Appendix L3

Fire Fuel Load Modeling Report

FINAL

Fire Fuel Load Modeling Report

Renzulli Estates Project
City of San Diego, California

AUGUST 2024

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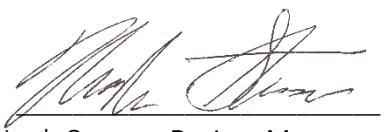

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AM&M	Alternative Materials and Methods
AMSL	Above Mean Sea Level
BMZ	Brush Management Zones
CAL FIRE	California Department of Forestry and Fire Protection
CBC	California Building Code
City	City of San Diego
CFC	California Fire Code
Du/ac.	Dwelling Unit per acre
FRAP	Fire and Resource Assessment Program
HOA	Homeowners Association
ISO	Insurance Services Office
MHPA	Multiple Habitat Preservation Area
MPH	Miles Per Hour
MSCP	Multiple Species Conservation Plan
NDP	Neighborhood Development Permit
NFPA	National Fire Protection Association
Project	The Renzulli Estates Project
RAWS	Remote Automated Weather Station
SCAL	Southern California
SDFRD	San Diego Fire-Rescue Department
SDP	Site Development Permit
USGS	U.S. Geological Survey
VHFHSZ	Very High Fire Hazard Severity Zone
VTM	Vesting Tentative Map

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1 Introduction

In accordance with Section 142.0412 of the San Diego Municipal Code (Brush Management) and Section 104.9 of the 2022 California Fire Code (CFC), we are requesting an alternate method of fire protection for The Renzulli Estates Project (project). The current development proposal consists of the demolition of the existing single-family home and associated structures, vegetation clearing and grading, and the construction of 100 single-family home lots and 12 multi-family affordable income rental units on a 40.56-acre parcel at 11495 Cypress Canyon Road (Assessor's Parcel Number (APN) 319-202-04-00) in northeastern section of the City of San Diego (City), California. More specifically, the project is located just south of Scripps Poway Parkway, north and west of Spring Canyon Road/Pomerado Road, and west of Cypress Canyon Park within Scripps Miramar Ranch Community Planning area of San Diego. Primary access to the project area would be from Cypress Canyon Road. Currently, Cypress Canyon Road is not connected and terminates at the northwest and southeast corners of the site. The proposed project internal roadways would connect these two termini and provide a connection through the site.

Current land uses within and immediately surrounding the study area include existing single-family residential development, Cypress Canyon Park, Spring Canyon Road and other neighborhood streets, sidewalks, traffic (vehicle and pedestrian), and open space associated with the MHPA in the canyons between developed residential areas. The existing residence and associated sheds, storage areas, and dirt roads currently occupy a portion of parcel; much of the parcel remains undeveloped. The undeveloped portion of the site currently includes native, non-native, and wetland vegetation communities. The project is within the City of San Diego's Multiple Species Conservation Plan (MSCP) Subarea Plan (City of San Diego 1997). A portion of the project site, including a portion of the project's development footprint, currently overlays the City's Multiple Habitat Preservation Area (MHPA) intended for biological conservation; however, the project proposes a Boundary Line Adjustment (BLA) that would remove the project footprint area from the MHPA and the project would provide replacement for MHPA area on and off-site. A portion of the site would remain as MHPA with the proposed BLA and would be conserved as native habitat in perpetuity. The project proposes the demolition of the existing residence (and all associated structures) on the parcel and subsequent clearing and grading to create suitable pads for the construction of 100 single-family homes and 12 multi-family affordable units. The project will would also install roads, sidewalks, and landscaping around the structure. The construction will be centered around the exiting residence on the parcel. Pending a boundary line correction and adjustment, the project would not encroach into the MHPA or a 50-foot wetland buffer around wetland habitat to the south of the Project footprint. No permanent development or infrastructure would occur within the MHPA, however, most of the boundary around the project footprint would be considered adjacent to the MHPA, and grading and fill activities would occur within the MHPA in order to construct manufactured slopes that would remain within the MHPA following project completion.

An important component of a fire protection system is the Brush Management Zone (BMZ). BMZs are typically designed to gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones and irrigated zones adjacent to each other on the perimeter of the Wildland Urban Interface (WUI) exposed structures. However, based on site-specific limitation, including the project development adjacency to the MHPA, lot constraints, project boundary limitations, and steep slopes adjacent to and below the residential lots, this project will incorporate one fully irrigated Zone 1 BMZ extending up to 57 feet from the single-family structures and up to 80 feet from the multi-family units. Zone 1 typically extends 35 feet out from the habitable structure towards flammable vegetation, and Zone 2 makes up the remaining 65 feet that extends beyond Zone 1. Specific to the project, Zone 1 would extend between 47.5 feet and 57 feet around the perimeter lots in the southern portion of the project site; 47.5 feet around the perimeter lots in the northern portion of the project site; and between approximately 15 and 80 feet around the perimeter multi-

family units, in the eastern portion of the site. Furthermore, the strip of land between a manufactured slope and the western property boundary of Lot 100 is an HOA maintained open space area. As part of the project, the HOA will grant a Brush Management Zone easement to allow for this area to be maintained as BMZ Zone 2, as this area is not proposed as part of the project's mitigation and therefore, can be incorporated as part of Brush Management Zone 2 requirements; there would be no Zone 2 BMZ proposed throughout the remaining portions of the development, and thus the project proposes a reduced BMZ throughout.

For all single-family lots around the perimeter of the project development area that do not achieve a full 100 feet of onsite Zone 1 BMZ, project specific alternative materials and methods (AM&M) of construction will include the installation of code exceeding dual pane dual tempered windows and an additional layer of 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the open space and naturally vegetated areas, as well as the construction of a six-foot-tall concrete masonry unit (CMU) fire wall near the top of the manufactured slopes to block or deflect all or part of the radiating heat with a vertical, non-combustible surface placed in the line of heat, fumes, flame and embers, thus making narrower fuel modification distances possible. Furthermore, for the perimeter multi-family units that do not achieve a full 100 feet of onsite BMZ, project specific AM&M of construction will include the installation of code exceeding dual pane dual tempered windows and an additional layer of 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the open space and naturally vegetated areas, as well as the construction of a soil nail wall and a 20-foot-plus tall retaining wall that will act as a fire wall. The installation of the code-exceeding dual pane dual tempered windows and extra layer of 5/8-inch Type X fire rated gypsum sheathing on the wildland exposed sides of the structures, along with the construction of a six-foot CMU fire wall will act as an alternative compliance measures to compensate for the reduced brush management areas of the perimeter lots and will be in compliance with The City of San Diego FPB Policy B-18-01 – Mitigation for Reduced Brush Management Zones (Section V.C.1). Based on the results from the Fire Behavior Analysis along with the homes being constructed in accordance with Chapter 7A of the 2022 CBC standards, including the installation of an NFPA 13 (Standard for the Installation of Sprinkler Systems) automatic fire sprinkler system, meeting the requirements for the type of occupancy and will include either 13D or 13R, the proposed AM&M's would provide equivalent protection for the onsite reduced BMZ. Furthermore, several substantial retaining walls will be constructed along portions of the southern, eastern, and western portions of the project site that would further reduce the potential for fire risk to the proposed structures.

This request is based on our assessment of the site, the project development footprint, off-site adjacent fuels, and the area's fire history and weather, as well as our expert experience and knowledge in the region. This Fire Fuel Load Modeling Report (FFLMR) discusses the project site and its fire environment, fire risk assessment, including fire behavior modeling, and based on the results from this study, requests an alternative method from the standard BMZ specifications with regard to the widths of Zone 1 and Zone 2 for specific locations adjacent to the proposed project. The existing conditions around the project area include sensitive habitat and the MHPA to the north, east, south and southwest. A portion of these biologically sensitive areas, along with lot constraints, create a condition where it is not possible to achieve a standard BMZ. As such, the FFLMR provides an alternative approach that provides for a modified Zone 1 within the project's building areas, along with additional AM&M's that are found to provide equivalent protection for the onsite reduced BMZ. Per San Diego Municipal Code, the Fire Chief may modify standard requirements in consideration of the topography, existing and potential fuel load, and other characteristics of the site related to fire protection. As stated in the Municipal Code, (142.0412(i)), an applicant may request approval of alternative compliance for brush management in accordance with Process One if all the following conditions exist:

1. The proposed alternative compliance provides sufficient defensible space between all structures on the premises and contiguous areas of native or naturalized vegetation as demonstrated to the satisfaction of the Fire Chief based on documentation that addresses the topography of the site, existing and potential fuel load, and other characteristics related to fire protection and the context of the proposed development.
2. The alternative measures proposed for the project's BMZ minimizes impacts to undisturbed native or naturalized sensitive habitat vegetation areas, especially within the adjacent MHPA, where possible, while still meeting the purpose and intent of Section 142.0412 to reduce fire hazards around structures and providing a fire break with at least the same functional equivalency.
3. The proposed alternative compliance is not detrimental to the public health, safety, and welfare of persons residing or working in the area.

This report provides project information, a request for modification, and justifications for the modification.

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2 Project Information

The project proposes the construction of 100 single-family home lots and 12 multi-family affordable income rental units, along with public roads, public and private utility improvements, and open space areas within Scripps Miramar Ranch Community Planning area in the City of San Diego, California. The project is located approximately 2.5 miles east of Interstate 15, 0.5 mile south of Scripps Poway Parkway and 0.1 mile north of Spring Canyon Road in the northeast portion of the City of San Diego. The project is located on an approximately 40.56-acre parcel located at 11495 Cypress Canyon Road (APN 319-020-04-00). The parcel is surrounded by existing residential development, small patches of undeveloped open space, and Cypress Canyon Park to the east (see Figure 1, *Project Location Map*). An existing residence and associated sheds, storage areas, and dirt roads currently occupy a portion of parcel; much of the parcel remains undeveloped. The Multi-Habitat Planning Area (MHPA), the "hardline preserve" developed by the City per the MSCP, overlaps with more than 75 percent of the total property parcel and also extends to adjacent lands outside of the parcel boundary. The project site is located within Section 27 of Township 14 South, Range 2 West of the Poway, California U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.

Site Address: Renzulli Estates Project
11495 Cypress Canyon Road
San Diego, California 92131

Contact: **The Green Phair Scripps Partners, LLC.**
Austin Dias
(619) 253-4837

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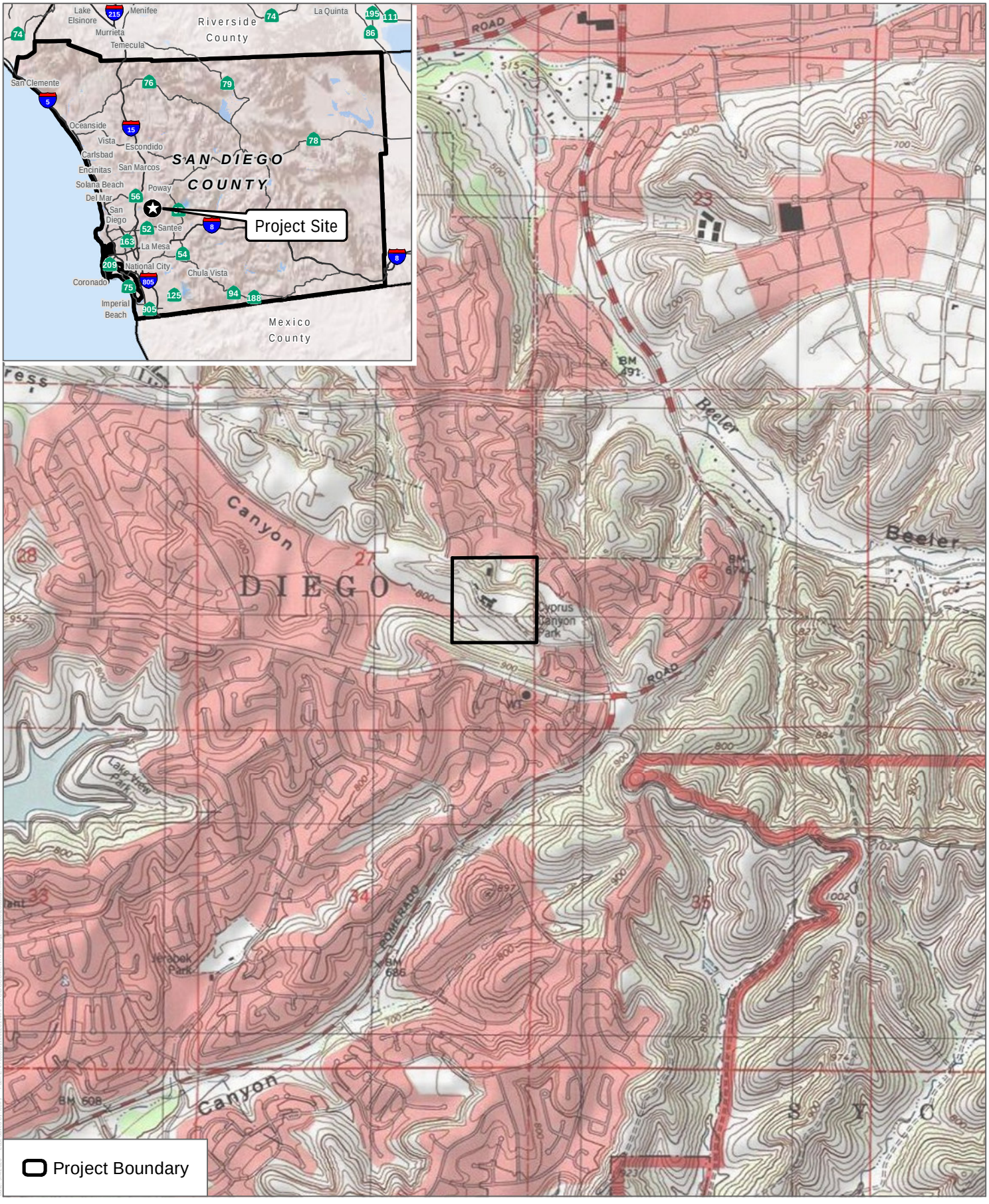

SOURCE: USGS 7.5-Minute Series Poway Quadrangle

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0 285 570 Meters
1:24,000

DUDEK

FIGURE 1

Project Location

Fire Fuel Load Modeling Report for the Renzulli Estates Project

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3 Project Description

The 40.56-acre project construction footprint and study area currently contain an existing single-family residence and several outbuildings. The current project will require a Vesting Tentative Map (VTM), a Site Development Permit (SDP) for environmentally sensitive lands, a Neighborhood Development Permit (NDP) to allow deviations to three (3) development standards for the proposed development proposal that consists of 100 new single-family homes and 12 multi-family units as affordable income rentals, along with public roads, public and private utility improvements, and open space areas (see Figure 2, Project Site Plan Map). All existing buildings onsite will be removed as part of the development proposal. In addition to the VTM, SDP, and NDP, the project will also require a Community Plan Land Use Amendment to change the existing residential designation of 1.1 dwelling units per acre (du/ac.) to 2.8 du/ac. Further, a re-zone is also proposed to change the existing AR-1-1 zone to RX-1-2 (single-family area), RM-2-4 (multi-family area), and OR-1-2 (open space). The project also requires an MSCP boundary correction and adjustment as part of the development proposal. Lastly, the project is located in the very high fire hazard severity zone (VHFHSZ).

The project would include infrastructure improvements on the parcel, including installation of utilities, a private storm drain system, internal sidewalks and roads, and on-site restoration and landscaping. Primary access to the project area will be from Cypress Canyon Road. Currently Cypress Canyon Road is not connected through the site, and ends at the northwest and southeast corners of the site. The proposed project internal roadways would connect these two termini and provide a connection through the site. Site access, including internal roadway widths and connectivity will be constructed to current City of San Diego emergency access road standards that would facilitate emergency vehicle access during project construction and operation. Dead-end internal roadways exceeding 150 feet in length shall be a minimum 26-foot wide, unobstructed road widths and provided with an approved area for turning around emergency apparatus; in this case, interior dead-end roads provide 96-foot diameter fire department turnaround (cul-de-sacs) and will be consistent with Section 503.2.5 and Appendix D of the California Fire Code (CFC). An existing private driveway would serve as primary access during construction. Construction activities will include ground and foundation preparation, framing and assembly of the residential structures, paving of internal roadways and driveway areas, installation of the retention basin and landscaping.

The project site is located within the San Diego Fire-Rescue Department (SDFRD) jurisdictional response area. SDFRD services approximately 343 square miles and a population of approximately 1,419,845 in the City of San Diego (City of San Diego 2022)[1]. SDFRD currently operates 52 Fire Stations with a staff of 949 full-time, uniformed Fire personnel (including Chief Officers). Based on current Fire Station distribution, SDFRD Fire Station 37 is analyzed herein due to the proximity to the project site. Station 37, located at 11640 Spring Canyon Road in San Diego, would provide initial response to the project site and is equipped with one Engine, one Type 3 Brush Engine, and one paramedic unit. Station 37 is approximately 1.3 miles from the most remote portion of the development accessed from the northwestern entrance off Cypress Canyon Road and could respond to an incident within approximately 2 minutes and 50 seconds; and approximately 1.7 miles from the most remote portion of the development accessed from the southeastern entrance off Cypress Canyon Road and could respond to an incident within approximately 3 minutes and 30 seconds. Emergency travel time for first arriving engine from Station 37 to the project site are derived from Google road data while travel times are calculated using Insurance Services Office (ISO) Public Protection Classification Program's Response Time Standard formula (Time=0.65 + 1.7(Distance). The ISO response travel time formula discounts speed for intersections, vehicle deceleration and acceleration, and does

[1] https://www.sandiego.gov/fire/about

not include turnout time. Automatic and/or Mutual Aid agreements with surrounding fire departments are in place and would potentially result in additional resources that are not analyzed in this report. The SDFRD response time policy is that the first-due fire unit should arrive within 7 minutes and 30 seconds of fire dispatch receiving the 9-1-1 call, a total of 90% of the time. As indicated above, the project site location in relation to the existing SDFRD closest station, travel time for the first arriving engine from Station 37 is approximately 3 minutes and 30 seconds to the most remote portion of the project site. Based on these calculations, emergencies within the project can be responded to by SDFRD's first arriving unit (average maximum initial response of no more than 7 minutes and 30 seconds for fire apparatus, a total of 90% of calls) in accordance with the City's standard.

As part of this project, the City of San Diego is a participant in the San Diego Multiple Species Conservation Program (MSCP), a comprehensive, regional long-term habitat conservation program designed to provide permit issuance authority for take of covered species to the local regulatory agencies. The MSCP addresses habitat and species conservation within approximately 900 square miles in the southwestern portion of San Diego County (County of San Diego 1998). It serves as an approved habitat conservation plan pursuant to an approved Natural Communities Conservation Plan in accordance with the state Natural Communities Conservation Planning Act (County of San Diego 1998). The MSCP identifies 85 plants and animals to be "covered" under the plan ("Covered Species"). Within the City of San Diego, the MSCP is implemented through the City of San Diego MSCP Subarea Plan (Subarea Plan) (City of San Diego 1997), which applies within 6,501 acres. Portions of the project are located within or adjacent to Multiple Habitat Preservation Areas (MHPAs) (City of San Diego 1997).

The project study area is located within the northeastern area of the Subarea Plan. The Subarea Plan is characterized by urban land uses with approximately three-quarters either built out or retained as open space/park system. As mentioned previously, the City MHPA is a "hard line" preserve developed by the City in cooperation with the wildlife agencies, property owners, developers, and environmental groups. The MHPA identifies biological core resource areas and corridors targeted for conservation, in which only limited development may occur (City of San Diego 1997). The project's development footprint currently overlays the City's Multiple Habitat Preservation Area (MHPA) but proposes a boundary line correction (BLA) and adjustment that will provide replacement for loss to MHPA area. With the implementation of this BLA, the project development footprint would be removed from the MHPA but areas on and adjacent to the site would remain within the MHPA biological conservation area. As the on-site MHPA is intended to be dedicated in fee to the City for biological conservation in perpetuity, no brush management is proposed within the adjusted MHPA.

SOURCE: SANGIS 2017, Hunsaker and ssociates 2024

DUDEK

0 125 250 Feet

FIGURE 2

Site Plan

Fire Fuel Load Modeling Report for the Renzulli Estates Project

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4 Fire Risk Analysis

4.1 Field Assessment

A field assessment of the project, including on-site and off-site adjacent areas, was conducted by Dudek on August 25, 2020 in order to document existing site conditions and determine potential actions for addressing the protection of proposed project in the City of San Diego. Assessments of the area's topography, natural vegetation and fuel loading, project impact areas, Brush Management Zone areas, assets, fire history, and general susceptibility to wildfire formed the basis of the site risk assessment. Among the field tasks that were completed are:

- Vegetation measurements and mapping refinements
- Fuel load analysis
- Topographic features documentation
- Photograph documentation
- Confirmation/Verification of office-based hazard assumptions.

Site photographs were collected (Appendix A, *Photograph Log*) and the existing vegetation (fuel) communities and their impacts were mapped (Figure 3, *Vegetation Community Map*) using 200-scale aerial images and project vegetation maps. Field observations were utilized to augment existing site data in generating the fire behavior models and formulating the recommendations detailed in this report.

4.2 Fire Environment

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

4.3 Vegetation (Fuels)

Based on species composition and general physiognomy, 14 vegetation communities and land covers exist on site, including six native vegetation communities, six non-native vegetation communities/land cover types, and two wetland communities. The vegetation communities and land covers were mapped according to Holland (1986) and Oberbauer et al. (2008), with a few exceptions. Some vegetation communities were given additional descriptions to identify highly dominant species within the community. These habitats were then cross-walked to their

corresponding community listed in the City's Biology Guidelines (City of San Diego 2018a). These vegetation communities and land cover types are described in detail in the Biological Technical Report (Dudek, October 2023) for the project.

In summary, the vegetation communities and land cover types include Diegan coastal sage scrub (including disturbed), Diegan coastal sage scrub (Baccharis-dominated), coastal sage-chaparral transition, flat-topped buckwheat scrub, southern mixed chaparral (including disturbed), scrub oak chaparral, emergent wetland, natural flood channel, disturbed habitat, eucalyptus woodland, developed land, *Arundo*-dominated disturbed habitat, and herbaceous wetland (refer to Table 1 and Figure 3, Vegetation *Community Map*). The site's vegetation fire risk is primarily determined by project-adjacent vegetation that will be preserved in the open space directly adjacent to the site's brush management zones (BMZs). The growth of vegetation types/fuel models is influenced by aspect (orientation), soil constituents, soil depth, soil moisture, and weather. The vegetation occurring on the slopes adjacent the site represents the site's fuel load, an important component of the site's wildfire risk assessment. The photographs in Appendix A display the fuels on and adjacent the property.

The vegetation communities and land cover types recorded in the study area are described in detail as follows, their acreages are presented in Table 1, encompassing 40.56 acres.

Table 1. Vegetation Communities and Land Cover Types in Project Area

Vegetation Community/ Land Cover Type	City of San Diego Biology Guidelines Vegetation Community	Acreage*
Native Vegetation Communities		
Diegan Coastal Sage Scrub (including disturbed)	Coastal Sage Scrub	4.60
Diegan Coastal Sage Scrub (Baccharis-dominated)	Coastal Sage Scrub	0.11
Coastal Sage-Chaparral Transition	Coastal Sage Scrub/Chaparral	4.08
Flat-topped Buckwheat Scrub	Coastal Sage Scrub	2.41
Southern Mixed Chaparral (including disturbed)	Mixed Chaparral	12.25
Scrub Oak Chaparral	Scrub Oak Chaparral	2.46
Non-Native Vegetation Communities and Land Covers		
Disturbed Habitat	Disturbed Land	6.96
Eucalyptus Woodland	Eucalyptus Woodland	3.58
Urban/Developed Land	Disturbed Land	2.34
Arundo-dominated disturbed habitat	Disturbed Land	0.74
Wetlands, including Non-Wetland Waters of the U.S. and State		
Emergent Wetland (artificial)	Freshwater Marsh	0.41
Herbaceous Wetland (artificial)	Disturbed Land	0.42
Natural Flood Channel	Disturbed Land	0.20
	Total	**40.56**

4.3.1 Diegan Coastal Sage Scrub (including disturbed)

Diegan coastal sage scrub is a native vegetation community that, according to Oberbauer et al. (2008), is composed of a variety of soft, low, aromatic shrubs, characteristically dominated by drought-deciduous species—such as coastal sagebrush (*Artemisia californica*), California buckwheat, and sages (*Salvia* spp.)—with scattered evergreen shrubs, including lemonadeberry (*Rhus integrifolia*) and laurel sumac (*Malosma laurina*).

Coastal sage scrub in the study area consists of coastal sagebrush, black sage (*Salvia mellifera*), and Nuttall's scrub oak (*Quercus dumosa*). Coastal sage scrub is present in moderately sized patches in the north and northwest section of the project parcel and in two small patches in the southern area. Some of the patches in the northern area of the project parcel, north of the existing residence, are considered disturbed due to a relatively high cover of non-native species (specifically giant reed [*Arundo donax*]) and evidence of human alteration. This vegetation community is considered a Tier II habitat by the City's Biology Guidelines (City of San Diego 2018a).

4.3.2 Diegan Coastal Sage Scrub (Baccharis-dominated)

Diegan coastal sage scrub (*Baccharis*-dominated) is similar to Diegan coastal sage scrub, but dominated by *Baccharis* species (broom baccharis [*Baccharis sarothroides*] and/or coyote brush [*Baccharis pilularis*]) (Oberbauer et al. 2008). This community typically occurs on disturbed sites or those with nutrient-poor soils and is often found within other forms of Diegan coastal sage scrub and on upper terraces of river valleys.

Diegan coastal sage scrub (*Baccharis*-dominated) in the study area is dominated by coyote brush, with chamise (*Adenostoma fasciculatum*), black sage, and mission manzanita (*Xylococcus bicolor*). It occurs in one small patch in the central northern section of the project parcel just west of the artificial herbaceous wetland, in an area likely disturbed by previous grading associated with the adjacent development to the north. This vegetation community is considered a Tier II habitat by the City's Biology Guidelines (City of San Diego 2018a).

4.3.3 Coastal Sage-Chaparral Transition

Coastal sage–chaparral transition is a habitat type composed of a mixture of coastal sage scrub and chaparral species occurring in the transition zone between coastal sage scrub and chaparral. Oberbauer et al. (2008) does not formally recognize this as a vegetation community, but the City acknowledges this vegetation community as coastal sage scrub/chaparral.

Coastal sage–chaparral transition in the study area consists of chamise, laurel sumac, and Nuttall's scrub oak. Coastal sage–chaparral transition is present in relatively large patches just southwest of the existing residence in the central area of the project parcel. This vegetation community is considered a Tier II habitat by the City's Biology Guidelines (City of San Diego 2018a).

4.3.4 Flat-topped Buckwheat Scrub

Flat-topped buckwheat scrub is a native vegetation community that, according to Oberbauer et al. (2008), is a nearly monoculture community of California buckwheat, usually resulting from disturbance and transitioning to coastal sage scrub or chaparral. It is often found in disturbed areas in coastal and foothills areas of San Diego County and intergrades frequently with Diegan coastal sage scrub.

Flat-topped buckwheat scrub in the study area is dominated by California buckwheat with felt-leaf yerba santa (*Eriodictyon crassifolium*) and coastal goldenbush (*Isocoma menziesii*). Buckwheat scrub is present in the south and southeast portion of the project parcel, southeast of the existing residence. This vegetation community most closely matches coastal sage scrub in the City's Biology Guidelines (City of San Diego 2018a). Therefore, it is considered a Tier II habitat.

4.3.5 Southern Mixed Chaparral (including disturbed)

Southern mixed chaparral is a drought- and fire-adapted community of woody shrubs that is 1.5 to 3 meters (5 to 10 feet) tall, frequently forming dense, impenetrable stands. It develops primarily on mesic, north-facing slopes and in canyons and is characterized by crown- or stump-sprouting species that regenerate following burns or other ecological catastrophes. This vegetation community is typically a mixture of chamise, bush-rue (*Cneoridium dumosum*), ceanothus (*Ceanothus* spp.), manzanita species (Eastwood's manzanita [*Arctostaphylos glandulosa*] and mission manzanita), Nuttall's scrub oak, laurel sumac, and black sage.

Southern mixed chaparral in the study area is dominated by chamise with coyote brush, black sage, Nuttall's scrub oak, laurel sumac, and Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*). Southern mixed chaparral is present in several relatively large patches in the northeast, east, southeast, and western portions of the project parcel. Two smaller patches of southern mixed chaparral exist in the northern area of the project parcel near an existing shed structure. One of these patches, west of this structure, is considered disturbed due to low vegetation cover and evidence of ground disturbance. This vegetation community is considered a Tier IIIA habitat by the City's Biology Guidelines (City of San Diego 2018a).

The southern mixed chaparral in the study area does not conform with southern maritime chaparral vegetation descriptions (Oberbauer et al. 2008). The two indicators of southern maritime chaparral on the project site are Del Mar manzanita and Nuttall's scrub oak, both of which occur in both coastal and relatively inland settings such as the eastern portions of Miramar Marine Corps Air Station. Other indicators of southern maritime chaparral are absent from the site, including wart-stem lilac (*Ceanothus verrucosus*), weathered sandstone soils, and low-growing, open vegetation cover. The chaparral on site, by contrast, has a tall, dense, closed canopy with a predominance of chamise. The project site is located approximately 11 miles from the coast, and topographic barriers exist such that the coastal influence required to establish the southern maritime chaparral vegetation community variety is also absent from this site.

4.3.6 Scrub Oak Chaparral

Scrub oak chaparral contains a dense, evergreen chaparral up to 20 feet tall, often dominated by Nuttall's scrub oak with considerable mountain-mahogany (*Cercocarpus* spp.). In San Diego County, scrub oak (*Quercus berberidifolia*) is often the dominant species (over 50% cover) and usually occurs in small patches within a variety of other vegetation communities (Oberbauer et al. 2008). Scrub oak chaparral is somewhat more mesic than many chaparrals, and often occurs at slightly higher elevations (to ~5,000 feet amsl). These more favorable sites recover from fire more quickly than other chaparrals. Substantial leaf litter accumulates. In San Diego County, this is usually found on north-facing or otherwise mesic slopes and can occur at various elevations (Oberbauer et al. 2008).

Scrub oak chaparral in the study area consists of Nuttall's scrub oak, toyon (*Heteromeles arbutifolia*), and mission manzanita. Scrub oak chaparral is present in a small patch on the central eastern section of the project parcel. This vegetation community is considered a Tier I habitat by the City's Biology Guidelines (City of San Diego 2018a). The

description in Section 3.2.1.5 detailing why the chaparral on site does not conform with southern maritime chaparral vegetation descriptions also applies to this community.

4.3.7 Eucalyptus Woodland

Eucalyptus woodland, according to Oberbauer et al. (2008), includes eucalyptus species (blue gum [*Eucalyptus globulus*], river red gum [*E. camaldulensis*], or other *Eucalyptus* species) planted as trees, groves, and windbreaks that form thickets with minimal shrubby understory and scattered trees with a well-developed understory. In most cases, however, eucalyptus trees form dense stands with closed canopies where the understory is either depauperate or absent owing to shade and the possible allelopathic (toxic) properties of the eucalyptus leaf litter. Although eucalyptus woodlands are of limited value to most native plants and animals, they frequently provide nesting and perching sites for several raptor species.

Eucalyptus woodland occurs mainly in the southwest portion of the project parcel, south of the wetlands in that area. Smaller patches of eucalyptus woodland occur northwest of the existing residence and in the southeast corner of the project parcel. Eucalyptus woodland is classified as a Tier IV vegetation community under the City's Biology Guidelines (City of San Diego 2018a).

4.3.8 Disturbed Habitat/Land

Disturbed lands are areas which have been subject to extensive physical anthropogenic disturbance and as a result cannot be identified as a native or naturalized vegetation association. However, these areas typically still have a recognizable soil substrate. The existing vegetation is typically composed of non-native ornamental or exotic species (Oberbauer et al. 2008).

Disturbed land comprises the gravel storage areas northeast of the residence, dirt roads and ornamental vegetation in the central section of the project parcel, and strips of land in the southern study area north of the wetlands that show evidence of grading and vegetation removal/clearing. This land cover is ranked as Tier IV and is not considered sensitive under the City's Biology Guidelines (City of San Diego 2018a).

4.3.9 Urban/Developed Land

According to Oberbauer et al. 2008, urban/developed land represents areas that have been constructed upon or otherwise physically altered to an extent that native vegetation communities are not supported. This land cover type generally consists of semi-permanent structures, homes, parking lots, pavement or hardscape, and landscaped areas that require maintenance and irrigation (e.g., ornamental greenbelts). Typically, this land cover type is unvegetated or supports a variety of ornamental plants and landscaping.

Within the study area, urban/developed land includes the existing residence, the associated paved driveway, and other human-made structures on the project parcel and the adjacent residential development areas. This land cover is synonymous with disturbed land and is considered a Tier IV vegetation community (City of San Diego 2018a).

4.3.10 Emergent Wetland (Artificial)

According to Oberbauer et al. (2008), emergent wetland is a generally persistent wetland type dominated by low-growing, perennial wetland species. These can be found in channels, seeps and springs, floodplains, margins of

lakes and rivers, and various basins such as pools and ponds, palustrine lakes, montane meadows, and dune swales. These may be freshwater or alkali wetlands. In San Diego County, these are often in previously disturbed areas where wetlands are emerging, but have not yet established a full suite of species; however, disturbance is not a necessary element of this vegetation community.

The area mapped as emergent wetland in the study area is dominated by mariposa rush (*Juncus dubius*), with annual beard grass (*Polypogon monspeliensis*), toad rush (*Juncus bufonius*), grass poly (*Lythrum hyssopifolia*), curly dock (*Rumex crispus*), Boccone's sand-spurrey (*Spergularia bocconi*), and other non-native herbaceous species. It occurs in two patches of lowlands adjacent to a well-defined drainage in the southern portion of the study area. These two patches correspond with areas of historic disturbance (see Appendix M); the upstream area being the location of a former artificial impoundment (i.e., stock pond) and the downstream area being the location where adjacent development created an artificial impoundment. Further, City records contain evidence that artificial surface runoff was discharged into this drainage from the adjacent Spring Canyon Reservoir (i.e., water tank) (City of San Diego 2013). Based on these factors, emergent wetland onsite is considered an artificial feature that does not meet the City's wetland definition and is considered a Tier IV upland.

4.3.11 Herbaceous Wetland (Artificial)

According to Oberbauer et al. (2008), herbaceous wetland is a seasonal wetland habitat that supports a variety of herbaceous annual species like annual beard grass. In San Diego County, these wetlands may only occur during wetter-than-average years and are usually found in swale areas or adjacent to drainages.

Herbaceous wetland (artificial) is present within the northern portion of the study area and is dominated by annual beard grass. Other species present include western ragweed (*Ambrosia psilostachya*), curly dock, mule-fat (*Baccharis salicifolia*), hottentot-fig (*Carpobrotus edulis*), saltcedar (*Tamarix ramosissima*), and jointed charlock (*Raphanus raphanistrum*). During the jurisdictional delineation in April 2020, Dudek biologists noted a large population of Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*) in this area.

However, this area is not considered a City wetland per the City's Biology Guidelines (City of San Diego 2018a) because, based on review of historical aerials and topography, the wetland established as a result of the construction of the residential development to the north, which directed runoff to this area and created conditions suitable for development of the wetland. Prior to the adjacent development, the area supported an upland hillslope, consistent with adjacent areas. As stated in the City's Biology Guidelines, "except for areas created for the purposes of wetland habitat or resulting from human actions to create open waters or from the alteration of natural stream courses, it is not the intent of the City to regulate artificially created wetlands in historically non-wetland areas unless they have been delineated as wetlands by the Army Corps of Engineers, and/or the California Department of Fish and Wildlife." As a result, the herbaceous wetland (artificial) in this location would be considered Tier IV (City of San Diego 2018a).

4.3.12 Natural Flood Channel

Natural flood channel, also described as non-vegetated channel or floodway (Oberbauer et al. 2008), is the sandy, gravelly, or rocky fringe of waterways or flood channels that are earthen-bottom, and unvegetated on a relatively permanent basis. Vegetation may be present but is usually less than 10% total cover and grows on the outer edge of the channel.

Natural flood channel is mapped within small ephemeral drainage features on the project site. Although unvegetated, natural flood channel can be considered a wetlands community according to the City's Biology Guidelines when the overall drainage is substantial enough to support "wetland dependent vegetation" (City of San Diego 2018a). The natural flood channel present in the southern section of the project parcel where it is connected to emergent wetland habitat upstream and downstream of these unvegetated channel sections. However, the emergent wetland is artificial (as described above). Therefore, both the natural flood channel extents that are located on the upland hillsides on the project parcel and in the southern section of the project parcel were determined to consist of seasonal drainage patterns that do not support wetland dependent vegetation and are not be considered City wetlands, according to the City's Biology Guidelines (City of San Diego 2018a).

4.3.13 Arundo-Dominated Disturbed Habitat

Arundo-dominated disturbed habitat is composed of monotypic or nearly monotypic stands of giant reed and is fairly widespread in Southern California. Typically, this habitat occurs on moist soils and/or in streambeds and may be related directly to soil disturbance or the introduction of propagules by grading or flooding.

Arundo-dominated disturbed habitat comprises one dense stand of giant reed within the study area just northeast of the existing residence in the central study area. It is positioned on a steep north-facing slope and did not show signs that it was associated with any wetland or riparian features. This land cover is synonymous with disturbed land and is considered a Tier IV vegetation community (City of San Diego 2018a).

Note: Each vegetation community corresponds to a designated fuel model (pre-determined vegetation type, densities, and structural characteristics) for fire behavior modeling purposes. Dudek has classified each of the cover types that will remain off-site and/or adjacent to the building footprints into fuel models, as discussed further below. Site-adjacent vegetation is important relative to wildfire as some vegetation, such as brush and grassland habitats are highly flammable while other vegetation, such as wetland communities or forest understory, are less flammable due to their higher plant moisture content, compact structure, and available shading from overstory tree canopies. The off-site, adjacent areas that will not be converted will represent the fire threat and were modeled (see section 4.7: Fire Behavior Modeling) to aid fire protection planning for this site.

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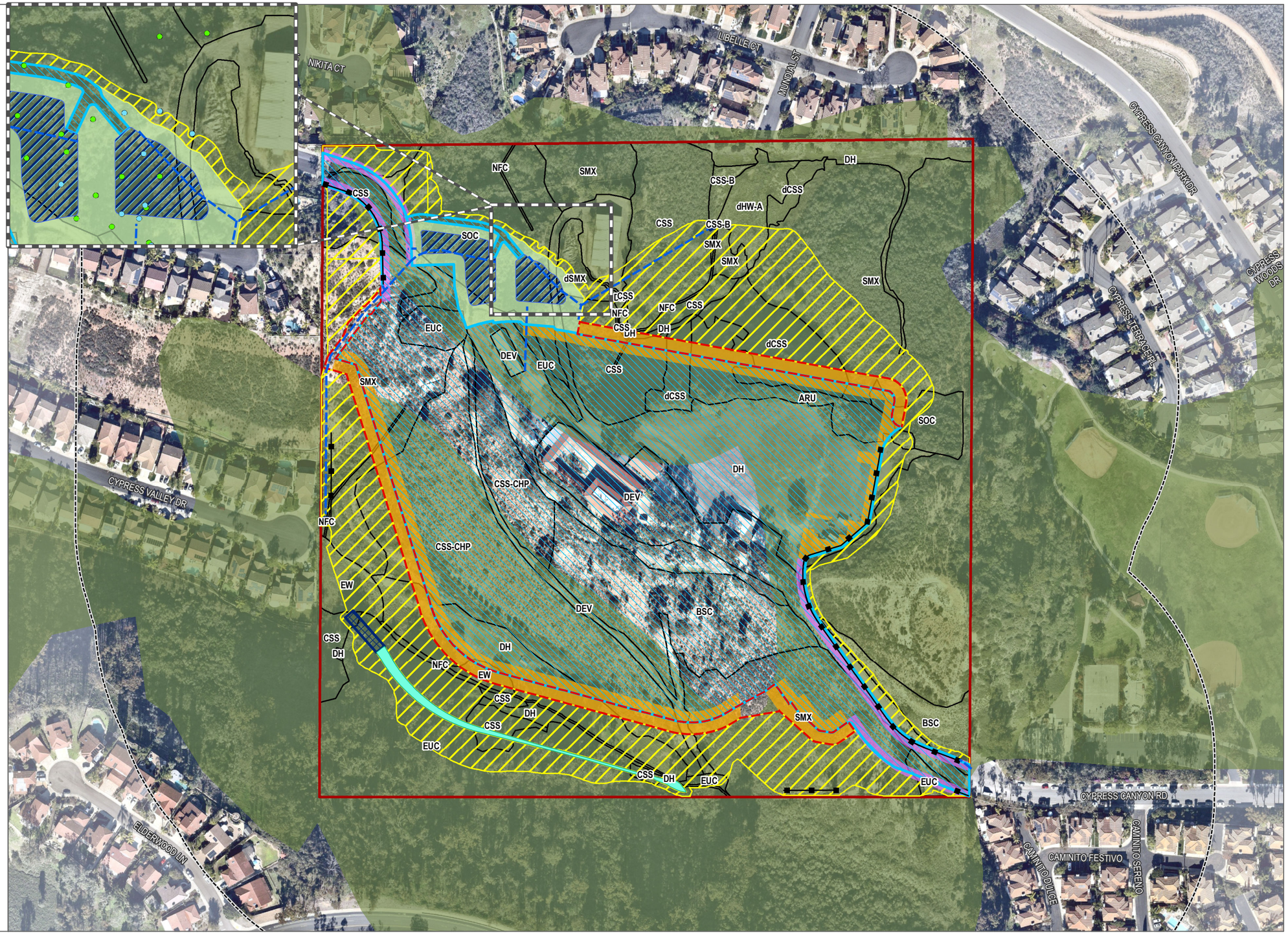
- Parcel Boundary
- MHPA Boundary
- 500-foot Project Impact Footprint Buffer
- Project Construction Footprint
- Rip Rap Dissipation Area
- Re-Established Natural Flood Channel
- Vegetated Stormwater Basin
- Manufactured Slopes
- Zone 1 Extension
- Infrastructure Pipelines
- Retaining Wall

Brush Management

- Zone 1
- Roadside Zone
- Vegetated Stormwater Basin Management Area (Vegetation Thinning Only)

Vegetation Communities and Land Covers

- ARU : Arundo-Dominated Disturbed Habitat (Tier IV)
- BSC : Flat-topped Buckwheat (Tier II)
- CSS : Diegan Coastal Sage Scrub (Tier II)
- CSS-B : Diegan Coastal Sage Scrub (Baccharis-dominated) (Tier II)
- CSS-CHP : Coastal Sage-Chaparral Transition (Tier II)
- DEV : Developed (Tier IV)
- DH : Disturbed Habitat (Tier IV)
- EUC : Eucalyptus Woodland (Tier IV)
- EW : Emergent Wetland (Tier IV)
- NFC : Natural Flood Channel (Tier IV)
- SMX : Southern Mixed Chaparral (Tier IIIA)
- SOC : Scrub Oak Chaparral (Tier I)
- dCSS : Diegan Coastal Sage Scrub (Tier II)
- dHW-A : Herbaceous Wetland (Artificial) (Tier IV)
- dSMX : Southern Mixed Chaparral (Tier IIIA)



SOURCE: SANGIS 2020

0 100 200 Feet

FIGURE 3

Vegetation Communities and Rare Plants

Fire Fuel Load Modeling Report for the Renzulli Estates Project

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4.4 Climate

San Diego 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 San Diego area is approximately 72°F, with average highs in the summer and early fall months (July–October) reaching 82°F. The average precipitation for the area is approximately 12.5 inches per year, with the majority of rainfall concentrated in the months of November to April, while smaller amounts of rain are experienced during the other months of the year (World Weather Online, 2020).

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 5 miles per hour (mph). During the summer season, the diurnal winds may average slightly higher (approximately 19 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 or mesas. Santa Ana winds generally coincide with the regional drought period and the period of highest fire danger. The project site is affected by Santa Ana winds. Winds funneled through mountains and onto the flat mesas dissipate and produce lower average wind conditions. The wind information used for fire behavior modeling for this site includes actual data from a Remote Automated Weather Station (RAWS) located in a similar inland location (latitude: 32.786907, longitude: -117.135065, elevation: 291 ft.) in San Diego County (Mission Valley RAWS Station).

4.5 Topography

Topography varies greatly throughout the study area but is generally steep and hilly with lowland canyon bottoms in the southern and northern portion of the parcel; these areas receive much of the runoff from the surrounding hills and support wetland vegetation or drainages. A generally flat mesa exists in the center of the parcel where the existing main residence is located. The elevation in the study area ranges from approximately 760 feet to 980 feet above mean sea level (AMSL). The project site is located within and adjacent to the MHPA. The project is not within the City Coastal Zone (City of San Diego 2008).

Topography affects wildfire movement and spread. Steep terrain typically results in faster fire spread due to pre-heating (and drying) of uphill vegetation. Flat areas typically result in slower fire spread, absent of windy conditions. Topography may form unique conditions which result in concentrated winds or localized fire funneling, such as saddles, canyons, and chimneys (land formations that collect and funnel heated air upward along a slope). Similarly,

terrain may slow the spread of fire. For example, fire generally moves slower downslope than upslope. Terrain may buffer or redirect winds away from some areas based on canyons or formations on the landscape. The occurrences of terrain features that may affect fire behavior on the project site were analyzed and incorporated into the risk assessment and in development of fire protection features.

4.6 Fire History

Fire history data provides valuable information regarding fire spread, fire frequency, ignition sources, and vegetation/fuel mosaics across a given landscape. 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, or, what type of fire burned on the site, and how a fire may spread. According to available data from the California Department of Forestry and Fire Protection's (CAL FIRE) Fire and Resource Assessment Program (FRAP 2019), approximately 49 fires have burned within 5 miles of the project area since the beginning of the historical fire data record (Refer to Appendix B, *Fire History Map*). These fires occurred between 1910 and 2007. There has been one fire in the historical record that burned onto the project site, which occurred in 1943. The San Diego Fire and Rescue Department (SDFRD) may have data regarding additional smaller fires (less than 10 acres) that have occurred near or on the site that are not included in CAL FIRE's dataset.

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 approximately 2 years with intervals ranging between 0 and 25 years. Based on this analysis, along with changes in the watershed over the last few decades that resulted in conversion of fuels to lower flammability urbanization, the project area is expected to be subject to wildfire that may include smaller fires during typical weather conditions and has the potential for larger wildfires during extreme weather conditions, but lacks consistent fuel beds to result in a large flaming front on the project site.

4.7 Fire Behavior Modeling

4.7.1 Fire Behavior Modeling Background

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

during the wildfire, can then be compared to the prediction results of Behave and refinements to the fuel models incorporated, retested, and so on.

Fire behavior modeling conducted on this site includes a relatively high-level of detail and analysis which results in reasonably accurate representations of how wildfire may move through available fuels on and adjacent the property. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, and fireline intensities, this analysis incorporated predominant fuel characteristics, slope percentages, and representative fuel models observed on site. The BehavePlus fire behavior fuel modeling system was used to analyze anticipated fire behavior within and adjacent to key areas just outside of the proposed BMZs.

As Rothermel summarized, 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 fire prevention and protection planning information. To be used effectively, the basic assumptions and limitations of BehavePlus must be understood.

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

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

The seven fuel characteristics help define the 13 standard fire behavior fuel models[2] and the five more recent custom fuel models developed for Southern California[3]. 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 modeling efforts. 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 (SCAL):

- 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 development of 40 new fire behavior fuel models[4] 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:

- 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 software was used in the development of this FFLMR in order to evaluate potential fire behavior for the project site. Existing site conditions were evaluated, and local weather data was incorporated into the BehavePlus modeling runs.

4.7.2 Fire Behavior Modeling Approach

Dudek utilized the BehavePlus software package to analyze fire behavior potential for the project site. Refer to Figure 4, *Fire Behavior Modeling Map* for fire modeling scenario locations and Appendices D and E for pre and post BMZ modeling results. As is customary for this type of analysis, four fire scenarios were evaluated, including two summer, onshore weather condition (northwest and southwest of project site) and two extreme fall, offshore weather condition (northeast and southeast of the project site). Fuels and terrain beyond that distance can produce flying embers that may affect the project, but the proposed single- and -multi-family structures and surrounding landscape will be built to extreme ignition and ember resistant standards pursuant to the proposed alternative

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

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

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

compliance which will minimize the possibility of ignition. It is the fuels next to the BMZs and within the BMZs that would have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement but based on the site's terrain and the planned retaining and fire walls, the vertical separation between vegetative fuels, and the project site's residential structures, is significant.

BehavePlus software requires site-specific variables for surface fire spread analysis, including fuel type, fuel moisture, wind speed, and slope data. The output variables used in this analysis include flame length (feet), rate of spread (feet/minute), fireline intensity (BTU/feet/second), and spotting distance (miles). The following provides a description of the input variables used in processing the BehavePlus models for the project site. In addition, data sources are cited, and any assumptions made during the modeling process are described.

4.7.2.1 Vegetation (Fuels)

To support the fire behavior modeling efforts conducted for this Fire Fuel Load Modeling Report, the different vegetation types observed adjacent to the site were classified into the aforementioned numeric fuel models. As is customary for this type of analysis, the terrain and fuels directly adjacent to the property are used for determining flame lengths and fire spread. It is these fuels that would have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement.

Vegetation types were derived from The Biological Technical Report (Dudek, 2023) and a site visit that was conducted on August 25, 2020 by a Dudek Fire Protection Planner. Based on the site visit, six different fuel models were used in the fire behavior modeling effort to model pre- and-post BMZ fuels presented herein. Fuel model attributes are summarized in Table 2. Modeled areas include eucalyptus woodlands with chaparral and shrub understory (Fuel Model 9 and SH4 = Eucalyptus Forest Habitat (Timber-Shrub)) occur south and below the proposed project development. Mature tree canopies for of the eucalyptus trees are assumed to have a canopy base height of approximately 30 feet off the ground. Canopy bulk density, the weight of canopy fuels per cubic foot of volume, is assumed to be the maximum allowable value in BehavePlus to represent broadleaf trees which, given canopy density and leaf size, have more weight per area than conifer trees (the standard for this value input in BehavePlus (Heinsch and Andrews 2010)). Foliar moisture, the moisture content of canopy foliage, is assumed to be 100%, a reasonable estimate in lieu of site-specific data (Scott and Reinhardt 2001).

Table 2. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
Sh1	Low Load, Dry Climate Shrub	Fuel type that will occur post development within Zone 1 BMZ thinning zone	<2.0 ft.
SH2	Moderate Load, Dry Climate Shrub	Vegetation communities located throughout the adjacent open space without maintenance.	<2.0 ft.
SH4	Eucalyptus Woodland Forest Habitat	Eucalyptus forest that exists south and below the project area.	>8.0 ft.
SH5	High Load Dry Climate Shrub	Vegetation communities located throughout the adjacent open space without maintenance	>4.0 ft.
4	Chaparral	Vegetation communities located throughout the adjacent open space without maintenance	>6.0 ft.

Table 2. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
8	Irrigated Landscape	Fuel type that will occur post development within Zone 1 BMZ.	<1.0 ft.

The results of this analysis were utilized in generating the Brush Management Zone map presented in Appendices C and D. This analysis models fire behavior outside of proposed BMZs (off-site) as these areas would be the influencing wildfire areas post-development of the site. The following section presents the fire weather and fuel moisture inputs utilized for the fire behavior modeling conducted for the project.

4.7.2.2 Topography

Slope is a measure of angle in degrees from horizontal and can be presented in units of degrees or percent. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fire burning uphill spreads faster than those burning on flat terrain or downhill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Slope values ranging from 16 to 26% were measured around the perimeter of the proposed project area from U.S. Geological Survey (USGS) topographic maps. The slopes surrounding the perimeter of the project site would influence fire behavior but would not be considered the primary wildfire factor due to the project being surrounded by existing residential communities in all directions; the fuels adjacent to the existing residential communities along with the current weather conditions would have a bigger influence on fire spread and flame lengths.

4.7.2.3 Weather Analysis

Historical weather data for the San Diego area, as described above, was utilized in determining appropriate fire behavior modeling inputs for the proposed project area fire behavior evaluations. To evaluate different scenarios, data from both the 50th and 97th percentile moisture values were derived from a nearby Remote Automated weather Station (RAWS) and utilized in the fire behavior modeling efforts conducted in support of this report. Weather data sets from the Mission Valley RAWS[5] Station were utilized in the fire modeling runs.

RAWS fuel moisture and wind speed data were processed utilizing the Fire Family Plus software package to determine atypical (97th percentile) and typical (50th percentile) weather conditions. Data from the RAWS was evaluated from August 1 through November 30 for each year between 2016 and 2019 (extent of available data record) for 97th percentile weather conditions and from June 1 through September 30 for each year between 2016 and 2019 for 50th percentile weather conditions.

Following analysis in Fire Family Plus, fuel moisture information was incorporated into the Initial Fuel Moisture file used as an input in BehavePlus. Wind speed data resulting from the Fire Family Plus analysis was also determined. Initial wind direction and wind speed values for the three BehavePlus runs were manually entered during the data input phase. The input wind speed and direction is roughly an average surface wind at 20 feet

5 https://wrcc.dri.edu/cgi-bin/rawMAIN.pl?caCMVA

above the vegetation over the analysis area. Table 3 summarizes the wind and weather input variables used in the Fire BehavePlus modeling efforts.

Table 3. BehavePlus Fire Behavior Inputs

Input Name	50th Percentile	97th Percentile
1 h fuel moisture	8%	2%
10 h fuel moisture	9%	4%
100 h fuel moisture	15%	8%
Live herbaceous moisture	58%	30%
Live woody moisture	116%	60%
20 ft. wind speed (mph)	18 mph	19 mph sustained wind speed; 50 mph (expected gust speed)
Wind adjustment factor	0.4	0.4
Slope steepness	16% to 22%	21% to 26%

4.7.2.4 BehavePlus Fire Behavior Modeling Effort

As mentioned, the BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the project site. Four focused analyses were completed, each assuming worst-case fire weather conditions for a fire approaching the project site from the north/northeast, south/southeast, northwest, and southwest. The results of the modeling effort included anticipated values for surface fires (flame length (feet), rate of spread (mph), and fireline intensity (Btu/ft/s), as well as crown fires (critical surface intensity (Btu/ft/s), critical surface flame length (feet), transition ratio (ratio: surface fireline intensity divided by critical surface intensity), transition to crown fire (yes or no), crown fire rate of spread (mph), critical crown rate of spread (mph), active ratio (ratio: crown fire rate of spread divided by critical crown fire rate of spread), active crown fire (yes or no), and fire type (surface, torching, conditional crown, or crowning)) for a fire going through the Eucalyptus forest area. The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2008). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds.

4.7.2.5 BehavePlus Fire Behavior Modeling Results

The results presented in Tables 4 and 5 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

Based on the BehavePlus analysis, worst-case fire behavior is expected in untreated, Diegan coastal sage scrub and southern mixed chaparral fuels northwest, northeast and southeast the project area under Peak weather conditions (represented by Fall Weather, Scenario 2). The fire is anticipated to be a wind-driven fire from the south/southeast during the fall. Under such conditions, expected surface flame lengths reach 41 feet with wind speeds of 50+ mph. Under this scenario, fireline intensities reach 17,932 BTU/feet/second with fast spread rates of 6.1 mph and could have a spotting distance up to 2.3 miles away.

Based on the BehavePlus analysis, post development fire behavior expected in the irrigated and replanted with plants that are acceptable with the San Diego Fire and Rescue Department (SDFRD) (BMZ Zone 1 – FM8) under peak weather conditions (represented by Fall Weather, Scenario 2), as well as in an area with thinning of the existing shrubs and chaparral within the Stormwater Basin areas (BMZ Zone 2 – Sh2) (represented by Summer Weather, Scenario 4) is presented in Table 5. Under such conditions, expected surface flame length is expected to be significantly lower, with flames lengths reaching approximately 10 feet with wind speeds of 50+ mph. Under this scenario, fireline intensities reach 743 BTU/feet/second with relatively slow spread rates of 1.2 mph and could have a spotting distance up to 0.8 miles away. Therefore, the modified BMZ proposed for the project are approximately 2.5-times the flame length of the worst-case fire scenario under peak weather conditions and would provide adequate defensible space to augment a wildfire approaching the perimeter of the project site. Further, the proposed six-foot fire walls installed near the top of the manufactured slope adjacent to the rear lot boundary for lots unable to achieve a full 100 feet of brush management, in addition to the proposed retaining walls along portions of the northern, southern, western, and eastern edges of the project developments, will provide flat, vertical non-combustible surfaces that separate the natural existing vegetation and thinning areas from the developed areas. This condition is a direct benefit to fire protection and is a commonly used approach within the shelter in place community of Cielo, Rancho Santa Fe, for example.

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

Fire Scenario	Flame Length[1] (Feet)	Spread Rate[1] (MPH[4])	Fireline Intensity[1] (Btu/ft/s)	Spot Fire[5] (Miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (MPH)	Crown Fire Flame Length (Feet)
Scenario 1: 26% slope; Fall Off-shore Extreme Wind (97th percentile) – (Northeast of Project site)							
High Load, Dry Climate Shrub (Sh5)	24.8 (41.2)[6]	2.1 (6.2)	6,119 (18,387)	0.8 (2.3)	N/A	N/A	N/A
Mixed Chaparral (FM4)	38.1 (69.6)	3.1 (11.7)	15,496 (57,427)	1.1 (3.3)	N/A	N/A	N/A
Scenario 2: 21% slope; Fall Off-shore Extreme Wind (97th percentile) – (Southeast of Project site)							
High Load, Dry Climate Shrub (Sh5)	24.0 (40.7)	1.9 (6.1)	5,665 (17,932)	0.8 (2.3)	N/A	N/A	N/A
Mixed Chaparral (FM4)	36.6 (68.9)	2.9 (11.4)	14,243 (56,172)	1.1 (3.3)	N/A	N/A	N/A
Scenario 3: 22% slope; Summer On-shore, Summer Winds (50th percentile) – (Southwest of Project site)							
Moderate Load, Dry Climate Shrub (Sh2)	1.7	0.0	18	0.1	Crowning [3]	0.49	89.0

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

Fire Scenario	Flame Length[1] (Feet)	Spread Rate[1] (MPH[4])	Fireline Intensity[1] (Btu/ft/s)	Spot Fire[5] (Miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (MPH)	Crown Fire Flame Length (Feet)
Riparian Habitat - Timber Shrub (Sh4)2	2.6	0.1	46	0.2	Crowning [3]	0.49	87.9
High Load, Dry Climate Shrub (Sh5)	14.1	0.8	1,797	0.5	Crowning [3]	0.49	93.5
Scenario 4: 16% slope; Summer, On-shore Winds (50th percentile) – (Northwest of Project site)							
Mixed Chaparral (FM4)	22.4	1.3	4,888	0.8	N/A	N/A	N/A
High Load, Dry Climate Shrub (Sh5)	14.5	0.9	1,899	0.6	N/A	N/A	N/A

Note:
1 Wind-driven surface fire.
2 Riparian overstory torching increases fire intensity. Modeling included canopy fuel over Sh4, which represents surface fuels beneath the tree canopies.
3 Crowning= fire is spreading through the overstory crowns.
4 MPH=miles per hour
5 Spotting distance from a wind driven surface fire
6 It should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

A crown fire with the modeled flame lengths listed in Table 4 would not be expected based on the BMZs being proposed, the ongoing maintenance of the BMZs, and the high moisture levels within the riparian zone areas. An active crown fire flame length modeled using the BehavePlus software is calculated based on the active crown fire intensity, which assumes that the crown fire is fully active.

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

Fire Scenario	Flame Length (Feet)	Spread Rate (MPH[1])	Fireline Intensity (Btu/ft/s)	Spot Fire (Miles)[2]
Scenario 1: 26% slope; Fall Off-shore Extreme Wind (97th percentile) – (Northeast of Project site)				
BMZ Zone 1 (FM8)	2.0 (2.6)[3]	0.1 (0.1)	25 (45)	0.1 (0.3)
Scenario 2: 21% slope; Fall Off-shore Extreme Wind (97th percentile) – (Southeast of Project site)				
BMZ Zone 1 (FM8)	1.9 (2.6)	0.1 (0.1)	23 (45)	0.1 (0.3)
Scenario 3: 22% slope; Summer On-shore, Summer Winds (50th percentile) – (Southwest of Project site)				
BMZ Zone 1 (FM8)	1.2	0.0	9	0.1
Scenario 4: 16% slope; Summer, On-shore Winds (50th percentile) – (Northwest of Project site)				
BMZ Zone 1 (FM8)	1.2	0.0	9	0.1
BMZ Zone 2 (SH2)	1.8	0.0	19	0.1

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

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

Surface Fire:

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

Crown Fire:

- **Transition to Crown Fire:** Indicates whether conditions for transition from surface to crown fire are likely. Calculation depends on the transition ratio. If the transition ratio is greater than or equal to 1, then transition to crown fire is Yes. If the transition ratio is less than 1, then transition to crown fire is No.
- **Crown Fire Rate of Spread (mph):** The forward spread rate of a crown fire. It is the overall spread for a sustained run over several hours. The spread rate includes the effects of spotting. It is calculated from 20-ft wind speed and surface fuel moisture values. It does not consider a description of the overstory.

Fire Type:

Fire type is one of the following four types: surface (understory fire), torching (passive crown fire; surface fire with occasional torching trees), conditional crown (active crown fire possible if the fire transitions to the overstory), and crowning (active crown fire; fire spreading through the overstory crowns).

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

Table 6. Fire Suppression Interpretation

Flame Length (Ft.)	Fireline Intensity (Btu/ft.sec.)	Interpretations
Under 4 feet	Under 100 BTU/ft./sec	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 to 8 feet	100-500 BTU/ft./sec	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./sec	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./sec	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Scenario Run #4

Summer On-Shore Fire
Slope: 16%
Fuel Model: FM4 and SH5
Wind: 18 mph sustained winds
Maximum Flame Length: 22.4 Ft.
Fireline Intensity: 4,888 Btu/ft/s
Spread Rate: 1.3 mph
Spot distance: 0.8 mi

Scenario Run #1

Extreme Fall Off-Shore Fire
Slope: 26%
Fuel Model: FM4 and SH5
Wind: 19 mph sustained winds
Maximum Flame Length: 24.8-Ft.
Fireline Intensity: 6,119 Btu/ft/s
Spread Rate: 2.1 mph
Spot Distance: 0.8 mi

Wind: 50mph gusts
Maximum Flame Length: 41.2-Ft
Fireline Intensity: 18,387 Btu/ft/s
Spread Rate: 6.2 mph
Spot Distance: 2.3 mi

Scenario Run #3

Summer On-Shore Fire
Slope: 22%
Fuel Model: SH2, SH4, and Sh5
Wind: 18 mph sustained winds
Maximum Flame Length: 14.1 Ft.
Active Crown Fire Flame Length: 93.5 Ft.
Fireline Intensity: 1,797 Btu/ft/s
Spread Rate: 0.8 mph
Spot distance: 0.5 mi

Scenario Run #2

Extreme Fall Off-Shore Fire
Slope: 21%
Fuel Model: FM4 and SH5
Wind: 18 mph sustained winds
Maximum Flame Length: 24.0 Ft.
Fireline Intensity: 5,665 Btu/ft/s
Spread Rate: 1.9 mph
Spot distance: 0.8 mi

Wind: 50mph gusts
Maximum Flame Length: 40.7 Ft
Fireline Intensity: 17,932 Btu/ft/s
Spread Rate: 6.1 mph
Spot Distance: 2.3 mi

Project Boundary

Table 1. BehavePlus Fire Behavior Inputs

Input Name	50th Percentile	97th Percentile
1 h fuel moisture	8%	2%
10 h fuel moisture	9%	4%
100 h fuel moisture	15%	8%
Live herbaceous moisture	58%	30%
Live woody moisture	116%	60%
20 ft. wind speed (mph)	18 mph	19 mph sustained wind speed; 50 mph (expected gust speed)
Wind adjustment factor	0.4	0.4
Slope steepness	16% to 22%	21% to 26%

Path: Z:\Projects\IA\6200\MAPDOC\DOCUMENT\Fire\FFLMP\Fig4_BehavePlusAnalysisMap.mxd

SOURCE: AERIAL-BING MAPPING SERVICE

DUDEK

0 250 500 1,000 Feet

FIGURE 4
BehavePlus Analysis Map
Fire Fuel Load Modeling Report for the Renzulli Estates Project

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5 Brush Management Zones

As indicated in preceding sections of this report, an important component of a fire protection system are the Brush Management Zones (BMZs). BMZs are typically designed to provide vegetation buffers that gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones and irrigated zones adjacent to each other on the perimeter of the WUI exposed structure(s). The project will be exposed to pockets of naturally-vegetated open space areas to the northwest, north, southwest, and southeast, however, the majority of the project development will be directly adjacent to existing residential communities to the north, south, east and west, and the Cypress Canyon Park to the east. BMZs will be provided around all new single- and multi-family development lots within the project development that are adjacent to open space areas in accordance with Section 142.0412 of the San Diego Municipal Code (Brush Management) and Section 104.9 of the 2022 California Fire Code. All dwelling units on the project site will be highly ignition resistant based on required construction design, materials, and methods, including a Class A roof, dual pane, single tempered windows, non-combustible exterior doors, non-combustible exterior walls surfaces, and the installation of an NFPA 13 automatic fire sprinkler system, meeting the requirements for the type of occupancy and will include either 13D or 13R, as outlined within FPB Policy B-18-01, Chapter 49 of the California Fire Code, Chapter 7A of the California Building Code, and Section R337 of the California Residential Code. BMZs would be located on the perimeter of all structures and along all ingress/egress roadways to and from Cypress Canyon Road.

Based on the modeled flame lengths for the project, the site's fire environment, and experienced judgement from similar projects, flame lengths under extreme fall weather conditions for sparse groupings of native shrubs on the western portion of the project area can reach approximately 41 feet or taller. Although the eucalyptus forest fuels that are south and downslope from the project site resulted in modeled flame lengths of 90 feet or more, these flame lengths would not be expected to impact the project site based on location of the eucalyptus forest, the high fuel moisture levels within the eucalyptus forest area, and the lack of continuous canopy toward the project. An active crown fire flame length modeled using the BehavePlus software is calculated from based on the active crown fire intensity, which assumes that the crown fire is fully active.

As previously mentioned, Dudek also conducted modeling of the site for post-fuel modification zones. A typical landscape/brush management installation in the City of San Diego consists of a 35-foot-wide, fully irrigated Zone 1 and a 65-foot-wide, non-irrigated, thinned Zone 2. However, based on site-specific limitation, including the project development being adjacent to MHPA areas, lot constraints, project boundary limitations, and steep slopes adjacent and below the residential lots, this project will incorporate one fully irrigated extended Zone 1 BMZ extending up to 57 feet from the single-family structures and up to 80 feet from the multi-family units to the point where manufactured slopes transition from 4:1 to 2:1. Furthermore, the strip of land between a manufactured slope and the western property boundary of Lot 100 is an HOA maintained open space area. As part of the project, the HOA will grant a Brush Management Zone easement to allow for this area to be maintained as BMZ Zone 2, as this area is not proposed as part of the project's mitigation and therefore, can be incorporated as part of Brush Management Zone 2 requirements; there would be no Zone 2 BMZ proposed throughout the remaining portions of the development, and thus the project proposes a reduced BMZ throughout.

Specific to the project, Zone 1 will extend between 47.5 feet and 57 feet around the perimeter lots in the southern portion of the project site, measured from the rear of the structures to the point where manufactured slopes transition from 4:1 to 2:1; ; 47.5 feet around the perimeter lots in the northern portion of the project site, measured from the rear of the structures to the point where manufactured slopes transition from 4:1 to 2:1; and between 15 and 80 feet

around the perimeter multi-family units in the eastern portion of the site, measured from the rear of the structures to the point where manufactured slopes transition from 4:1 to 2:1. Furthermore, the strip of land between a manufactured slope and the western property boundary of Lot 100 is an HOA maintained open space area. As part of the project, the HOA will grant a Brush Management Zone easement to allow for this area to be maintained as BMZ Zone 2, as this area is not proposed as part of the project's mitigation and therefore, can be incorporated as part of Brush Management Zone 2 requirements; there would be no Zone 2 BMZ proposed throughout the remaining portions of the development, and thus the project proposes a reduced BMZ throughout (see Appendix E, *Brush Management Zone Plan).* For all single-family lots around the perimeter of the project development area that do not achieve a full 100 feet of onsite Zone 1 BMZ, project specific alternative materials and methods (AM&M) of construction for these lots will include the installation of code exceeding dual pane dual tempered windows and an additional layer of 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the open space and naturally vegetated areas, as well as the construction of a six-foot-tall concrete masonry unit (CMU) fire wall near the top of the manufactured slopes to block or deflect all or part of the radiating heat with a vertical, non-combustible surface placed in the line of heat, fumes, flame and embers, thus making narrower fuel modification distances possible. Furthermore, for the perimeter multi-family units that do not achieve a full 100 feet of onsite Zone 1 BMZ, mitigation for these units will also include the installation of code exceeding dual pane dual tempered windows and an additional layer of 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the open space and naturally vegetated areas, as well as the construction of a soil nail wall and a 20-foot-plus tall retaining wall that will act as a fire wall. It should be noted that existing offsite equivalent BMZ from the adjacent residential community to the west and the existing park area further to the east will provide additional protection to the perimeter Lots 98, 99, and 100, as well as for the perimeter multi-family units. The installation of the code-exceeding dual pane dual tempered windows and extra layer of 5/8-inch Type X fire rated gypsum sheathing on the wildland exposed sides of the structures, along with the construction of a six-foot CMU fire wall will act as an alternative compliance measures to compensate for the reduced brush management areas of the perimeter lots and will be in compliance with The City of San Diego FPB Policy B-18-01 – Mitigation for Reduced Brush Management Zones (Section V.C.1). Based on the results from the Fire Behavior Analysis along with the homes being constructed in accordance with Chapter 7A standards, including the installation of an NFPA 13 automatic fire sprinkler system, meeting the requirements for the type of occupancy and will include either 13D or 13R., the proposed mitigations are found to provide equivalent protection for the onsite reduced BMZ. Furthermore, several substantial retaining walls will be constructed along portions of the southern, eastern, and western portions of the Project site.

The implementation of an extended all-irrigated Zone 1 condition brush management area, along with the code-required and code-exceeding ignition resistance of the residential structures is expected to provide a fire-hardened site. The irrigated zones, ignition resistant building construction, construction of six-foot CMU fire walls along the perimeter of the project development area adjacent to naturally-vegetated, open space areas manufactured slopes, and proposed retaining walls along portions of the southern, western, and eastern perimeters of the Project boundary, provide a level of fire protection that is considered at least as robust as a standard BMZ, providing the same practical effect and enabling the deviation from the standard. Every part of the BMZ will be a critical component of the site's landscape theme, thereby ensuring that the plants will be maintained in a healthy and low flammability condition. All BMZs would be implemented at once prior to any on-site grading or construction (included as a condition of approval).

BMZ Zone 1 Requirements:

- The landscape area will be Zone 1 condition equivalent landscaping adjacent to the structures.

- Zone 1 will consist of primarily irrigated landscape along with a paved development area.
- Zone 1 will only be from the edges of the proposed building to the point where manufactured slopes transition from 4:1 to 2:1 or up to the MHPA boundary.
- There shall be no habitable structures, structures that are directly attached to habitable structures, or other combustible construction that can mean transmitting fire to habitable structures.
- Structures such as fences, gazebos, walls, palapas, play structures, and non-habitable gazebos with this zone shall be made of non-combustible, one hour-fire rated, or Type IV heavy timber as defined in the CBC.
- Plant species within Zone 1 shall be primarily low-growing and less than 4 feet in height with the exception of trees. Plants shall be low-fuel and not be fire facilitating species and comply with the prohibited plant list (Appendix E).
- Trees within Zone 1 shall be located away from structures to a minimum distance of 10 feet as measured from the structure to the drip line of the tree at maturity and spaced horizontally and vertically in accordance with the Landscape Standards of the Land Development Manual. All trees will not be fire facilitating species and comply with the prohibited plant list (Appendix E).t
- Permanent irrigation is required for all planting areas within Zone 1 with the following exceptions:
  - When planting areas only contain species that do not grow taller than 24 inches in height
  - When planting areas contain only native or naturalized species that are not summer-dormant and have a maximum height at plant maturity of less than 24 inches.
- Zone 1 irrigation overspray and runoff shall not be allowed into adjacent areas of native or naturalized vegetation.
- Zone 1 shall be maintained regularly by pruning and thinning plants, controlling weeds, and maintain irrigation systems.

Specific Brush Management Zone Requirements for Renzulli Estates Project

1. Within the Zone 1 BMZ area, the vegetation that is not fire resistive shall be cleared and re-planted with fire-resistant plants. Zone 1 will be permanently irrigated. Native vegetation may remain in this area provided that the vegetation is modified so that combustible vegetation does not occupy more than 50% of the square footage of this area. Weeds and annual grasses are to be mowed to a height of 4– to- 6 inches. Any chipping that is done on site should be spread not to exceed 6 inches in depth.
2. Landscaping and BMZs will adhere to the plant palette and brush management criteria and will consist of low maintenance, fire-resistive plants, which are addressed in the project's Conceptual Landscape Plan that is being produced by GMP Landscape Architecture.
3. Homeowners and private lot owners shall be responsible for all vegetation management on their lots (Zone 1 BMZs), in compliance with this FFLMR which is consistent with SDFRD requirements. The "Approved Maintenance Entity" shall be responsible for and shall have the authority to ensure long term funding, ongoing compliance with all provisions of this FFLMR, including vegetation planting, brush management maintenance around the perimeter of the multi-family structure (Zone 1 area), within the Zone 2 area along the perimeter of Lot 100, and within interior maintained common areas, vegetation management, and maintenance requirements on all private lots, multi-family residences, parks, common areas, roadsides, and open space under their control (if not considered biological open space).

5.1 Brush Management Area Vegetation Maintenance

Vegetation management shall be completed annually by May 1 and more often as needed for fire safety, as determined by the SDFRD. Homeowners and private lot owners shall be responsible for all vegetation management on their lots (Zone 1 BMZs), in compliance with this FFLMR which is consistent with SDFRD requirements.

The "Approved Maintenance Entity" shall be responsible for and shall have the authority to ensure long term funding, ongoing compliance with all provisions of this FFLMR, including vegetation planting, brush management maintenance around the perimeter of the multi-family structure (Zone 1 area), within the Zone 2 area along the perimeter of Lot 100, and within interior maintained common areas, vegetation management, and maintenance requirements on all private lots, multi-family residences, parks, common areas, roadsides, and open space under their control (if not considered biological open space). Any water quality basins, will be kept clear of flammable vegetation, subject to the FFLMR.

6 Justification for Modified Brush Management Zones

As presented in this Fire Fuel Load Modeling Report, the BMZs provided for the proposed project are not standard BMZs. Rather, based on site-specific limitation, including the project development location adjacent to MHPA areas, lot constraints, project boundary limitations, and steep slopes adjacent and below the residential lots, this project will incorporate one fully irrigated, increased Zone 1 BMZ extending up to 57 feet from the single-family structures and up to 80 feet from the multi-family units to the point where manufactured slopes transition from 4:1 to 2:1. Furthermore, the strip of land between a manufactured slope and the western property boundary of Lot 100 is an HOA maintained open space area. As part of the project, the HOA will grant a Brush Management Zone easement to allow for this area to be maintained as BMZ Zone 2, as this area is not proposed as part of the project's mitigation and therefore, can be incorporated as part of Brush Management Zone 2 requirements; there would be no Zone 2 BMZ proposed throughout the remaining portions of the development, and thus the project proposes a reduced BMZ throughout. Specific to the project, Zone 1 will extend between 47.5 feet and 57 feet around the perimeter lots in the southern portion of the project site, measured from the rear of the structures to the point where manufactured slopes transition from 4:1 to 2:1; 47.5 feet around the perimeter lots in the northern portion of the project site, measured from the rear of the structures to the point where manufactured slopes transition from 4:1 to 2:1; and between 15 and 80 feet around the perimeter multi-family units in the eastern portion of the site, measured from the rear of the structures to the point where manufactured slopes transition from 4:1 to 2:1. As mentioned above, the strip of land between a manufactured slope and the western property boundary of Lot 100 is an HOA maintained open space area. As part of the project, the HOA will grant a Brush Management Zone easement to allow for this area to be maintained as BMZ Zone 2, as this area is not proposed as part of the project's mitigation and therefore, can be incorporated as part of Brush Management Zone 2 requirements; there would be no Zone 2 BMZ proposed throughout the remaining portions of the development, and thus the project proposes a reduced BMZ throughout. Alternative compliance measures include an existing off-site BMZ extension from adjacent existing residential property to the west and the existing park area to the east, as well as the installation of code exceeding dual pane dual tempered windows, adding an additional layer of 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the open space and naturally vegetated areas, and the construction of a six-foot-tall concrete masonry unit (CMU) fire wall near the top of the manufactured slopes to block or deflect all or part of the radiating heat with a vertical, non-combustible surface placed in the line of heat, fumes, flame and embers, thus making narrower fuel modification distances possible. The installation of the code-exceeding dual pane dual tempered windows and extra layer of 5/8-inch Type X fire rated gypsum sheathing on the wildland exposed sides of the structures, along with the construction of a six-foot CMU fire wall will act as an alternative compliance measures to compensate for the reduced brush management areas of the perimeter lots and will be in compliance with The City of San Diego FPB Policy B-18-01 – Mitigation for Reduced Brush Management Zones (Section V.C.1).

6.1 Additional Structure Protected Measures

The following are **City and California State fire and building code required measures** for building in wildland urban interface areas.

1. The structures within the project site will be code compliant, ignition resistive, and fully-sprinklered in compliance with accordance with Section 142.0412 of the San Diego Municipal Code (Brush Management) and Section 104.9 of the 2022 California Fire Code, as well as with the 2022 edition of the California Building Code, including Chapter 7A;
2. The buildings will be provided with an NFPA 13 (Standard for the Installation of Sprinkler Systems) automatic fire sprinkler system, meeting the requirements for the type of occupancy and will include either 13D or 13R. The NFPA 13 automatic sprinkler system will be installed in accordance with Section 903.3.1.1 (including subsections 903.3.1.1.1 and 903.3.1.1.2) of the 2022 CFC, which also requires sprinkler protection for exterior balconies, deck, and ground floor patios of sleeping units where the building is of Type V construction, as well as open-ended corridors and exterior stairways and ramps.
3. Zone 1 requires on-site irrigated landscape planting with drought-tolerant, fire resistive plants. The landscape will be routinely maintained and will be watered by an automatic irrigation system that will maintain healthy vegetation with high moisture content that would prevent ignition of embers from a wildfire.
4. Each lot will also provides an unimpeded, all-weather pathway (minimum three feet wide) on all sides of the building for firefighter access around the entire perimeter of the residential structures.
5. Areas requiring ventilation to the outside environment will require ember-resistant vents such as Brandguard, Vulcan, or O'Hagin brands. These vents exceed the code requirement of a minimum 1/16-inch not to exceed 1/8-inch openings. All vents used for this project will be approved by SDFRD.

The following **code exceeding fire protection measures** are being provided due to project constraints that do not allow the development to provide a full 100 feet of brush management requirements around the perimeter lots because of property boundaries and environmental constraints such as the MHPA**.** These code exceeding mitigations were found to meet or exceed the code required 100 feet BMZs through science and application and were accepted by numerous fire agencies throughout California.

1. Due to the project constraints that do not allow the development to provide a full 100 feet of on-site brush management around the exterior of each of the perimeter lots, each property will be required to be maintained in a Zone 1 condition that will consist of an all-irrigated low fuel landscape with drought-tolerant, fire resistive plants and a paved hardscape development area surrounding all sides of the building to the point where the manufactured slope transitions from a 4:1 slope to a 2:1 slope/MHPA line. The irrigated Zone 1 landscape will include no undesirable, highly flammable plant species. Plants within this zone will be routinely maintained and watered by an automatic irrigation system that will maintain healthy vegetation with high moisture contents that would prevent ignition by embers from a wildfire.
2. Due to the inability to provide a full 100 feet of on-site brush management around the exterior of each of the perimeter lots due to property boundary limitations, adjacency to native or naturalized vegetation and/or the MHPA, all windows on the wildland exposed sides of the structures are required to provide exterior glazing in windows (and sliding glass doors) to be dual pane with both panes tempered glass. Dual pane, one pane tempered glass has been shown during testing and in after fire assessments to significantly decrease the risk of breakage and ember entry into structures. Therefore, requiring code-exceeding dual pane, both panes tempered is anticipated to be an important safety measure that provides enhanced structure protection and provides mitigation for reduced fuel modification zones and limited setbacks from adjacent structures. *The window upgrade also exceeds the requirements of Chapter 7A of the CBC and providing additional protection for the structure's most vulnerable, exterior side* **(CODE EXCEEDING FIRE PROTECTION MEASURE).**

3. Due to the project constraints that do not allow the development to provide a full 100 feet of on-site brush management around the exterior of each of the perimeter lots due to property boundary limitations, adjacency to native or naturalized vegetation and/or the MHPA, the wildland exposed sides of the structures are also required to include 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the MHPA open space and naturally vegetated areas. 5/8-inch Type X fire rated gypsum sheathing is required to be manufactured in accordance with established ASTM standards defining type X wallboard sheathing as that which provides not less than one-hour fire resistance when tested in specified building assemblies and has been tested and certified as acceptable for use in a one-hour fire rated system. CertainTeed Type X Gypsum Board has a Flame Spread rating of 15 and Smoke Developed rating of 0, in accordance with ASTM E 84, (UL 723, UBC 8-1, NFPA 255, CAN/ULC-S102); UL classified for Fire Resistance (ANSL/UL 263; ASTM E119) and listed under UL File No. CKNX.R3660 (Certainteed, 2021). (**CODE EXCEEDING FIRE PROTECTION MEASURE).**

6.2 Structure Ignition

There are three primary concerns for structure ignition: 1) radiant and/or convective heat, 2) burning embers, and 3) direct flame contact (NFPA 1144 2008, 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 for the Renzulli Project is required by the City of San Diego and state codes but are worth listing because they have been proven effective for minimizing structural vulnerability to wildfire and, with the inclusion of a required NFPA 13 automatic interior fire sprinkler system to extinguish interior fires, should embers succeed in entering a structure. The structure would include highly resistant materials and construction methods that will be built to California Essential Services Buildings Standards, which are least as ignition resistant as Chapter 7A of the San Diego Building Code. 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. For perimeter lots unable to achieve the full 100 feet of BMZs, dual pane dual tempered glass windows will be installed on the exposed sides of the new residential structures. Dual pane, one pane tempered glass has been shown during testing and in after fire assessments to significantly decrease the risk of breakage and ember entry into structures. Therefore, requiring code-exceeding dual pane, both panes tempered is anticipated to be an important safety measure that provides enhanced structure protection and provides mitigation for reduced fuel modification zones and limited setbacks from adjacent structures. The window upgrade also exceeds the requirements of Chapter 7A of the CBC and providing additional protection for the structure's most vulnerable, exterior side.

4. Ember resistant vents (recommend BrandGuard or similar vents).
5. Automatic, interior fire sprinkler system to code for occupancy type.

6.3 Fuel Separation

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 to 18 meters (roughly 32 to 60 feet) in southern California fires, 85% to 95% of the homes survived (Howard et al. 1973, Foote and Gilless 1996). Similarly, San Diego County after fire assessments indicate strongly that the building codes are working in preventing home loss: of 15,000 structures within the 2003 fire perimeter, 17% (1,050) were damaged or destroyed. However, of the 400 structures built to the 2001 codes (the most recent at the time), only 4% (16) were damaged or destroyed. Further, of the 8,300 homes that were within the 2007 fire perimeter, 17% were damaged or destroyed. A much smaller percentage (3%) of the 789 homes that were built to 2001 codes were impacted and an even smaller percentage (2%) of the 1,218 structures built to the 2004 Codes were impacted (IBHS 2008). Damage to the structures built to the latest codes is likely from flammable landscape plantings or objects next to structures or open windows or doors (Hunter 2008).

These results support Cohen's (2000) findings that if a community's homes have a sufficiently low home ignitability, 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 requires 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. Obstacles, including steep terrain and non-combustible fire walls can block or deflect all or part of the radiation and heat, thus making narrower fuel modification distances possible. Fires in ravines, chutes, coves, v-drainages, and steep-sided canyons can, under specific conditions, result in an upward draft, similar to a fireplace chimney. Chimneys on the landscape are created when air is drawn in from lower elevations, creating strong upslope drafts. The result can be acceleration of radiant and convective heat as well as actual fire spread, similar to opening the damper in a fire place chimney. Areas where the terrain includes a restriction or narrowing can result in this type of acceleration. The terrain features adjacent the project site include few mild examples of these "chimneys" that are not expected to significantly alter fire behavior.

6.4 Heat Deflecting Walls

Much of the perimeter along the northern and southern sides of the development will require the construction of a fire wall near the top of the manufactured slopes due to the inability of these lots being able to achieve the required 100 feet BMZ. Additionally, the project's slopes require the construction of significant retaining walls along portions

of the southern eastern, and western property boundaries. The installation of fire and retaining wall creates an elevated pad and vertical separation from fuels. The fire and retaining walls function as heat-deflecting surfaces and provide justification for the BMZ modifications. One wall option is a non-combustible, six-foot tall, heat and ember deflecting wall (lower two feet CMU masonry block wall and upper four feet dual pane, one pane tempered glazing) and the second option being a six-foot tall all CMU block construction, to provide additional deflection for the impacted structures and fuel modification areas. When buildings are set back from slopes, flames spreading up those slopes are deflected vertically and over the structure where cooling occurs, reducing the effects of convective heat on the structure. If a structure cannot be setback adequately, or where the slope is less than 30%, a noncombustible wall can help deflect the flames from the structure (NFPA 2005)[6].

When buildings are set back from slopes, and a wall is placed near the top of slope, flames spreading up those slopes are deflected and ground and low air-based embers are captured, reducing the effects of convective heat and ember encroachment on the structure. The duration of radiant heat impact on the downhill facing side of the building is also reduced. An imaginary line extended along the slope depicts the path of the heat (hot air rises) and flame. The structure set back is important to avoid heat and/or flame intersection with the structure.

Heat-deflecting retaining fire walls of the lower two feet CMU masonry blocks and upper four feet dual pane, one pane tempered glazing or complete masonry construction will be incorporated along the lot lines, as well as within the project's developed area. The retaining fire walls provide a vertical, non-combustible surface in the line of heat, fumes, flame and embers traveling up the slope. Once these fire byproducts intersect the wall, they are deflected or captured. In the case where lighter fuels are encountered, they are quickly consumed, heat and flame are absorbed or deflected by the wall, and the fuels burn peaks out within a short (30 second–2 minute) time frame (Quarles and Beall 2002). Walls like these have been observed to deflect heat and airborne embers on numerous wildfires in San Diego, Orange, Los Angeles, Ventura, and Santa Barbara County. Rancho Santa Fe Fire Protection District, Laguna Beach Fire Protection District, Orange County Fire Authority, and others utilize these walls as alternative methods based on observed performance during wildfires. This has led to these agencies approving use of non-combustible landscape walls as mitigations for reduced fuel modification zones and reduced setbacks at top of slope. These walls are consistent with NFPA 1144 Standard for Reducing Structure Ignition Hazards from Wildland Fire – 2008 Edition, Section 5.1.3.3 and A.5.1.3.3 and International Urban Wildland Interface Code (ICC 2012). NFPA 1144, A.5.1.3.3 states: "Noncombustible walls and barriers are effective for deflecting radiant heat and windblown embers from structures." These walls and barriers are usually constructed of noncombustible materials (concrete block, bricks, stone, stucco) or earth with emergency access openings built around a development where 30 feet (9 meters) of defensible space is not available.

As indicated in this report, the BMZs and additional fire protection measures proposed for the project provide equivalent wildfire buffers but are not standard SDFRD zones (see Appendix F, *BMZ Map,*). 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, fuels, neighboring communities relative to the project area, 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.

6 Protecting Life and Property from Wildfire (NFPA 2005). James C. Smalley, Editor. NFPA Wildland Fire Protection. 2005.

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7 Conclusion

The goal of the BMZs along with the fire protection features provided for the project is to provide the structures with the ability to survive a wildland fire while minimizing impacts on response resources. Preventing ignition to the single- and multi-family residential structures will result in reduction of the exposure of residents/visitors to hazards that threaten personal safety and will reduce property damage and losses. Mitigating ignition hazards and fire spread potential reduce the threat to the structures and can help the SDFRD optimize the deployment of personnel and apparatus during a wildfire. The analysis in this Fire Fuel Load Model Report provides support and justifications for acceptance of the proposed BMZ for this project based on the site-specific fire environment. As presented in this report, the alternative measures proposed for the project's BMZ supplement the standard requirements and provide at least functional equivalency.

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8 Limitations

This Fire Fuel Load Modeling Report does not provide guarantee that occupants and visitors will be safe at all times because of the fire protection features it requires. There are many variables that may influence overall safety. This report provides requirements and recommendations for implementation of the latest fire protection features that have proven to result in reduced wildfire-related risk and hazard.

For maximum benefit, the Renzulli Estates occupants and visitors, contractors, engineers, and architects are responsible for proper implementation of the concepts and requirements set forth in this report. The project permittee is responsible for maintaining the proposed BMZs as required by this report, the applicable Fire Code and the SDFRD, which helps protect against catastrophic loss as a result of a wildland fire.

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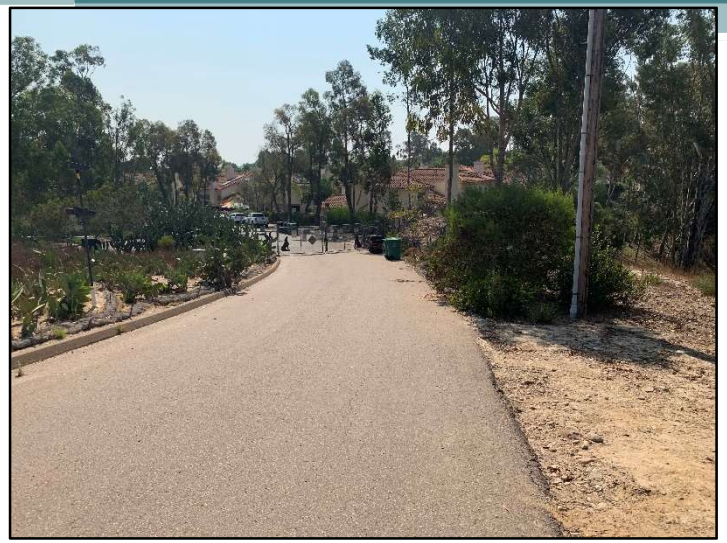
Appendix A

The Renzulli Estates Photograph Log

Photograph Log

Renzulli Estates

Photograph 1. View facing northwest of eastern entrance to Project site.

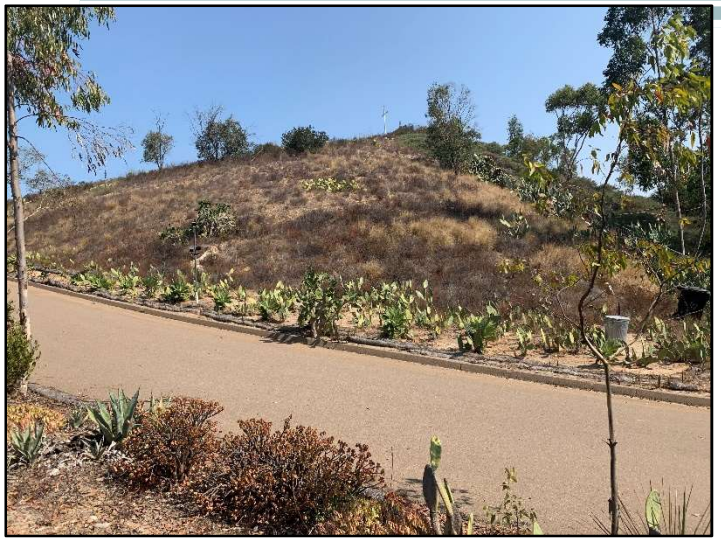


Photograph 2. View of Project Site's eastern entrance, facing southeast.

Photograph 3. View facing southeast of existing vegetation along existing driveway on eastern portion of Project site.

Photograph 4. View facing west of existing vegetation along driveway on southern Project boundary.

Photograph 5. Looking west from the southside of the existing driveway on the eastern portion of the Project site.



Photograph 6. Looking northeast to the north side of the existing driveway on the eastern portion of the Project site.

Photograph 7. View looking northeast to the along the existing driveway on the eastern portion of the Project site.

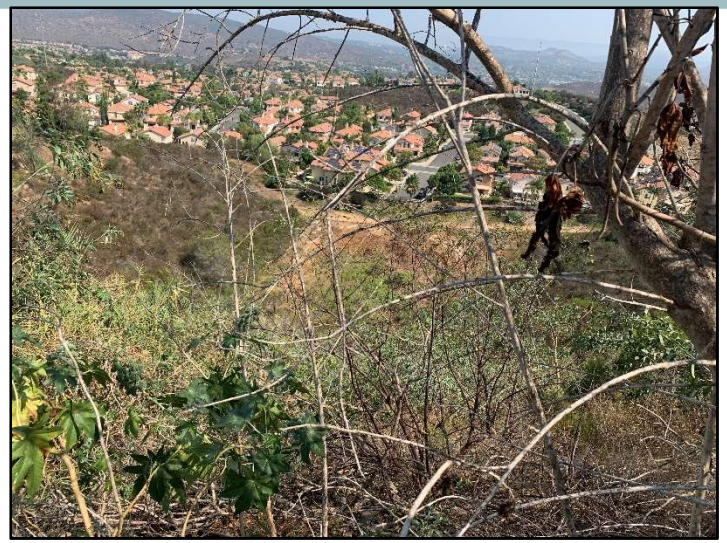
Photograph 8. View looking north of the vegetation in front of the existing single home structure.

Photograph 9. View looking northeast of the vegetation and developed area adjacent to the existing single-family home.

Photograph 10. View of vegetation east of the dirt/gravel lot adjacent to the existing single-family home.

Photograph 11. View of existing vegetation looking north toward the northern Project boundary.

Photograph 12. View looking west from dirt/gravel lot from the central portion of the Project site.



Photograph 13. View of the vegetation looking toward the housing development north of the Project site.

Photograph 14. View looking north from behind the existing single-family home.

Photograph 15. View looking northeast of the northern Project site boundary.

Photograph 16. View of vegetation looking northeast.

Photograph 17. View of vegetation looking northwest from the road to the northeast of the existing single-family structure.

Photograph 18. View of vegetation looking northeast from the road to the northeast of the existing single-family structure.

Photograph 19. View of vegetation and existing residential development to the northwest of the Project site.

Photograph 20. View looking southwest from the southeastern corner of the existing residential structure.

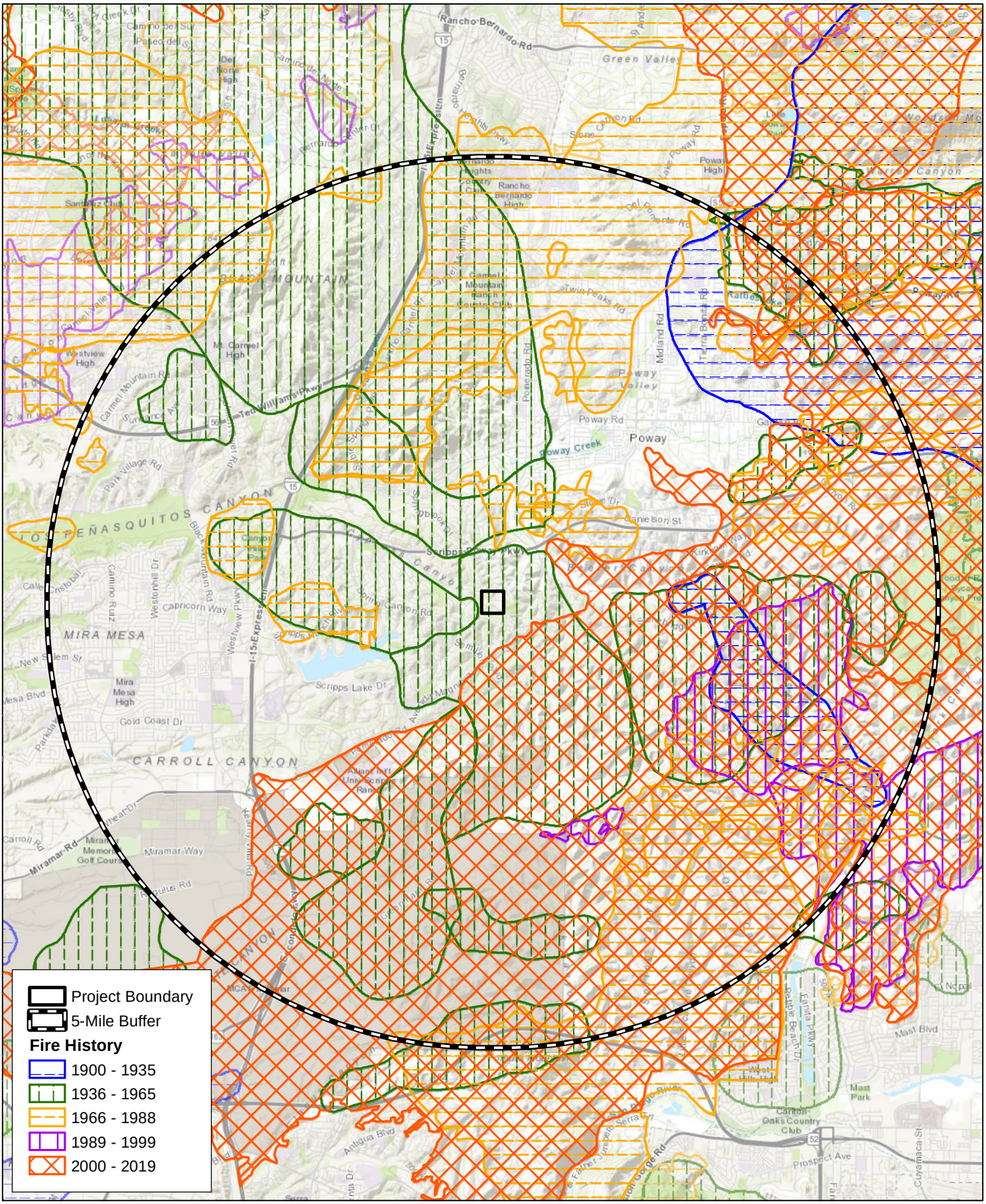
Photograph 21. View from Cypress Canyon Park Drive looking toward the northeast corner of the Project site.

Photograph 22. View from Angelique Street facing the open space northwest of the Project site.

Photograph 23. View looking northeast toward the Project site from Cypress Valley Drive.

Photograph 24. View looking southeast of the Project site from Cypress Valley Drive.

Appendix B
Fire History Map



SOURCE: BASE MAP- ESRI; FIRE DATA-CALFIRE 2019

DUDEK

0 1 2 Miles

APPENDIX B

Fire History Map

Fire Fuel Load Modeling Report for the Renzulli Estates Project

Appendix C

Fire Behavior Modeling Results – Pre BMZ Results

Inputs: SURFACE, SPOT

Description		Renzulli Estates Scenario 1: Fall, extreme wind

Fuel/Vegetation, Surface/Understory

Fuel Model		4, sh5

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	2
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	8
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	60

Weather

20-ft Wind Speed	mi/h	19, 50
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	30

Terrain

Slope Steepness	%	26
Site Aspect	deg	45
Ridge-to-Valley Elevation Difference	ft	112
Ridge-to-Valley Horizontal Distance	mi	.08
Spotting Source Location		VB

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]

Surface Fireline Intensity (Btu/ft/s) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scenario 1: Fall, extreme wind

Head Fire

Surface Fire Rate of Spread (mi/h)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	3.1	11.7
sh5	2.1	6.2

Renzulli Estates Scenario 1: Fall, extreme wind

Head Fire

Surface Fireline Intensity (Btu/ft/s)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	15496	57427
sh5	6119	18387

Renzulli Estates Scenario 1: Fall, extreme wind

Head Fire

Surface Fire Flame Length (ft)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	38.1	69.6
sh5	24.8	41.2

Renzulli Estates Scenario 1: Fall, extreme wind

Head Fire

Spot Dist from a Wind Driven Surface Fire (mi)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	1.1	3.3
sh5	0.8	2.3

Discrete Variable Codes Used
Renzulli Estates Scenario 1: Fall, extreme wind

Fuel Model

4	4	Chaparral
145	sh5	High load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

VB	Valley Bottom

Inputs: SURFACE, SPOT

Description		Renzulli Estates Scenario 2: Fall, extreme wind

Fuel/Vegetation, Surface/Understory

Fuel Model		4, sh5

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	2
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	8
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	60

Weather

20-ft Wind Speed	mi/h	19, 50
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	160

Terrain

Slope Steepness	%	21
Site Aspect	deg	300
Ridge-to-Valley Elevation Difference	ft	225
Ridge-to-Valley Horizontal Distance	mi	.12
Spotting Source Location		RT

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]

Surface Fireline Intensity (Btu/ft/s) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scenario 2: Fall, extreme wind

Head Fire

Surface Fire Rate of Spread (mi/h)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	2.9	11.4
sh5	1.9	6.1

Renzulli Estates Scenario 2: Fall, extreme wind

Head Fire

Surface Fireline Intensity (Btu/ft/s)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	14243	56172
sh5	5665	17932

Renzulli Estates Scenario 2: Fall, extreme wind

Head Fire

Surface Fire Flame Length (ft)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	36.6	68.9
sh5	24.0	40.7

Renzulli Estates Scenario 2: Fall, extreme wind

Head Fire

Spot Dist from a Wind Driven Surface Fire (mi)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
4	1.1	3.3
sh5	0.8	2.3

Discrete Variable Codes Used
Renzulli Estates Scenario 2: Fall, extreme wind

Fuel Model

4	4	Chaparral
145	sh5	High load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

RT	Ridge Top

Inputs: SURFACE, CROWN, SPOT

Description: Renzulli Estates Scenario 3: Summer, on-shore wind

Fuel/Vegetation, Surface/Understory

Fuel Model		sh2, sh4, sh5

Fuel/Vegetation, Overstory

Canopy Height	ft	30
Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open
Canopy Base Height	ft	4
Canopy Bulk Density	lb/ft3	0.062

Fuel Moisture

1-h Fuel Moisture	%	8
10-h Fuel Moisture	%	9
100-h Fuel Moisture	%	15
Live Herbaceous Fuel Moisture	%	58
Live Woody Fuel Moisture	%	116

Weather

20-ft Wind Speed	mi/h	18
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	220

Terrain

Slope Steepness	%	22
Site Aspect	deg	45
Ridge-to-Valley Elevation Difference	ft	328
Ridge-to-Valley Horizontal Distance	mi	0.11
Spotting Source Location		RT

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Crown fire method uses Rothermel (1991) [CROWN].

(continued on next page)

Input Worksheet (continued)

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]
Surface Fireline Intensity (Btu/ft/s) [SURFACE]
Surface Fire Flame Length (ft) [SURFACE]
Active Crown Fire Rate of Spread (mi/h) [CROWN]
Active Crown Fireline Intensity (Btu/ft/s) [CROWN]
Active Crown Fire Flame Length (ft) [CROWN]
Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scenario 3: Summer, on-shore wind

Head Fire

Fuel Model	Surface Fire Rate of Spread mi/h	Surface Fireline Intensity Btu/ft/s	Surface Flame Length ft	Active Crown ROS mi/h
sh2	0.0	18	1.7	0.5
sh4	0.1	46	2.6	0.5
sh5	0.8	1797	14.1	0.5

Renzulli Estates Scenario 3: Summer, on-shore wind

Head Fire

< Fuel Model	Active Crown FLI Btu/ft/s	Active Crown FL ft	Surface Fire Spot Dist mi
sh2	9317	88.6	0.1
sh4	9209	87.9	0.2
sh5	10109	93.5	0.5

Discrete Variable Codes Used
Renzulli Estates Scenario 3: Summer, on-shore wind

Fuel Model

142	sh2	Moderate load, dry climate shrub (S)
144	sh4	Low load, humid climate timber-shrub (S)
145	sh5	High load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

RT	Ridge Top

Inputs: SURFACE, SPOT

Description: Renzulli Estates Scenario 4: Summer, onshore wind

Fuel/Vegetation, Surface/Understory

Fuel Model		4, sh5

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	8
10-h Fuel Moisture	%	9
100-h Fuel Moisture	%	15
Live Herbaceous Fuel Moisture	%	58
Live Woody Fuel Moisture	%	116

Weather

20-ft Wind Speed	mi/h	18
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	310

Terrain

Slope Steepness	%	16
Site Aspect	deg	0
Ridge-to-Valley Elevation Difference	ft	853
Ridge-to-Valley Horizontal Distance	mi	0.11
Spotting Source Location		VB

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]

Surface Fireline Intensity (Btu/ft/s) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scenario 4: Summer, onshore wind

Head Fire

Fuel Model	Surface Fire Rate of Spread mi/h	Surface Fireline Intensity Btu/ft/s	Surface Flame Length ft	Surface Fire Spot Dist mi
4	1.3	4888	22.4	0.8
sh5	0.9	1899	14.5	0.6

Discrete Variable Codes Used

Renzulli Estates Scenario 4: Summer, onshore wind

Fuel Model

4	4	Chaparral
145	sh5	High load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

VB	Valley Bottom

Appendix D

Fire Behavior Modeling Results – Post BMZ Results

Inputs: SURFACE, SPOT

Description		Renzulli Estates Scen. 1 Fall, off-shore wind (Post)

Fuel/Vegetation, Surface/Understory

Fuel Model		8, sh1

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	2
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	8
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	60

Weather

20-ft Wind Speed	mi/h	19, 50
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	30

Terrain

Slope Steepness	%	26
Site Aspect	deg	45
Ridge-to-Valley Elevation Difference	ft	112
Ridge-to-Valley Horizontal Distance	mi	0.8
Spotting Source Location		VB

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]

Surface Fireline Intensity (Btu/ft/s) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scen. 1 Fall, off-shore wind (Post)

Head Fire

Surface Fire Rate of Spread (mi/h)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	0.1	0.1
sh1	0.4	1.2

Renzulli Estates Scen. 1 Fall, off-shore wind (Post)

Head Fire

Surface Fireline Intensity (Btu/ft/s)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	25	45
sh1	235	743

Renzulli Estates Scen. 1 Fall, off-shore wind (Post)

Head Fire

Surface Fire Flame Length (ft)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	2.0	2.6
sh1	5.5	9.4

Renzulli Estates Scen. 1 Fall, off-shore wind (Post)

Head Fire

Spot Dist from a Wind Driven Surface Fire (mi)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	0.1	0.3
sh1	0.3	0.8

Discrete Variable Codes Used
Renzulli Estates Scen. 1 Fall, off-shore wind (Post)

Fuel Model

8	8	Short needle litter
141	sh1	Low load, dry climate shrub (D)

Downwind Canopy Cover

Open	Open

Spotting Source Location

VB	Valley Bottom

Inputs: SURFACE, SPOT

Description		Renzulli Estates Scen. 2 Fall, off-shore wind (Post)

Fuel/Vegetation, Surface/Understory

Fuel Model		8, sh1

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	2
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	8
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	60

Weather

20-ft Wind Speed	mi/h	19, 50
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	160

Terrain

Slope Steepness	%	21
Site Aspect	deg	300
Ridge-to-Valley Elevation Difference	ft	225
Ridge-to-Valley Horizontal Distance	mi	.12
Spotting Source Location		RT

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]

Surface Fireline Intensity (Btu/ft/s) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scen. 2 Fall, off-shore wind (Post)

Head Fire

Surface Fire Rate of Spread (mi/h)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	0.1	0.1
sh1	0.4	1.2

Renzulli Estates Scen. 2 Fall, off-shore wind (Post)

Head Fire

Surface Fireline Intensity (Btu/ft/s)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	23	45
sh1	217	743

Renzulli Estates Scen. 2 Fall, off-shore wind (Post)

Head Fire

Surface Fire Flame Length (ft)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	1.9	2.6
sh1	5.3	9.4

Renzulli Estates Scen. 2 Fall, off-shore wind (Post)

Head Fire

Spot Dist from a Wind Driven Surface Fire (mi)

Fuel Model	20-ft Wind Speed mi/h	
	19	50
8	0.1	0.3
sh1	0.3	0.8

Discrete Variable Codes Used
Renzulli Estates Scen. 2 Fall, off-shore wind (Post)

Fuel Model

8	8	Short needle litter
141	sh1	Low load, dry climate shrub (D)

Downwind Canopy Cover

Open	Open

Spotting Source Location

RT	Ridge Top

Inputs: SURFACE, SPOT

Description		Renzulli Estates Scen. 3 Summer, on-shore wind (Post)

Fuel/Vegetation, Surface/Understory

Fuel Model		8, sh2

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	8
10-h Fuel Moisture	%	9
100-h Fuel Moisture	%	15
Live Herbaceous Fuel Moisture	%	58
Live Woody Fuel Moisture	%	116

Weather

20-ft Wind Speed	mi/h	18
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	220

Terrain

Slope Steepness	%	22
Site Aspect	deg	45
Ridge-to-Valley Elevation Difference	ft	328
Ridge-to-Valley Horizontal Distance	mi	.11
Spotting Source Location		RT

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]

Surface Fireline Intensity (Btu/ft/s) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scen. 3 Summer, on-shore wind (Post)

Head Fire

Fuel Model	Surface Fire Rate of Spread mi/h	Surface Fireline Intensity Btu/ft/s	Surface Flame Length ft	Surface Fire Spot Dist mi
8	0.0	9	1.2	0.1
sh2	0.0	18	1.7	0.1

Discrete Variable Codes Used

Renzulli Estates Scen. 3 Summer, on-shore wind (Post)

Fuel Model

8	8	Short needle litter
142	sh2	Moderate load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

RT	Ridge Top

Inputs: SURFACE, SPOT

Description		Renzulli Estates Scen. 4 Summer, on-shore wind (Post)

Fuel/Vegetation, Surface/Understory

Fuel Model		8, sh2

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	8
10-h Fuel Moisture	%	9
100-h Fuel Moisture	%	15
Live Herbaceous Fuel Moisture	%	58
Live Woody Fuel Moisture	%	116

Weather

20-ft Wind Speed	mi/h	18
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	310

Terrain

Slope Steepness	%	16
Site Aspect	deg	0
Ridge-to-Valley Elevation Difference	ft	853
Ridge-to-Valley Horizontal Distance	mi	.11
Spotting Source Location		VB

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (mi/h) [SURFACE]

Surface Fireline Intensity (Btu/ft/s) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Spot Dist from a Wind Driven Surface Fire (mi) [SPOT]

Notes

Renzulli Estates Scen. 4 Summer, on-shore wind (Post)

Head Fire

Fuel Model	Surface Fire Rate of Spread mi/h	Surface Fireline Intensity Btu/ft/s	Surface Flame Length ft	Surface Fire Spot Dist mi
8	0.0	9	1.2	0.1
sh2	0.0	19	1.8	0.1

Discrete Variable Codes Used

Renzulli Estates Scen. 4 Summer, on-shore wind (Post)

Fuel Model

8	8	Short needle litter
142	sh2	Moderate load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

VB	Valley Bottom

Appendix E
Prohibited Plant List

Providing enough fire protection for rural areas of San Diego County has become difficult. This is due to the large number of residents who are moving to the rural areas of the County and the increasing amounts of brush, weeds and other vegetation that provide fuel for wildfires and cause them to burn hotter. While its important to protect the wild native vegetation in the County's rural areas it's also important to take steps for adequate fire protection for structures. Legally clearing vegetation protects the other wild native plants and at the same time eliminates the fire hazards.

During the October 2003 Firestorms, it was painfully evident that there was insufficient "Defensible Space" on many properties which led to destroyed homes and other structures. As a result, San Diego County has amended an ordinance to require residents to keep their property free of fire hazards that include certain vegetation, green waste and rubbish. Residents can comply with these ordinances by creating a "Defensible Space" and taking other preventative steps on their property.

WHAT IS DEFENSIBLE SPACE?

This is the area around a structure where combustible vegetation, that can cause fire, has been cleared, reduced or replaced. This space acts as a barrier between an advancing fire and a structure.

HOW DO I CLEAR LEGALLY?

Combustible vegetation can only be removed by mowing, cutting and grazing as long as the root structure is left intact. Any trees you remove shall have the stumps cut no higher than 8" above the ground. The only exception would be an orchard. Orchard trees may have their stumps completely removed.

CAN I CLEAR INTO AN OPEN SPACE EASEMENT?

Depending upon fuel loads and topography, the Local Fire District may require clearing within an open space easement. This clearing does not require a permit so long as you obtain a letter from the Local Fire District specifying the amount of additional clearing required and comply with any clearing provisions stated in the recorded open space easement document or recorded subdivision map. .

WHAT IS COMBUSTIBLE VEGETATION?

This is any material that in its natural state will readily ignite, burn and cause fire to move to any structure or other vegetation. This would include dry grass, brush, weeds, litter and waste. This would not include fire resistant landscaping some of which can be found in the "Suggested Plant List For Defensible Space" on page 4 of this handout.

HOW LARGE SHOULD THE DEFENSIBLE SPACE BE?

- You need to clear combustible vegetation in a 100' radius from any structure. Only the fire agency may authorize you to clear more. You are not required to

cross your property line in order to clear the 100'. The neighboring property owner may be required to clear the additional distance by the fire agency.

HOW DO I MAINTAIN THE DEFENSIBLE SPACE?

- You may plant fire-resistant, irrigated, landscaping in the first 50'of the 100' from your structure. These plants need to be maintained all year around.
- You need to keep natural vegetation in the remaining 50' of the 100' space. This would be the area furthest away from your structure. The plants need to be thinned and cut back to no more than 6" above the ground. You may need to do this several times a year since the plants grow back.
- Do not completely remove all vegetation which would leave the ground bare. Some vegetation is necessary to prevent erosion.
- Remove dead and dying vegetation.
- Trim trees that overhang or touch your structures.

WHAT TYPES OF FIRE-RESISTANT PLANTS SHOULD I CHOOSE FOR MY DEFENSIBLE SPACE?

You will find a list of suggested plants for Defensible Space on page 4 of this handout. Generally these plants:

- Grow close to the ground.
- Have a low sap or resin content
- Grow without accumulating dead branches, needles or leaves.
- Are easily maintained and pruned
- Are drought-tolerant

WHAT TYPES OF PLANTS SHOULD I NOT PLANT OR KEEP ON MY PROPERTY?

On page 16 of this handout you will find an extensive list of plants that you should avoid. These plants and trees burn easily since they have large amounts of oil, sap, rough bark and other material that is flammable.

WHAT OTHER THINGS SHOULD I DO TO PROTECT MY PROPERTY AGAINST FIRE?

- You should clear combustible vegetation on your property if it is within 30' of your property line.
- Vary the height of plants and adequately space them. Taller plants need to be spaced wider apart.
- Existing trees and large shrubs should be pruned by cutting off any branches up to 6' above the ground to prevent ground fires from spreading upwards into trees.
- For fire truck access, remove vegetation within 10' of each side of your driveway.
- Remove any tree limbs within 10' of your chimney
- Work with your neighbors to clear common areas between houses, and prune areas of heavy vegetation that are a fire threat to both properties.
- Avoid planting trees under or near electrical lines. They may grow into, or make contact with overhead lines under windy conditions, causing fire.

- If you have a heavily wooded area on your property, remove some of the trees to which will lower the fire hazard. You will improve growing conditions for your trees if you remove dead, weak, or diseased trees. This will leave you with a healthy mixture of both new and older trees.
- Any removed trees may be chipped and left on your property if they don't present a fire hazard. Contact your local fire agency to find out how to do this.
- Don't forget to legally despose of all your cut vegetation. You may contact your local landfill to inquire about green waste recycling. Open burning may not be allowed. Contact your fire agency for more information.
- Stack firewood and scrap wood piles at least 50' from any structure and clear away any combustible vegetation within 10' of the piles. Many homes have "survived" as a fire moved past it, only to burn later from a wood pile that caught fire after the firefighters had moved on to protect other homes.
- Check and clean your roofs and gutters on all structures several times during the spring, summer and fall to remove debris that can easily ignite from a spark.

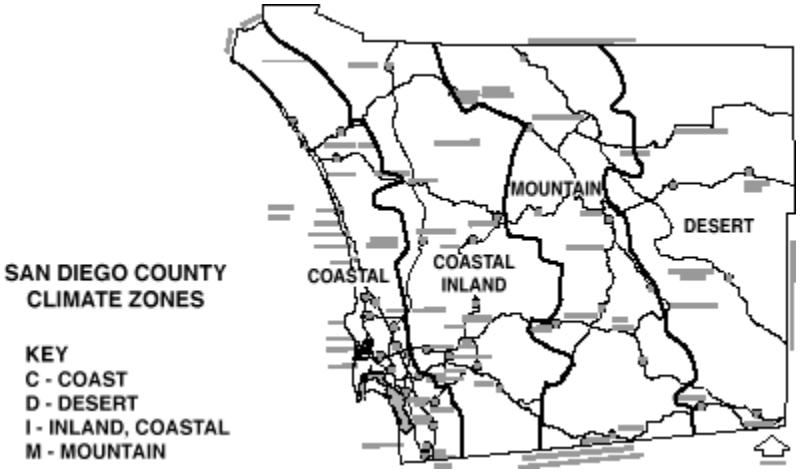
ACCEPTABLE PLANTS FOR A DEFENSIBLE SPACE IN FIRE PRONE AREAS

All plants on the following list are considered drought-tolerant in the climate zone indicated. Remember, however, that no plant is totally fire resistant. Drought-tolerant plants are trees, shrubs, groundcovers, and other vegetation that can grow and reproduce with only natural moisture such as rainfall. Occasional irrigation is necessary only in extreme drought situations.

Plants that are indicated by the **"R"** are the least drought-tolerant plants on the list. These plants grow best in riparian areas. Riparian areas can be described as areas where the water table is very near the surface of the ground. Although the ground may be dry, the plants growing there will be green and lush all year around.

When first planting drought-tolerant plants, you need to water deeply to encourage the roots to find natural moisture in the soil. This type of watering needs to continue for at least three years. More water should be provided in summer and less (if any) in the winter. After three years, you should be watering the plants less and depending more on the natural rainfall to provide moisture.

Plants on the list which are noted with ** are San Diego County native or naturalizing plant species. These are types of plants native to or brought into the San Diego County area. These plants are able to grow and reproduce in the local climate and the natural rainfall is enough moisture.



SUGGESTED PLANT LIST FOR A DEFENSIBLE SPACE

BOTANICAL NAME	COMMON NAME	Climate Zone
TREES		
Acer		
platanoides	Norway Maple	M
rubrum	Red Maple	M
saccharinum	Silver Maple	M
saccarum	Sugar Maple	M
macrophyllum	Big Leaf Maple	C/ (R)
Alnus rhombifolia	White Alder	C/I/M (R)
Arbutus		
unedo	Strawberry Tree	All zones
Archontophoenix		
cunninghamiana	King Palm	C
** Arctostaphylos spp.	Manzanita	C/I/D
Brahea		
armata	Blue Hesper Palm	C/D

edulis	Guadalupe Palm	C/D
Ceratonia siliqua	Carob	C/I/D
Cerdidium floridum	Blue Palo Verde	D
** Cercis occidentalis	Western Redbud	C/I/M
Cornus		
nuttallii	Mountain Dogwood	I/M
stolonifera	Redtwig Dogwood	I/M
Elaeagnus		
angustifolia	Russian Olive	I/M
Eriobotrya		
japonica	Loquat	C/I/D
Erythrina caffra	Kaffirboom Coral Tree	C
Gingko biloba "Fairmount"	Fairmount Maidenhair Tree	I/M
Gleditisia triacanthos	Honey Locust	I/D/M
Juglans		
californica	California Walnut	I
hindsii	California Black Walnut	C/I
Lagerstroemia indica	Crape Myrtle	I/D/M
Ligustrum lucidum	Glossy Privet	I
Liquidambar styraciflua	Sweet Gum	C/I/M
Liriodendron tulipifera	Tulip Tree	I
Lyonothamnus floribundus		
ssp. asplenifolius	Fernleaf Catalina Ironwood	C
Melaleuca spp.	Melaleuca	C/I/D

Myoporum spp.	Myoporum	C/I
Nerium oleander	Oleander	C/I/D
Parkinsonia aculeata	Mexican Palo Verde	D
Pistacia		
chinensis	Chinese Pistache	C/I/D
vera	Pistachio Nut	I
Pittosporum		
phillyraeoides	Willow Pittosporum	C/I/D
viridiflorum	Cape Pittosporum	C/I
Platanus		
acerifolia	London Plane Tree	All zones
** racemosa	California Sycamore	C/I/M
Populus		
alba	White Poplar	D/M
** fremontii	Western Cottonwood	I
trichocarpa	Black Cottonwood	I/M
Prunus		
xblireiana	Flowering Plum	M
caroliniana	Carolina Laurel Cherry	C
cersifera ‘Newport’	Newport Purple-Leaf Plum	M
** ilicifolia	Hollyleaf Cherry	C
** lyonii	Catalina Cherry	C
serrulata ‘Kwanzan’	Flowering Cherry	M
yedoensis ‘Akebono’	Akebono Flowering Cherry	M

Quercus		
** agrifolia	Coast Live Oak	C/I
** engelmannii	Engelmann Oak	I
suber	Cork Oak	C/I/D
Rhus		
** lancea	African Sumac	C/I/D
** Salix spp.	Willow	All zones (R)
Tristania conferta	Brisbane Box	C/I
Ulmus		
parvifolia	Chinese Elm	I/D
pumila	Siberian Elm	C/M
** Umbellularia californica	California Bay Laurel	C/I
SHRUBS		
Agave	Century Plant	D
americana	Desert Century Plant	D
deserti	Shaw's Century Plant	D
** shawii		
** Amorpha fruticosa	False Indigobush	I
Arbutus		
** menziesii	Madrone	C/I
** Arctostaphylos spp.	Manzanita	C/I/D
** Atriplex		
canescens	Hoary Saltbush	I
lentiformis	Quail Saltbush	D

** Baccharis		
glutinosa	Mule Fat	C/I
pilularis	Coyote Bush	C/I/D
Carissa grandiflora	Natal Plum	C/I
** Ceanothus spp.	California Lilac	C/I/M
Cistus spp.	Rockrose	C/I/D
** Cneoridium dumosum	Bushrue	C
** Comarostaphylis		
diversifolia	Summer Holly	C
Convolvulus cneorum	Bush Morning Glory	C/I/M
Dalea		
orcuttii	Orcutt's Delea	D
** spinosa	Smoke Tree	I/D
Elaeagnus		
pungens	Silverberry	C/I/M
** Encelia		
californica	Coast Sunflower	C/I
farinosa	White Brittlebush	D/I
Eriobotrya		
deflexa	Bronze Loquat	C/I
Eriophyllum		
** confertiflorum	Golden Yarrow	C/I
staechadifolium	Lizard Tail	C
Escallonia spp.	Escallonia	C/I

Feijoa sellowiana	Pineapple Guava	C/I/D
Fouqueria splendens	Ocotillo	D
** Fremontodendron		
californicum	Flannelbush	I/M
mexicanum	Southern Flannelbush	I
Galvezia		
juncea	Baja Bush-Snapdragon	C
speciosa	Island Bush-Snapdragon	C
Garrya		
elliptica	Coast Silktassel	C/I
** flavescens	Ashy Silktassel	I/M
** Heteromeles arbutifolia	Toyon	C/I/M
Lantana spp.	Lantana	C/I/D
Lotus scoparius	Deerweed	C/I
Mahonia spp.	Barberry	C/I/M
Malacothamnus		
clementinus	San Clemente Island Bush Mallow	C
** fasciculatus	Mesa Bushmallow	C/I
Melaleuca spp.	Melaleuca	C/I/D
** Mimulus spp.	Monkeyflower	C/I (R)
Nolina		
parryi	Parry’s Nolina	I
parryi ssp. wolfii	Wolf’s Bear Grass	D
Photinia spp.	Photinia	All zones

Pittosporum		
crassifolium		C/I
rhombifolium	Queensland Pittosporum	C/I
tobira ‘Wheeleri’	Wheeler’s Dwarf	C/I/D
undulatum	Victorian Box	C/I
viridiflorum	Cape Pittosporum	C/I
Plumbago auriculata	Cape Plumbago	C/I/D
Prunus		
caroliniana	Carolina Laurel Cherry	C
** ilicifolia	Hollyleaf Cherry	C
** yonii	Catalina Cherry	C
Puncia granatum	Pomegranate	C/I/D
Pyracantha spp.	Firethorn	All zones
Quercus		
** dumosa	Scrub Oak	C/I
Rhamus		
alaternus	Italian Blackthorn	C/I
** californica	Coffeeberry	C/I/M
Rhaphiolepis spp.	Rhaphiolepis	C/I/D
Rhus		
continus	Smoke Tree	M
** integrifolia	Lemonade Berry	C/I
laurina	Laurel Sumac	C/I
lentii	Pink-Flowering Sumac	C/D

** ovata	Sugarbush	I/M
** trilobata	Squawbush	I
Ribes		
viburnifolium	Evergreen Currant	C/I
** speciosum	Fuschia-Flowering Gooseberry	C/I/D
Romneya coulteri	Matilija Poppy	I
Rosa		
** californica	California Wild Rose	C/I
minutifolia	Baja California Wild Rose	C/I
** Salvia spp.	Sage	All zones
** Sambucus spp.	Elderberry	C/I/M
** Symphoricarpos mollis	Creeping Snowberry	C/I
Syringa vulgaris	Lilac	M
Tecomaria capensis	Cape Honeysuckle	C/I/D
Teucrium fruticans	Bush Germander	C/I
** Toxicodendron		
diversilobum	Poison Oak	I/M
Verbena		
lilacina	Lilac Verbena	C
Xylosma congestum	Shiny Xylosma	C/I
** Yucca		
schidigera	Mojave Yucca	D
whipplei	Foothill Yucca	I
GROUNDCOVERS		

** Achillea	Yarrow	All zones
Aptenia cordifolia	Aptenia	C
** Arctostaphylos spp.	Manzanita	C/I/D
** Baccharis		
pilularis	Coyote Bush	C/I/D
** Ceanothus spp.	California Lilac	C/I/M
Cerastium tomentosum	Snow-in-Summer	All zones
Coprosma kirkii	Creeping Coprosma	C/I/D
Cotoneaster spp.	Redberry	All zones
Drosanthemum hispidum	Rosea Ice Plant	C/I
Dudleya		
brittonii	Britton's Chalk Dudleya	C
** pulverulenta	Chalk Dudleya	C/I
virens	Island Live-Forever	C
** Eschscholzia californica	California Poppy	All zones
Euonymus fortunei		
'Carrierei'	Glossy Winter Creeper	M
'Coloratus'	Purple-Leaf Winter Creeper	M
** Ferocactus viridescens	Coast Barrel Cactus	C
Gaillardia grandiflora	Blanket Flower	All zones
Gazania spp.	Gazania	C/I
** Helianthemum spp.	Sunrose	All zones
Lantana spp.	Lantana	C/I/D

Lasthenia		
** californica	Common Goldfields	I
glabrata	Coastal Goldfields	C
** Lupinus spp.	Lupine	C/I/M
Myoporum spp.	Myoporum	C/I
Pyracantha spp.	Firethorn	All zones
Rosmarinus officinalis	Rosemary	C/I/D
Santolina		
chamaecyparissus	Lavender Cotton	All zones
virens	Santolina	All zones
Trifolium frageriferum	O'Connor's Legume	C/I
Verbena		
rigida	Verbena	All zones
** Viguiera laciniata	San Diego Sunflower	C/I
Vinca		
major	Periwinkle	C/I
minor	Dwarf Periwinkle	M
VINES		
Antigonon leptopus	San Miguel Coral Vine	C/I
Distictis buccinatoria	Blood-Red Trumpet Vine	C/I/D
** Keckiella cordifolia	Heart-Leaved Penstemon	C/I
Lonicera		
japonica 'Halliana'	Hall's Honeysuckle	All zones
** subspicata	Chaparral Honeysuckle	C/I

Solanum jasminoides	Potato Vine	C/I/D
PERENNIALS		
Coreopsis		
gigantea	Giant Coreopsis	C
grandiflora	Coreopsis	All zones
** maritima	Sea Dahlia	C
verticillata	Coreopsis	C/I
Heuchera maxima	Island Coral Bells	C/I
** Iris douglasiana	Douglas Iris	C/M
** Iva hayesiana	Poverty Weed	C/I
Kniphofia uvaria	Red-Hot Poker	C/I/M
Lavandula spp.	Lavender	All zones
Limonium californicum		
var. mexicanum	Coastal Statice	C
perezii	Sea Lavender	C/I
Oenothera spp.	Primrose	C/I/M
** Penstemon spp.	Penstemon	C/I/D
Satureja douglasii	Yerba Buena	C/I
Sisyrinchium		
bellum	Blue-Eyed Grass	C/I
californicum	Golden-Eyed Grass	C
Solanum		
xantii	Purple Nightshade	C/I

** Zauschneria		
californica	California Fuschia	C/I
cana	Hoary California Fuschia	C/I
‘Catalina’	Catalina Fuschia	C/I
ANNUALS		
** Lupinus spp.	Lupine	C/I/M

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.

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
*Anthemis cotula****	Mayweed, Stinking Chamolile
Araucaria species	Monkey Puzzle, Norfolk Island Pine
*Arctostaphylos species***	Manzanita
*Artemesia californica***	California Sagebrush
Arundo donax	Giant Cane
Bambusa species	Bamboo
*Brassica species****	Mustard
Callistemon species	Bottlebrush
Calocedrus decurrens	Incense Cedar
*Cardaria draba****	Hoary Cress, Perennial Peppergrass
Ceanothus species	Ceanothus
Cedrus species	Cedar
Chamaecyparis species	False Cypress
Cinnamomum species	Camphor Tree
*Cirsium vulgare****	Wild Artichoke
*Conyza Canadensis****	Horseweed
Coprosma pumila	Prostrate Coprosma
Cortaderia selloana	Pampas Grass
Cotoneaster lacteus	Cotoneaster
Cryptomeria japonica	Japanese Cryptomeria
Cupressocyparis leylandii	Leylandii Cypress
Cupressus forbesii	Tecate Cypress
Cupressus glabra	Arizona Cypress
Cupressus macrocarpa	Monterey Cypress
Cupressus sempervirens	Italian Cypress
*Cynara cardunculus****	Artichoke Thistle
Cytisus species	Scotch Broom, French Broom,etc.
Dodonea viscosa	Hopseed Bush

Elaeagnus angustifolia	Russian Olive
Elaeagnus pungens	Silverberry
*Eriogonum fasciculatum***	Common Buckwheat
Eucalyptus species	Eucalyptus
*Gensita species****	Broom
*Heterotheca grandiflora***	Telegraph Plant
Jubaea chilensis	Chilean Wine Palm
Juniperus species	Junipers
*Lactuca serriola****	Prickly Lettuce
Larix species	Larch
Lonicera japonica	Japanese Honeysuckle
Miscanthus species	Eulalia Grass
*Muehlenbergia species***	Deer Grass
Nicotiana species	Tree Tobacco
Palmae species	Palms
Pennisetum setaceum	Fountain Grass
Picea species	Spruce Trees
*Pickeringia Montana***	Chaparral Pea
Pinus species	Pines
Podocarpus species	Fern Pine
Pseudotsuga menziesii	Douglas Fir
Ricinus communis	Castor Bean
Rosmarinus species	Rosemary
*Salsola australis****	Russian Thistle, Tumbleweed
*Salvia species***	Sage
Schinus molle	California Pepper
Schinus terebinthifolius	Brazilian Pepper
*Silybum marianum****	Milk Thistle
Spartium junceum	Spanish Broom
Tamarix species	Tamarisk
Taxodium species	Cypress
Taxus species	Yew
Thuja species	Arborvitae
Trachycarpus fortunei	Windmill Palm
Tsuga species	Hemlock
*Ulex europea****	Gorse
*Urtica urens***	Burning Nettle
Washingtonia species	California/Mexican Fan Palm

** San Diego County native species
*** Introduced weeds to San Diego County

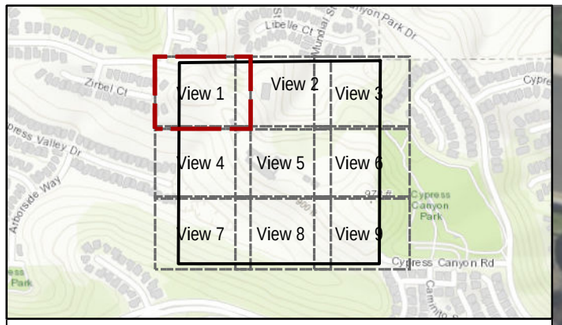
California Department of Forestry and Fire Protection (619) 590-3100
United States Forest Service (619) 674-2901
County Fire Service Coordinator (858) 495-5092
County Farm and Home Advisor (858) 694-2845
Insurance Information Network of California -- Brochures

(www.iinc.org <http://www.iinc.org>) or call (800) 397-1679

REFERENCES

- Combustible Vegetation and Other Flammable Materials Ordinance. Sections 68.401 thru 86.406 of the County of San Diego's Zoning Ordinance.
- California Department of Fish and Game (858) 467-4201
- U.S. Fish and Wildlife Service (760) 431-9440
- Protecting Your Property From Soil Erosion (www.sdcounty.ca.gov/dpw/docs/fire/homeerosion.pdf <http://www.sdcounty.ca.gov/dpw/docs/fire/homeerosion.pdf>)
- Homeowner's Guide for Flood, Debris, and Erosion Control After Fires (www.sdcounty.ca.gov/dpw/docs/fire/AfterFire.pdf <http://www.sdcounty.ca.gov/dpw/docs/fire/AfterFire.pdf>)
- Burn Institute (www.burninstitute.org)

Appendix F
Brush Management Plan



Project Boundary
6' High Fire Wall
Soil Nail Wall
Retaining Wall
BMZ Dimension

Land
Manufactured Slope
Stormwater Basin
Roadway
Multi-Family
Development

Brush Management
Zone 1 (irrigated)
Zone 2 (thinning)
Roadside Zone (20-ft wide unless noted otherwise)
Offsite BMZ Equivalent*

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NOTE: The following are code-exceeding fire protection measures that are being proposed for the structures on the perimeter lots of the development that are unable to provide a full 100 feet of Brush Management:

1) Each of the structures on the perimeter lots will be required to be maintained in a Zone 1 condition that would consist of all irrigated, low fuel landscaping with drought-tolerant, fire resistive plants and paved hardscape around all sides of the structures to the point where the manufactured slopes transition from a 4:1 slope to a 2:1 slope/MHPA line.

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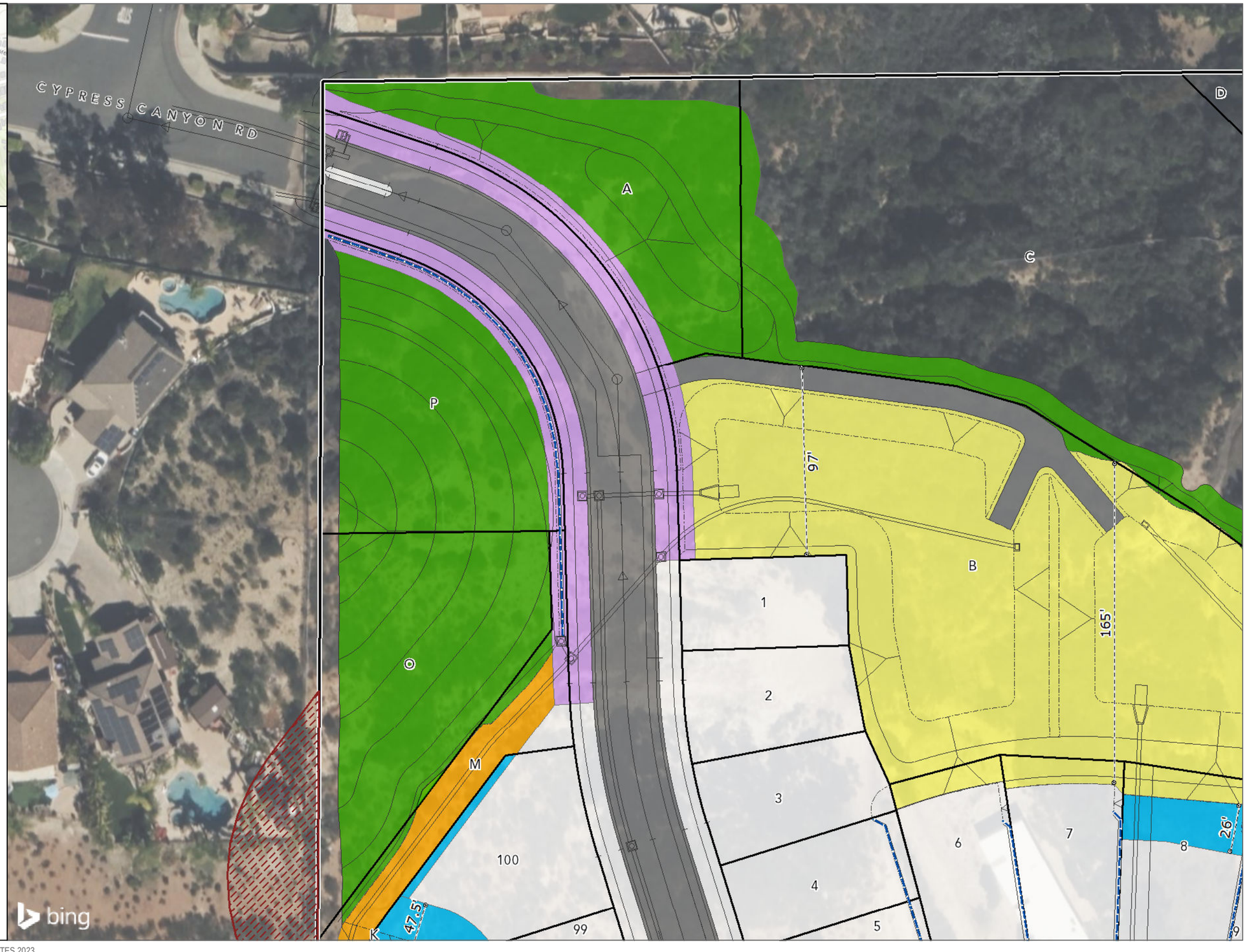


SOURCE: AERIAL- BING MAPPING SERVICE 2022; DEVELOPMENT - HUNSAKER & ASSOCIATES 2023

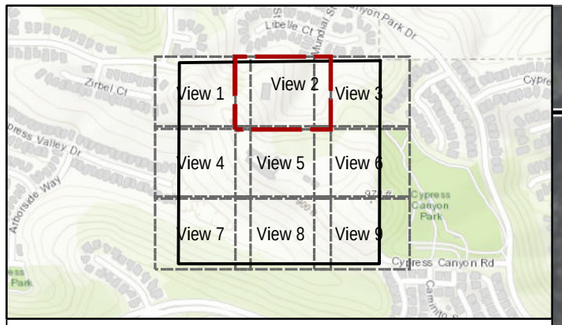
DUDEK

0 25 50 Feet
0 5 10 Meters

APPENDIX F - View 1

Brush Management Plan

Fire Fuel Load Modeling Report for the Renzulli Estates Project



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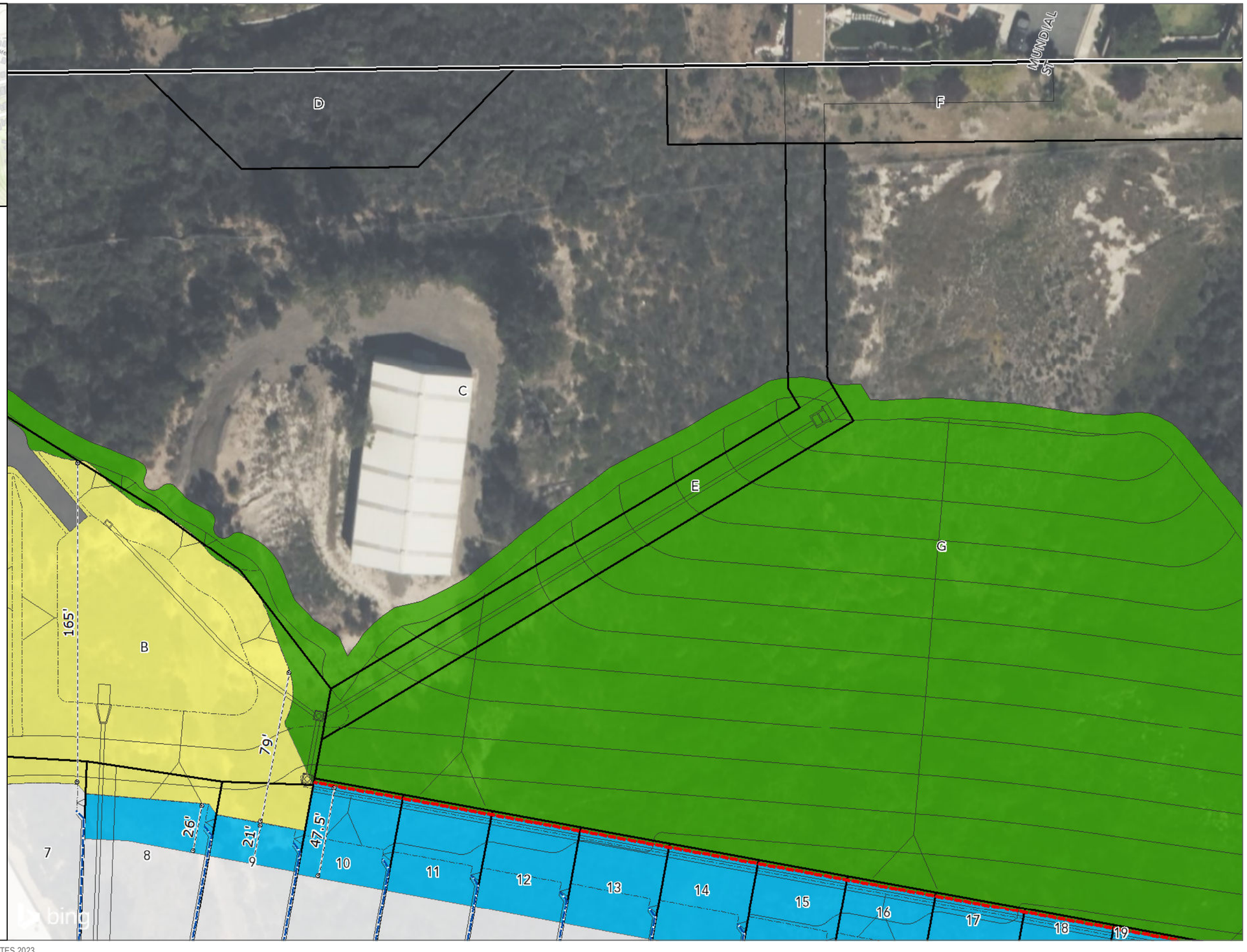

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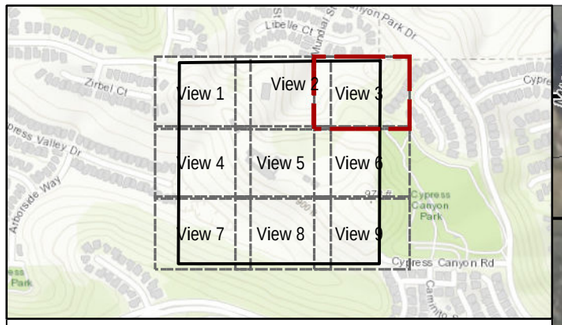
DUDEK

0 25 50 Feet
0 5 10 Meters



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- 6' High Fire Wall
- Soil Nail Wall
- Retaining Wall
- BMZ Dimension

Land
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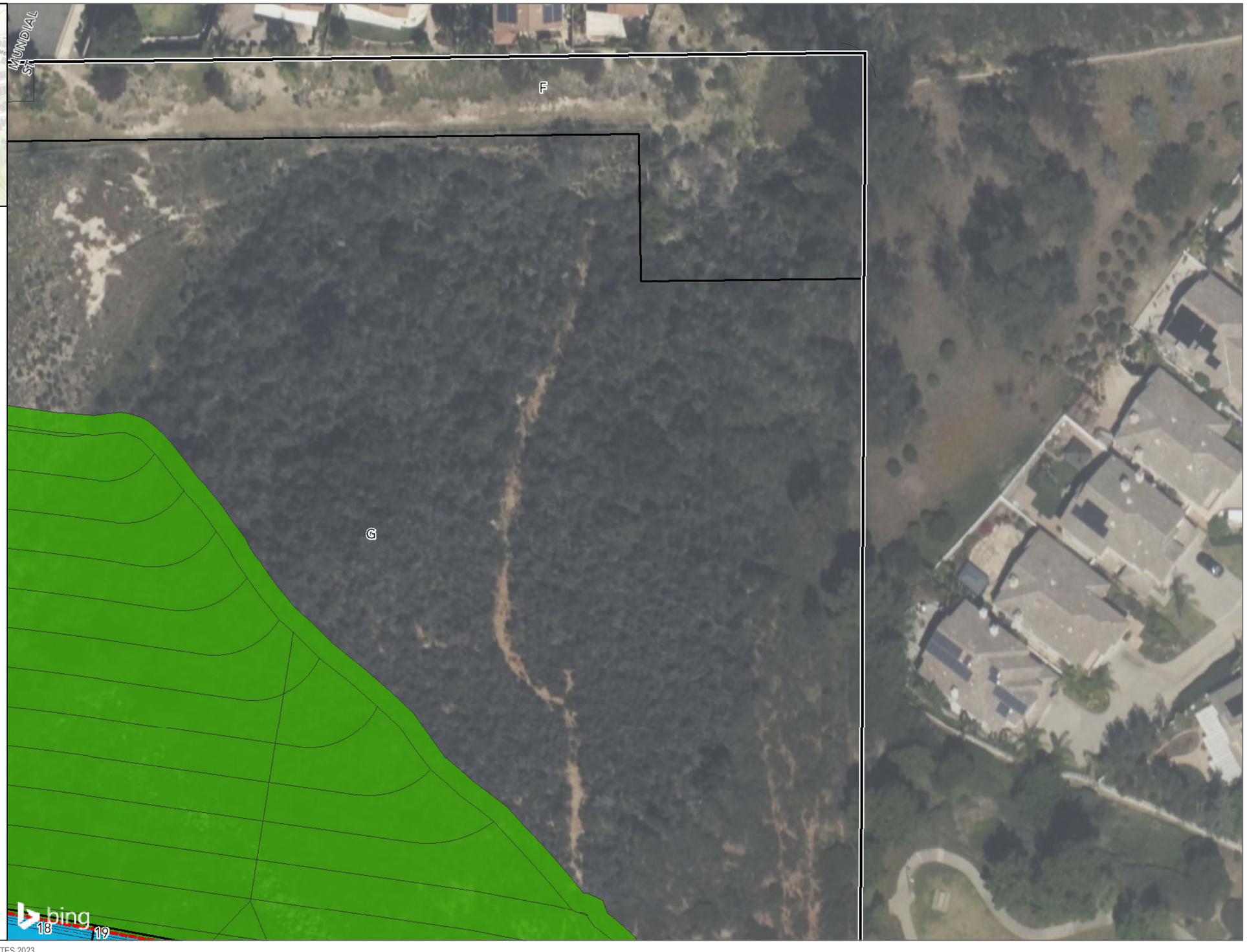

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DUDEK

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APPENDIX F - View 3

Brush Management Plan

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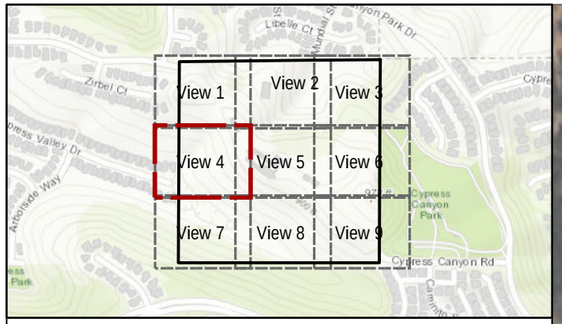

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- BMZ Dimension

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- Development

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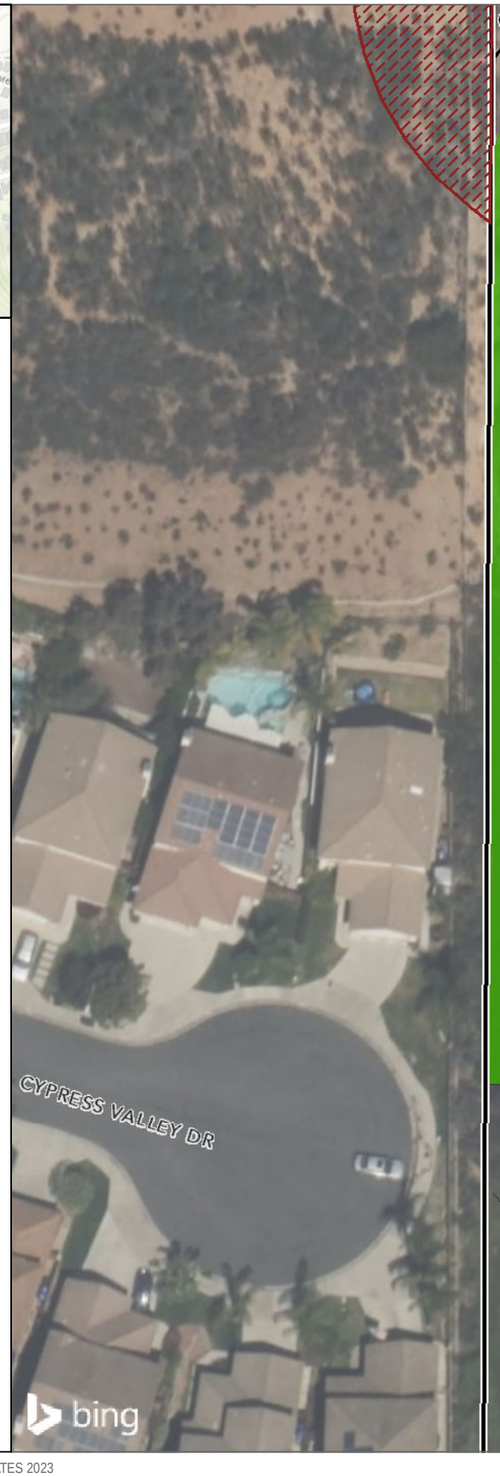

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DUDEK

0 25 50 Feet
0 5 10 Meters

APPENDIX F - View 4

Brush Management Plan

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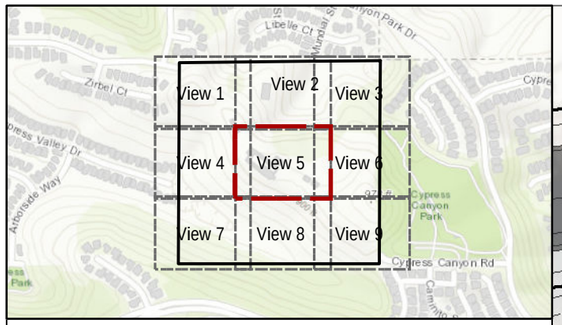

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DUDEK

0 25 50 Feet
0 5 10 Meters

APPENDIX F - View 5

Brush Management Plan

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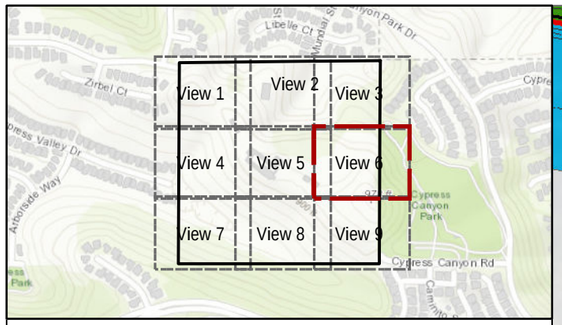

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Land
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- Offsite BMZ Equivalent*

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NOTE: The following are code-exceeding fire protection measures that are being proposed for the structures on the perimeter lots of the development that are unable to provide a full 100 feet of Brush Management:

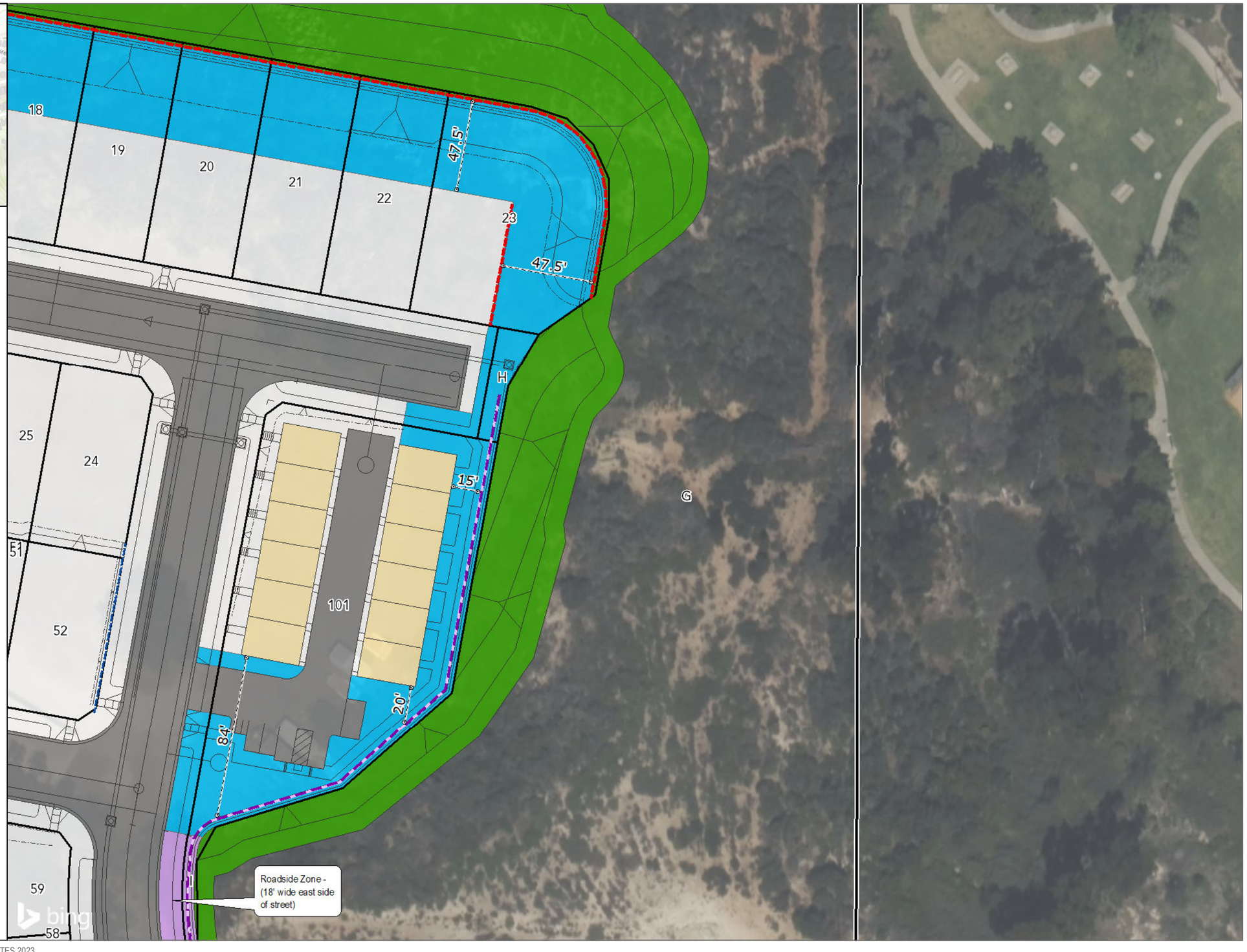
1) Each of the structures on the perimeter lots will be required to be maintained in a Zone 1 condition that would consist of all irrigated, low fuel landscaping with drought-tolerant, fire resistive plants and paved hardscape around all sides of the structures to the point where the manufactured slopes transition from a 4:1 slope to a 2:1 slope/MHPA line.

2) All windows on the exposed side(s) of the perimeter structures will be required to provide exterior glazing in windows (and sliding glass doors) to be dual pane with both panes tempered glass.

3) The exposed side(s) of each of the structures on the perimeter lots are also required to include 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding on the exterior side of the framing from the foundation to the roof for a facade facing the MHPA open space and naturally vegetated areas.

4) Much of the perimeter along the north, south, and east sides of the development require the construction of a 6-foot fire wall near the top of the manufactured slopes due to the inability of these lots being able to achieve the required 100 feet of BMZ.

5) The strip of land between a manufactured slope and the western property boundary of Lot 100 is an HOA maintained open space area. As part of the project, the HOA will grant a Brush Management Zone easement to allow for this area to be maintained as BMZ Zone 2, as this area is not proposed as part of the project's mitigation and therefore, can be incorporated as part of Brush Management Zone 2 requirements.



SOURCE: AERIAL- BING MAPPING SERVICE 2022; DEVELOPMENT - HUNSAKER & ASSOCIATES 2023

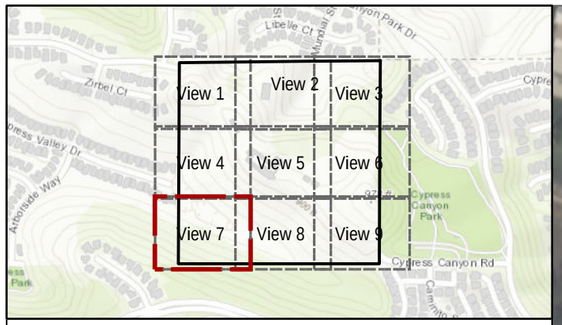
DUDEK

0 25 50 Feet
0 5 10 Meters

APPENDIX F - View 6

Brush Management Plan

Fire Fuel Load Modeling Report for the Renzulli Estates Project



Project Boundary
6' High Fire Wall
Soil Nail Wall
Retaining Wall
BMZ Dimension

Land
Manufactured Slope
Stormwater Basin
Roadway
Multi-Family
Development

Brush Management
Zone 1 (irrigated)
Zone 2 (thinning)
Roadside Zone (20-ft wide unless noted otherwise)
Offsite BMZ Equivalent*

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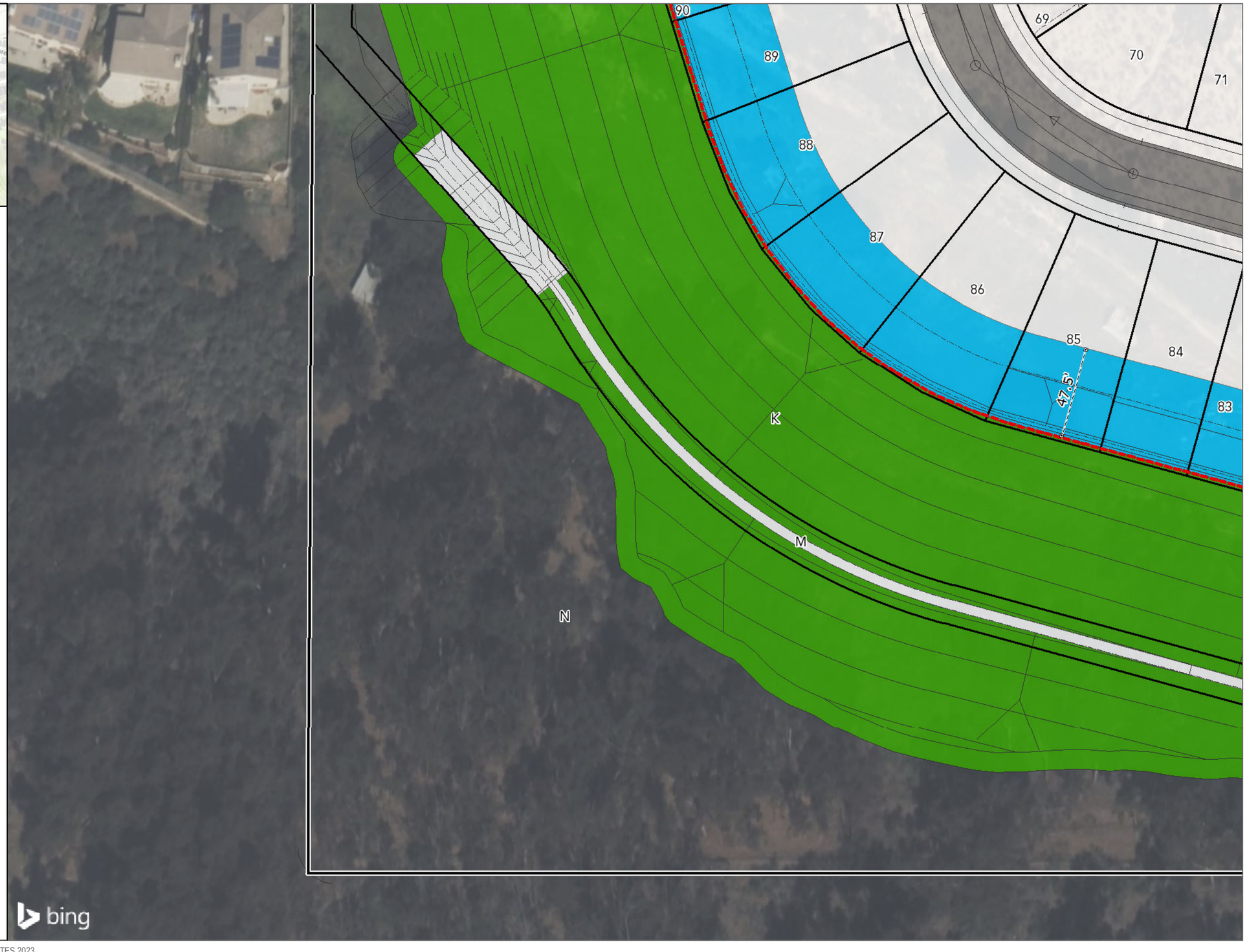


SOURCE: AERIAL- BING MAPPING SERVICE 2022; DEVELOPMENT - HUNSAKER & ASSOCIATES 2023

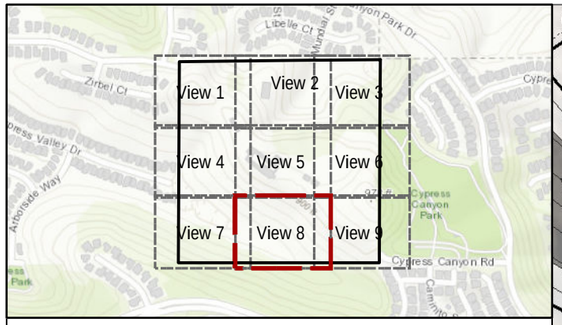
DUDEK

0 25 50 Feet
0 5 10 Meters

APPENDIX F - View 7

Brush Management Plan

Fire Fuel Load Modeling Report for the Renzulli Estates Project



- Project Boundary
- 6' High Fire Wall
- Soil Nail Wall
- Retaining Wall
- BMZ Dimension

Land
- Manufactured Slope
- Stormwater Basin
- Roadway
- Multi-Family
- Development

Brush Management
- Zone 1 (irrigated)
- Zone 2 (thinning)
- Roadside Zone (20-ft wide unless noted otherwise)
- Offsite BMZ Equivalent*

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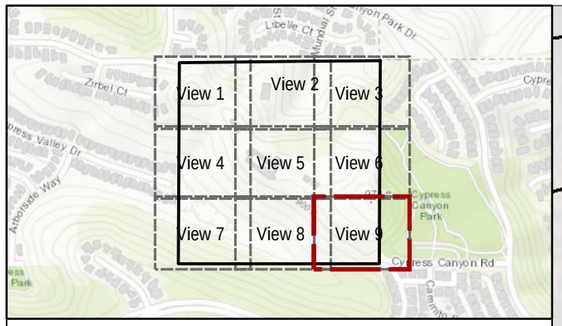
DUDEK

0 25 50 Feet
0 5 10 Meters

APPENDIX F - View 8

Brush Management Plan

Fire Fuel Load Modeling Report for the Renzulli Estates Project



- Project Boundary
- 6' High Fire Wall
- Soil Nail Wall
- Retaining Wall
- BMZ Dimension

Land
- Manufactured Slope
- Stormwater Basin
- Roadway
- Multi-Family
- Development

Brush Management
- Zone 1 (irrigated)
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DUDEK

0 25 50 Feet
0 5 10 Meters

APPENDIX F - View 9

Brush Management Plan

Fire Fuel Load Modeling Report for the Renzulli Estates Project