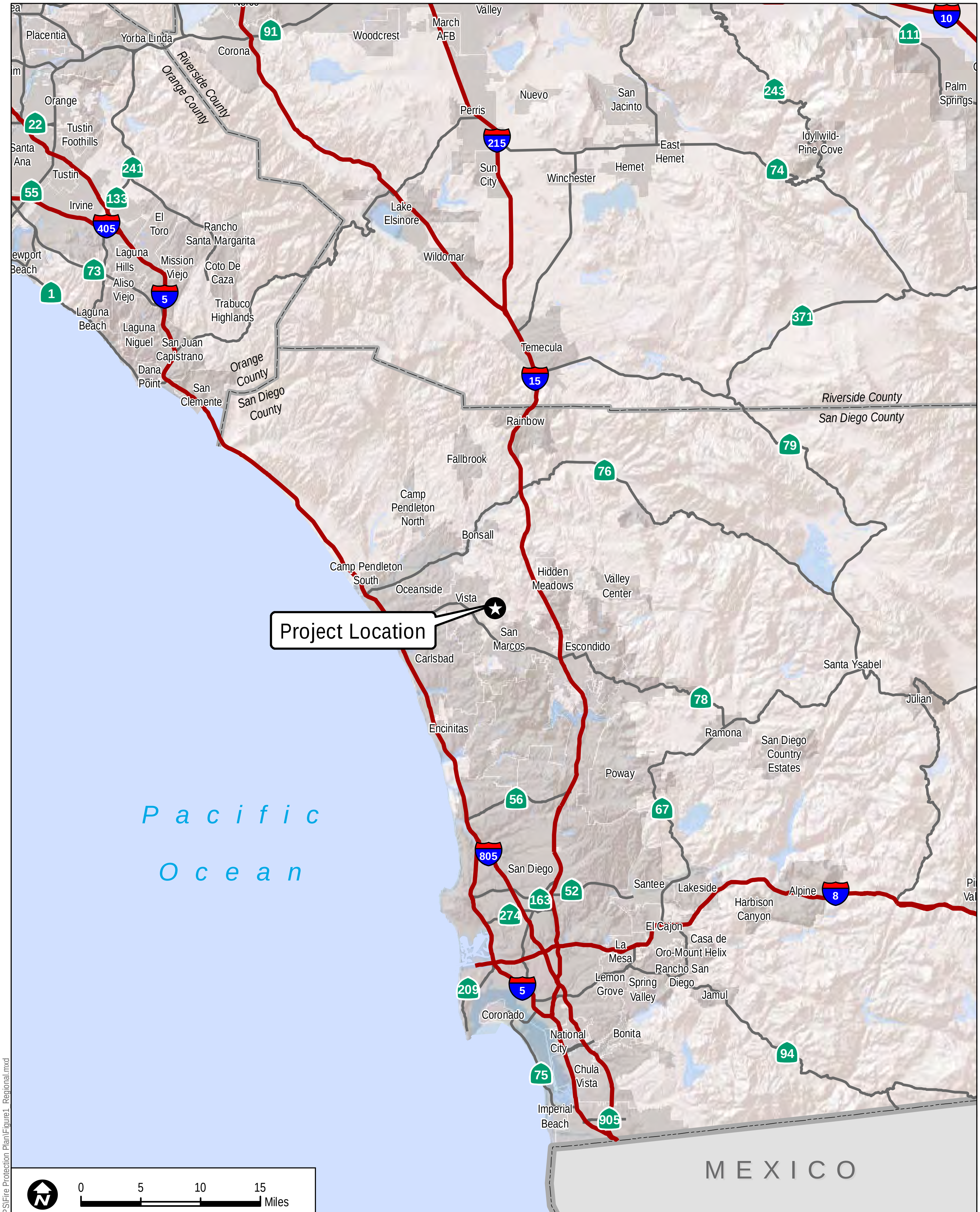

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FIGURE 1

Regional Map

Lone Oak Road Project - Fire Protection Plan

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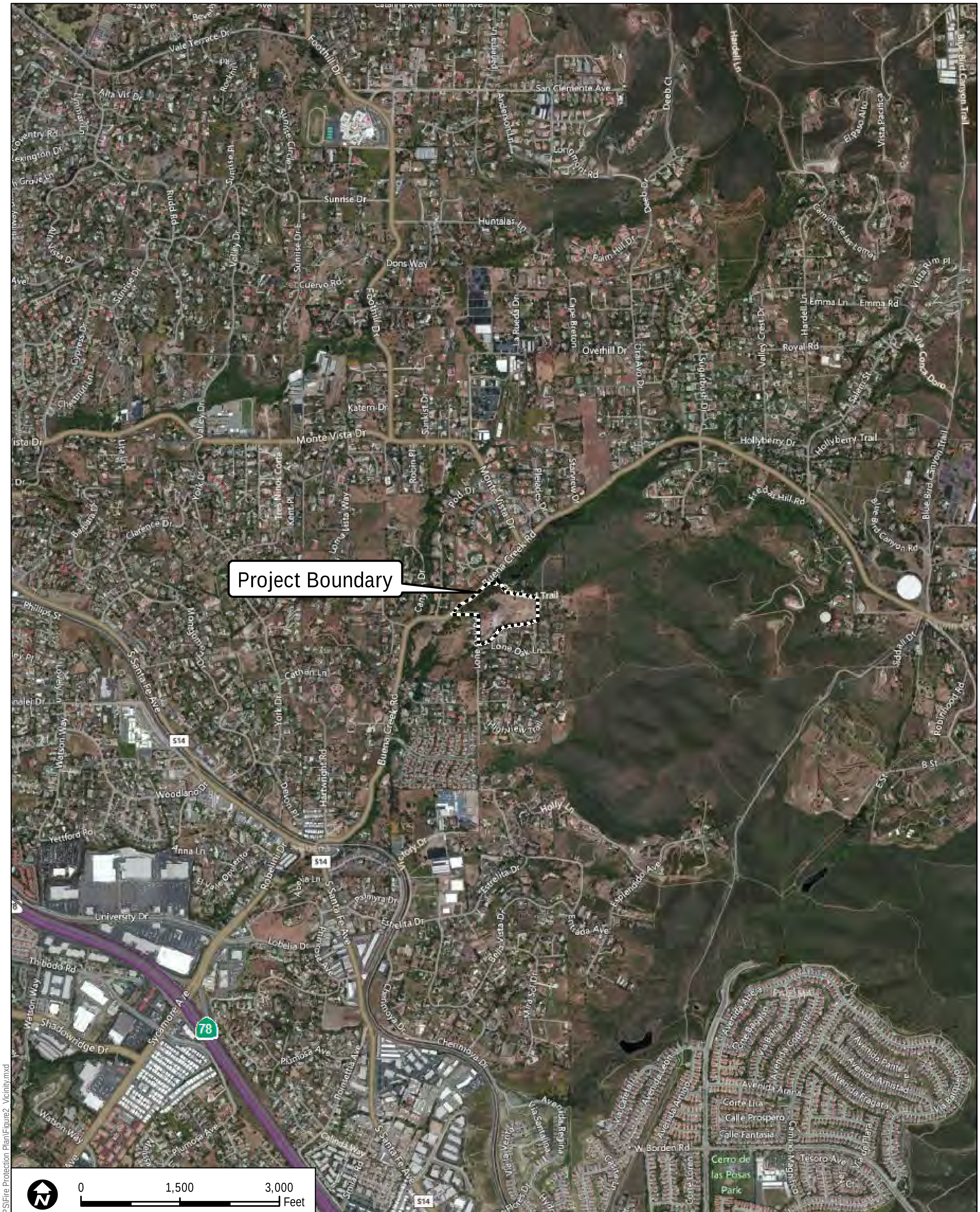

SOURCE: USGS 7.5-Minute Series San Marcos Quadrangles.

FIGURE 2
Vicinity Map

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Lone Oak Road Project - Fire Protection Plan

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1.1.3.1 Topography

The project site consists of flat to gently sloping terrain which trends from the northeast to the southwest on an alluvial fan originating from the extent of the San Marcos Mountain range to the east. Buena Creek flows through the project site along the northern edge, adjacent to Buena Creek Road. The perennial creek consists of an unvegetated channel that is surrounded by coast live oak trees and is heavily disturbed by non-native trees and understory plants along its banks. Elevations on site range from roughly 520 feet above mean seal level (amsl) in the southwest corner of the property to just over 540 feet amsl in the northwestern portion of the project site.

1.1.3.2 Vegetation and Land Cover

Based on the project's Biological Resources Letter Report (Dudek 2015), there are eight vegetation communities/land cover types within the project site boundaries. They include coast live oak woodland, freshwater marsh, disturbed southern coast live oak riparian forest, developed, disturbed habitat, extensive agriculture, non-native grassland, and non-native woodland. The acreage of each of these vegetation communities or land cover types are provided in Table 1 and illustrated in Figure 3.

Table 1
Lone Oak Road Project Vegetation Communities and Land Cover Types

Vegetation Community or Land Cover Type	Acres
Coast live oak woodland	0.3
Freshwater marsh	0.1
Disturbed southern coast live oak riparian forest	2.4
Developed	4.2
Disturbed habitat	5.5
Extensive agriculture	0.4
Non-native grassland	0.4
Non-native woodlands	0.9
Total	14.2

Vegetation communities of concern are those that are more likely to facilitate fire spread into the proposed development. One vegetation community (photographs are in Appendix A) and two off-site communities not listed in the Dudek's Biological Resources Letter (2015), were identified as potentially facilitating fire spread toward the project. They are as follows:

Disturbed Southern Live Oak Riparian Forest

The southern coast live oak riparian forest dominates the riparian corridor which bisects the site. This vegetation community consists primarily of coast live oak (*Quercus agrifolia)*, red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), poison oak (*Toxicodendron diversilobum*), California blackberry (*Rubus ursinus*), and desert wild grape (*Vitis girdiana*). This community appears to be richer in herbs and less in understory shrubs. Coast live oaks may reach 35 to 50 feet in height.

Coast Live Oak Woodland

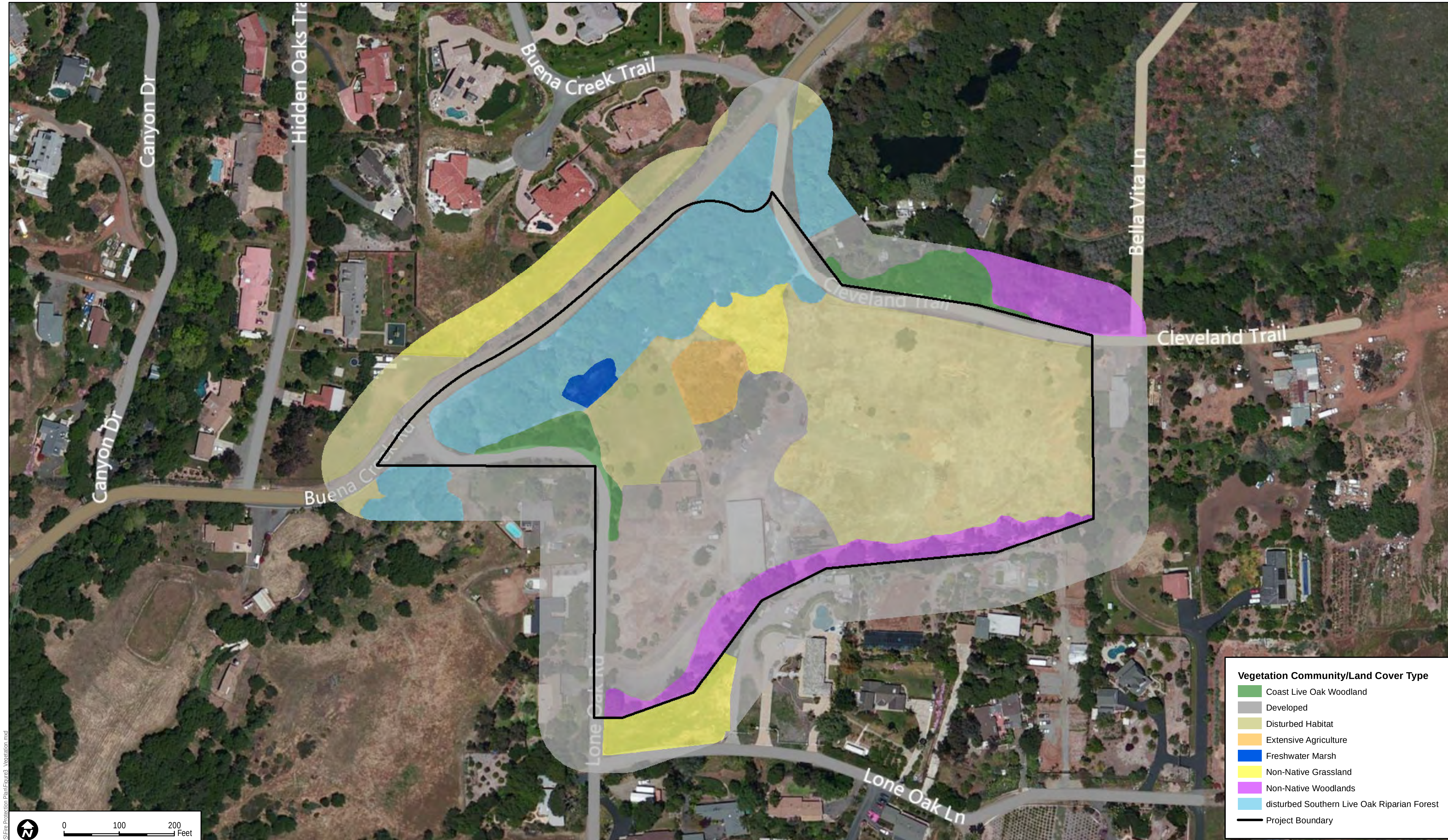
According to Holland (1986), coast live oak woodland is dominated by a single evergreen species: coast live oak (*Quercus agrifolia*). Canopy height reaches 32 to 82 feet (10 to 25 meters). The shrub layer is poorly developed, but may include toyon (*Heteromeles arbutifolia*), gooseberry (*Ribes* spp.), laurel sumac (*Malosma laurina*) or Mexican elderberry (*Sambucus mexicana*). The herb component is continuous, dominated by a variety of introduced species. On site, this community is dominated by mature coast live oak and the understory contains various grass species. This community occurs immediately north of Lone Oak Road.

Southern Mixed Chaparral (Off-site)

Southern mixed chaparral is composed of broad-leaved sclerophyllous shrubs that can reach heights of 10 feet. The shrubs are generally deep rooted, with well-developed soil litter layer, and high canopy coverage. Dominant plant species in this vegetation community off- site include chamise (*Adenostoma fasciculatum*), lemonade berry (*Rhus integrifolia*), California sagebrush (*Artemisia californica*), mission manzanita (*Xylococcus bicolor*), and bushrue (*Cneoridium dumosum*). This habitat occurs off site and east of the project site.

Ornamental Vegetation (Off-site)

Southern California's climate is capable of supporting many types of ornamental landscape plant material (evergreen and deciduous). There is diversity in terms of structure, height, and density of these plants. The ornamental landscape exists because of humans, and in most cases it is dependent upon humans to be irrigated and maintained. An ornamental landscape will commonly blend into native habitat. This vegetation type is usually planned and regularly maintained (pruned, watered, and removal of dead plants). However, not all ornamental landscapes are considered fire safe. For example, a landscape that is poorly maintained, or is planted too densely may be compromised, and therefore, become more flammable. This vegetation type occurs as front or back yards around the semi-rural homes in the northwest, west, east, and south of the property.



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SOURCE: BING 2015; Dudek 2015

FIGURE 3

Vegetation Map

Lone Oak Road Project - Fire Protection Plan

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1.1.3.3 Fuel Loads

The vegetation described above translates to fuel models used for fire behavior modeling, discussed in Chapter 3 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 have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (leaf size, branching patterns), and overall fuel loading. Vegetative fuels within the proposed development and within the project grading limits will be converted to roads, ignition-resistant homes, and firesmart landscaping following project completion.

Off-site fuels include irrigated and non-irrigated ornamental vegetation on residential properties along the northwestern, eastern, western, and southern boundaries of the project site. The adjacent hillsides to the northeast and east are covered with chaparral fuel types, as mentioned above. Chaparral vegetative fuels have a continuous fuel bed comprised of live and dead woody material. Fuel bed heights for adjacent chaparral are 6 to 12 feet, with a high amount of dead branches and foliage. Fuel loading in this vegetation community is estimated at 4 to 6 tons per acre of dead and live fuels. Wildland fire behavior and intensity in this vegetative fuel type will be moderate to high depending on live and dead fuel moisture content and weather conditions. In the northern and northwestern portion of the project site, Buena Creek runs southward and is vegetated with southern coast live oak riparian forest and includes occasional eucalyptus trees. Understory fuels are present and comprise roughly 2-3 tons per acre with respect to fuel loading. Fires could spread along the creek bed drainage, like the “wick” on a candle, to homes that abut these vegetative fuel types. Typical fire behavior in riparian fuel types are slow burning, low intensity fires burning in the duff layer or low herbaceous, surface fuels. However, a crown fire can occur as the fuel loading buildups from dead and down trees or dead branches and low hanging foliage left on the standing trees.

Additionally, the majority of the fuel types (both on and off the project site) have not burned for over 50 years according to the recorded fire history for the area.

1.1.3.4 Fire History

Fire history is an important component of a Project FPP. Fire history information can provide an understanding of fire frequency, fire type, most vulnerable project areas, and significant ignition sources, amongst others. Fire frequency, behavior, and ignition sources are important for fire response and planning purposes. 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 site, and how a fire may spread.

According to available data from CAL FIRE's Fire and Resource Assessment Program (CAL FIRE 2014), numerous fires have burned in the vicinity of the project site since the beginning of the historical fire data record (Appendix B). These fires, occurring in 1937, 1943, 1954, 1960, 1969, 1970, 1971, 1972, 1979, 1981, 1982, 1984, 1985, 1987, 1996, 2004, and 2007 burned within 5 miles of the project site. No recorded fires have burned on the project site, with the closest fire being the 1970 fire (unnamed), which burned 1,916 acres approximately 800 feet south of the project site. outside the project area near southeast corner.

Based on an analysis of this fire history data set, specifically the years in which the fires burned, the average interval between wildfires burning within a 5-mile radius of the project site was calculated to be 3.7 years with intervals ranging between 0 (multiple fires in the same year) and 11 years. Based on this analysis, the area is expected to be subject to regular, wide-spread wildfire, but may include smaller fires during typical weather conditions and has the potential for larger wildfires during extreme weather conditions. Based on fire history, wildfire risk for the project site is associated primarily with a Santa Ana wind-driven wildfire burning or spotting onto the site from the east, although a fire approaching from the west during more typical on-shore weather patterns is possible.

1.1.3.5 Climate

North San Diego County and the project area are influenced by the Pacific Ocean and are frequently under the influence of 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 74°F, with daily highs in the summer and early fall months (July–October) exceeding 95°F. Precipitation typically occurs between December and March.

The prevailing wind pattern is from the west (on-shore), but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are from the west–southwest (sea) and at night winds are from the northeast (land), averaging 2 miles per hour (mph). During the summer season, the diurnal winds may average slightly higher (approximately 16 mph) than the winds during the winter season due to greater pressure gradient forces. Surface winds can also be influenced locally by topography and slope variations. The highest wind velocities are associated with downslope, canyon, and Santa Ana winds.

Typically the highest fire danger is produced by the high-pressure systems that occur in the Great Basin, which result in the Santa Ana winds of Southern California. Sustained wind speeds recorded during recent major fires in San Diego County exceeded 30 mph and may exceed 50 mph during extreme conditions. The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis during late summer and early fall. Santa Ana winds are warm winds that flow from the higher desert elevations in the north through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Consequently, peak velocities are highest at the mouths of canyons and dissipate as they spread across valley floors. Santa Ana winds generally coincide with the regional drought period and the period of highest fire danger. The project site is affected by strong winds, such as Santa Anas.

1.1.3.6 Current Land Use

The project parcels are approximately 14.1 acres and the entire area is fenced. Much of the site is disturbed through regular mowing/disking or previous grading, and much of the vegetation is non-native. Buena Creek flows through the project site along the northern edge, adjacent to Buena Creek Road. The perennial creek consists of an unvegetated channel that is surrounded by coast (or California) live oaks (*Quercus agrifolia*) and is heavily disturbed, with non-native trees and understory plants along its banks. Non-native plants in this area include blue gum trees (*Eucalyptus globulus*), Mexican fan palms (*Washingtonia robusta*), Canary Island date palms (*Phoenix canariensis*), castor bean (*Ricinus communis*)) and annual grasses.

Surrounding land uses include semi-rural residential properties located to the north, east, south, and west. There is some undeveloped land with steep, chaparral-covered or abandoned avocado orchards on west facing hillsides to the east and southeast of the project site.

1.1.3.7 Proposed Land Use

The project, as proposed, will include:

- 24 single family residential lots;
- 2 open space lots;
- Reduced fuel modification zones (with provided alternative materials and methods) along the perimeter lots;
- Streets, fire hydrants, and associated infrastructure;
- All structures to meet top of slope setback standards;
- Secondary ingress/egress route through existing, Cleveland Trail drive which connects to Buena Creek Road;
- Primary access road onto the property from Buena Creek Road to Lone Oak Road.

The proposed land use improvements described above would be completed according to the VFPD Ordinances and San Diego County Consolidated Fire Code and County Building Code (as applicable), and in effect at the time of building plan submittal and would include ignition-resistive construction, interior sprinklers, required fire flow, and a designated fuel modification area, among other requirements as described further in this FPP.

2 DETERMINATION OF PROJECT EFFECTS

FPPs provide an evaluation of the adverse environmental effects a proposed project may have from wildland fire. The FPP must provide mitigation for identified impacts to ensure that development projects do not unnecessarily expose people or structures to a significant loss, injury or death involving wildland fires. Significance is determined by answering the following questions:

Would the project expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

The wildland fire risk in the vicinity of the project site has been analyzed and it has been determined that wildfires may occur in wildland areas to the east and south of the project site as well as potentially in the preserved on-site fuels, but would not be significantly increased in frequency, duration, or size with the construction of the project. The project would include conversion of existing vegetation to maintained urban development with designated landscaping and fuel modification areas.

The types of potential ignition sources that currently exist in the area include vehicle and roadway, electrical transmission line, and machinery associated with agricultural operations and off-site residential neighborhoods. The project would introduce potential ignition sources, but would also include conversion of fuels to lower flammability landscape and include better access throughout the site, managed and maintained landscapes, more eyes and ears on the ground, and generally a reduction in the receptiveness of the areas landscape to ignition. Fires from off-site would not have continuous fuels across this site and would therefore be expected to burn around and/or over the site via spotting. Burning vegetation embers may land on project structures, but are not likely to result in ignition based on ember decay rates and the types of non-combustible and ignition resistant materials that will be used on site.

The project would comply with applicable fire and building codes and would include a layered fire protection system designed to current codes and inclusive of site-specific measures that will result in a project that is less susceptible to wildfire than surrounding landscapes and that would facilitate fire fighter and medical aid response.

Would the project result in inadequate emergency access?

The project includes fire access throughout the development and is consistent with the County and VFPD Codes. Fire apparatus access throughout the development will include 24-foot-wide roads. Fire access on the Project site will be improved from its current condition, which provides only limited access on dirt/gravel roads. The on-site roadways include one dead end that is inclusive of a cul-de-sac that meets County and Fire District requirements and is less than 800 feet in total length from the point where it provides egress in two separate directions. In addition, secondary access is provided at the terminus of Private Drive "A" which provides access to the existing Cleveland Trail road north of the site. Cleveland Trail will be improved to provide a 24-foot-wide road between the project secondary access point and Buena Creek Road. Roads will conform with surface, width, turning radius, and vertical clearance Code requirements for emergency access. Therefore, emergency access is considered adequate for this site.

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance service ratios, response times or other performance objectives for fire protection?

The Project is projected to add an estimated fewer than 8 calls per year to the VFPD's existing call load. This estimate is a conservative estimate in that it uses District-wide data, which incorporates call volumes from typically higher volume areas than would be expected from this site. The primary response (first in) would be provided by Station 2. The addition of 8 calls per year to an urban fire station that currently responds to approximately 5 calls per day is considered insignificant and will not require the construction of additional Fire Station facilities based on that increase alone. For perspective, urban fire stations that respond to five calls per day are considered average and 10 calls per day would be considered a busy station. A portion of the project's parcel tax revenue will be allocated to fire protection, which can be used to maintain current levels of protection without impacting existing citizens.

Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

The project will be served by Vista Irrigation District and sufficient water supplies will be available to serve the project from existing entitlements and resources. The Water District requires new development to meet a dual 2,500 gpm fire flow in the district for a total fire flow of 5,000 gpm. The pressures in the development will remain above 20 psi when meeting the fire requirements for the water district.

The measures described in the responses to these significance questions are provided more detail in the following sections.

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 fire that would be expected on or adjacent to the project site given characteristic site features such as topography, vegetation, and weather. Results are provided below and a more detailed presentation of the modeling inputs and results is provided in Appendix C.

3.1.1 Fuel Models

Fuel Models are simply tools to help fire experts realistically estimate fire behavior for a vegetation type. Fuel models are selected by their vegetation type; fuel stratum most likely to carry the fire; and depth and compactness of the fuels. Fire behavior modeling was conducted for vegetative types that surround the proposed development. The vegetation types are represented primarily by four fuel models as shown in Table 2. Other fuel models may exist, but not at quantities that significantly influence fire behavior in and around the proposed development. 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).

3.1.2 Fuel Model Output Results

Focused fire behavior modeling utilizing BehavePlus 5.0.5 was conducted for the project site. A more detailed discussion of the BehavePlus analysis, including weather input variables, is presented in Appendix C. Fuel model typing was completed in the field concurrent with site hazard evaluations. Based on field analysis, four different fire scenarios were evaluated for the project site.

- **Scenario 1:** Peak fire weather with off-shore, Santa Ana winds and fire burning upslope within the disturbed coast live oak riparian forest along the northwestern edge of the project site, adjacent to the proposed development area.
- **Scenario 2:** Peak fire weather with off-shore, Santa Ana winds and fire burning downslope in chaparral fuels within an adjacent drainage approximately 600 feet northeast of the project site.
- **Scenario 3:** Peak fire weather with off-shore, Santa Ana winds and fire burning upslope within the disturbed coast live oak riparian forest along the northeastern edge of the project site, adjacent to the proposed development area.

- **Scenario 4:** Summer fire weather with on-shore winds and fire burning on gently sloping terrain with ornamental vegetation on residential lots adjacent to the western edge of the project site.
- **Scenario 5:** Peak fire weather with off-shore, Santa Ana winds and fire burning upslope in grassland fuels adjacent to proposed fuel modification zones for Lots #1-7.

The unique terrain and fuel models used for BehavePlus modeling for the project site are presented in Table 2. Locations of BehavePlus model runs are presented graphically in Figure 4. Based on the BehavePlus analysis, worst-case fire behavior is expected in extreme wind-driven fires (represented by Scenarios 1-3 and 5) from the northwest and northeast of the project site. Under such conditions, expected surface flame lengths reach 12.7 feet during peak weather conditions with wind speeds of 26 mph in non-native grassland fuels. Under this scenario, fireline intensities can reach 1,415 BTU/foot/second with high spread rates of 8.3 mph. This scenario represents a worst-case situation and assumes that grassland fuels are un-grazed. Additionally, the relatively narrow area of grassland fuels between the adjacent oak riparian forest and irrigated fuel modification zones limits the extent of fuels that could burn and reduces the time of combustion, and heat produced. This risk is mitigated with expanded irrigated fuel modification zones for some lots and the inclusion of ignition-resistive construction for all adjacent lots. Nearby, in heavier chaparral fuels located approximately 600 feet to the northeast of the project site, flame lengths reach 32.6 feet, fireline intensities reach 11,061 BTU/foot/second, and spread rates reach 3.7 mph during peak weather conditions. This scenario is more likely than fires burning within adjacent grassland or riparian areas, although the primary risk associated with type of fire is burning embers landing on the developed site. However, this risk is mitigated with ignition-resistive construction and managed fuel modification zones. Fires burning from the west of the proposed development area and pushed by on-shore winds (summer weather) exhibit less severe fire behavior, with flame lengths reaching 9.1 feet, fireline intensities reaching 683 BTU/foot/second and a spread rate reaching 0.3 mph. The results from all BehavePlus fire behavior modeling scenarios are presented in Table 3.

Table 2
Lone Oak Ranch Fire Behavior Model Variables

Scenario	Weather	Fuel Model(s)	Slope	Aspect
1	Peak (Santa Ana)	Disturbed southern coast live oak riparian forest (8)	10%	Northwest
2	Peak (Santa Ana)	Chaparral (SH5)	5%	South
3	Peak (Santa Ana)	Disturbed southern coast live oak riparian forest (8)	15%	North
4	Summer (On-shore)	Ornamental vegetation (10)	6%	West
5	Peak (Santa Ana)	Non-native grassland (1)	5%	West

Table 3
Lone Oak Ranch BehavePlus Fire Behavior Model Results

Scenarios	Flame Length (feet)	Fireline Intensity (Btu/ft/s)	Surface Rate of Spread (mph)
1 (Peak fire in disturbed southern coast live oak riparian forest fuels; 10% slope; 26 mph winds)	2.6	46	0.1
2 (Peak fire in chaparral fuels; 5% slope; 26 mph winds)	32.6	11,061	3.7
3 (Peak fire in disturbed southern coast live oak riparian forest fuels; 15% slope; 26 mph winds)	2.6	46	0.1
4 (Summer fire in ornamental vegetation fuels; 6% slope; 19 mph winds)	9.1	683	0.3
5 (Peak fire in non-native grassland fuels, 5% slope, 26 mph winds)	12.7	1,415	8.3

Note: The results presented in Table 3 depict values based on inputs to the BehavePlus software. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. 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.

The results presented in Table 3 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.

3.2 On-Site Risk Assessment

Given the lack of wildfire history on the site, the history of wildfire in the vicinity of the site, combined with the post-project vegetation conversion, potential ignition sources, and anticipated fire behavior, the project is not expected to be vulnerable to recurring wildfire ignition and spread, but may be subject to nearby wildfire that could, under worst-case conditions, spread on site or ignite from burning embers landing in receptive, ornamental landscape fuels. Fire is not expected to have readily ignitable fuels in the post-project landscape. Should the ornamental vegetation ignite, it would be expected to burn in a spotty manner due to the presence shading and hydrated fuels.

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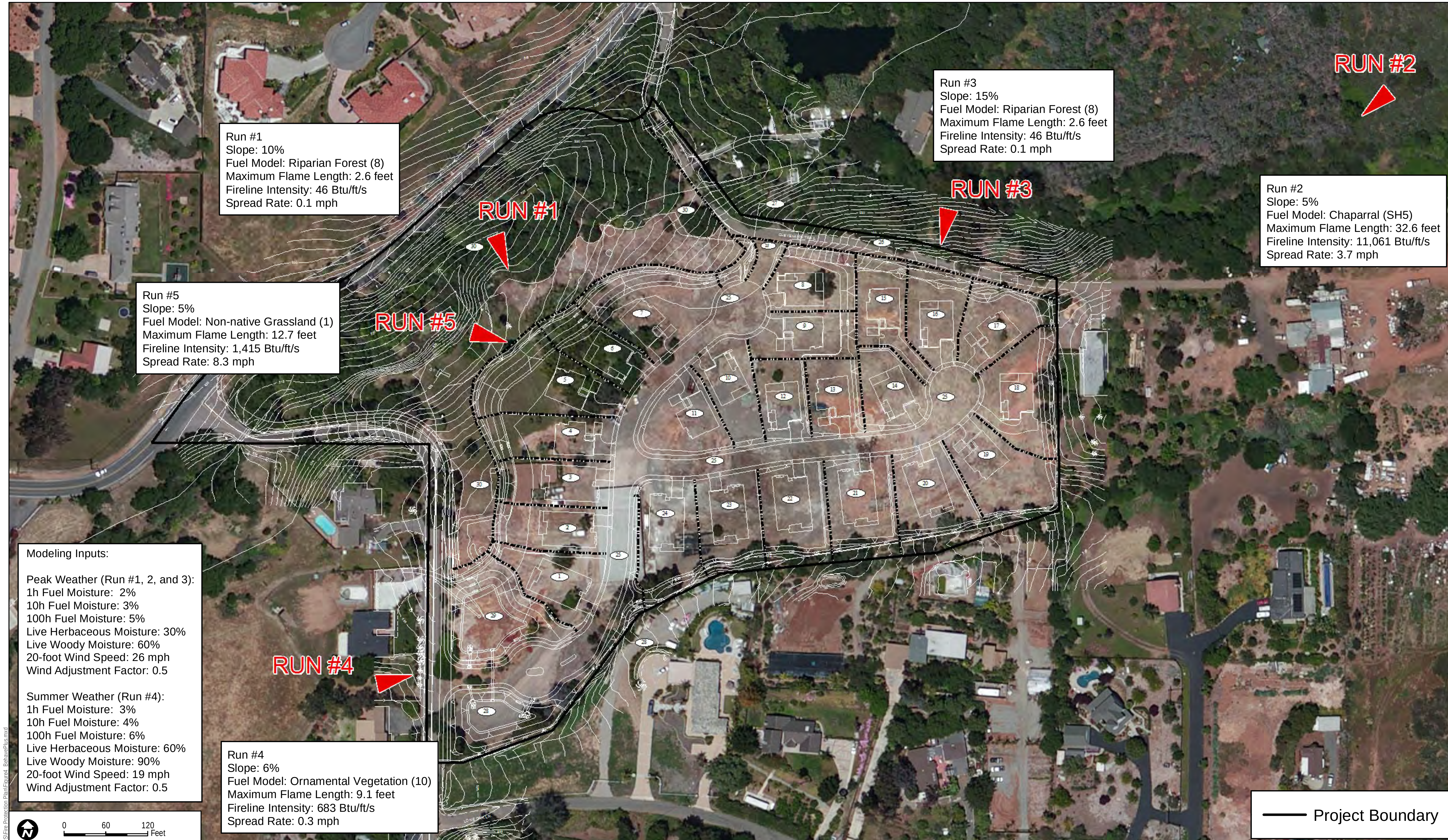

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SOURCE: Hunsaker 2015; Bing 2015

FIGURE 4

BehavePlus Analysis Map

Lone Oak Road Project - Fire Protection Plan

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4 ANALYSIS OF PROJECT EFFECTS

4.1 Adequate Emergency Services

4.1.1 Emergency Response

The project is located within the jurisdiction of the VFPD. VFPD contracts with the City of Vista Fire Department (VFD) for initial response to all structural fire, medical and associated emergencies within the 17.5 square miles of Fire District. Additionally, VFD also covers 19 square miles in the City limits. VFD has six fire stations, fully equipped with the latest firefighting apparatus and highly trained personnel, to cover the 36.5 square miles for a population of roughly 115,569. The VFD operates two Fire Stations that would likely be dispatched to an incident at the project site (Stations 2 and 4), although primary response would be from Station 2, with Station 4 responding as necessary to round out the effective firefighting force. Table 4 presents a summary of the location, equipment, staffing levels, maximum travel distance, and travel time for the two VFD stations most likely responding to the project site. Travel distances are derived from SANGIS Geographic Information System road data while travel times are calculated using the Insurance Services Office (ISO) formula that represents an average 35 mph response speed and considers average terrain, average traffic, weather, and slowing down for intersections. Response times do not include time for donning firefighter turnout gear.

Table 4
Vista Fire Department Responding Stations Summary

Station	Location	Equipment	Staffing	Maximum Travel Distance*	Expected Travel Time**
Station 2	1050 Valley Drive. Vista, CA	Paramedic Engine Company Brush Truck	On-duty: 3	1.5 mi.	3.2 min. (3:12)
Station 4	2121 Thibodo Rd. Vista, CA	Paramedic Truck Company Brush Truck Paramedic Ambulance	On-duty: 5	2.1 mi.	4.2 min. (4:13)

* Distance measured to the furthest point in development. For Station 2, access is via the secondary access road point along Cleveland Trail. For Station 4, access is via the main project entrance on Lone Oak Road.

** Assumes travel to the furthest point in the project and utilizes the ISO formula (T=0.65+1.7d) that represents an average 35mph response speed and considers average terrain, average traffic, weather, and slowing down for intersections (https://firechief.iso.com/FCWWeb/mitigation/ppc/3000/ppc3015.jsp).

Based on the project site location in relation to existing VFD stations, travel time to the site for the first responding engine from Station 2 is not expected to exceed 4 minutes to the furthest portion of the project site (end of cul-de-sac at Lots 15-18). Secondary response is expected to arrive within 4.25 minutes travel time. Based on these calculations, emergencies within the project can be responded to by primary and secondary response according to the county-wide five-minute travel threshold standard (average maximum initial travel response of no more than five minutes) and within the national standard of 4 minutes travel for primary response (NFPA 1710).

In addition, the City has a signed automatic aid agreement on first alarm or greater with all surrounding communities. The boundary drop agreement utilizes automatic vehicle locators so that the dispatch center can determine the closest unit. The closest unit, regardless of agency, is dispatched as first in. The City is also part of both the San Diego County and State of California Master Mutual Aid Agreements.

4.1.1.1 Emergency Service Level

VFD's annual call volume over the last three years has averaged about 11,300 total calls (11,896 total calls in 2013) for both City and Fire District, most of which are emergency medical services responses (8,979 calls in 2013). This equates to 31 calls per day, which would be distributed among the VFD's six fire stations (calculated from annual call volume provided by VFD's 2011 - 2013 Annual Reports). Individual fire station call volumes were not available at the time of this FPP's preparation. Determination of individual fire station call volumes would enable a more accurate estimate of the project's call load impact, but based on the Department wide numbers, the impact is considered small.

Using San Diego County fire agencies' estimate of 82 annual calls per 1,000 population, the project's estimated 84 residents (24 residences x 3.5 per household) may generate up to 7 calls per year (approximately one call every two months), most of which are expected to be medical-related calls and is considered to be overly conservative with actual calls generated being lower due to a variety of socio-economic factors.

Service level requirements for VFD are not expected to be significantly impacted with the increase of 7 calls per year, even if all of the calls are from the closest station. The department currently responds on the average to just over 32 calls per day in its entire service area or roughly 5 calls per day per fire station. For reference, a station that responds to 5 calls per day is considered average and 10 calls per day is considered busy. Therefore, the project is not expected to cause a decline in the VFD response times. The requirements described in this FPP are intended to aid firefighting personnel and minimize the demand placed on the existing emergency service system.

4.2 Buildings, Infrastructure and Defensible Space

The VFPD Ordinances and County Consolidated Fire Code and Building Codes govern the building, infrastructure, and defensible space requirements detailed in this FPP. The project will meet or exceed applicable codes or will provide alternative materials and/or methods. The following summaries highlight important fire protection features. All underground utilities, hydrants, water mains, curbs, gutters, and sidewalks will be installed and the drive surface shall be approved prior to combustibles being brought on site.

4.2.1 Fire Access

4.2.1.1 Primary

The primary access to the project site will be via a newly constructed private street (Private Drive "A") originating at the existing Lone Oak Road, approximately 0.12 miles south of its intersection with Buena Creek Road. Proposed private streets are 24 feet in width with no parking. No traffic calming measures (speed bumps, speed humps, and speed control dips), which may interfere with emergency apparatus, will be installed.

The roadways within the proposed development will comply with the County of San Diego Public Works roadway standards. To ensure that the roadways continue to meet requirements, road maintenance within the private portions of the development will be provided by a Homeowners Association or similar funded entity. The entity will assess maintenance dues monthly, provide reserve funding, and maintain the site's roads.

4.2.1.2 Entrance

The primary entry into the project site is off of Lone Oak Road, approximately 0.12 miles south of its intersection with Buena Creek Road. The main roadway is divided by a center median with two-16-foot wide roadways with one-way directional flow. A community entrance gate is proposed for the development and it will meet VFPD and County standards. The entrance gate construction plans will be reviewed and approved by VFPD and the County prior to installation. The main gate shall be automatic and designed for rapid, reliable access. Consequently, the gate will be equipped with sensors detecting emergency vehicle strobe lights from any direction of approach. The gate will also have a Knox brand key-operated electric switch that is keyed to VFD specifications for emergency access. The automatic gate will have a battery back-up or manual mechanical disconnect in case of a power failure and will include an emergency traffic control-activating strobe light sensor (Opticom override). In addition, the main gate must be located a minimum of 30 feet from the nearest edge of Lone Oak Road and must be at least two feet wider than the width of the traffic lanes serving the gate.

4.2.1.3 Dead Ends

The project includes one dead end road that is provided a cul-de-sac and is less than the allowed 800 feet to the nearest point where travel in two separate directions is provided. All site access roadways are provided with cul-de-sacs that meet the turning radius requirements for fire apparatus. Driveways exceeding 150 feet in length will have a fire department approved turn around or hammerhead.

4.2.1.4 Secondary Access

The project includes a secondary access that is gated at the end of the northern-most cul-de-sac (Private Drive "A"). This secondary access connects from the terminus of Private Drive "A" to the existing Cleveland Trail road. This access driveway will be 24 feet in width, gated, and would be available to residents and fire personnel on a daily basis as well as in case of an emergency. It is not expected that this access will receive a high level of normal community traffic. The gate shall be automatic and designed for rapid, reliable access. Consequently, the gate will be equipped with sensors detecting emergency vehicle strobe lights from any direction of approach. The gate will also have a Knox brand key-operated electric switch that is keyed to VFD specifications for emergency access. The gate will include a magnetic loop so the gate opens automatically from the inside. The automatic gate will have a battery back-up or manual mechanical disconnect in case of a power failure and will include an emergency traffic control-activating strobe light sensor (Opticom override). In addition, the main gate must be located a minimum of 50 feet from the nearest edge of Cleveland Trail. This secondary access will support the imposed loads of responding fire apparatus (up to 75,000 pounds). No parking along the secondary access road will be allowed.

4.2.1.5 Width and Turning Radius

All proposed private streets will have a minimum paved width of 24 feet. Private residential driveways will be at least 16 feet wide. The horizontal inside radius of a street or driveway will be designed to a minimum of 28 feet, as measured from the inside edge of the improvement width. Turning radii for provided roadways will comply with the County's minimum 28-foot inside turning radius standard for residential areas. Cross sections and requested exceptions for improvements to existing roads (Cleveland Trail, Lone Oak Road, and Buena Creek Road) and for new roads (Private Drive "A") are presented in Appendix D.

4.2.1.6 Grade

Road and driveway grades comply with the City's maximum grade of 20%. Any grade sections exceeding 15% will be constructed with Portland cement concrete surface with a heavy broom finish perpendicular to the slope. The angle of departure or approach for all roads and driveways will be under 12%.

4.2.1.7 Surface

The primary fire access roadways will be of asphalt or concrete and designed and maintained to support the imposed loads of fire apparatus (not less than 75,000 pounds) that may respond, including engines, trucks, and dozer transports. All fire access roadways will be maintained unobstructed and drivable by emergency vehicles throughout the construction process. A paved all-weather driving service, capable of supporting fire apparatus, will be installed before combustible construction materials are brought on the site. The first lift of asphalt paving will be installed at a minimum. The final lift of paving can be postponed until just before building final for roadway cosmetic purposes. Access roads shall be completed and paved prior to building final inspection.

4.2.1.8 Vertical Clearance

Minimum vertical clearance of 13 feet 6 inches will be maintained for the entire required width of fire access roads, including driveways that will require fire apparatus to travel to a residence.

4.2.1.9 Premises Identification

Identification of streets and structures will comply with VFPD and County standards as follows:

- All structures shall be identified by a street address which is visible from the street fronting the property from either direction of approach. Street numbers shall be 4 inches in height, ½ inch stroke, and contrast with their background for visibility.
- Street name signs will comply with the County of San Diego private road signage standards at all intersections. Street signs shall be displayed for both street names at the intersection.

4.2.1.10 Gates

All development automatic gates shall be equipped with a Knox, emergency key-operated switch overriding all command functions and opening the gate(s). Automatic gates accessing through the main entrance and secondary access roadways shall be equipped with approved emergency traffic control-activating strobe light sensor(s) or “Click to enter” which will activate the gate from both directions of travel on the approach of emergency apparatus. The automatic gate will have a battery back-up or manual mechanical disconnect in case of a power failure. Gates will have a magnetic loop system on the interior to allow for exiting without a key.

Pole gates, if any, or other structures or devices which could obstruct fire access roadways or otherwise hinder emergency operations shall be equipped with an approved, Knox padlock.

4.3 Water

Water service for the project will be provided by Vista Irrigation District (VID) and will be consistent with VFPD requirements. VID requires new development to meet a dual 2,500 gpm fire flow in the district for a total fire flow of 5,000 gpm. One of these simulated fires is assumed to be a structure in the development and the other is assumed within another area of the same zone. The pressures on the project site will remain above 20 psi when meeting the fire requirements for the water district.

4.3.1 Hydrants

Hydrants shall be located along fire access roadways as determined by the VFPD to meet operational needs, at intersections, at the beginning radius of cul-de-sacs, and at a minimum every 350 feet (on-center) of fire access roadways, pursuant to the VFPD Fire Code. Hydrants will be consistent with VFPD Design Standards. Hydrant locations are presented in Figure 5.

A three-foot clear space (free of ornamental landscaping and retaining walls) shall be maintained around the circumference of all fire hydrants. Hydrants will be in place and serviceable prior to delivery of combustible materials to the site.

4.4 Ignition-Resistant Construction and Fire Protection Systems

The project will meet applicable building and fire codes for a residential community (see project description). Each of the proposed buildings will comply with the ignition-resistant construction standards of the 2013 California Building Code, Chapters 7A and 15, 2013 California Residential Code, 2013 California Fire Code, 2011 County Consolidated Fire Code, Vista Fire Protection District Ordinance No. 20 and NFPA 13-D.

4.4.1 Fire Sprinklers

All residential structures and attached garages shall have automatic fire sprinkler system per Vista Fire Protection District Ordinance No. 2013-13. Each structure will include a life safety system conforming to NFPA 13-D, Automatic Fire Sprinkler System requirements. All sprinkler building plans must be reviewed and approved by the VFPD prior to building permit issuance.

4.4.2 Pre-Construction Requirements

Prior to combustible materials' presence on the site, utilities shall be in place, fire hydrants operational, an approved all-weather roadway in place, and fuel modification zones established and approved.

4.5 Ignition Resistant Construction and Fire Protection Systems

All new structures will be constructed to VFPD and County Fire Code standards. Each of the proposed buildings will comply with the enhanced ignition-resistant construction standards of the 2013 or most current California Building Code (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.

There are two primary concerns for structure ignition: 1) radiant and/or convective heat and 2) burning embers (NFPA 1144 2008, Ventura County Fire Protection District 2011, IBHS 2008, and others). Burning embers have been a focus of building code updates for at least the last decade, and new structures in the WUI built to these codes have proven to be very ignition resistant. Likewise, radiant and convective heat impacts on structures have been minimized through the Chapter 7A exterior fire ratings for walls, windows and doors. Additionally, provisions for modified fuel areas separating wildland fuels from structures have reduced the number of fuel-related structure losses. As such, most of the primary components of the layered fire protection system provided the Lone Oak Road project are required by Fire District, County, and state codes but are worth listing because they have been proven effective for minimizing structural vulnerability to wildfire and, with the inclusion of required interior sprinklers (required in the 2013 Building/Fire Code update), of extinguishing interior fires, should embers succeed in entering a structure (such as through a window inadvertently left open). Even though these measures are now required by the latest Building and Fire Codes, at one time, they were used as mitigation measures for buildings in WUI areas, because they were known to reduce structure vulnerability to wildfire. These measures performed so well, they were adopted into the code. The following project features are required for new development in WUI areas and form the basis of the system of protection necessary to minimize structural ignitions as well as providing adequate access by emergency responders:

1. Application of Chapter 7A, ignition resistant building requirements
2. Minimum 1-hour rated exterior walls and doors
3. Multi- pane glazing with a minimum of one tempered pane, fire-resistance rating of not less than 20 minutes when tested according to NFPA 257 or be tested to meet the performance requirements of State Fire Marshal Standard 12-7A-2

4. Ember resistant vents (recommend BrandGuard or similar vents)
5. Interior fire sprinklers to code for all occupancies
6. Modern infrastructure, access roads, and water delivery system.

4.6 Defensible Space and Vegetation Management

The Lone Oak Road project will be exposed to non-native grassland and riparian forest-dominated wildland areas in the northern and northwestern portion of the site and ornamental vegetation on the remaining edges. Of the 24 lots on the project site, 18 (Lots #1-8, and 15-24) are considered perimeter lots which will require fuel modification/defensible space. Of these 18 lots, only portions of 7 lots (Lots #1, 4, 5, 7, 8, 19, and 24) will include a total of 100 feet of fuel modification. Where 100 feet of fuel modification is available, it includes at least a 50-foot wide irrigated zone (Zone A) and a 50-foot wide thinned zone (Zone B). For Lots #4 and 5, a 75-foot wide irrigated zone (Zone A) is proposed. The remaining portions of these 7 lots and the entirety of the other 11 perimeter lots (#2, 3, 6, 15-18, and 20-24) will have between 35 and 100 feet of fuel modification, the maximum distance available on site and outside of Open Space Lot #30. While these lots are unable to obtain 100 feet of fuel modification on-site, they are proposed to receive alternative materials and/or methods of fire protection, including structural enhancement and annual fuel modification inspection (Section 5.0). Table 5 summarizes the available fuel modification and off-site condition for the 18 lots requiring fuel modification.

Table 5
Vista Fire Department Responding Stations Summary

Lot (s)	Minimum Available Fuel Modification Distance	Comments
1	50 to 70-foot A Zone and 50-foot B Zone	Abuts Open Space Parcel #30.
2	64 to 70-foot A Zone	Abuts Open Space Parcel #30.
3	61 to 68-foot A Zone	Abuts Open Space Parcel #30.
4	50 to 75-foot A Zone and 25-foot B Zone	Abuts Open Space Parcel #30.
5	67 to 75-foot A Zone and 25-foot B Zone	Abuts Open Space Parcel #30.
6	59 to 80-foot A Zone	Abuts Open Space Parcel #30.
7	48 to 50-foot A Zone and 0 to 50-foot B Zone	Abuts Open Space Parcel #30.
8, 15-17	50-foot A Zone and 8 to 30-foot B Zone	Abut existing Cleveland Trail road immediately off site (incorporated into Zone B) adding additional 8-30 feet of non-combustible land cover. Opposite Cleveland Trail is southern coast live oak riparian forest with 2.6-foot modeled flame lengths under Peak conditions.

Table 5
Vista Fire Department Responding Stations Summary

Lot (s)	Minimum Available Fuel Modification Distance	Comments
18	35-foot A Zone	Abuts developed parcel along eastern edge with irrigated vegetation and low fuel loads.
19	50-foot A Zone and 13 to 50-foot B Zone	Abuts developed parcels along the eastern and southern edges with non-fuel areas (dirt roads), irrigated vegetation, and overall low fuel loads.
20-23	40 to 55-foot A Zone	Abut developed parcels along the southern edge with non-fuel areas (dirt roads), irrigated vegetation, and overall low fuel loads.
24	50-foot A Zone and 1 to 50-foot B Zone	Abuts developed parcels along the southern edge with non-fuel areas (dirt roads), irrigated vegetation, and overall low fuel loads.

4.6.1 Vegetation Management

Prescribed defensible space (fuel management zones) will be maintained on at least an annual basis or more often, as needed, by the private property owners. Boundaries of fuel management zones will be clearly and permanently marked. Planting used in the fuel modification areas will include drought-tolerant, fire resistive trees. Shrubs and groundcovers will be approved by the VFPD. The planting list and spacing will be reviewed and approved by the VFPD, included on submitted landscape plans and will be consistent with the VFPD approved plant list (Appendix F). The intent of the approved plant list is to provide examples of plants that are less prone to ignite or spread flames to other vegetation and/or combustible structures during a wildfire. Additional plants can be added to the landscape plant material palette with the approval from the VFPD.

4.6.1.1 Fuel Modification Zones

Fuel modification zones are designed to 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 WUI exposed structures. Because this site will utilize non-combustible construction and will implement enhanced ignition resistant construction techniques, and given the predicted flame heights and intensity the proposed fuel modification areas will provide adequate setback for the potential short duration wildfire that may be realized in adjacent open space areas west.

All fuel modification zones will be fully contained within the project property. All zone dimensions are measured on a horizontal plane. Therefore, actual dimensions of the zones on the slope may vary from horizontal dimensions on Figure 5. To ensure long-term identification and maintenance, a fuel modification area shall be identified by a permanent zone marker meeting the approval of

VFPD. 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.

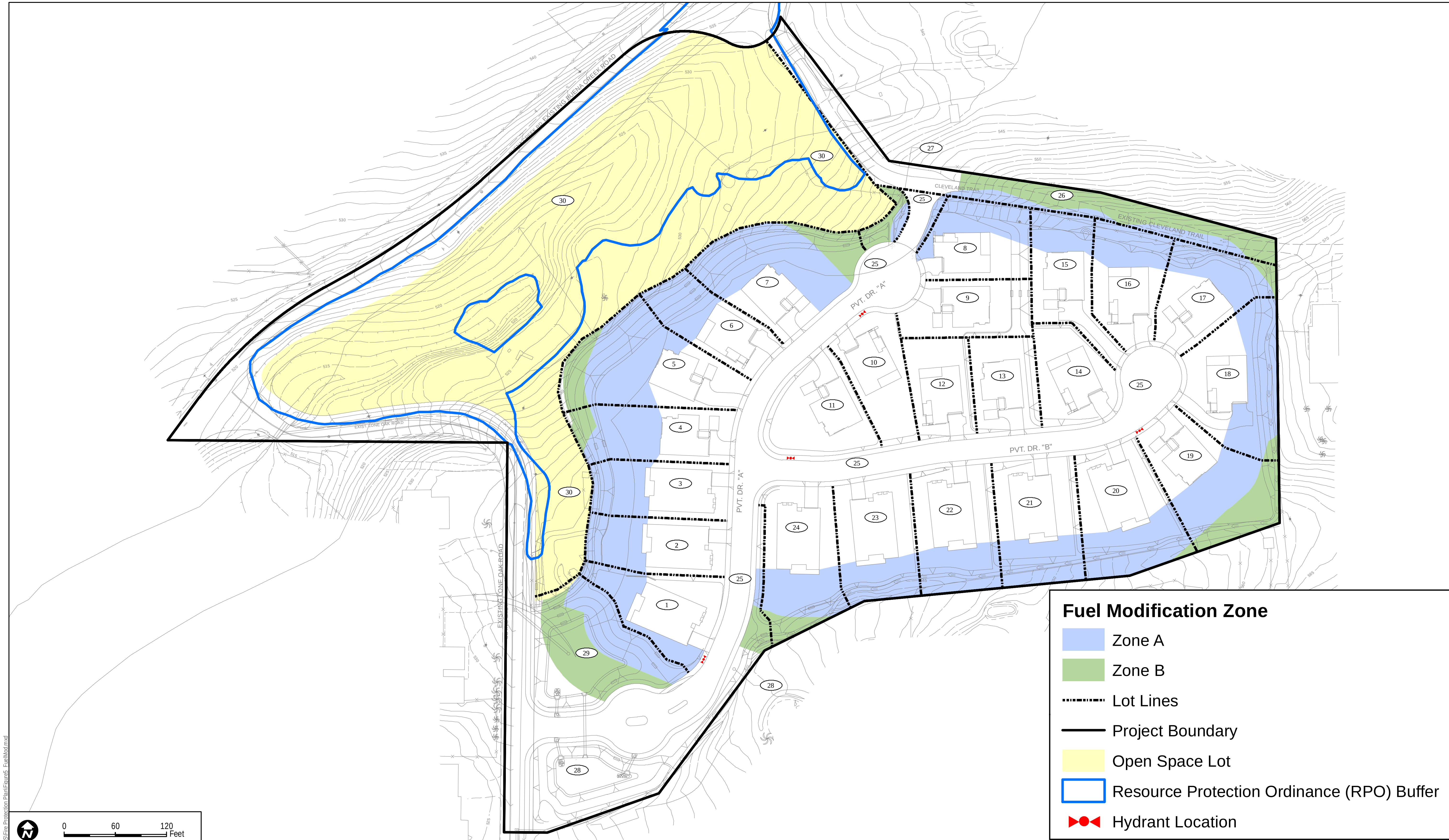
4.6.1.2 Fuel Modification Zone Requirements

The following requirements are provided for fuel modification zones. These zones are presented graphically in Figure 5.

Zone A – Non-Flammable, Irrigated Zone (structure to 50 feet)

Zone A is applicable site wide for every perimeter structure (identified in Table 5) and is measured on a horizontal plane from the structure outward to 50 feet in all directions (or up to 75 feet for lots adjacent to Open Space Parcel #30). This zone will be planted with drought-tolerant, fire resistive plants from the approved plant list (Appendix E). It includes the following key components:

- Landscape Plan prepared and submitted in compliance with VFPD Ordinance 21, FPP guidelines, and the VFPD approved plant list.
- Combustible mulches and wood chips must be 12 inches away from any side of a combustible structure with weep screeds.
- Non-combustible surface (pavement, concrete, decomposed granite, etc.) for pathways around the residences for VFPD access to doorways and rescue windows.
- Irrigated wet zone (water conserving irrigation systems with efficient drip emitters and "smart" controllers).
- No tree crowns within 10 feet of structures (at maturity) if the trees are considered fire resistive per VFPD standards. Non-fire resistive trees, such as pines, must be planted and maintained 50 feet from the tree canopy to the closest structure.
- Tree spacing of a minimum 10 feet between individual crowns at maturity for trees planted on less than 20 % slope, and 20 feet, if planted on 21% to 40% slope, and 30 feet if planted greater than 41% slope. A grouping of two to three trees together can be considered as one large tree canopy from a wildfire flammability perspective.
- No tree limb encroachment within 10 feet of a structure or chimney, including outdoor fireplaces.



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SOURCE: Hunsaker 2015

FIGURE 5

Fuel Modification Zone Map

Lone Oak Road Project - Fire Protection Plan

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Zone B – Non-Flammable, Reduced-Fuel Zone (50 to 100 feet from structure)

Zone B is a thinning zone where native vegetation may remain, but all native, unbroken vegetation must be thinned out by 50% canopy cover. Zone B includes the following key components thinning out native vegetation:

- Mow weeds and grasses or other ground cover to 6 inches high.
- Minimum 20 feet between tree canopies. A grouping of two to three trees together can be considered as one large tree canopy from a wildfire flammability perspective.
- Skirt or limb mature trees to one-third or 10 feet of the height, whichever is greater. This requires cutting the lower branches. If the tree is 30 feet tall, remove branches 10 feet up the trunk.
- If shrubs or trees create a "ladder effect", shrubs adjacent to increasingly taller trees should be removed or more aggressively skirting of the taller trees.
- Horizontal thinning of native shrubs less than 6 feet high, 20 feet on center.
- Single-specimen native shrubs, exclusive of chamise, California sagebrush, California buckwheat, and sages, may be retained 20 feet on center.

4.6.1.3 Other Vegetation Management

Roadside Fuel Modification Zones

- All roads will be subject to flammable, native vegetation clearance for 20 feet on each side.
- Canopies shall be interrupted to provide discontinuous fuels.
- Grass shall be mowed to 6-inch stubble height or lower.
- Single specimens of trees, ignition-resistive shrubs, or cultivated ground cover, such as green grass, succulents, or similar plants used as ground covers, may be used, provided they do not form a means of readily transmitting fire. Plant material will be selected from approved plant list in Appendix E.

Trees may be placed within the Roadside Vegetation Management Zones. The following criteria must be followed:

- Tree spacing to be 20 feet between mature canopies. A grouping of two to three trees together can be considered as one large tree canopy from a wildfire flammability perspective.
- Trees must be limbed up one-third the height of the mature tree or 10 feet, whichever is greater.

- No tree canopies lower than 13 feet 6 inches over roadways.
- No tree trunks intruding into roadway width. It is recommended to plant tree trunks at a minimum of 10 feet from edge of roadway or a driveway.
- No trees shall be planted that are not on the approved plant list or provided approval by VFPD during landscape plan review.
- No flammable understory is permitted beneath trees.
- Any vegetation under trees to be ignition resistive and kept to 2 feet in height or lower, and no more than one-third the height of the lowest limb/branch on the tree.
- No tree limbs/branches are permitted within 10 feet of a structure.

Pre-Construction Structure Locations

- Perimeter fuel modification areas must be implemented prior to commencement of construction utilizing combustible materials.
- Existing flammable shrubs shall be reduced by 60% on vacant lots upon commencement of construction or weeds or grasses mowed to six inches in height.
- Dead fuel, ladder fuel (fuel which can spread fire from ground to trees), and downed fuel shall be removed and trees/shrubs shall be properly limbed, pruned, and spaced per this plan.
- The remainder of the Vegetation Management Zones required for the particular lot shall be installed and maintained prior to combustible materials being brought onto any lot under construction.

Prohibited Plants

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be physical or chemical.

The plants included in the Prohibited Plant List (Appendix F) are unacceptable from a fire safety standpoint, and shall not be planted within fuel modification zones.

4.6.1.4 Fuel Modification Area Vegetation Maintenance

Provisions for continuous maintenance will be addressed in the Lone Oak Road Homeowner Association’s (HOA) Covenants, Conditions, and Restrictions for common areas and individual properties. Maintenance refers to anything needed to maintain the fuel modification area in a fire-safe condition as required by VFD, including the periodical removal of undesirable, combustible vegetation; replacement of dead or dying fire-resistant plantings; maintenance of the operational integrity and programming of irrigation systems; and preservation of identification markers.

All fuel modification area vegetation maintenance shall be completed annually by June 1st of each year and more often as needed for fire safety, as determined by the VFPD. This FPP requires that the HOA budget for and hire an approved 3rd party fuel modification zone inspector annually to provide guidance and approval of the fuel modification zone maintenance, described further in the following section. Individual property owners will be responsible for all vegetation management on private property in compliance with the requirements detailed herein and VFPD requirements. Enforcement of the provision of maintenance will be accomplished by the Lone Oak Road HOA and VFPD Prevention Bureau through any legal remedies available to both jurisdictions, including fees and liens.

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5 ALTERNATIVE MATERIALS AND METHODS FOR NON-CONFORMING FUEL MODIFICATION

As previously mentioned, due to site constraints, it is not feasible to achieve the standard FMZ width for 18 lots (#1-8 and 15-24). As such, this FPP incorporates additional analysis and measures that will be implemented to compensate for potential fire related threats. These measures are customized for this site based on the analysis results and focus on providing functional equivalency as a VFPD-defined, full fuel modification zone. Even though Lots 18 and 20-23 have less than a 50-foot Zone A within the development, additional fire protection measures are not considered required since the adjacent properties are landscaped up to the project's eastern and southern boundaries from existing developed areas. Therefore, this section addresses Lots #1-8, 15-17, and 19 along the project's northern and western edges.

The specific lots that are affected by this analysis are those that cannot provide at least 100 feet of structural setback from the property line. Standard fuel modification zones are 100 feet in many jurisdictions (or to property line – PRC 4291). However, 100 feet is typically required where a true wildland urban interface exists. The land uses adjacent to Lots #8, 15-17, and 19 (paved roads, riparian forest) present reduced risk when compared to native shrub lands. The vegetative fuels off site can ignite and burn completely during extreme weather conditions. However, they are expected to burn in a spotty manner due to the presence of heavy shading and higher plant moisture. For Lots #1-7, the adjacent vegetation on Open Space Lot #30 is comprised of a 50-foot swath of non-native grassland nearest development and disturbed Southern Live Oak Riparian Forest beyond. These vegetative fuels in the open space parcel can ignite and burn completely during extreme weather conditions. Fuel modification along the interface between Lots #1-7 and Open Space Lot #30 has been modified from the standard 50-foot A Zone and 50-foot B Zone to mitigate the reduction in overall width. Specifically, where available, 75 feet of irrigated fuel modification is provided (Zone A) and 25 feet of thinning is provided (Zone B).

5.1 Alternative Materials and Methods

The project will provide code-exceeding fire protection features to compensate for the reduced fuel modification on the 18 lots.

1. Window upgrade to dual pane, both panes tempered.
2. 3rd party fuel modification zone inspections to be funded by the HOA annually.

5.1.1 Alternative Material and Method Justifications for Findings

As experienced in numerous wildfires, including the most recent fire storms in San Diego County (2003 and 2007), homes in the WUI are potential fuel. The distance between the wildland fire that is consuming wildland fuel and the home ("urban fuel") is the primary factor for structure ignition (not including burning embers). 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 2007).

These results support Cohen's (2000) findings that if a community's homes have a sufficiently low home ignitability (i.e., 2011 County Consolidated Code and Building Code), the community can survive exposure to wildfire without major fire destruction. This provides the option of mitigating the wildland fire threat to homes/structures at the residential location without extensive wildland fuel reduction. Cohen's (1995) studies suggest, as a rule-of-thumb, larger flame lengths and widths require wider fuel modification zones to reduce structure ignition. For example, valid SIAM results indicate that a 20-foot high flame has minimal radiant heat to ignite a structure (bare wood) beyond 33 feet (horizontal distance). Whereas, a 70-foot-high flame may require about 130 feet of clearance to prevent structure ignitions from radiant heat (Cohen and Butler 1996). This study utilized bare wood, which is more combustible than the ignition resistant exterior walls for structures built today. Fire behavior modeling conducted for this project indicates that fires in the riparian forest would result in roughly 3-foot flame lengths under peak weather conditions and those within adjacent grassland fuels would result in approximately 13-foot flame lengths under peak weather conditions. Extreme conditions may result in crown fire in riparian forest fuels, where tree crowns burn and create more intense fire and longer flame lengths. Minimum fuel modification zone widths along the interface between Open Space Lot #30 and Lots #1-7 is 48 feet. Fire during extreme conditions would be less likely to affect residents of this community because it is anticipated that they would be evacuated well before wildland fire from the east or north encroached upon this area.

As indicated in this report, the FMZs and additional fire protection measures proposed for Lots #1-8, 15-17, and 19 provide equivalent wildfire buffer, but are not standard zones. Rather, they are based on a variety of analysis criteria including predicted flame length, fire intensity (Btu), 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 proposed 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 alternatives proposed for this project.

5.1.1.1 Exterior Windows

A potentially vulnerable structure component with regard to radiant or convective heat exposure is a structure's windows. A concern for structures on the western and northern side of the project (Lots #1-8. 15-17, and 19) is the exterior glazing that could be subject to radiant or convective heat from a wildland fire and whether provision for a fuel modification zone slightly narrower is adequate. To address this issue, it is worthwhile to examine the structure ignitability modeling, independent ignition experiments, and case studies that support fuel treatments as low as roughly 35 feet from structures, and compare them with the project. Cohen's (1995) structure ignitability model (SIAM) assesses ignitability of bare wood when exposed to a continuous heat source. The model assumes a worst-case condition of a constant 1700 degrees (F). A constant, maximum heat source is typically not the case during a wildfire due to the movement of a fire, non-uniform vegetation distribution, and the lack of a uniform, constant flame front. Further, a flame temperature of 1700 degrees (F) is likely higher than would be experienced by the fuels adjacent this site, but is a valid temperature for testing, as Pyne et al. (1996) confirms that flaming combustion typically occurs in wildland fuels between flame temperatures of 1,466 to 2,186 degrees (F). For comparison, Dennison (2006) studied the heat signatures from a Southern California wildfire that was burning oak woodlands, dense chaparral, sparse chaparral, and grasslands. Results from this study indicate that the maximum temperature commonly observed was 2,200 degrees (F) and associated with the dense, higher fuel load oak and chaparral vegetation, while cooler (980–1340 degrees (F)) and smaller fires were associated with the mixed chaparral and grasslands. The analysis conducted for this report indicates that the structure setbacks only 5–15% less than the typical requirement, is adequate for separating the structures from the short-duration heat and flame associated with a fire burning toward the community in the fuels that occur adjacent this portion of the development. The typical duration of large flames from burning vegetation is on the order of 1 minute and up to several minutes for larger fuels at a specific location (Cohen 1995; Butler et al. 2004, Ramsay and Rudolph 2003, Cohen and Quarles 2011). Tests of various glazing products indicate that single pane, tempered glass failure may occur between 120–185 seconds from exposure (University of California 2011; Manzello et al. 2007) but those tests include direct and constant heating that would not be experienced during a wildfire near Lots #1-8, 15-17, and 19. Depending on the heat applied and the type of glass used in the various studies, the cracking/failure time varied. However, given the short duration of maximum heat (likely 60–90 seconds for the riparian forest leaf litter), the loss of heat over distance (48 feet minimum, inclusive of fuel modification), and the fire-rated minimum 20-minute glazing specified for this project, the heat experienced by the windows from the wildland fire is not expected to be enough (in temperature or duration) to cause window failure. Quarles et al. (2010) provides strong endorsement for tempered (toughened) glass performance. His research and tests conclude that multi-pane (2–3 panes) with at least one pane tempered is well-suited for wildfire exposures. He indicates that tempered glass is at least four times stronger and much more resistant to thermal exposures than normal annealed glass. The use of code required dual pane, one pane tempered glass provides several benefits, with thermal exposure performance the most important for this study. This project would utilize dual pane, both panes tempered to increase the thermal and overall strength of the exposed windows on the Lots #1-8, 15-17, and 19 structures.

5.1.1.2 3rd Party Fuel Modification Zone Inspections

The HOA or similar funded entity will annually hire a 3rd party fuel modification zone inspector to conduct an assessment of the community's fuel modification areas. The inspector will utilize this FPP along with the then current VFPD/County fuel modification requirements for determining whether the fuel modification areas comply. Where maintenance is required, the inspector will notify the HOA/funded entity of the situation and will direct activities so that compliance is achieved. Once in compliance, the 3rd party inspector will provide a certification letter to VFPD and the County indicating that the fuel modification area meets the required conditions. This process will help ensure that the project's fuel modification zones continue to meet the intent of this FPP and provide an appropriately structured setback from native fuels.

It is understood that the County or the VFPD may require additional measures based on a structure's proximity to fuels and the fuel loads represented by those areas. This FPP is provided to assist the VFPD with determinations of any additional measures. 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 wildfire burning in the vicinity of the site or within the site's landscape.

6 CONCLUSION

This FPP is submitted in support of an application for project entitlement of the Lone Oak Road development project. It is submitted in compliance with requirements of the Vista Fire Protection District Ordinances and San Diego County Fire Authority Codes. The requirements in this document meet fire safety, building design elements, intent of fuel management/modification, and landscaping recommendations of the County. Where the project does not strictly comply with the Code, such as with some fuel modification zone widths, alternative materials and methods have been proposed that provide functional equivalency as the code intent.

Fire and Building Codes and other local, county, and state regulations in effect at the time of each building permit application supersede these recommendations unless the FPP recommendation is more restrictive.

The recommendations provided in this FPP have been designed specifically for the proposed project and the Wildland Urban Interface (WUI) zone at the Lone Oak Road project site. The project site's fire protection system includes a redundant layering of protection methods that have been shown, through post-fire damage assessments, to reduce risk of structural ignition and compensate for fuel modification area reductions.

Modern infrastructure will be provided along with implementation of the latest ignition resistant construction methods and materials. Further, all structures are required to include interior sprinklers consistent with Fire District and County Code. Fuel modification will occur on exposed edges and adjacent biological preserve areas of the project site. Fuel modification areas receive fuel reduction treatments initially, and then maintenance over time includes removing all dead and dying materials and maintaining appropriate horizontal and vertical spacing. In addition, plants that establish or are introduced to the fuel modification zone that are not on the approved plant list will be removed by the HOA and certified by a 3rd party Fuel Modification Zone inspection.

Ultimately, it is the intent of this FPP to guide, through code and other project specific requirements, the construction of structures that are defensible from wildfire and, in turn, do not represent significant threat of ignition source for the adjacent native habitat. It must be noted that during extreme fire conditions, there are no guarantees that a given structure will not burn. Precautions and mitigating actions identified in this report are designed to reduce the likelihood that fire would impinge upon the proposed structures. 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 mitigating fuel modification requirements provided in this FPP will accomplish the goal of this FPP to assist firefighters in their efforts to defend these structures and reduce the risk associated with this project's WUI location. For maximum benefit, the developer, contractors, engineers, and architects are responsible for proper implementation of the concepts and requirements set forth in this report. Homeowners are responsible to maintain their structures and lots as required by this report, the applicable Fire Code and the VFPD.

Although the proposed development and landscape will be significantly improved in terms of ignition resistance, it should not be considered a shelter-in-place community. It is recommended that the homeowners or other occupants who may reside within the Lone Oak Road neighborhood adopt 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![1]"stance on evacuation. Accordingly, occupants should evacuate the residence and the area as soon as they receive notice to evacuate, or sooner, if they feel threatened by wildfire or structure fire in a nearby residence. Fire is a dynamic and somewhat unpredictable occurrence and it is important for residents to educate themselves on practices that will improve their home survivability and their personal safety.

[1] International Fire Chiefs Association "Ready, Set, Go" website link: http://wildlandfirersg.org/

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8 LIST OF PREPARERS

Project Manager/Lead Fire Protection Planner:

Michael Huff
Fire Protection Planner; San Diego County California Environmental Quality Act Consultant List
Dudek

Fire Protection Planner:

Mike Scott
Urban Forester
Dudek

GIS Fire Behavior Modeling:

Scott Eckardt
Registered Professional Forester, GIS fire modeling and exhibit preparation
Dudek

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APPENDIX A

Photograph Log

Lone Oak Ranch
Photograph Log

1. View of looking north on Lone Oak Road adjacent to western boundary of property. Existing road is 24 feet wide.

2. Photograph of existing single family residence on the property. Residence will be removed as part of the project.

Lone Oak Ranch
Photograph log

3. Photograph shows existing garage and storage building which will be removed as part of the project.

4. View of vacant portion of property. Photograph is showing northwestern portion of property with southern live oak riparian forest in the middle of the photograph.

Lone Oak Ranch
Photograph Log

5. Another view looking northwest at southern live oak riparian forest comprised of coast live oak and willow with ornamental trees, such as Jacaranda, Liquidambar, and eucalyptus.

6. The riparian forest also has Mexican fan palms, Canary island date palms, cedars, and coast redwoods.

Lone Oak Ranch
Photograph Log

7. View underneath the oak tree canopy is either oak leaf litter or toyon shrubs with minimal oak regeneration.

8. The understory vegetation is a mixture of castor bean, ivy, and giant reed where sunlight penetrates through the dense riparian forest canopy.

Lone Oak Ranch
Photograph Log

9. View looking north onto adjoining property, where the southern live oak riparian forest continues along Buena Creek Road. Cleveland Trail Road is just on the other side of the chain-link fence. Note low voltage power line that traverses through eastern and northern portion of property.

10. Photograph taken along south side of Buena Creek Road looking west. Photograph is showing most northern extent of southern live oak riparian forest.

Lone Oak Ranch
Photograph Log

11. The Buena Creek Estates is located north of Buena Creek Road and northwest of the project site.

12. View looking east of the project site towards adjacent semi-rural residential area in foreground and hillsides vegetated with southern mixed chaparral behind the homes.

Lone Oak Ranch
Photograph Log

13. Photograph of Southern Mixed Chaparral community comprised of California sage brush, California buckwheat, coyote brush, laurel sumac, and Lemonadeberry. Fuel bed is approximately 6 to 10 feet high.

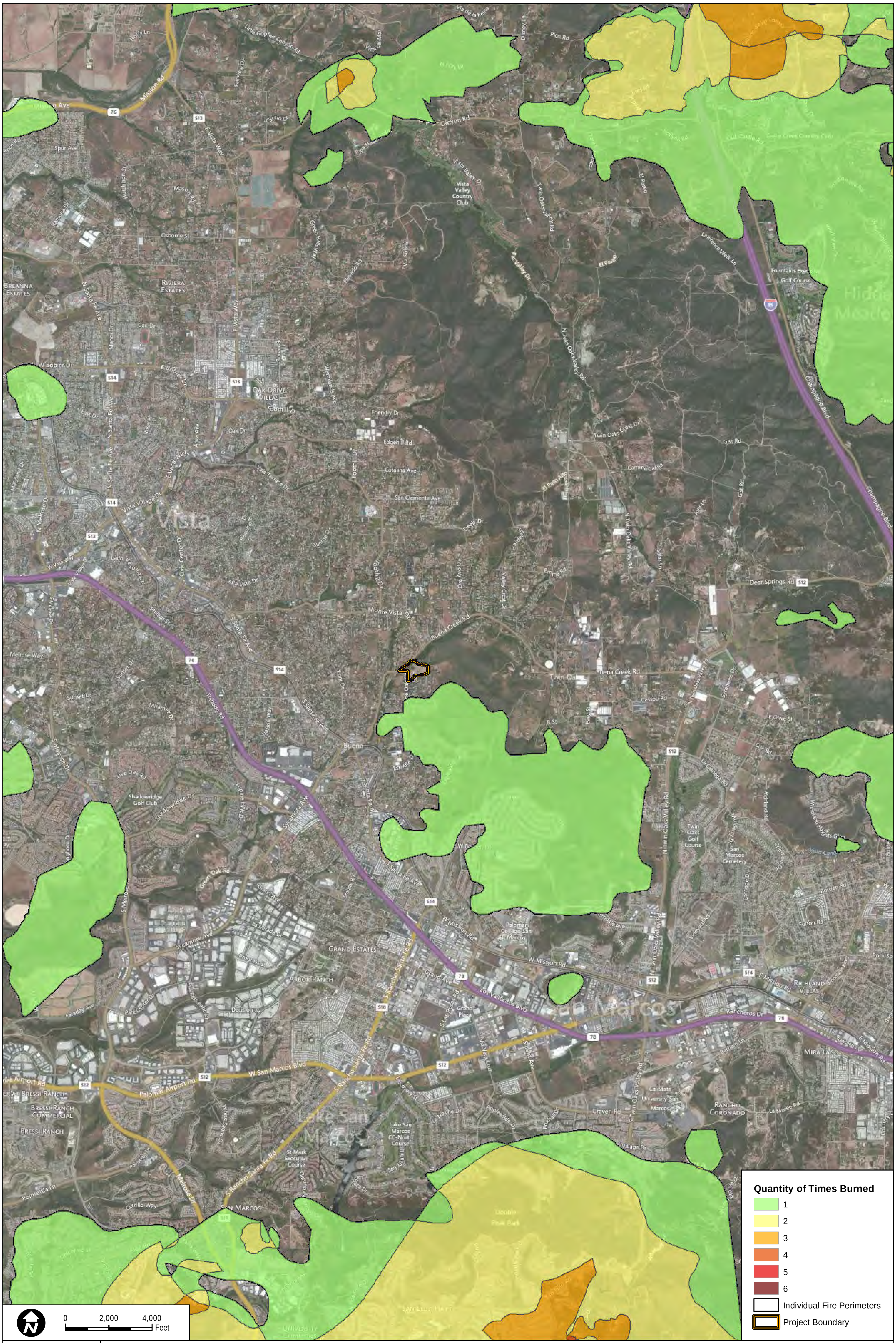
14. Photograph of row of trees, including Blue gums and coast live oaks, along southern perimeter of project site.

Lone Oak Ranch
Photograph Log

15. Photograph of typical home construction and landscaping for the semi-rural residential neighborhoods to the south and west of property boundary.

16. Another photograph of typical home construction to the west of the project site. Note in the middle of the photograph is a glimpse of a large vacant lot that is routinely mowed.

APPENDIX B
Fire History Exhibit



DUDEK

7997

SOURCE: Bing Maps 2014, FRAP 2014

APPENDIX B

Fire History Map

Lone Oak Road Project - Fire Protection Plan

APPENDIX C

BehavePlus Fire Behavior Analysis

APPENDIX C
BehavePlus Fire Behavior Analysis

BEHAVEPLUS FIRE BEHAVIOR MODELING

Fire behavior modeling includes a high level of analysis and information detail to arrive at reasonably accurate representations of how wildfire would move through available fuels on a given site. 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, the BehavePlus 5.0.5 fire behavior modeling system was applied using predominant fuel characteristics, slope percentages, and extreme weather variables for the site.

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 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 (Anderson 1982) and the more recent custom fuel models developed for southern California (Weise and Regelbrugge 1997). 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 (Scott and Burgan 2005) 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
- Shrub Models SH1 through SH9
- Timber-understory Models TU1 through TU5
- Timber litter Models TL1 through TL9
- Slash blowdown Models SB1 through SB4

BEHAVEPLUS FIRE BEHAVIOR MODELING INPUTS

Vegetation/Fuels

To support the fire behavior modeling efforts conducted for this Fire Protection Plan, fuel models were identified for five key locations in order to represent multiple wildfire scenarios on or adjacent to the project site. While vegetation types other than those selected are located on site, the selected areas represent the most likely wildfire threat for the proposed project. Table 1 summarizes fuel model assignments by modeling scenario.

Table 1
BehavePlus Fine Dead Fuel Moisture Calculation

Scenario	Vegetation Type	Fuel Model
1	Disturbed southern coast live oak riparian forest	8
2	Chaparral	SH5
3	Disturbed southern coast live oak riparian forest	8
4	Ornamental vegetation	10
5	Non-native grassland	1

Weather

Fire behavior modeling conducted in support of this FPP utilized the guidelines and standards presented by the County of San Diego, Department of Planning and Land Use[1]. These guidelines identify acceptable fire weather inputs for extreme fire conditions during summer months and Santa Ana fire weather patterns. The County analyzed and processed fire weather from Remote Automated Weather Stations (RAWS) between April 15 to December 31 in order to represent the general limits of the fire season. Data provided by the County's analysis included temperature, relative humidity, and sustained wind speed and is categorized by weather zone, including Maritime, Coastal, Transitional, Interior, and Desert.

To evaluate potential fire behavior for the project site, Dudek utilized the BehavePlus (v. 5.0.5) fire behavior modeling software package to determine fuel moisture values and expected fire behavior for the site. The temperature, relative humidity, and wind speed data for the Coastal[2] weather zone were utilized for this FPP based on the project location. Reference fuel moistures were calculated in BehavePlus and were based on site-specific topographic data inputs. Fire behavior for the site was calculated in five different locations using worst-case fuels and topography (steepest slopes). Four of the modeling scenarios (Scenarios 1-3 and 5) analyzed

1 County of San Diego Report Format and Content Requirements – Wildland Fire and Fire Protection (August 31, 2010). On-line at http://www.sdcounty.ca.gov/dplu/docs/Fire-Report-Format.pdf

2 SANGIS 2011 (http://www.sangis.org/)

potential fire behavior along the northwestern and northeastern edges of the project site during Peak weather conditions. The other scenario (Scenario 4) analyzed potential fire behavior along the western edge during summer fire weather conditions. Table 2 summarizes the fuel moisture calculations utilized for this FPP.

Table 2
BehavePlus Fine Dead Fuel Moisture Calculation

Variable	Summer Weather	Peak Weather
Dry Bulb Temperature	90 -109 deg. F	90 -109 deg. F
Relative Humidity	10 - 14 %	0 -4 %
Reference Fuel Moisture	2 %	1 %
Month	Feb Mar Apr Aug Sept Oct	Feb Mar Apr Aug Sept Oct
Time of Day	12:00 - 13:59	12:00 - 13:59
Elevation Difference	Level (within 1,000 ft.)	Level (within 1,000 ft.)
Slope	0-30%	0-30%
Aspect	West	West
Fuel Shading	Exposed (< and > 50% shading)	Exposed (< and > 50% shading)
Fuel Moisture Correction	1 %	1 %
Fine Dead Fuel Moisture	3 %	2 %

Topography

The topography of the site is discussed in greater detail in the FPP. 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 down hill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Slope values for this site were measured from site topographic maps and are presented in units of percent.

The modeling locations were adjacent to proposed development areas on the site with slope measurements ranging from 5 to 15%. Scenarios to the northeast and northwest were selected based on the strong likelihood of fire approaching from the both directions during a Santa Ana wind-driven fire event. Scenario 2 was modeled approximately 600 feet offsite to the northeast to identify potential fire behavior in chaparral fuels within the drainage opposite Cleveland Trail. The scenario to the west (Scenario 4) was selected to evaluate fire behavior potential during a summer fire occurring during typical on-shore wind flow patterns. Finally, Scenario 5 was modeled to understand potential ire behavior in Open Space Lot #30 adjacent to the fuel modification zones for Lots #1-7. The fire behavior modeling input variables for the project site are presented in Table 3. Locations for each modeling run are presented graphically in Figure 4 of the FPP.

Table 3
BehavePlus Fire Behavior Modeling Inputs

Variable	Summer Weather (Onshore Flow)	Peak Weather (offshore/Santa Ana Condition)
Fuel Model	10	8, SH5
1h Moisture	3%	2%
10h Moisture	5%	3%
100h Moisture	7%	5%
Live Herbaceous Moisture	60%	30%
Live Woody Moisture	90%	60%
20-foot Wind Speed (upslope/downslope)	19 mph	26 mph
Wind Adjustment Factor	0.5	0.5
Slope Steepness	6%	5-15%

BEHAVEPLUS FIRE BEHAVIOR MODELING RESULTS

Three fire behavior variables were selected as outputs from the BehavePlus analysis conducted for the project site, and include flame length (feet), rate of spread (mph), and fireline intensity (BTU/feet/second). 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 2004). It is a somewhat subjective and non-scientific measure of fire behavior, but is extremely important to fireline personnel in evaluating fireline intensity and is worth considering as an important fire variable (Rothermel 1983). 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. The information in Table 4 presents an interpretation of these fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Table 5, as well as in Table 3 of the FPP. Additionally, identification of modeling run locations is presented graphically in Figure 4 of the FPP.

Table 4
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.

Table 4
Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
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.

Source: BehavePlus 5.0.5 fire behavior modeling program (Andrews, Bevins, and Seli 2004)

Table 5
BehavePlus Fire Behavior Modeling Results

Scenarios	Flame Length (feet)	Fireline Intensity (Btu/ft/s)	Surface Rate of Spread (mph)
1 (Peak fire in disturbed southern coast live oak riparian forest fuels; 10% slope; 26 mph winds)	2.6	46	0.1
2 (Peak fire in chaparral fuels; 5% slope; 26 mph winds)	32.6	11,061	3.7
3 (Peak fire in disturbed southern coast live oak riparian forest fuels; 15% slope; 26 mph winds)	2.6	46	0.1
4 (Summer fire in ornamental vegetation fuels; 6% slope; 19 mph winds)	9.1	683	0.3
5 (Peak fire in non-native grassland fuels, 5% slope, 26 mph winds)	12.7	1,415	8.3

Note: The results presented in Table 5 depict values based on inputs to the BehavePlus software. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. 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.

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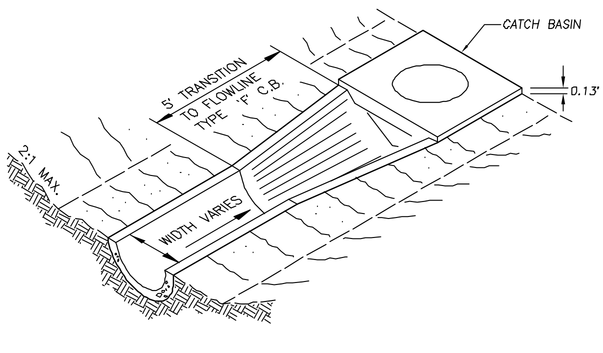
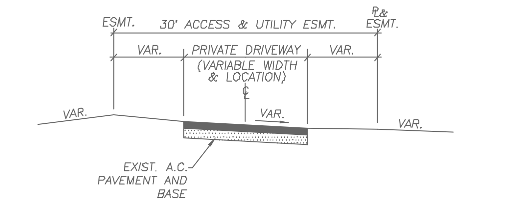
APPENDIX D

Existing and Proposed Road Cross Sections

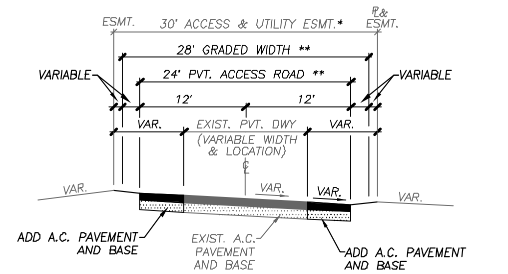
County Of San Diego Tract TM # 5585 (RPL 1)



DITCH TO CATCH BASIN TRANSITION
NTS

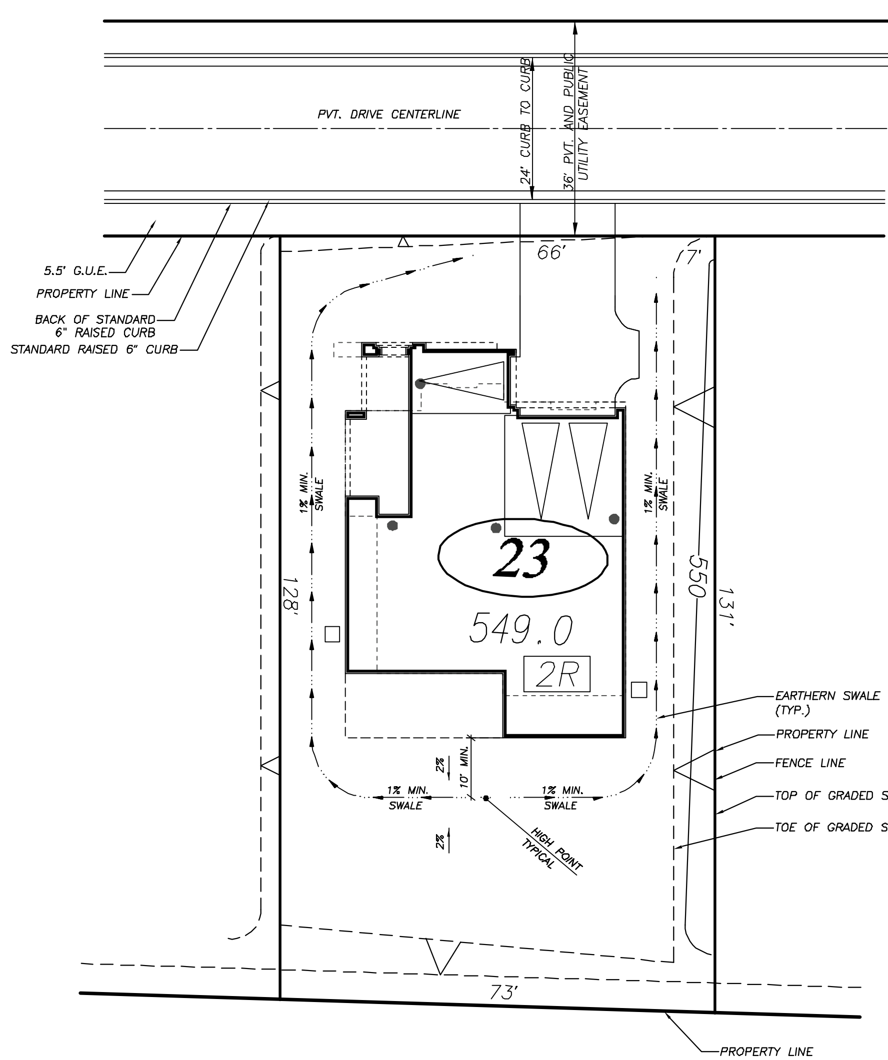


EXISTING CLEVELAND TRAIL
PRIVATE DRIVE — NTS



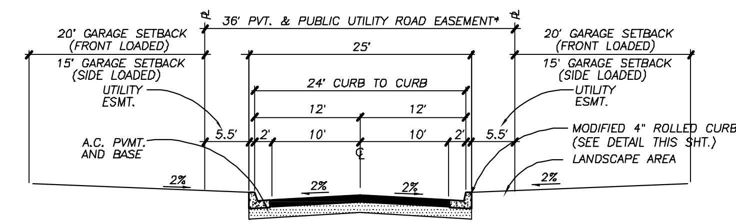
PROPOSED CLEVELAND TRAIL
PRIVATE ACCESS ROAD — NTS

NOTE
1. 30' OFFSITE ACCESS & UTILITY EASEMENT TO BE OBTAINED FOR OFFSITE PORTION OF CLEVELAND TRAIL EXTENDING TO BUENA CREEK ROAD.
* SEE EXCEPTION REQUEST #1 THIS SHEET.
* SEE EXCEPTION REQUEST #7 THIS SHEET.



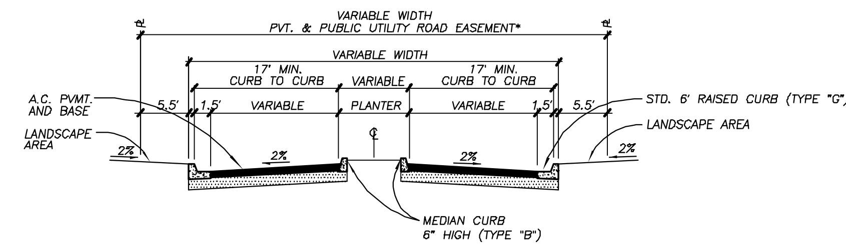
TYPICAL LOT DRAINAGE
NTS

NOTES
1. OPTIONAL USE OF AREA DRAINS WITH SWALES
2. SEE SHEET C9 FOR TYPICAL LOT BUILDING SETBACK DETAIL



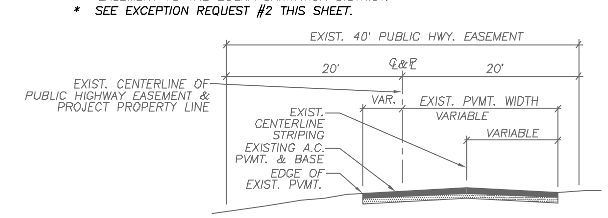
PRIVATE DRIVE "A" & "B"
GENERAL UTILITY EASEMENT — NTS

NOTE
1. PROPOSED PRIVATE DRIVE TO BE DEDICATED AS PUBLIC SEWER EASEMENT TO THE BUENA SANITATION DISTRICT.
* SEE EXCEPTION REQUEST #2 THIS SHEET.

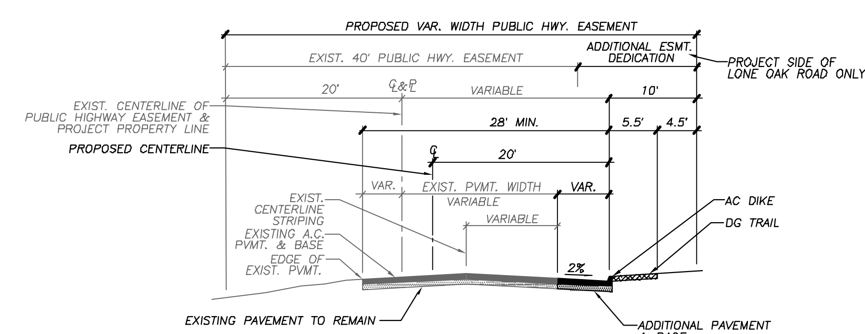


PRIVATE DRIVE "A" (AT ENTRY)
GENERAL UTILITY EASEMENT — NTS

NOTE
1. PROPOSED PRIVATE DRIVE TO BE DEDICATED AS PUBLIC SEWER EASEMENT TO THE BUENA SANITATION DISTRICT.
* SEE EXCEPTION REQUEST #2 THIS SHEET.



EXISTING LONE OAK ROAD
NON-MOBILITY ELEMENT RESIDENTIAL COLLECTOR — NTS



PROPOSED LONE OAK ROAD
NON-MOBILITY ELEMENT RESIDENTIAL COLLECTOR — NTS

EXCEPTION REQUESTS (COUNTY STANDARD SHOWN IN PARENTHESIS)

SUBDIVISION ORDINANCE

1. EXCEPTION REQUEST FOR A REDUCTION TO PRIVATE ROAD EASEMENT WIDTH FOR CLEVELAND TRAIL BOTH ONSITE AND & OFFSITE. (Subdivision Ordinance, 81.402(a)(2) Private road easements at least 40 feet wide in accordance with the San Diego County Standards for Private Roads, if the Director DPW determines the roads will ultimately serve no more than an estimated 100 ADT or will not feasibly provide a current or future connection to another public road or another subdivision.)

2. EXCEPTION REQUEST FOR A REDUCTION TO PRIVATE ROAD EASEMENT WIDTH FOR PRIVATE DRIVE "A" & "B". Subdivision Ordinance,(81.402(a)(2) Private road easements at least 40 feet wide in accordance with the San Diego County Standards for Private Roads, if the Director DPW determines the roads will ultimately serve no more than an estimated 100 ADT or will not feasibly provide a current or future connection to another public road or another subdivision.)

SAN DIEGO COUNTY DESIGN STANDARDS

3. EXCEPTION REQUEST TO MODIFY THE GATED ENTRY IMPROVEMENT AS SHOWN ON SHEET C3 OF THE TENTATIVE MAP. (San Diego County Stds. for Private Roads, Section 3.6. Private Gated Entries must conform to San Diego County Design Standards DS-17, DS-18 or DS-19.)

PUBLIC ROAD STANDARDS

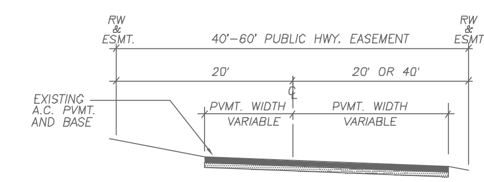
4. EXCEPTION REQUEST FOR A REDUCTION TO THE HORIZONTAL RADIUS REQUIREMENT FOR LONE OAK ROAD, A NON-MOBILITY ELEMENT RESIDENTIAL COLLECTOR, TO MATCH THE EXISTING AC PAVEMENT CENTERLINE RADIUS DUE TO PHYSICAL AND ENVIRONMENTAL CONSTRAINTS. (Public Road Stds.,Section 4.2) Tables 2A and 2B are a listing of all road requirements. The data specified in Tables 2A and 2B are minimumns and are subject to modification as further defined in this section.)

5. EXCEPTION REQUEST TO ELIMINATE ROAD IMPROVEMENTS FOR BUENA CREEK ROAD, A MOBILITY ELEMENT MAJOR ROAD, DUE TO ENVIRONMENTAL CONSTRAINTS. (Public Road Stds.,Section 4.2) Tables 2A and 2B are a listing of all road requirements. The data specified in Tables 2A and 2B are minimumns and are subject to modification as further defined in this section.)

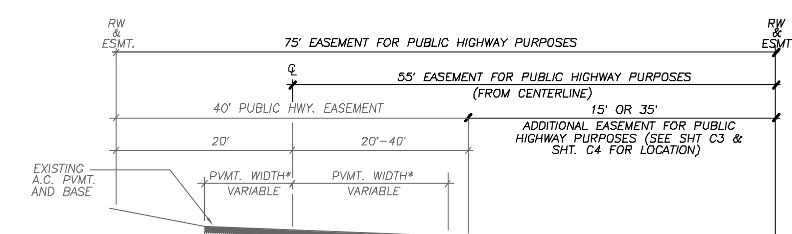
6. EXCEPTION REQUEST FOR A REDUCTION TO PUBLIC ROAD IMPROVEMENT WIDTH IN THE VICINITY OF THE CULVERT CROSSING ON LONE OAK ROAD AT THE BUENA CREEK ROAD INTERSECTION. (Public Road Stds.,Section 4.2) Tables 2A and 2B are a listing of all road requirements. The data specified in Tables 2A and 2B are minimumns and are subject to modification as further defined in this section.)

STANDARDS FOR PRIVATE ROADS

7. EXCEPTION REQUEST FOR A REDUCTION TO PRIVATE ROAD IMPROVEMENT WIDTH IN THE VICINITY OF THE CONCRETE DIP SECTION ON CLEVELAND TRAIL. (Stds. for Private Roads, Section 3.1(c) Where no dedications, offers of dedications, or irrevocable offers of dedication are required, the roads shall be designed and constructed to the minimum standards: ...)



EXISTING BUENA CREEK ROAD
MOBILITY ELEMENT MAJOR ROAD — NTS



PROPOSED BUENA CREEK ROAD
MOBILITY ELEMENT MAJOR ROAD — NTS

* EXISTING BUENA CREEK ROAD PAVEMENT TO BE MAINTAINED. NO ADDITIONAL GRADING OR PAVEMENT IS PROPOSED FOR BUENA CREEK ROAD FOR THE ENTIRE PROJECT FRONTAGE. SEE EXCEPTION REQUEST #5 THIS SHEET.

DETAILS

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC.
PLANNING ENGINEERING SURVEYING
9707 Waples Street San Diego, Ca 92121
PH(858)558-4500 · FX(858)558-1414

TENTATIVE MAP
TM # 5585 (RPL1)
LONE OAK RANCH
COUNTY OF SAN DIEGO, CALIFORNIA
ENV LOG #: ER-14-08-006

SHEET C2 OF C11

W.O.# 2414-35

R:\1191\&Pln\Lone Oak - TM - Sht 02.dwg[]Oct-11-2014:09:34

APPENDIX E
Approved Plant List

APPENDIX E
Approved Plants

County of San Diego
Acceptable Plants for Defensible Space in Fire Prone Areas

No.	Type	Genus	Species	Common Name
1	Annual	*Lupinus spp.*	*nanus*	Lupine
2	Groundcover	*Achillea*	*millefolium*	Yarrow
3	Groundcover	*Aptenia*	*cordifolia*	Aptenia
4	Groundcover	*Arctostaphylos* spp.		Manzanita
5	Groundcover	*Cerastium*	*tomentosum*	Snow-in-Summer
6	Groundcover	*Coprosma*	*kirkii*	Creeping Coprosma
7	Groundcover	*Cotoneaster spp.*		Redberry
8	Groundcover	*Drosanthemum*	*hispidum*	Rosea Ice Plant
9	Groundcover	*Dudleya*	*pulverulenta*	Chalk Dudleya
10	Groundcover	*Dudleya*	*virens*	Island Live-Forever
11	Groundcover	*Dudleya*	*brittonii*	Britton's Chalk Dudleya
12	Groundcover	*Eschscholzia*	*californica*	California Poppy
13	Groundcover	*Ferocactus*	*viridescens*	Coast Barrel Cactus
14	Groundcover	*Gaillardia*	*grandiflora*	Blanket Flower
15	Groundcover	*Gazania spp.*		Gazania
16	Groundcover	*Helianthemum* spp.		Sunrose
17	Groundcover	*Lantana spp.*		Lantana
18	Groundcover	*Lasthenia*	*californica*	Common Goldfields
19	Groundcover	*Lasthenia*	*glabrata*	Coastal Goldfields
20	Groundcover	*Lupinus* spp.		Lupine
21	Groundcover	*Myoporum* spp.		Myoporum
22	Groundcover	*Pyracantha* spp.		Firethorn
23	Groundcover	*Rosmarinus*	*officinalis*	Rosemary
24	Groundcover	*Santolina*	*chamaecyparissus*	Lavender Cotton
25	Groundcover	*Santolina*	*virens*	Santolina
26	Groundcover	*Trifolium*	*frageriferum*	O'Connor's Legume
27	Groundcover	*Verbena*	*rigida*	Verbena
28	Groundcover	*Viguiera*	*laciniata*	San Diego Sunflower
29	Groundcover	*Vinca*	*major*	Periwinkle
30	Groundcover	*Vinca*	*minor*	Dwarf Periwinkle
31	Perennial	*Coreopsis*	*gigantea*	Giant Coreopsis
32	Perennial	*Coreopsis*	*grandiflora*	Coreopsis
33	Perennial	*Coreopsis*	*maritima*	Sea Dahlia
34	Perennial	*Coreopsis*	*verticillata*	Coreopsis
35	Perennial	*Heuchera*	*maxima*	Island Coral Bells
36	Perennial	*Iris*	*douglasiana*	Douglas Iris
37	Perennial	*Iva*	*hayesiana*	Poverty Weed
38	Perennial	*Kniphofia*	*uvaria*	Red-Hot Poker
39	Perennial	*Lavandula* spp.		Lavender

County of San Diego
Acceptable Plants for Defensible Space in Fire Prone Areas

No.	Type	Genus	Species	Common Name
40	Perennial	*Limonium*	*californicum perezii*	Coastal Statice
41	Perennial	*Limonium*	*californicum* var. *mexicanum*	Coastal Statice
42	Perennial	*Oenothera* spp.		Primrose
43	Perennial	*Penstemon* spp.		Penstemon
44	Perennial	*Satureja*	*douglasii*	Yerba Buena
45	Perennial	*Sisyrinchium*	*bellum*	Blue-Eyed Grass
46	Perennial	*Sisyrinchium*	*californicum*	Golden-Eyed Grass
47	Perennial	*Solanum*	*xantii*	Purple Nightshade
48	Perennial	*Zauschneria*	*'Catalina' ?*	Catalina Fuschia
49	Perennial	*Zauschneria*	*californica*	California Fuschia
50	Perennial	*Zauschneria*	*cana*	Hoary California Fuschia
51	Shrub	*Agave*	*americana*	Desert Century Plant
52	Shrub	*Agave*	*Amorpha fruticosa*	False Indigobush
53	Shrub	*Agave*	*deserti*	Shaw's Century Plant
54	Shrub	*Agave*	*shawii*	NCN
55	Shrub	*Agave*		Century Plant
56	Shrub	*Arctostaphylos* spp.		Manzanita
57	Shrub	*Atriplex*	*canescens*	Hoary Saltbush
58	Shrub	*Baccharis*	*pilularis*	Coyote Bush
59	Shrub	*Baccharis*	*salicifolia*	Mule Fat "R"
60	Shrub	*Carissa*	*macrocarpa*	Natal Plum
61	Shrub	*Ceanothus* spp.		California Lilac
62	Shrub	*Cistus spp.*		Rockrose
63	Shrub	*Cneoridium*	*dumosum*	Bush rue
64	Shrub	*Comarostaphylis*	*diversifolia*	Summer Holly
65	Shrub	*Convolvulus*	*cneorum*	Bush Morning Glory
66	Shrub	*Dalea*	*attenuata v orcuttii*	Orcutt's Delea
67	Shrub	*Elaeagnus*	*pungens*	Silverberry
68	Shrub	*Encelia*	*californica*	Coast Sunflower
69	Shrub	*Encelia*	*farinosa*	White Brittlebush
70	Shrub	*Eriobotrya*	*deflexa*	Bronze Loquat
71	Shrub	*Eriophyllum*	*confertiflorum*	Golden Yarrow
72	Shrub	*Eriophyllum*	*staechadifolium*	Lizard Tail
73	Shrub	*Escallonia* spp.		Escallonia
74	Shrub	*Feijoa*	*sellowiana*	Pineapple Guava
75	Shrub	*Fremontodendron*	*californicum*	Flannelbush
76	Shrub	*Fremontodendron*	*mexicanum*	Southern Flannelbush
77	Shrub	*Galvezia*	*juncea*	Baja Bush-Snapdragon
78	Shrub	*Galvezia*	*speciosa*	Island Bush-Snapdragon
79	Shrub	*Garrya*	*elliptica*	Coast Silktassel

County of San Diego
Acceptable Plants for Defensible Space in Fire Prone Areas

No.	Type	Genus	Species	Common Name
80	Shrub	*Garrya*	*flavescens*	Ashy Silktassel
81	Shrub	*Heteromeles*	*arbutifolia*	Toyon
82	Shrub	*Lantana* spp.		Lantana
83	Shrub	*Lotus*	*scoparius*	Deerweed
84	Shrub	*Mahonia* spp.		Barberry
85	Shrub	*Malacothamnus*	*clementinus*	San Clemente Island Bush Mallow
86	Shrub	*Malacothamnus*	*fasciculatus*	Mesa Bushmallow
87	Shrub	*Melaleuca* spp.		Melaleuca
88	Shrub	*Mimulus* spp.		Monkeyflower
89	Shrub	*Nolina*	*parryi*	Parry's Nolina
90	Shrub	*Photinia* spp.		Photinia
91	Shrub	*Pittosporum*	*crassifolium*	NCN
92	Shrub	*Pittosporum*	*rhombifolium*	Queensland Pittosporum
93	Shrub	*Pittosporum*	*tobira 'Wheeleri'*	Wheeler's Dwarf
94	Shrub	*Pittosporum*	*viridiflorum*	Cape Pittosporum
95	Shrub	*Pittosporum*	*undulatum*	Victorian Box
96	Shrub	*Plumbago*	*auriculata*	Cape Plumbago
97	Shrub	*Prunus*	*caroliniana*	Carolina Laurel Cherry
98	Shrub	*Prunus*	*ilicifolia*	Hollyleaf Cherry
99	Shrub	*Prunus*	*lyonii*	Catalina Cherry
100	Shrub	*Puncia*	*granatum*	Pomegranate
101	Shrub	*Pyracantha* spp.		Firethorn
102	Shrub	*Quercus*	*dumosa*	Scrub Oak
103	Shrub	*Rhamus*	*alaternus*	Italian Buckthorn
104	Shrub	*Rhamus*	*californica*	Coffeeberry
105	Shrub	*Rhaphiolepis* spp.		Rhaphiolepis
106	Shrub	*Rhus*	*continus*	Smoke Tree
107	Shrub	*Rhus*	*integrifolia*	Lemonade Berry
108	Shrub	*Rhus*	*laurina*	Laurel Sumac
109	Shrub	*Rhus*	*ovata*	Sugarbush
110	Shrub	*Romneya*	*coulteri*	Matilija Poppy
111	Shrub	*Rosa*	*californica*	California Wild Rose
112	Shrub	*Rosa*	*minutifolia*	Baja California Wild Rose
113	Shrub	*Salvia* spp.		Sage
114	Shrub	*Sambucus spp.*		Elderberry
115	Shrub	*Symphoricarpos*	*mollis*	Creeping Snowberry
116	Shrub	*Tecomaria*	*capensis*	Cape Honeysuckle
117	Shrub	*Teucrium*	*fruticans*	Bush Germander
118	Shrub	*Verbena*	*lilacina*	Lilac Verbena
119	Shrub	*Xylosma*	*congestum*	Shiny Xylosma

County of San Diego
Acceptable Plants for Defensible Space in Fire Prone Areas

No.	Type	Genus	Species	Common Name
120	Shrub	*Yucca*	*schidigera*	Mojave Yucca
121	Shrub	*Yucca*	*whipplei*	Foothill Yucca
121	Tree	*Acer*	*macrophyllum*	Big Leaf Maple
122	Tree	*Acer*	*saccharinum*	Silver Maple
123	Tree	*Arbutus*	*unedo*	Strawberry Tree
124	Tree	*Archontophoenix*	*cunninghamiana*	King Palm
125	Tree	*Brahea*	*armata*	Blue Mexican Palm
126	Tree	*Brahea*	*edulis*	Guadalupe Palm
127	Tree	*Ceratonia*	*siliqua*	Carob
128	Tree	*Cercis*	*occidentalis*	Western Redbud
129	Tree	*Eriobotrya*	*japonica*	Loquat
130	Tree	*Erythrina*	*caffra*	Kaffirboom Coral Tree
131	Tree	*Gingko*	*biloba "Fairmount"*	Fairmount Maidenhair Tree
132	Tree	*Juglans*	*californica*	California Walnut
133	Tree	*Ligustrum*	*lucidum*	Glossy Privet
134	Tree	*Liquidambar*	*styraciflua*	Sweet Gum
135	Tree	*Liriodendron*	*tulipifera*	Tulip Tree
136	Tree	*Lyonothamnus*	*floribundus* ssp. *Asplenifolius*	Fernleaf Catalina Ironwood
137	Tree	*Melaleuca* spp.		Melaleuca
138	Tree	*Myoporum* spp.		Myoporum
139	Tree	*Nerium*	*oleander*	Oleander
140	Tree	*Parkinsonia*	*aculeata*	Mexican Palo Verde
141	Tree	*Pistacia*	*chinensis*	Chinese Pistache
142	Tree	*Pittosporum*	*phillyreoides*	Willow Pittosporum
143	Tree	*Pittosporum*	*viridiflorum*	Cape Pittosporum
144	Tree	*Platanus*	*acerifolia*	London Plane Tree
145	Tree	*Platanus*	*racemosa*	California Sycamore "R"
146	Tree	*Populus*	*trichocarpa*	Black Cottonwood "R"
147	Tree	*Prunus*	*caroliniana*	Carolina Laurel Cherry
148	Tree	*Prunus*	*ilicifolia*	Hollyleaf Cherry
149	Tree	*Prunus*	*lyonii*	Catalina Cherry
150	Tree	*Quercus*	*agrifolia*	Coast Live Oak
151	Tree	*Quercus*	*engelmannii*	Engelmann Oak
152	Tree	*Quercus*	*suber*	Cork Oak
153	Tree	*Rhus*	*lancea*	African Sumac
154	Tree	*Salix* spp.		Willow "R"
155	Tree	*Tristania*	*conferta*	Brisbane Box
156	Tree	*Ulmus*	*parvifolia*	Chinese Elm
157	Tree	*Umbellularia*	*californica*	California Bay Laurel "R"
158	Vine	*Antigonon*	*leptopus*	San Miguel Coral Vine

County of San Diego
Acceptable Plants for Defensible Space in Fire Prone Areas

No.	Type	Genus	Species	Common Name
159	Vine	*Distictis*	*buccinatoria*	Blood-Red Trumpet Vine
160	Vine	*Keckiella*	*cordifolia*	Heart-Leaved Penstemon
161	Vine	*Lonicera*	*japonica 'Halliana'*	Hall's Honeysuckle
162	Vine	*Lonicera*	*subspicata*	Chaparral Honeysuckle
163	Vine	*Solanum*	*jasminoides*	Potato Vine

Source: Vista Fire Protection District (http://www.vistafireprotectiondistrict.com/#!page-5)

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APPENDIX F

Prohibited Plant List

UNDESIRABLE PLANT LIST

The following species are highly flammable and should be avoided when planting within the first 50 feet adjacent to a structure. The plants listed below are more susceptible to burning, due to rough or peeling bark, production of large amounts of litter, vegetation that contains oils, resin, wax, or pitch, large amounts of dead material in the plant, or plantings with a high dead to live fuel ratio. Many of these species, if existing on the property and adequately maintained (pruning, thinning, irrigation, litter removal, and weeding), may remain as long as the potential for spreading a fire has been reduced or eliminated.

BOTANICAL NAME	**COMMON NAME**
Abies species	Fir Trees
Acacia species	Acacia (trees, shrubs, groundcovers)
*Adenostoma sparsifolium***	Red Shanks
*Adenostoma fasciculatum***	Chamise
Agonis juniperina	Juniper Myrtle
Araucaria species	Monkey Puzzle, Norfolk Island Pine
*Artemesia californica***	California Sagebrush
Bambusa species	Bamboo
Cedrus species	Cedar
Chamaecyparis species	False Cypress
Coprosma pumila	Prostrate Coprosma
Cryptomeria japonica	Japanese Cryptomeria
Cupressocyparis leylandii	Leylandii Cypress
*Cupressus forbesii***	Tecate Cypress
Cupressus glabra	Arizona Cypress
Cupressus sempervirens	Italian Cypress
Dodonea viscosa	Hopseed Bush
*Eriogonum fasciculatum***	Common Buckwheat
Eucalyptus species	Eucalyptus
*Heterotheca grandiflora***	Telegraph Plant
Juniperus species	Junipers
Larix species	Larch
Lonicera japonica	Japanese Honeysuckle
Miscanthus species	Eulalia Grass
*Muehlenbergia species***	Deer Grass
Palmae species	Palms
Picea species	Spruce Trees
*Pickeringia Montana***	Chaparral Pea
Pinus species	Pines
Podocarpus species	Fern Pine
Pseudotsuga menziesii	Douglas Fir
Rosmarinus species	Rosemary
*Salvia mellifera***	Black Sage
Taxodium species	Cypress
Taxus species	Yew
Thuja species	Arborvitae
Tsuga species	Hemlock
*Urtica urens***	Burning Nettle

** San Diego County native species

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