Appendix H3

Fire Protection Plan

SUNBOW II, PHASE 3 PROJECT
FIRE PROTECTION PLAN

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Acronyms and Abbreviations

Acronym	Definition
AMSL	Above Mean Sea Level
CAL FIRE	California Department of Forestry and Fire Protection
CBC	California Building Code
CFC	California Fire Code
FAHJ	Fire Authority Having Jurisdiction
FMZ	Fuel Modification Zone
FPP	Fire Protection Plan
FRAP	Fire and Resource Assessment Program
GIS	Geographical Information System
HOA	Homeowner's Association
Project	Sunbow II, Phase 3 Project
SANDAG	San Diego Association of Governments
SanGIS	San Diego Geographic Information Source
WUI	Wildland Urban Interface

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Executive Summary

This Fire Protection Plan (FPP) has been prepared for the proposed Sunbow II, Phase 3 Project (Proposed Project) in the City of Chula Vista. This FPP evaluates and identifies the potential fire risk associated with the Proposed Project's land uses and identifies requirements for water supply, fuel modification and defensible space, emergency access, building ignition and fire resistance, fire protection systems, and wildfire emergency pre-planning, among other pertinent fire protection criteria. The purpose of this plan is to generate and memorialize the fire safety requirements of the City of Chula Vista along with project-specific measures based on the site, its intended use, and its fire environment.

This document provides an analysis of the site's fire environment and its potential impact on the Proposed Project as well as the Proposed Project's potential impact on the existing fire protection service in the area. Requirements and recommendations herein are based on site-specific fire environment and Proposed Project characteristics and incorporate input from Chula Vista Fire Department (CVFD), local fire personnel, area fire planning documents, site risk analysis, and standard principles of fire protection planning.

As described in this FPP, the Proposed Project will meet applicable Fire and Building Code requirements or offer alternative materials and methods for complying with the codes. The recommendations and conditions provided herein are also consistent with the lessons learned from After Fire Action Reports from numerous fires occurring over the last roughly 20 years, including the 2003, 2007, 2014, and 2017 San Diego County Fires.

As determined during the analysis of this site and its fire environment, the Proposed Project multi-family residential development, in its current, undeveloped condition, is considered to include characteristics that, under favorable conditions, have the potential to facilitate fire spread. Under extreme conditions, wildfires on portions of the site could burn erratically and aggressively and result in significant ember production. Once the Proposed Project is built, the Proposed Project's on-site fire potential will be lower than its current condition due to conversion of areas of wildland fuels to managed landscapes, extensive fuel modification areas, improved accessibility to firefighting personnel and equipment, and new structures built to the latest ignition resistant codes.

It is important to note that the fire safety requirements that will be implemented on this site, including ignition resistant construction standards, along with requirements for water supply, fire apparatus access, fuel modification and defensible space, interior fire sprinklers and fast fire response travel times were integrated into the fire and building code requirements based on results of post-fire assessments, similar to the After Action Reports that are now prepared after large fire events. When it became clear that specifics of how homes were built, how fire and embers ignited homes, what effects fuel modification had on structure ignition, how fast firefighters could respond, and how much (and how reliable) water was available, were critically important to structure survivability, the Fire and Building codes were revised appropriately. These fire safety measures were adopted into the 2007 Fire and Building Codes and have been retained and enhanced in code updates since then.

The Proposed Project includes the subdivision of an approximately 135.7-acre parcel into 720 multi-family residential units on 44.2 acres. The Project Site is within a wildland urban interface (WUI) location that is in an area statutorily designated a Local Responsibility Area Non-Fire Hazard Severity Zone by the City and California Department of Forestry and Fire Protection (CAL FIRE). The Project Site is within a Supplemental Fire Hazard Zone as designated by the City. Fire hazard designations are based on topography, vegetation, and weather, amongst other factors with more hazardous sites including steep terrain, unmaintained fuels/vegetation, and WUI locations. The Project Site is currently undeveloped and in a semi-disturbed condition, including primarily non-native grassland

with smaller representations of native grassland and coastal sage scrub. The Proposed Project is located adjacent to open space areas to the north and west, a landfill to the south, planned development to the east and a narrow strip of open space and a residential development to the north. Terrain on site and within the vicinity of the Proposed Project is characterized by gentle slopes, with gradients reaching up to 8%. The area, like all of San Diego County, is subject to seasonal weather conditions that can heighten the likelihood of fire ignition and spread, and, considering the site's terrain and vegetation, may result in fast moving and moderate-intensity wildfire.

Access to the Proposed Project site is from two planned points from Olympic Parkway, east of Brandywine Avenue. The entire site has been designed with fire protection as a key objective. The site improvements are designed to facilitate emergency apparatus and personnel access throughout the site. Driveway and road improvements with fire engine turnouts and turnarounds provide access to within 150 feet of all sides of every building. Residential water availability and flow will be consistent with City requirements including fire flow and duration. These features along with the ignition resistance of all buildings, the automatic interior fire sprinklers, and the pre-planning, training and resident awareness will assist responding firefighters through prevention, protection and suppression capabilities. As detailed in this FPP, the Proposed Project site's fire protection system will include a redundant layering of protection methods that have proven to reduce overall fire risk. The requirements and recommendations included herein are performance oriented and site specific based on its unique characteristics rather than a prescriptive, one-size-fits-all approach. The fire protection system is designed to reduce the wildfire risk to each property, to minimize risks associated with typical uses, and aid the responding firefighters during an emergency. No singular measure is intended to be relied upon for the Proposed Projects' fire protection, but rather, a system of fire protection measures, methods, and features combine to result in enhanced fire safety, reduced fire potential, and a prepared community.

Early evacuation for any type of wildfire emergency near the Project Site is the preferred method of providing for resident safety, consistent with the City's current approach. As such, each property owner will be individually responsible to adopt, practice, and implement a "Ready, Set, Go!" (International Fire Chiefs Association 2013) approach to site evacuation. The "Ready, Set, Go!" concept is widely known and encouraged by the state of California and most fire agencies. Pre-planning for emergencies, including wildfire emergencies, focuses on being prepared, having a well-defined plan, minimizing potential for errors, maintaining the site's fire protection systems, and implementing a conservative (evacuate as early as possible) approach to evacuation and site uses during periods of fire weather extremes.

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1 Introduction

This Fire Protection Plan (FPP) has been prepared for the proposed Sunbow II, Phase 3 Project (Proposed Project) in the City of Chula Vista (City), California. This FPP provides specific measures for fire protection which meet or provide equivalent protection as 2019 California Fire and ignition-resistant Building Codes or the most current version in place when homes are constructed. It also identifies the fire risk associated with proposed land uses, and identifies requirements for fuel modification, building design and construction, and other pertinent development infrastructure criteria for fire protection. These requirements are based on site-specific characteristics and incorporate input from the Proposed Project's developer/applicant, planners, engineers, and architects, fire protection planners, urban foresters, as well as the City.

As part of the assessment, the plan has considered the property location, topography, geology, combustible vegetation (fuel types), climatic conditions, fire history and the proposed land use. The plan also addresses water supply, access (including secondary emergency access), structural ignitability and ignition resistive building features, fire protection systems and equipment, impacts to existing emergency services, defensible space, and vegetation management. The plan identifies fuel modification zones and recommends the types and methods of treatment that are designed to protect the Proposed Project's homeowners and its essential infrastructure. The FPP recommends measures that the property owner, developer, and builders will implement to reduce the probability of ignition of structures throughout the area addressed by the plan.

The following tasks were performed in the completion of this plan:

- Gather site specific climate, terrain, and fuel data;
- Collect site photographs;
- Process and analyze the data using the latest GIS technology;
- Predict fire behavior using industry standard, scientifically based fire behavior models;
- Analyze and guide design of proposed infrastructure;
- Analyze the existing emergency response capabilities;
- Assess the risk associated with the Proposed Project and the Project Site; and
- Prepare this FPP detailing how fire risk will be mitigated through a system of fuel modification, homeowner education, and structural ignition resistance enhancements.

Field observations were utilized to augment existing digital site data in generating the fire behavior models and formulating the recommendations presented in this FPP. Refer to Appendix A for site photographs of existing fuel types.

1.1 Applicable Codes and Existing Regulations

This FPP demonstrates compliance with California Fire and Building Codes requirements, namely Title 15 – Building and Construction, Sections 15.34 (Fire Zones), 15.36 (Fire Code adopting the 2019 California Fire Code), and 15.38 (Urban Wildland Interface Code adopting the 2000 Urban Wildland Interface Code) and Section 15.08 adopting the 2019 California Building Code, specifically, Chapter 7A for development in wildland urban interface (WUI) areas. Additionally, this FPP is consistent with the Chula Vista Fire Department's (CVFD) Fire Prevention Division's Fire Engineering Safety Detail and Specification Sheets. Lastly, this FPP conforms to the City's Multiple Species Conservation Program (MSCP) Subarea Plan

Brush Management Guidelines and Resource Management Plan Preserve Edge Requirements. The Proposed Project will comply with the applicable adopted codes in place at the time of construction.

The entirety of the Proposed Project lies within the local responsibility area (LRA) Non- Fire Hazard Severity Zone, as designated by the CVFD and California Department of Forestry and Fire Protection (CAL FIRE). Therefore, the requirements in Chapter 7A of the CBC would not typically be implemented for this development. However, the proposed fire protection measures for the Proposed Project will meet or under certain circumstances, exceed all applicable fire and building codes requirements.

1.2 Proposed Project Summary

1.2.1 Location

As depicted in Figure 1, Proposed Project Location Map, the Project Site is located in the Sunbow II, Phase 3 Section Planning Area of the City, approximately 11 miles southeast of downtown San Diego and 4.2 miles north of the U.S./Mexico International border. The Project Site consists of two parcels: Assessor Parcel Numbers (APN): 644-011-06-00 on western half and 644-020-11-00 on eastern half of the property. The 135.7-acre property is located adjacent to Poggi Canyon approximately 0,5 miles east of Interstate 805, and south of Olympic Parkway between Brandywine Avenue and Heritage Road. The Project Site is located in Sections 17 and 18, Township 18 South, Range 1 West on the U.S. Geographical Survey (USGS), 7.5-minute Imperial Beach quadrangle map.

1.2.2 Proposed Project Description

Sunbow II, Phase 3 Sectional Planning Area (SPA) Plan Amendment encompasses approximately 135.7[1] acres (Project Area) that includes a 67.5-acre development area comprised of 44.2 acres of residential, a 0.9-acre Community Purpose Facility (CPF) site, 5.9 acres of public streets and 16.5 of manufactured slopes/basins. Approximately 4.3 acres of conserved Poggi Creek Easement areas, a 0.3-acre of conserved wetland resource area and 63.6[2] acres of adjacent MSCP Preserve area are also within the Project Area.

The Proposed Project's residential land use includes four unique multi-family attached residential product types with 15 unique floor plans, ranging in square footage from approximately 1,100 to 2,050 square feet in two- and three-story units. Each home includes a two-car garage and two to four bedrooms.

The Proposed Project includes a Chula Vista General Plan Amendment, Sunbow General Development Plan Amendment, Sunbow II SPA Plan Amendment, a rezone, and a Tentative Map. The Proposed Project also includes a Chula Vista MSCP Boundary Adjustment to implement minor adjustments to the development limits and the adjacent MSCP Preserve areas that would result in a 0.09-acre increase to MSCP Preserve Area and an MSCP Minor Amendment to address off-site grading adjacent to the southwestern boundary of the development area.

[1] Acreages are rounded to the nearest 1/10th acre and may vary slightly from calculated total.
[2] The Proposed MSCP area includes approximately 1.31 acres of "Mapping Correction Area" and approximately 1.12 acres of MSCP Allowable Use (Basin – Future Facility).

Table 1. Sunbow II, Phase 3 Site Utilization Table

Sunbow II, Phase 3	Land Use District	Acres[1]	Units	Density
Multi-Family Residential				
R-1	RM	8.5	131	15.4
R-2	RM	4.6	73	15.8
R-3	RM	8.1	108	13.3
R-4	RM	8.2	118	14.4
R-5	RM	7.1	104	14.7
R-6	RC	7.6	184	24.1
Subtotal Residential		*44.2*	*718*	*16.3*
Other				
Community Purpose Facility	CPF	0.9		
MSCP Preserve Conserved Open Space (OS-1,2, 3, and OS-9b)	OSP	63.6		
Poggi Creek Easement Conserved Area (OS-4, 5, 6a and 6b)	OS	4.3		
Manufactured Slopes/Basins (OS-7, 8, 9a, 10 - 13)	OS	16.5		
Conserved Wetland Resource Area (OS-14)	OS	0.3		
Public Streets	Circulation	5.9		
Subtotal Other		*91.5*		
Total		**135.7**	**718**	**16.3**

[1] Acreages rounded to nearest 1/10th acre and may vary slightly from the calculated total.

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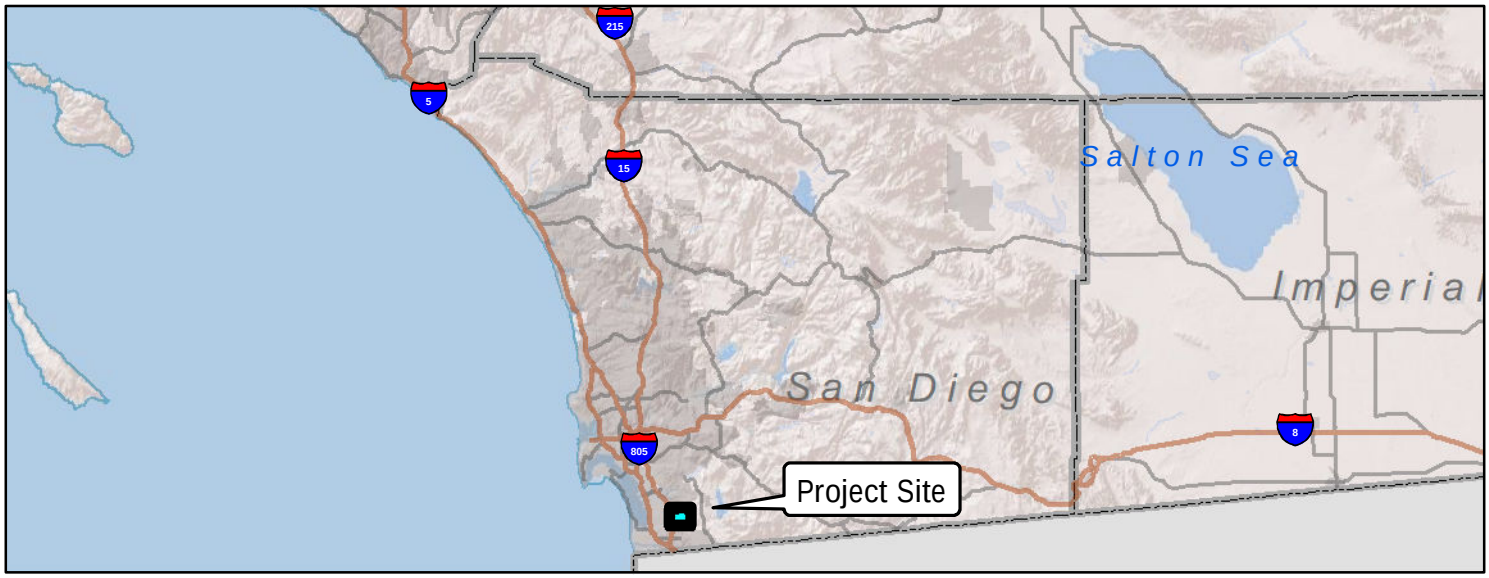

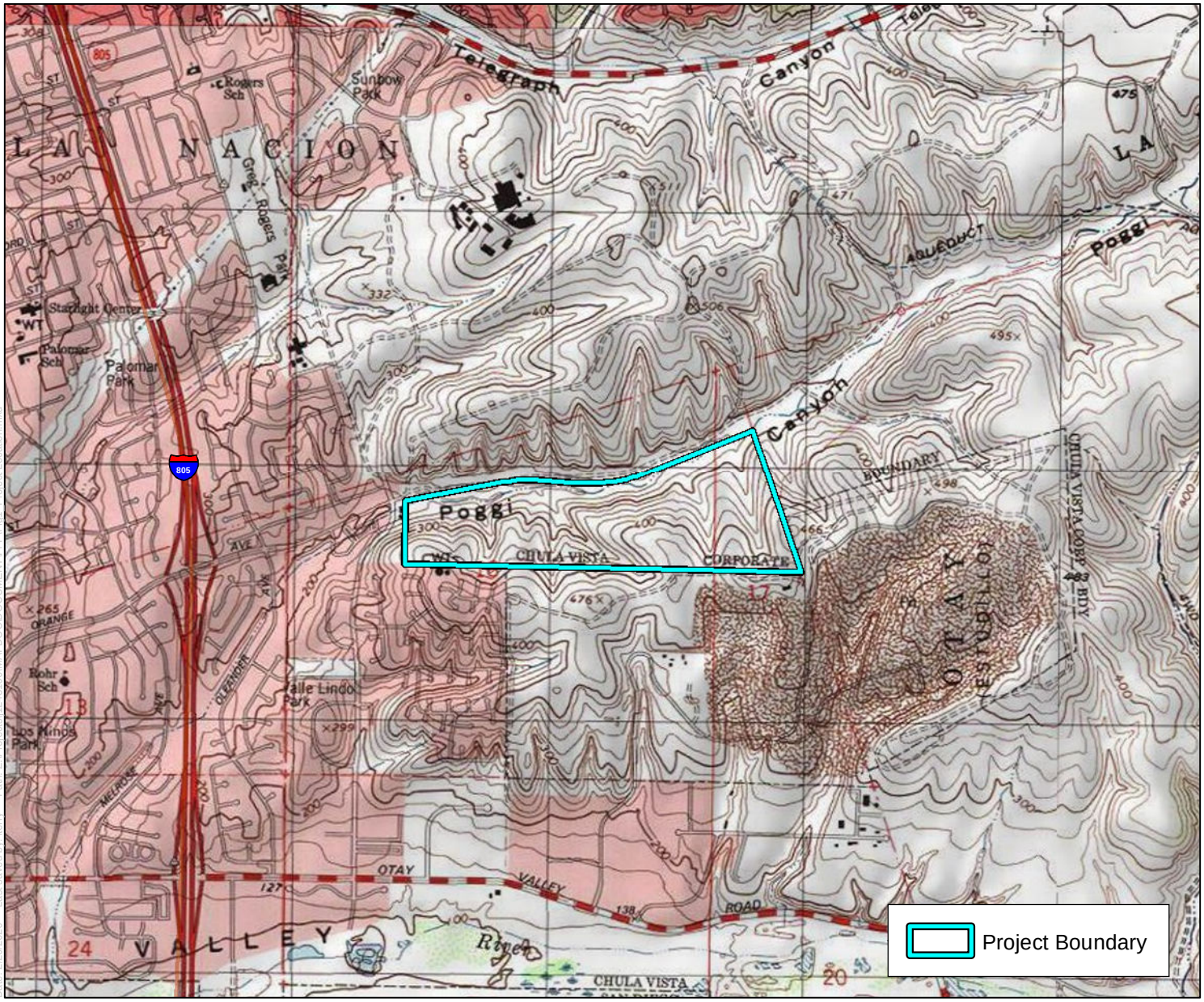

SOURCE: USGS 7.5 Minute Series, Imperial Beach Quadrangle
Township 18 South, Range 1 West, Sections 17 & 18

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0 1,000 2,000 Feet

FIGURE 1

Project Location

Fire Protection Plan for the Sunbow II, Phase 3 Project

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SOURCE: HUNSAKER & ASSOCIATES, INC. 2020

FIGURE 2
Sunbow PA 23 Site Plan
Fire Protection Plan for the Sunbow PA 23 Project

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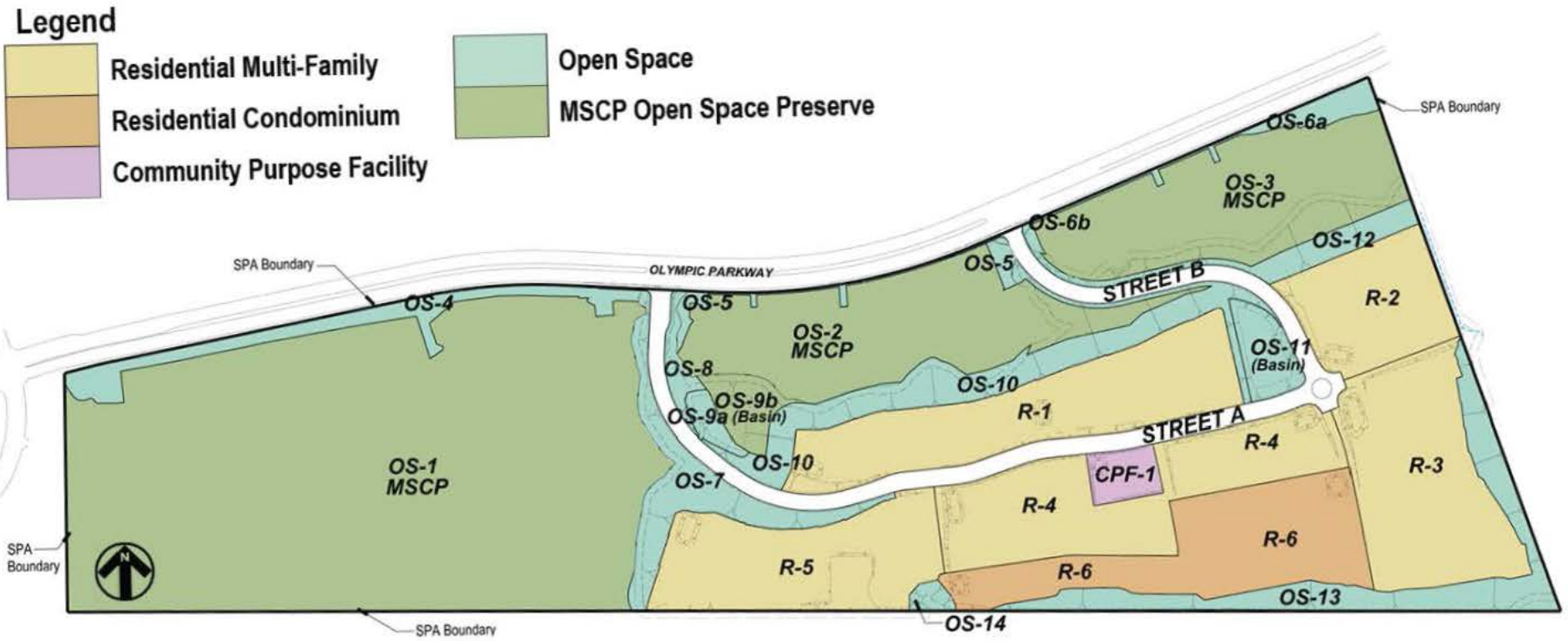

SOURCE: HUNSAKER & ASSOCIATES, INC. 2020

FIGURE 3

Sunbow II, Phase 3 Project Land Use Plan (revised)

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2 Proposed Project Site Risk Analysis

2.1 Environmental Setting and Field Assessment

Dudek conducted a site evaluation on January 22, 2020, in order to acquire site information, document existing site conditions, and to determine potential actions for addressing the protection of the Proposed Project's future structures. While on the site, Dudek's Fire Planner assessed the area's topography, natural vegetation and fuel loading, surrounding land use and general susceptibility to wildfire. Among the field tasks that were completed included:

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

Field observations were utilized to augment existing site data in generating the fire behavior models and formulating the recommendations detailed in this report.

2.2 Site Characteristics and Fire Environment

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

2.2.1 Topography

The Project Site is situated at the south side of Poggi Canyon, a narrow canyon generally trending northeast toward the southwest. The general topography at the property is moderately hilly and slopes downward to the north towards Poggi Creek and the south side of Olympic Parkway. Elevations range from approximately 455 feet above mean sea level (amsl) at the southeast property boundary to 228 feet amsl in the northwestern end of the property. Topographic features that

may present a fire spread facilitator are the narrow sub-drainages that trend south to north which may serve to funnel winds. From a regional perspective, the northeast to southwest alignment of Poggi Canyon is conducive to channeling and funneling wind towards the Project Site.

2.2.2 Existing/Vicinity Land Use

The Proposed Project is located in a predominately residential area of the City of Chula Vista. It is bounded to the north by an open space preserve, which runs along the southern side of Olympic Parkway. North of Olympic Parkway is a single-family residential community. The future Otay Ranch Village 2 development is immediately to the east and the Otay Landfill and City of Chula Vista open space/future community park to the south-southeast. Both the City of Chula Vista and the County of San Diego own undeveloped land to the south of the Project Site. Brandywine Avenue and existing residential communities border the western and southwestern edges, respectively, of the property.

2.2.3 Climate

Throughout Southern California, including at the Project Site, climate has a large influence on fire risk. Local climate is typical of a Mediterranean area, with warm, dry summers and wetter winters. Precipitation typically occurs between December and March. The prevailing wind is an on-shore flow from the Pacific Ocean, which is approximately 6.6 miles to the west, Santa Ana winds, which typically occur in the fall, from the northeast can gust to 50 miles per hour (mph) or higher. Drying vegetation (fuel moisture of less than 5% for 1-hour fuels is possible) during the summer months becomes fuel available to advancing flames should an ignition occur. Extreme conditions, used in fire modeling for this site, include 92°F temperatures in summer and winds of up to 50 mph during the fall. Relative humidity of 12% or less is possible during fire season. The site is within the coastal influence area and would be expected to, on average, include higher humidity and resulting plant moisture, than more inland areas.

2.2.4 Vegetation (Fuels)

The Proposed Project site is currently undeveloped land with four native or naturalized vegetation communities and one land cover type that were mapped on the site by Merkel & Associates, Inc. (2020). These vegetation and land cover types were verified by Dudek fire protection planners and assigned a fuel model for use during site fire behavior modeling as discussed in Section 3. The acreage of each on-site vegetation community or land cover type is provided in Table 2. There are three pre-dominant vegetation types mapped on the property (Figure 4), including Diegan coastal sage scrub, native grasslands, and non-native grasslands which encompass approximately 22%, 25%, and 46% of the property, respectively. Smaller areas of wetlands/non-wetlands waters, disturbed habitat, and the Poggi Creek Maintenance area are also present on the site. More detailed information regarding the site's plant communities is provided in the Biological Resources Technical Report for the Proposed Project (Merkel & Associates, Inc. 2020). Representative photographs of the site's fuel beds are presented in Appendix A.

The area proposed for development and within the project grading limits will be converted to roads, structures, and landscaped vegetation following project completion. Any native vegetative fuels within fuel modification zones will be modified as a result of development, altering their current structure and species composition. Areas outside of proposed development and fuel modification zones will continue to be grassland-sage scrub fuels.

Table 2. Proposed Project Vegetation Communities and Land Cover Types

Vegetation Community or Land Cover Type	Total Acres	Inside Preserve (Acres)	Outside Preserve (Acres)
Diegan Coastal Sage Scrub	29.8	22.6	7.2
Native Grassland	33.6	27.4	6.2
Non-native Grassland	62.2	4.4	57.8
Non-native Vegetation	0.4	0.3	0.1
Southern Willow Scrub (including Seep)	1.3	0.4	0.9
Mulefat Scrub	<0.1	<0.1	0.0
Coastal and Valley Freshwater Marsh	8.4	7.0	1.4
Total	**135.7**	**62.1**	**73.6**

Source: Merkel & Associates, Inc. 2020

2.2.5 Vegetation Dynamics

The vegetation described above translates to fuel models used for fire behavior modeling, discussed in Chapter 3 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (bark thickness, leaf size, branching patterns), and overall fuel loading. For example, the native shrub species that compose the chaparral plant communities on site are considered to exhibit higher potential hazard (higher intensity heat and flame length) than grass dominated plant communities (fast moving, but lower intensity) if ignition occurred. The corresponding fuel models for each of these vegetation types are designed to capture these differences. Additionally, vegetative cover influences fire suppression efforts through its effect on fire behavior. For example, while fires burning in grasslands may exhibit lower flame lengths and heat outputs than those burning in native shrub habitats, fire spread rates in grasslands are often more rapid.

As described, vegetation plays a significant role in fire behavior, and is an important component to the fire behavior models discussed in this report. A critical factor to consider is the dynamic nature of vegetation communities. Fire presence and absence at varying cycles or regimes disrupts plant succession, setting plant communities to an earlier state where less fuel is present for a period of time as the plant community begins its succession again. In summary, high-frequency fires tend to convert shrublands to grasslands or maintain grasslands, and fire exclusion tends to convert grasslands to shrublands over time as shrubs sprout back or establish and are not disturbed by repeated fires.

In general, biomass and associated fuel loading will increase over time, assuming that disturbance (e.g., fire, grazing, or farming) or fuel reduction efforts are not diligently implemented, which would not occur on this site due to the funded maintenance entity. It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed FMZs for the Project Site. The FMZs will consist of irrigated and maintained landscapes that will be subject to regular “disturbance” in the form of maintenance and will not be allowed to accumulate excessive biomass over time, which results in reduced fire ignition, spread rates, and intensity. In contrast, conditions outside the fuel modification zones, where the wildfire threat will exist post-development, are classified as medium to heavy fuel loads due to the maturity of the vegetation, which haven’t burned for many decades.

2.2.6 Fire History

Fire history is an important component of FPPs. Fire history information can provide an understanding of fire frequency, fire type, most vulnerable areas, and significant ignition sources. In turn, this understanding of why fires occur in an area and how they typically behave can be used for pre-planning and designing defensible communities. Figure 4 Fire History Map provides a graphical representation of the quantity of times the landscape has burned in the area. As presented on the fire history exhibit, there have been six wildfires recorded by California Department of Forestry and Fire Protection (CAL FIRE) in their Fire and Resource Assessment Program (FRAP) database (CAL FIRE FRAP 2019)[3] within 3 miles of the property. Table 3 summarizes the fire history for the area within three miles of the site. CAL FIRE FRAP summarizes fire perimeter data dating to the late 1800s, but which is incomplete due to the fact that it only includes fires over 10 acres in size and has incomplete perimeter data, especially for the first half of the 20th century (Syphard and Keeley 2016). However, the data does provide a summary of recorded fires and can be used to show whether large fires have occurred in the Proposed Project area, which indicates whether they may be possible in the future.

As presented in Figure 4, the Project Site has been subject to one wildfire during the recorded fire history period. The Maxwell Fire in 1984 burned along the southern portion of the property. In addition to the one fire burning on the property, Figure 4 illustrates that the majority of other large wildfires historically start east of the Proposed Project area and are typically contained east of Lower Otay Lake.

The lack of recent fire history does not indicate that a fire cannot occur in the vegetation that would be adjacent to the Proposed Project. It is expected that fires have not consistently spread into the Proposed Project area due to three factors: 1) the position of the surrounding urban developments which ae newer, ignition resistant construction, 2) the position of lower Otay Lake to the east, presenting a very wide firebreak; and 3) the effective wildland fire fighting capabilities of Chula Vista Fire Department.

Table 3. Historical Wildfires within Three Miles of the Sunbow II, Phase 3 Project Site

Fire Year*	Fire Name	Total Area Burned (acres)
1945	Un-named	1,022
1969	Telegraph	371
1979	Un-named	51
1979	Un-named	212
1980	Assist #14	39
1984	Maxwell	43

Source: CAL FIRE FRAP 2019

[3] Based on polygon Geographical Information System (GIS) data from CAL FIRE's Fire and Resource FRAP, which includes data from CAL FIRE, USDA Forest Service Region 5, Bureau of Land Management, National Park Service, contract counties and other agencies. The data set is a comprehensive fire perimeter GIS layer for public and private lands throughout the state and covers fires 10 acres and greater between 1914–2019.

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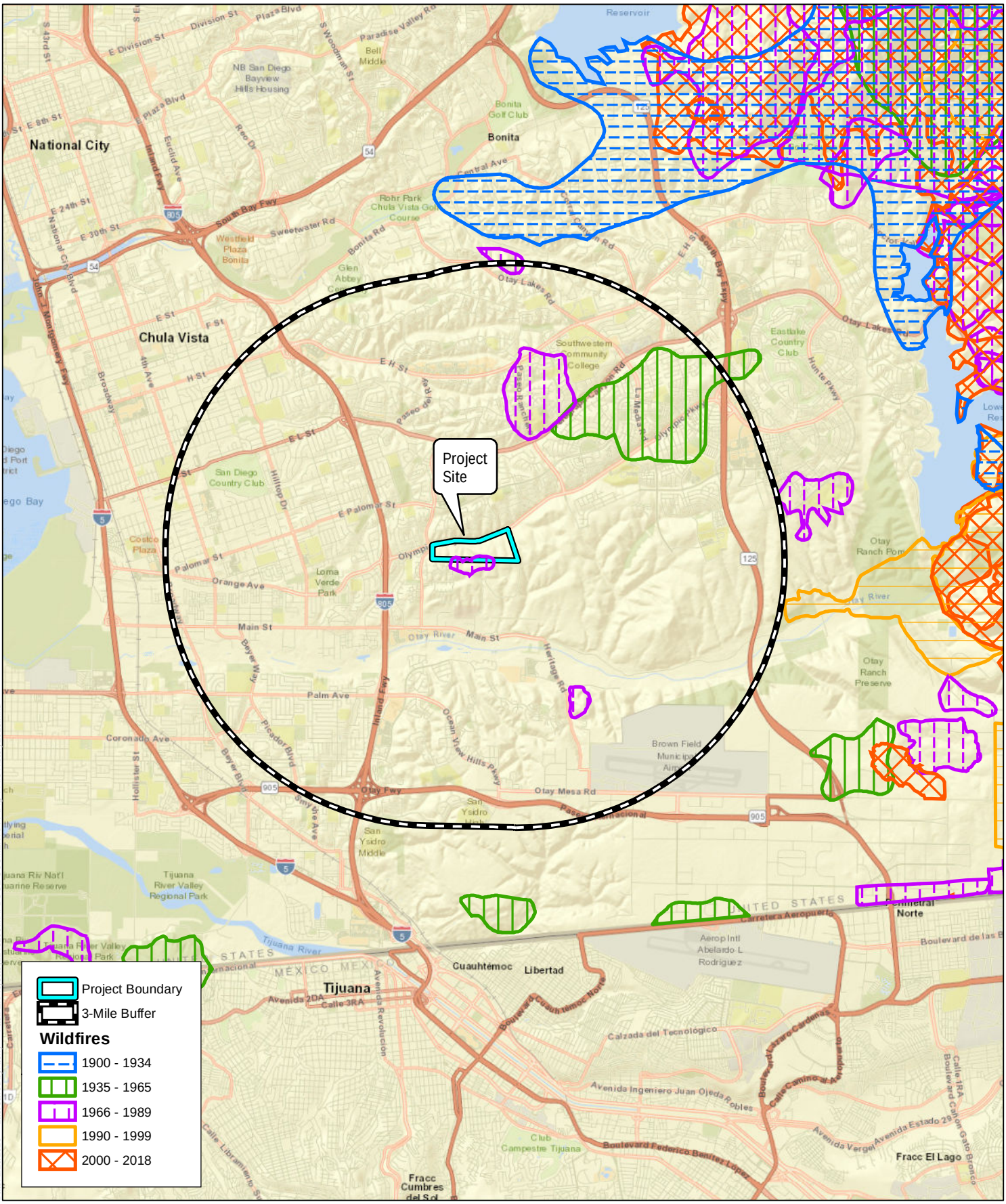

SOURCE: AERIAL- BING MAPPING SERVICE; FIRE DATA-CALFIRE 2018

FIGURE 4

Fire History Map

Fire Protection Plan for the Sunbow II, Phase 3 Project

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3 Anticipated Fire Behavior

3.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of fire that would be expected on and adjacent to the Project Site given characteristic site features such as topography, vegetation, and weather. BehavePlus software package version 5.5 (Andres, Bevins, and Seli 2008), which is the industry standard, was utilized to analyze potential fire behavior for the northern, eastern, southern, and western edges of the proposed Project Site with assumptions made for pre- and post-project slope and fuels conditions. Results are provided below and a more detailed presentation of the BehavePlus analysis, including fuel moisture and weather input variables, is provided in Appendix B.

3.2 Fire Behavior Modeling Analysis

An analysis utilizing the BehavePlus software package was conducted to evaluate fire behavior variables and to objectively predict flame lengths, intensities, and spread rates for four modeling scenarios. These fire scenarios incorporated observed fuel types representing the dominant on-site and off-site vegetation on vacant land to the north, east, south and west, in addition to measured slope gradients, and wind and fuel moisture values derived from Remote Automated Weather Stations (RAWs) weather data sets (San Miguel, ID No. 045737)) for both the 50th percentile weather (summer, on-shore winds) and the 97th percentile weather (fall, off-shore winds). Modeling scenario locations were selected to better understand different fire behavior that may be experienced on or adjacent the site.

Vegetation types, which were derived from the field assessment for the Project Site, were classified into a fuel model. Fuel Models are simply tools to help fire experts realistically estimate fire behavior for a vegetation type. Fuel models are selected by their vegetation type; fuel stratum most likely to carry the fire; and depth and compactness of the fuels. Fire behavior modeling was conducted for vegetative types that surround the proposed development. Fuel models were selected from *Standard Fire Behavior Fuel Models: a Comprehensive Set for Use with Rothermel's Surface Fire Spread Model* (Scott and Burgan 2005). Fuel models were also assigned to the perimeter fuel management areas to illustrate post-project fire behavior changes. Based on the anticipated pre- and post-project vegetation conditions, three different fuel models were used in the fire behavior modeling effort presented herein. Fuel model attributes are summarized in Table 4.

Table 4. Fuel Model Characteristics

Fuel Model	Description	Location	Fuel Bed Depth (Feet)
FM8	Irrigated, landscapes	Fuel Modification Zone 1	<3.0
Gr1	cut grasses less than 6 inches in height	Fuel Modification Zone 2	<0.5
Gr4	Moderate Load, Dry Climate Grasses	Throughout property (to be removed from development area)	<2.0
Sh1	50% thinning of shrubs	Fuel Modification Zone 2	<3.0
Sh5	Diegan Coastal Sage Scrub (untreated fuel bed)	Throughout property (to be removed from development area)	>4.0

The results of fire behavior modeling analysis for pre- and post-project conditions are presented in Tables 5 and 6, respectively. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 5, BehavePlus Fire Behavior Analysis exhibit.

Table 5. BehavePlus Fire Behavior Modeling Results - Existing Conditions

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph[1])	Spotting Distance[2] (miles)
Scenario 1: grasslands-sage scrub; east facing , 15% slope, 50 mph offshore winds				
Fuel Model Gr4	33.4	11,616	14.0	2.0
Fuel Model Sh5	41.3	18,451	6.2	2.3
Scenario 2: grasslands-scattered shrubs; south-facing, 7% slope, 50 mph offshore winds				
Fuel Model Gr4	33.3	11,575	14.0	2.0
Scenario 3: sage scrub-grasslands; north-facing, 15% slope, 12 mph onshore winds				
Fuel Model Gr4	8.1	540	0.82	0.3
Fuel Model Sh5	11.7	1,190	0.54	0.4
Scenario 4: willow-sage scrub (5% slope) and grasslands, on north-facing slopes, 34% slope, 12 mph onshore winds				
Fuel Model Gr4	8.1	531	0.53	0.3
Fuel Model Sh5	11.5	1,155	0.80	0.4

Notes (Tables 5 and 6):
1 mph = miles per hour
2 Spotting distance from a wind driven surface fire.

Table 6. BehavePlus Fire Behavior Modeling Results - Post-Project Conditions

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph[1])	Spotting Distance (miles[2])
Scenario 1: Fuel treatments on east-facing, 15% slope, 50 mph offshore winds				
Fuel modification zone 1 (FM8)	2.6	45	0.13	0.3
Fuel modification zone 2 (Sh1)	9.5	760	1.3	0.8
Scenario 2: Fuel treatments on south-facing, 7% slope, 50 mph offshore winds				
Fuel modification zone 1 (FM8)	2.6	45	0.13	0.3
Fuel modification zone 2 (Gr1)	3.1	67	1.3	0.4
Scenario 3: Fuel treatments on north-facing, 15-50% slope, 12 mph onshore winds				
Fuel modification zone 1 (FM8)	1.0	5	0.02	0.1
Fuel modification zone 2 (Sh1)	0.6	2	0.02	N/A
Scenario 4: Fuel treatments on north-facing, 5-50% slope, 12 mph onshore winds				
Fuel modification zone 1 (FM8)	1.0	5	0.21	0.1
Fuel Modification zone 2 (Sh1)	0.6	2	0.02	N/A
Fuel Modification zone 2 (Gr1)	1.7	18	0.16	0.1

Notes:
1 mph = miles per hour
2 Spotting distance from a wind driven surface fire.

The results presented in Tables 5 and 6 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, but the models provide a worst-case wildfire behavior condition as part of a conservative approach. 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 would be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

3.3 Fire Modeling Summary

As presented, wildfire behavior in non-treated sage scrub, modeled as a Sh5, and non-native grasslands, modeled as a Gr4, varies based on timing of fire (Refer to Table 2). A fire being fanned by 12 mph, onshore winds (fire scenarios 3 and 4) would result in a fire spreading in sage or willow-scrub at roughly 1.0 mph with 11.5 to 11.7 feet high flames. Under the same wind conditions, a grass fire or flashy fuels would generate 8.1-foot high flame at less than 1.0 mph rate of spread.

A worst-case fire under gusty Santa Ana winds and low fuel moistures (fire scenarios 1 and 2) is expected to be fast moving between 6.2 (sage scrub fuel type) and 14.0 mph (grass fuel type). Flame length values with intense radiant heat would range between 33.4 feet to 41.3 feet for grass and sage scrub fuels burning, respectively, in specific portions off and on site. Spotting is projected to occur less than 1.0 mile during a fire influenced by onshore winds and nearly 2.3 miles during a fire fanned by offshore, gusty winds.

As previously mentioned, Dudek conducted modeling of the site for post-fuel modification zones. Typical fuel modification includes establishment of a minimum 50-foot wide irrigated zone (Zone 1) and a 50-foot wide thinned zone (Zone 2) on the periphery of the Project Site, beginning from the rear or side yard lot line. For modeling the post-FMZ treatment condition, the fuel model assignment for coastal sage scrub-willow scrub were re-classified according to the specific fuels management (e.g., irrigated, fire resistive landscaping vs. 50% thinned native brush) treatment.

As depicted in Table 6, the FMZ areas experience a significant reduction in flame length and intensity. The 41.3-foot flame lengths predicted for sage scrub habitat during pre-treatment modeling for fire scenarios 1 and 2 are reduced to approximately 9.5 feet at the outer edges of the FMZ (Zone 2) and to 2.6 feet by the time the inner portions of the FMZ (Zone 1) are reached. During onshore weather conditions, a fire approaching from the west towards the development footprint would be reduced from 11.7-foot tall flames to less than 1.0-foot tall for Zones 1 and 2 with low fire intensity and spotting distances due to the higher live and dead fuel moisture contents. These reduction of flame lengths and intensities are assumed to occur within the full 100 feet of fuel modification (a combination of Zones 1 and 2), which is not achievable on the south side of the site, but which is mitigated through landscape and building hardening described later in this report.

3.4 Wildland Fire Risk Assessment

Wildland fires are a common natural hazard in most of southern California with a long and extensive history. Southern California landscapes include a diverse range of plant communities, including vast tracts of shrublands, like those found adjacent to the Project Site. Wildfire in this Mediterranean-type ecosystem ultimately affects the structure and functions of vegetation communities (Keeley 1984) and will continue to have a substantial and recurring role (Keeley and Fotheringham 2003). Supporting this are the facts that 1) native landscapes, from chaparral to grasslands, become highly flammable each fall; 2) the climate of southern California has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with high winds (Santa Ana) occurring during autumn after a six-month drought period each year; and 3) homes embedded in

natural and managed landscape vegetation in what may be accurately described as a wildland urban intermix. Based on this research, it can be anticipated that periodic wildfires will occur in the designated Preserve lands at the northern and western portions of the property.

Wildfires have occurred within 3 miles of the site. As such, wildlands near the Proposed Project are expected to be vulnerable to recurring wildfire ignition and spread and may be subject to nearby wildfire that could, under worst case conditions, spread through the grassland-sage scrub covered hillsides to the west and north and burn along the periphery of the Proposed Project's developed areas. However, the Proposed Project site, once developed, would not facilitate wildfire spread and would reduce projected flame lengths to levels that would be manageable by firefighting resources for protecting the site's structures and inhabitants, especially given the ignition resistance of the structures and the planned ongoing maintenance of the FMZs surrounding the site.

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Table 1: BehavePlus Fire Behavior Model Variables

Variable	Summer Weather (Onshore Flow) 50th Percentile	Peak Weather (Offshore Flow) 97th Percentile
1h Moisture	8%	2%
10h Moisture	9%	3%
100h Moisture	15%	8%
Live Herbaceous Moisture	59%	30%
Live Woody Moisture	118%	60%
20-ft Wind Speed	12 mph, average sustained wind	19 mph, average sustained wind (50 mph max. gusts)
Wind Adjustment Factor (BehavePlus)	0.4	0.4
Slope Steepness	7% to 15%	5% to 34%

Table 2: Sunbow BehavePlus Fire Behavior Model Results Existing Conditions

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1:coastal sage scrub-grasslands, east-facing, 15% slope (50 mph winds)				
Grassland (Gr4)	33.4	11,616	14.0	2.0
Diegan Coastal Sage Scrub (Sh5)	41.3	18,451	6.2	2.3
Scenario 2: grasslands-sparse shrub on south-facing, 7% slope (50 mph winds)				
Grassland (Gr4)	33.3	11,575	14.0	2.0
Scenario 3: coastal sage scrub-grasslands on north-facing, 15% slope (12 mph winds)				
Grassland (Gr4)	8.1	540	0.82	0.3
Diegan Coastal Sage Scrub (Sh5)	11.7	1,190	0.54	0.4
Scenario 4:willow-sage scrub (5% slope)) and grasslands on north-facing, 34% slope (12 mph winds)				
Willow-sage scrub (Sh5)	11.5	1,155	0.80	0.4
Grassland (Gr4)	8.1	531	0.53	0.3

Table 3: Sunbow BehavePlus Fire Behavior Model Results Post-Development Conditions

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: Fuel treatments on east facing, 15% slope, (50 mph winds)				
Fuel modification zone 1 (FM8)	2.6	45	0.13	0.3
Fuel modification zone 2 (Sh1)	9.5	760	1.3	0.8
Scenario 2: Fuel treatments on south-facing, 7% slope, (50 mph winds)				
Fuel modification zone 1 (FM8)	2.6	45	0.13	0.3
Fuel modification zone 2 (Gr1)	3.1	67	1.3	0.4
Scenario 3: Fuel treatments on north-facing, 15-50% slope, (12 mph winds)				
Fuel modification zone 1 (FM8)	1.0	5	0.02	0.1
Fuel modification zone 2 (Sh1)	0.6	2	0.02	0.0
Scenario 4: Fuel treatments on north-facing, 5-50% slope, (12 mph winds)				
Fuel modification zone 1 (FM8	1.0	5	0.21	0.1
Fuel modification zone 2 (Sh1)	0.6	2	0.02	0.0
Fuel modification zone 2 (Gr1)	1.7	18	0.16	0.1

SOURCE: AERIAL-BING MAPPING SERVICE 2019; DEVELOPMENT-HUNSAKER 2020

DUDEK 0 350 700 Feet

FIGURE 5

BehavePlus Fire Behavior Analysis

Fire Protection Plan for the Sunbow PA 23 Project

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4 Emergency Response and Service

The following sections analyze the Proposed Project in terms of current Chula Vista Fire Department (CVFD) Fire Service capabilities and resources to provide Fire Protection and Emergency Services. The analysis that follows examines the ability of the existing CVFD fire stations to adequately serve the Proposed Project. Response times were evaluated using Proposed Project build-out conditions. It was assumed that phased construction would include access roads to the newly constructed buildings and that the shortest access route to those structures would be utilized.

4.1 Emergency Response

The Proposed Project site is located within the CVFD jurisdictional area. CVFD services 52 square miles and a population of approximately 271,651 in the City of Chula Vista (U.S. Census Bureau 2020, City of Chula Vista 2020a). CVFD currently operates nine Fire Stations with 120 uniformed fire personnel (City of Chula Vista 2016b). For additional support, CVFD relies on numerous Automatic Aid agreements with jurisdictions adjoining the City.

Based on current Fire Station distribution, Fire Stations 3, 7, and 9 are most likely to provide initial response. However, all stations within the CVFD are available to service the Project Site, if necessary. Figure 6 illustrates the location of these fire stations. Table 7 presents a summary of the location, equipment, staffing levels, maximum travel distance, and estimated travel time for the three closest stations responding to the Proposed Project.

As depicted in Table 7 and Figure 6, CVFD Fire Station No. 3, located at 1410 Brandywine Avenue is the closest station that services the Project Site. Station 3 is located 1.2 miles from the most remote portion of the development. This Station is staffed with 4 firefighters on a Type 1 Heavy Rescue apparatus, which responds to fires, technical rescues, and medical emergencies. Existing CVFD Fire Stations 7 and 9, which are located at 1640 Santa Venetia and 266 East Oneida, respectively, are the next two closest stations that could respond to the site. Station 7 is located 2.9 miles away and is staffed with 8 firefighters on a Type 1 Fire Engine, a Ladder Truck, and a Battalion Chief vehicle. Station 9[4] is currently located 2.7 miles from the most southern boundary of the site, however, a newly constructed CVFD Station 9 will be constructed approximately 4 miles from the site. The existing CVFD Station 9 is equipped with a Type 1 Fire Engine and 3 firefighters.

Emergency travel time for first arriving engines from each station to the Project Site are provided in Table 7. Travel distances are derived from Google road data while travel times are calculated using response speeds of 35 mph, consistent with nationally recognized National Fire Protection Association (NFPA) 1710 and 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 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 FPP.

[4] It should be noted that CVFD Fire Station 9 is being newly constructed at the southeast corner of Naples Street and Alpine Avenue and is proposed to be completed by the middle of 2021. The new CVFD Fire Station 9 when constructed, will be approximately 4 miles from the most remote portion of the development.

Table 7. CVFD Emergency Response Analysis for the Proposed Project Site

Chula Vista Fire Department Station No.	Total Mileage to Furthest Extent on Proposed Project Site	Estimated Response Travel Time[2]	Firefighting Resources[3]
3	1.2 miles	2 min. 05 sec.	USAR 53 *(4 personnel/shift)*
7	2.9 miles	4 min. 58 sec.	Engine 57; Truck 57; Battalion 52 *8 personnel/shift)*
9	2.7 miles	4 min. 40 sec.	Engine 59 (3 personnel/shift)
9 (relocated site)	4.0 miles[1]	6 min. 50 secs.	N/A

Notes:

1. It should be noted that CVFD Fire Station 9 is being newly constructed at the southeast corner of Naples Street and Alpine Avenue and is proposed to be completed by the middle of 2021.
2. Table 2 presents results of response travel time utilized travel distances derived from Google road data while travel times are calculated using response speeds at an average of 35 mph, consistent with nationally recognized National Fire Protection Association (NFPA) 1710 and does not include turnout times. Response times are to the furthest extent of the Proposed Project.
3. The Effective Firefighting Force could include responses from all three stations with a best-case assembly travel time of just under 6 minutes to the furthest extent of the Project Site.

As indicated in Table 7, the first arriving engine from Station 3 with four firefighters onboard achieves an approximately 2-minute 05- second travel time to the southeastern portion of the Project Site. This first arriving response substantially conforms with the approved response goal of 5 minutes 90% of the time, and it satisfies the OSHA two-in and two-out standard. As mentioned above, CVFD Station 9 is being newly constructed at the southeast corner of Naples Street and Alpine Avenue and is proposed to be completed by the middle of 2021. With that said, once construction of the new CVFD Station 9 is completed, the current second arriving engine from Station 9 would instead be from Station 7, which archives an approximately 4-minute 58- second travel time to the southeastern portion of the Project site. The newly constructed CVFD Station 9 located at the southeastern corner of Naples Street and Alpine Avenue would be able to respond in in approximately 6-minutes 50-seconds travel time to the southeastern portion of the Project site.

The Effective Fighting Force (EFF) or first 3 engines, 1 truck and battalion chief for a total of 14 firefighters could be on-scene within roughly 7 minutes travel time from three fire stations (including travel time from the new CVFD Station 9). In this case, the emergency responses from Stations 3, 7, and 9 are substantially within 5 minutes and under the 8-minute travel time goal for EFF.

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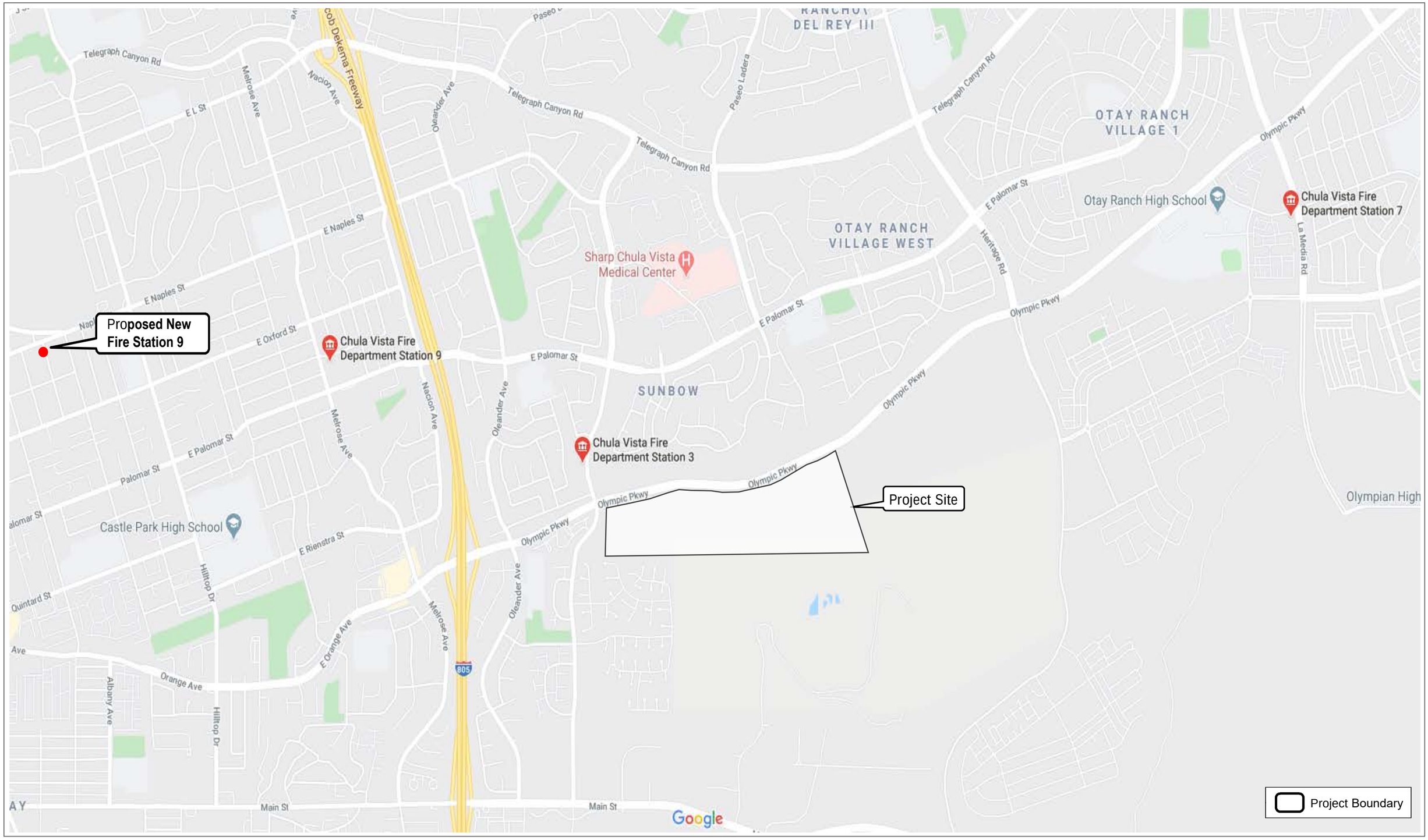

SOURCE: AERIAL-BING MAPPING SERVICE 2019; DEVELOPMENT-HUNSAKER 2020

DUDEK

0 800 1,600 Feet

FIGURE 6

Closest Fire Station Locations

Fire Protection Plan for the Sunbow II, Phase 3 Project

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4.2 Estimated Calls and Demand for Service

Determining the potential impact associated with the Proposed Project's population increase is required in order to compare how many additional calls may be realized and determine what effects they may have on the available response resources. The estimated incident call volume of the Proposed Project is based on a conservatively calculated estimate from the maximum potential number of additional persons that would be expected on site. Emergency call volumes related to typical projects, such as new residential developments, can be reliably estimated based on the historical per-capita call volume from a particular fire jurisdiction.

During 2018, CVFD documented 21,514 total incidents (City 2020b) that were generated by a City-wide service area total population of approximately 271,651 persons. The City's per capita annual call volume is approximately 79 calls per 1,000 persons. The resulting per capita call volume is 0.079.

As previously described, the Proposed Project's development includes up to 720 multi-family residential units with an average unit occupancy of 3.35 people per dwelling unit (U.S. Census Bureau 2020), which calculates to a total population of 2,412 people (3.35 x 720 DUs = 2,412 persons). The estimated incident call volume at buildout from the Proposed Project is based on a conservative estimate of the maximum potential number of persons on site at any given time (considered a "worst case" scenario).

As summarized in Table 8, using the CVFD estimate of 79 annual calls per 1,000 population, the Proposed Project's estimated 2,412 people would generate a very conservatively calculated 191 calls per year (about 0.52 calls per day), roughly 69% of which (131 calls per year) is expected to be medical emergencies, based on past call statistics.

Table 8. Calculated Call Volume Associated with the Proposed Project

Emergency Calls per 1,000 (2016 CVFD Incident Data)	Estimated Population	Avg. No. Calls per Year (2,412\1,000) x 79)	Avg. No. Calls per Day (191/365)
79	2,412	191	0.52
Type of call	**Per capita call generation factor**		**Number of estimated annual calls**
Total Calls	**100%**		**191**
Total Fires	**1.9%**		**3.6**
Total EMS Calls	**68.8%**		**131**
Total Rescue Calls	**0.83%**		**1.6**
Total Other Calls	**28.47%**		**54.4**

For this study's analysis, Fire Stations 3 (USAR 53), 7 (Engine 57 and Truck 57), and 9 (Engine 59) were evaluated as it provides perspective for the potential impacts from build out of the Proposed Project. Heavy Rescue (USAR) 53 responded to 2,195 calls; Engine 57 responded to 1,793 calls; Truck 57 responded to 548 calls; and Engine 59 responded to 2,638 during 2018 (City 2020b). This calculates as 6 calls per day for USAR 53; 5 calls per day for Engine 57 (E57); 7 calls per day for Engine 59; and 1.5 calls per day for Truck 57 (T57).

As previously mentioned, the Proposed Project's estimated 2,412 people would generate approximately 191 calls per year (about 1 call per every 2 days). The addition of less than 1 call per day to Fire Station 7 that currently has fire apparatus that responds to approximately 1.5 (T57) and 4.9 (E57), calls per day, respectively is considered average for typical urban fire stations. Six or seven calls per day for Stations 3 and 9, respectively, would be

considered already busy stations. For perspective, a typical station averages five calls per day and a busy station responds to about ten calls per day. With the additional 1 call per day, as described herein, and the currently low call volume at Station 7 and slightly above average calls at other stations, the additional calls associated with build out can be absorbed and still result in acceptable emergency response coverage. Table 9 presents estimated call volume increases based on the demand from the Proposed Project

Table 9. Calculated Call Volume Increase Per Station Associated with the Proposed Project

Chula Vista Fire Station	Current Daily Call Volume	Estimated Daily Call Volume Increase	Estimated Total Daily Call Volumes with Proposed Project[1]
3	6.0 (USAR 53)	Less than 1.0	Approx. 6.5
7	4.9 (Engine 57) + 1.5 (Truck 57)	Less than 1.0	Less than 6.9
9	7.2 (Engine 59)	Less than 1.0	Less than 7.7

Notes:

[1] Estimated total daily call volume is based on existing volume in addition to the conservatively calculated 0.52 calls per day from the Proposed Project.

4.3 Response Capability Impact Assessment

The available firefighting and emergency medical resources in the vicinity of the Proposed Project site include an assortment of fire apparatus and equipment considered capable of responding to the type of fires and emergency medical services potentially occurring within the Proposed Project. The Proposed Project, which includes 720 multi-family DUs, is projected to slightly increase the nearest station's (Fire Station 3) current call volume, but not at significant levels, because the current call volume is considered slightly above average compared to other urban fire stations and the capacity would not be considered impacted to the point of resulting in a busy or stressed condition. Additionally, the Proposed Project and other new projects will provide fire service and availability fees and tax revenues to the CVFD, enabling the acquisition of response resources needed to maintain acceptable response capabilities over time.

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5 Buildings, Infrastructure, and Defensible Space

The City's Municipal Code (Refer to Section 1.1 of this FPP for code references) governs the building, infrastructure, and defensible space requirements detailed in this FPP. The Proposed Project will meet applicable codes or will provide alternate methods that will be approved by CVFD prior to their implementation.

The following summaries highlight important fire protection features. All underground utilities, hydrants, water mains, curbs, gutters, and sidewalks will be installed, and the drive surface shall be approved by VCFD prior to combustibles being brought on site.

5.1 Site Access

Site access, including fire lane, driveway, and entrance road widths, primary and secondary access, gates, turnarounds, dead end lengths, signage, aerial fire apparatus access, surface, and other requirements will comply with the requirements of the 2019 California Fire Code and CVFD Standards. Fire access will be reviewed and approved by CVFD prior to construction.

The developer will provide information illustrating the new roads, in a format acceptable to the City, for updating of City maps.

5.1.1 Fire Apparatus Access

The Project Site would be accessed from Olympic Parkway from two signalized access entrances that are 1,213 feet apart.

- Interior circulation roads include all roadways that are considered common or primary roadways for traffic flow through the site and for fire department access.
- Any dead-end roads serving new buildings that are longer than 150 feet shall have approved provisions for fire apparatus turnaround.
- Roadways and/or driveways will provide fire department access to within 150 feet of all portions of the exterior walls of the first floor of each structure.
- Angle of driveway/roadway approach/departure will not exceed 7° (12%) per CVFD.
- Road grades will not exceed 10%, unless approved by the Fire Chief.
- Cul-de-sac bulbs are required on dead-end roads in residential areas where roadways serve more than two residences and per City standards.
- Road infrastructure improvements shall accommodate fire department apparatus turning capabilities per CVFD's Auto Turn detail, which can be downloaded at http://www.chulavista.ca.gov/home/showdocument?id=2844.
- The longest dead-end road (cul-de-sac) allowed by the 2019 California Fire Code is 800 feet for this community. The Proposed Project includes dead-end cul-de-sac lengths that will exceed 800 feet but is proposed for a modification based on provision of an emergency secondary access road that resolves this issue.

5.1.2 Road Widths and Circulation

All on-site roads will be constructed to current Fire Codes and County of San Diego Standards for Public and Private Roads, including minimum 24-foot wide, unobstructed road widths. No buildings will exceed 30 feet heights, so no additional widths for ladder truck access would be required.

5.1.3 Gates

Any access gates will comply with CVFD standards applicable at the time of building plan approval. Gates on private roads will comply with CVFD standards for electric gates and will include a Knox box or code pad for emergency access.

5.1.4 Dead-Ends

The longest dead-end road (cul-de-sac) allowed by the 2019 California Fire Code is 800 feet for this type of development. Cul-de-sac bulbs are required on dead-end roads in residential areas where roadways serve more than two residences and per City standards.

5.1.5 Surface

All on-site roads shall be constructed and maintained to support the imposed loads of fire apparatus (75,000 lbs.) and shall be improved with asphalt paving materials. All underground utilities, hydrants, water mains, curbs, gutters and sidewalks must be installed, and the drive surface shall be approved by CVFD prior to combustibles being brought on site.

5.1.6 Vertical Clearance

Minimum unobstructed vertical clearance of 13 feet 6 inches will be maintained for the entire required width for all streets, including driveways that require emergency vehicle access.

5.1.7 Driveways

Any structure that is 150 feet or more from a common road in the development shall have a paved driveway meeting CVFD requirements as follows:

1. Grades 10% or less with surfacing and sub-base consistent with CVFD.
2. Approved fire apparatus turnaround with inside radius no less than 40 feet, except for a mini-bulb (30 feet radius) on Street E, which is only 90 feet from center of bulb to the centerline of Street D.
3. Driveways serving two houses or fewer will be 16 feet wide unobstructed with a fire apparatus turnaround. Driveways serving more than two houses will be a minimum 20 feet wide, unobstructed.
4. Courtyard driveways, if applicable, shall be designated as fire lanes and identified in accordance with CVFD Fire Lane Identification Standards.
5. Lighted house addresses shall be posted at the entrance to each driveway if house numbers are not visible from the street.

5.1.8 Premise Identification

Identification of roads and structures will comply with CVFD and Fire Prevention Division Standards, as follows:

1. All structures required to be identified by street address numbers at the structure. Numbers to be minimum 6 inches high with 1-inch stroke (0 to 50 feet from face of curb), 10-inches high with 1.5-inch stroke (51 to 150 feet from face of curb), or 16 inches with 2-inch stroke (greater than 150 feet from face of curb). Numbers will contrast with background.
2. Multiple structures located off common driveways will include posting addresses on structures, on the entrance to individual driveways, and at the entrance to the common driveway for faster emergency response.
3. Proposed roads within the development will be named, with the proper signage installed at intersections to satisfaction of the CVFD and the Department of Public Works.
4. Streets will have street names posted on non-combustible street signposts. Letters/numbers will be 4 inches high, reflective, on a 6-inch-high backing. Signage will be 7 feet above grade. There will be street signs at the entrances to the development, all intersections, and elsewhere as needed subject to approval of the Fire Chief.
5. Access roads to private lots to be completed and paved prior to issuance of building permits and prior to the occurrence of combustible construction.

5.2 Ignition Resistant Construction

All new structures within the Proposed Project will be constructed to at least the California Fire Code standard. Each of the proposed buildings will comply with the enhanced ignition-resistant construction standards of the 2019 CBC (Chapter 7A) and Chapter 5 of the Urban-Wildland Interface code, except where buildings require enhanced ignition resistance as part of an alternative material and method proposal. These requirements address roofs, eaves, exterior walls, vents, appendages, windows, and doors and result in hardened structures that have been proven to perform at high levels (resist ignition) during the typically short duration of exposure to burning vegetation from wildfires.

While these standards will provide a high level of protection to structures in this development and should reduce the potential for ordering evacuations in a wildfire, there is no guarantee that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

5.2.1 Additional Requirements and Recommendations Based on Occupancy Type

Buildings that include higher occupancies shall meet all California Fire and Building requirements for higher occupancy structures. Included in the high occupancy category are multi-family residences over three units, attached condominiums, and attached townhomes up to three stories, but less than 30 feet overall height.

5.3 Fire Protection Systems

5.3.1 Water Supply

Water service will be provided by the Otay Water District. Water supply requirements specified in the California Fire Code (Section 404 of the Wildland-Urban Interface Code and Appendix B – Fire Flow Requirements for Buildings, Appendix C – Fire Hydrant Locations and Distribution {Chula Vista revisions – Sections 15.36.050 and 15.36.055}) including for hydrants and interior sprinklers will be provided for the Proposed Project. See Overview of the Water Service for Sunbow Planning Area 23 (EIR, Appendix L) for additional details. The final fire flow and duration calculations will be prepared during Design Review/final engineering and are subject to review and approval by the CVFD.

5.3.2 Fire Hydrants

Hydrants shall be located along fire access roadways and cul-de-sacs as determined by the CVFD Fire Marshal to meet operational needs. Hydrants will be consistent with CVFD Design Standards and provided every 500 feet (on-center).

5.3.3 Automatic Fire Sprinkler Systems

All structures within the Proposed Project will include interior sprinklers, per code requirements (Section R313.3 of the 2019 California Residential Code, Chapter 9, Section 903 of the 2019 California Fire Code, and Section 602 of the Urban-Wildland Interface Code). Sprinklers will be specific to each occupancy type and based on the most recent NFPA 13, 13R, or 13D, requirements.

5.3.4 Fire Alarm Systems and Residential Hazard Detectors

All residential units shall have a fire alarm system be installed in accordance with NFPA 72, *Fire Protection Signaling System* and CVFD requirements. The fire alarm system will be supervised by a third-party alarm company. The system will be tested annually, or as needed, with test results provided to CVFD.

Additionally, all residences will be equipped with residential smoke detectors and carbon monoxide detectors and comply with current CBC, CFC, and California Residential Code standards.

All residential dwelling units shall have electric-powered, hard-wired smoke detectors with battery backup per CVFD.

5.4 Defensible Space and Vegetation Management

5.4.1 Fuel Modification Zones

An important component of a fire protection system is the provision for fire resistant landscapes and modified vegetation buffers. FMZs are designed to provide vegetation buffers that gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones, restricted vegetation zones, and irrigated zones adjacent to each other. FMZs would be located on the perimeter of all structures and along both ingress/egress roadways to and from Olympic Parkway. The FMZ is an important part of the fire protection system designed for this

site. This section provides standard Chula Vista Fire Department FMZ requirements while specific Proposed Project FMZ details are provided in following sections.

5.4.1.1 Chula Vista Fuel Modification Zone Standards

Definition

Fuel Modification Zone: A brush management area that is measured on a horizontal plane from the rear of the structure extending outwards towards Preserve land or the Otay Landfill area. All brush management zones and related fuel modification activities shall occur outside of the Preserve. Fuel modification zones (FMZ) shall be a minimum of 100 feet in width. A 100-foot-wide FMZ will be installed for lots abutting designated Preserve Lands to the north and west of the Project Site. To ensure long-term identification and maintenance, each respective FMZ shall be identified by a permanent marker system meeting the approval of CVFD.

General Criteria

1. Plantings in FMZs will be consistent with the Proposed Project Plant List (Appendix C) prepared by Schmidt Design. The intent of the Proposed Project plant list is to provide examples of plants that are less prone to ignite or spread flames to other vegetation and/or combustible structures during a wildfire. Additional plants can be added to the landscape plant material palette with the approval from the CVFD.
2. Vegetation included on the Prohibited Plant List (Appendix D) is prohibited in any Fuel Modification Zone.
3. Prior to approval of any landscape and irrigation plans for areas designated FMZs, the Applicant shall provide proof to the City of Chula Vista that a Fire Protection Planning Consulting Firm has reviewed and confirmed that the plans are in conformance with the requirements of the FPP.
4. All plant and seed material in Zones 1 to be locally sourced to the greatest extent possible to avoid genetically compromising the existing Preserve Vegetation.
5. Plant 50%–70% of the overall fuel modification zone with deep rooting plant material.
6. Maintain all plant material in irrigated zones in a hydrated condition.
7. Remove debris and trimmings produced by thinning and pruning from the site, except for larger woody debris that may be chipped and left on site for weed and erosion control.
8. There shall be no hedging of shrubs (i.e., no continuous hedges) as hedges may form a means of rapidly transmitting fire from the native growth to the structures. All mature trees must be limbed to six feet or 3x the height of understory plants, whichever is greater.
9. Plant shrubs in clusters not exceeding a total of 400 square feet.
10. Provide a distance of no less than the width of the largest shrub's mature spread between each shrub cluster.
11. Combustible materials, including chipped biomass, bark, wood chips, should be no closer than 5 feet to structures unless of size and type shown to reduce potential ignitions.
12. Provide a minimum 30-foot distance between mature canopies on slopes that exceed 40%.
13. Provide fire department access every 1,000 lineal feet along portions of the development adjacent to the Preserve areas or WUI.

Zone 1 (0–50 feet starting at rear of the structures)

Zone 1 – Definition:

All public and private areas located between the rear of the structures and 50 feet outward. These areas may be located on public slopes, private open-space lots, or public streets, as illustrated on the landscape fuel modification exhibits.

Zone 1 – Specific Criteria:

1. Provide a permanent irrigation system within this irrigated wet zone.
2. Only those trees on the Proposed Project Plant List (Appendix C) and those approved as not being invasive are permitted within this zone.
3. Tree limbs shall not encroach within 10 feet of a structure or chimney, including outside barbecues or fireplaces.
4. Provide a minimum of 30 feet between tree canopies.
5. Additional trees (excluding prohibited or highly flammable species) may be planted as parkway trees on single loaded streets.
6. Limit 75% of all groundcover and sprawling vine masses to a maximum height of 18 inches.
7. 25% of all groundcover and sprawling vine masses may reach a maximum height of 24 inches. Ground covers must be of high-leaf moisture content.
8. Shrubs shall be less than 2 feet tall and planted on 5-foot centers.
9. Randomly placed approved succulent type plant material may exceed the height requirements, provided that they are spaced in groups of no more than three and a minimum of five feet away from described "clear access routes."
10. Vegetation/Landscape Plans shall be in compliance with this FPP.

Zone 2 (51–100 feet from Zone 1)

Zone 2 – Definition:

All public and private areas located between the outside edge of Zone 1 and 50 feet outward to 100 feet, per this FPP.

Zone 2 – Specific Criteria:

1. Utilize temporary irrigation to ensure the establishment of vegetation intended to stabilize the slopes and minimize erosion.
    a. Temporary irrigation, with the exception of tree bubblers, shall be removed from site once the slope plantings are fully established and the maintenance period has been completed.
2. Trees may be located within this zone, provided they are planted in clusters of no more than three. A minimum distance of no less than 30 feet shall be maintained between the tree cluster's mature canopies.
3. Only those trees on the Proposed Project Plant List (Appendix C) and those approved by the Development Services Director as not being invasive shall be permitted within this zone.
4. 100% of all groundcover shall be limited to 50% at 24-inches and 50% at 36-inches.
5. Shrubs may be planted in clusters not exceeding a total of 400 sq. ft.

6. Provide a distance of no less than the width of the largest shrub's mature spread between each shrub cluster.
7. Provide “Avenue” devoid of shrubs a minimum width of 6 feet and spaced a distance of 200 linear feet on center to provide a clear access route from toe of slope to tope of slope.
8. When shrubs or other plants are planted underneath trees, the tree canopy shall be maintained at a height no less than three times the shrub or other plant's mature height (break up any fire laddering effect).
9. Hedging of shrubs is prohibited.

5.4.1.2 Sunbow II, Phase 3 Specific FMZ Criteria

As indicated in the Figures 7A through 7D, achievable fuel modification for the Proposed Project varies, as follows.

- FMZ on North and West sides of Proposed Project – A total of 100 feet FMZ is achievable from the rear of the structures outward. The FMZ is comprised by two 50 feet wide zones with the zone closest to the developed area being irrigated as described previously.
- FMZ on East side of Proposed Project – FMZ widths vary between 24 feet and 100 feet. The FMZ located between the rear of the structures and a 6 feet tall non-combustible landscape wall (heat and ember catching) would be consistent with irrigated zone. Fuel modification to the east of the Proposed Project will tie into existing/proposed development area landscaping for Otay Ranch Village 2. If the Proposed Project is constructed before Village 2, an interim, off-site 100-foot fuel modification zone will be installed per Zones 1 and 2 criteria.
- FMZ on South side of Proposed Project – FMZ widths vary between 23 to 100 feet wide. Terrain in the area is favorable, sloping up and away from the Proposed Project. The FMZ from rear of the structures to the provided 6 feet, non-combustible landscape wall at the property boundary would be irrigated Zone 1 and the buildings would be enhanced, as described in Section 5.4.4.1.
- The Proposed Project must comply with the landscape and fuel modification plant palette contained in Appendix C, Suggested Plant List for a Defensible Space and avoid use of prohibited plants in Appendix D.
- Interior landscape areas will be irrigated and maintained by the HOA per Zone 1 standards.

5.4.1.3 Other Vegetation Management

Roadway-Adjacent Defensible Space

New roads will be subject to fuel modification zones with Zone 1 and/or Zone 2 standards described above. The combustible vegetation will be modified within 30 feet from each side of Streets A and B. Roadway-adjacent fuel modification does not preclude the planting of street trees in these fuel modification zones, as long as they are not found on the Prohibited Plant List (Appendix D), are included in the Approved Plant Palette (Appendix C) and follow all CVFD spacing and maintenance requirements.

Pre-Construction Requirements

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

Undesirable Plants

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be physical (structure promotes ignition or combustion) or chemical (volatile chemicals increase flammability or combustion characteristics). The plants included in the Prohibited Plant List (Appendix D) are unacceptable from a fire safety standpoint and will not be planted on the site or allowed to

establish opportunistically within fuel modification zones or landscaped areas. No fuel modification zones are proposed within the MSCP areas, thus no vegetation within the MSCP will be removed.

Tree Notes for Publicly Owned Areas

- All standard form (single trunk) trees to include a single strong central leader with no branches extending at an angle narrower than 30 degrees from the main trunk. If the tree does not display a single strong central leader, a tree may be approved if the Developer's arborist or landscape architect of record can demonstrate that a single strong central leader can be achieved through structural pruning. All trees requiring structural pruning for the purposes of achieving a strong central leader shall be pruned by the Nursery's Arborist prior to Landscape Architect of Record approval of tree submittal (see bullet 5 below) or by the Developer's Arborist at planting.
- No grafted species will be allowed as a street tree.
- Tree sizing based on caliper and tree height per American Standard for Nursery Stock (ANSI Z60.1-2014):
    - 15-gal: 1-inch to 1-1/2-inch caliper; 5 feet to 7 feet height
    - 24-inch box: 1-1/2-inch to 1-3/4-inch caliper; 7 feet to 12 feet height
    - 36" box: 1-3/4-inch to 3-inch caliper; 8 feet to 14 feet height
    - 48" box: 3-inch to 4-inch caliper; 14 feet to 18 feet height

  *Note: Caliper to be measured at 6-inches above the root crown
- Live crown ratio shall be a minimum of 50%, meaning there shall be live branches in the upper 50% of the trunk to distribute wind stress and develop trunk taper for stability.
- The Landscape Architect of Record shall submit to the City's Landscape Architect a copy of the applicant's approved tree submittal with photos representative of those trees to be delivered to the site, including representative measurements. The City's Landscape Architect will review the submittal to verify the included trees comply with the noted requirements prior to any trees being delivered to the site.
- All 36-inch box trees and larger, multi-trunk and other specimen trees shall be tagged at the nursery by the landscape architect of record and photos submitted to the City's Landscape Architect as described above.

Vacant Parcels and Lots

- Vegetation management would not be required on vacant lots until construction begins. However, perimeter FMZs must be implemented prior to commencement of construction utilizing combustible materials (See Pre-Construction Requirements, above).
- Vacant lots adjacent to active construction areas/lots would be required to implement vegetation management if they are within 50 feet of the active construction area. Perimeter areas of the vacant lot would be maintained as a vegetation management zone extending 50 feet from roadways and adjacent construction areas.

- Prior to issuance of a permit for any construction, grading, digging, installation of fences, etc., on a vacant lot, the 50 feet at the perimeter of the lot is to be maintained as a vegetation management zone.
- Installation of manufactured slope landscape and irrigation improvements within areas designated FMZs do not need to be completed prior to commencement of construction; however, all flammable vegetation and plants listed on the Prohibited Plant List must be removed (i.e. grubbed/graded) or mowed prior to construction.
- In addition to the establishment of a 50-foot-wide vegetation management zone prior to combustible materials presence on site, existing vegetation on the lot would be reduced by at least 70% upon commencement of construction.
- Dead fuel, ladder fuels, and downed fuels would be removed, and trees/shrubs would be properly limbed, pruned and spaced per Zone 2 standards (See Section 5.4.1.3).

5.4.2 Fuel Modification Area Vegetation Maintenance

All fuel modification area vegetation management shall be completed annually by May 1 of each year and more often as needed for fire safety, as determined by the CVFD.

5.4.3 Annual Fuel Modification Zone Compliance Inspection

The property owner would obtain an FMZ inspection and report from a qualified CVFD-approved 3rd party inspector in May of each year certifying that vegetation management activities throughout the Project Site have been performed pursuant to this FPP. A copy of the annual inspection report would be provided to the Proposed Project HOA and a copy made available to CVFD, if requested.

5.4.4 Reduced Fuel Modification Zone Discussion

As previously mentioned, due to site constraints, it is not feasible to achieve a 100-foot FMZ width on the south side of the proposed development. This FPP incorporates additional fire protection measures that will be implemented to compensate for potential fire related threats. These measures are customized for this site based on the analysis results and focus on providing functional equivalency for reduced defensible space.

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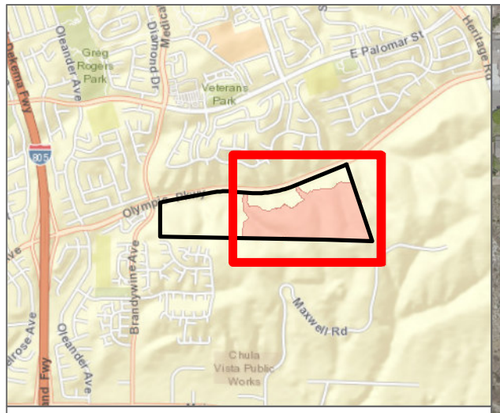

- Project Site
- Waters of the State
- Fire Access
- Additional Protection Measures for Non-Conforming Buildings Adjacent to Southern Boundary

Fuel Modification Zones

- Zone 1 (irrigated)
- Zone 2 (50% thinned)
- 30-Ft Roadside Zone
- Interim Offsite Zone

Land Use

- Development
- Roadway

NOTES:

1. REFER TO FIGURE 7B, 7C & 7D FOR FMZ CROSS SECTIONS FOR THE SOUTH, EAST, AND NORTH EDGES OF PROPOSED DEVELOPMENT.

2. BUILDING LOCATIONS AND FOOTPRINTS ARE CONCEPTUAL AND WILL BE REFINED DURING THE DESIGN REVIEW PROCESS.

SOURCE: AERIAL- SANGIS 2017; DEVELOPMENT - HUNSAKER AND ASSOCIATES, INC. 2020

DUDEK 0 137.5 275 Feet

FIGURE 7A

Conceptual Fuel Modification Map

Fire Protection Plan for the Sunbow PA 23 Project

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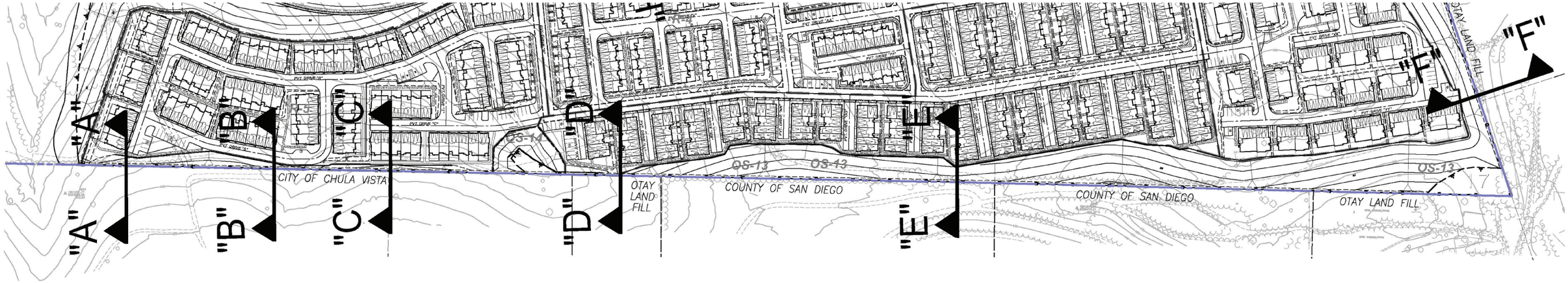

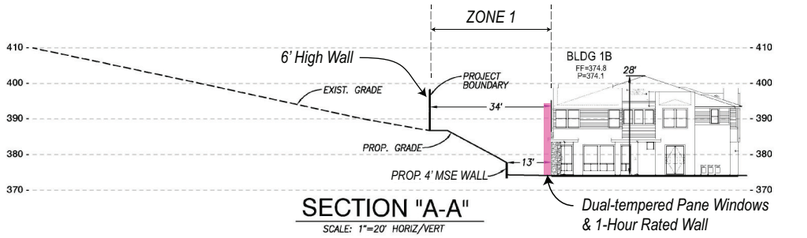

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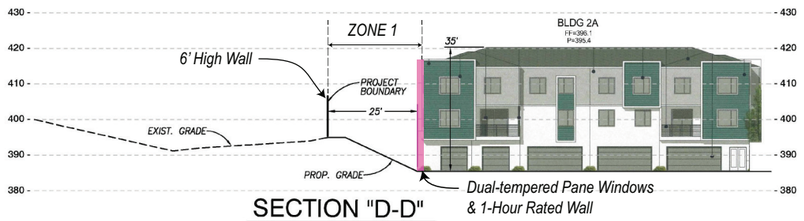

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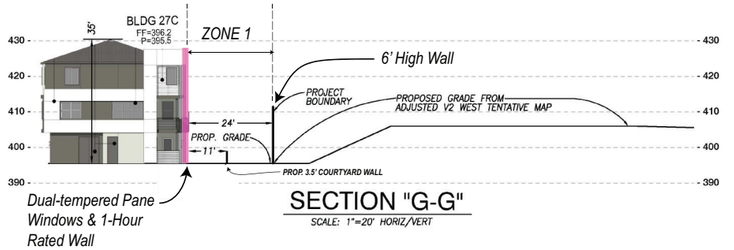

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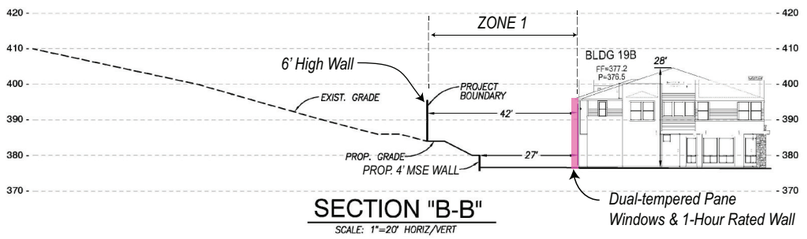

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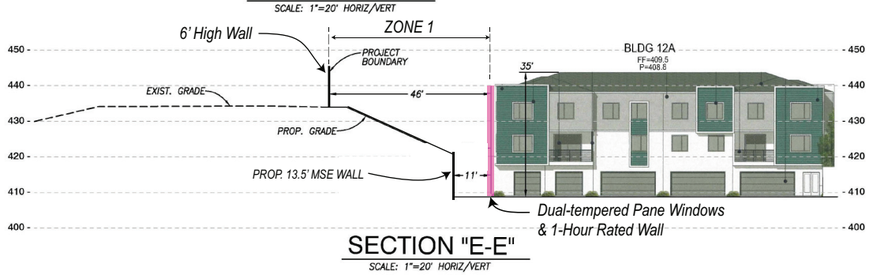

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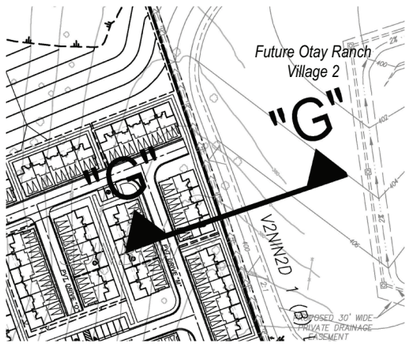

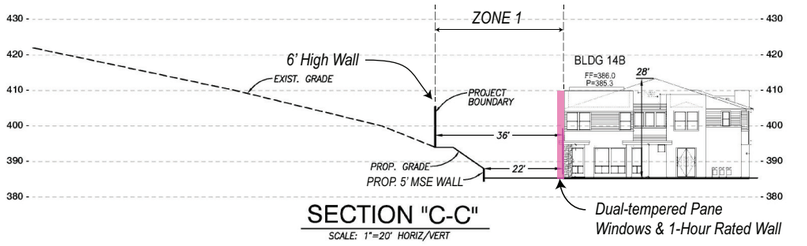

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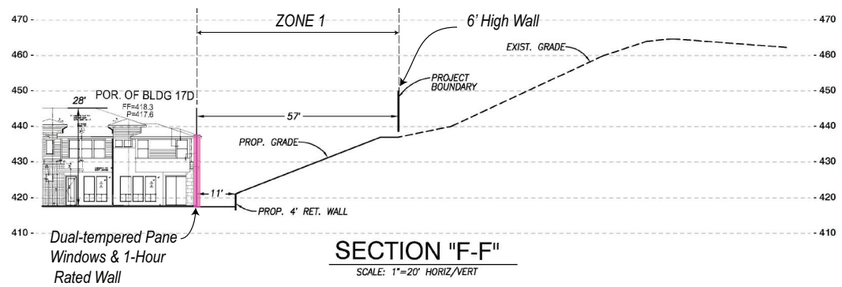

SECTION "F-F"

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SOURCE: HUNSAKER & ASSOCIATES, INC. 2020

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FIGURE 7B

Fuel Modification Zone Cross Sections

Fire Protection Plan for the Sunbow PA 23 Project

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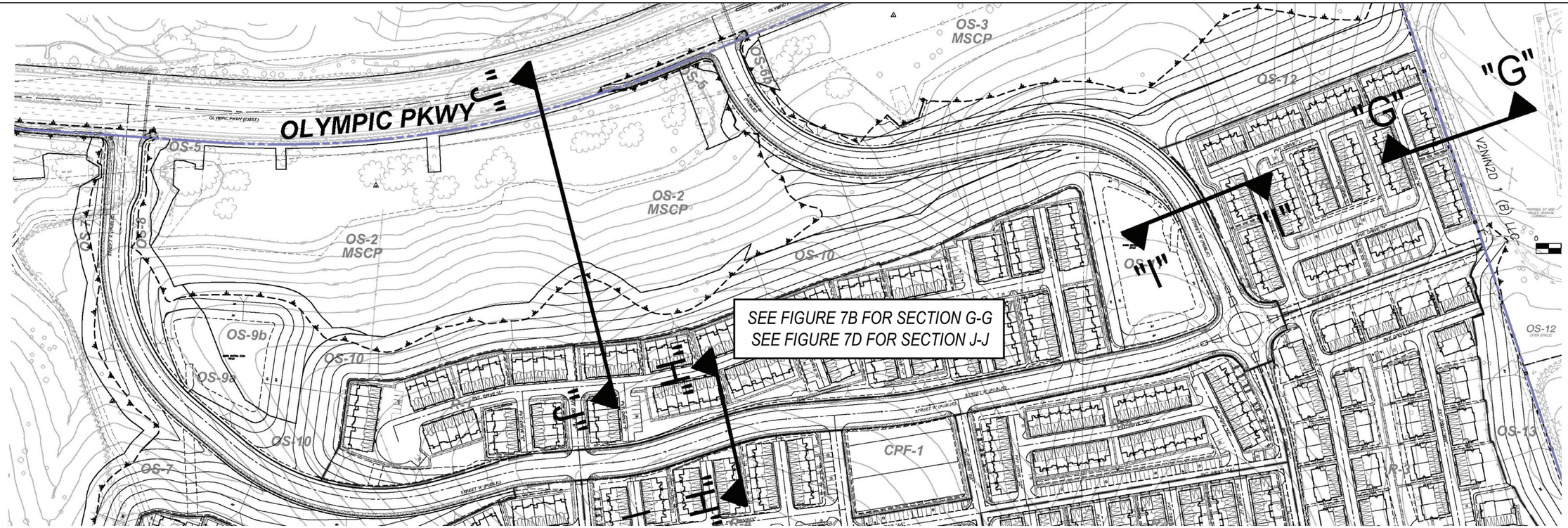

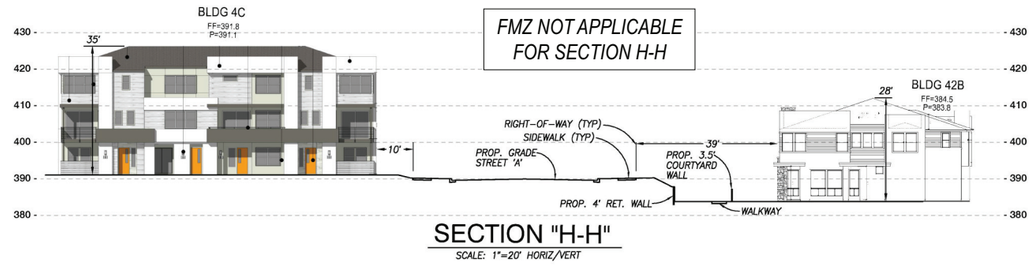

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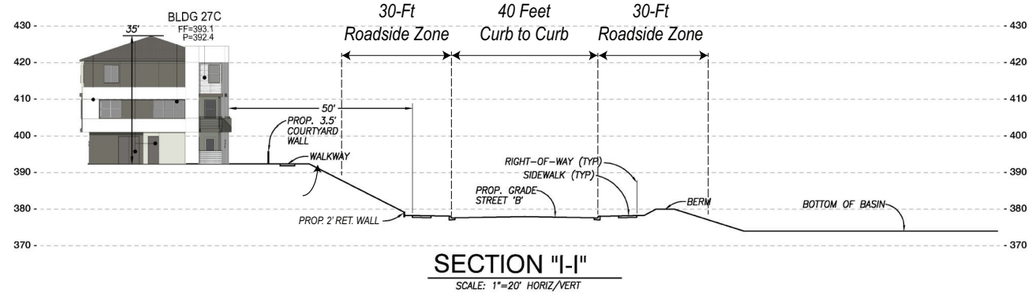

SECTION "I-I"

SCALE: 1"=20' HORIZ/VERT

SOURCE: HUNSAKER & ASSOCIATES, INC. 2020

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FIGURE 7C

Fuel Modification Zone Cross Sections

Fire Protection Plan for the Sunbow PA 23 Project

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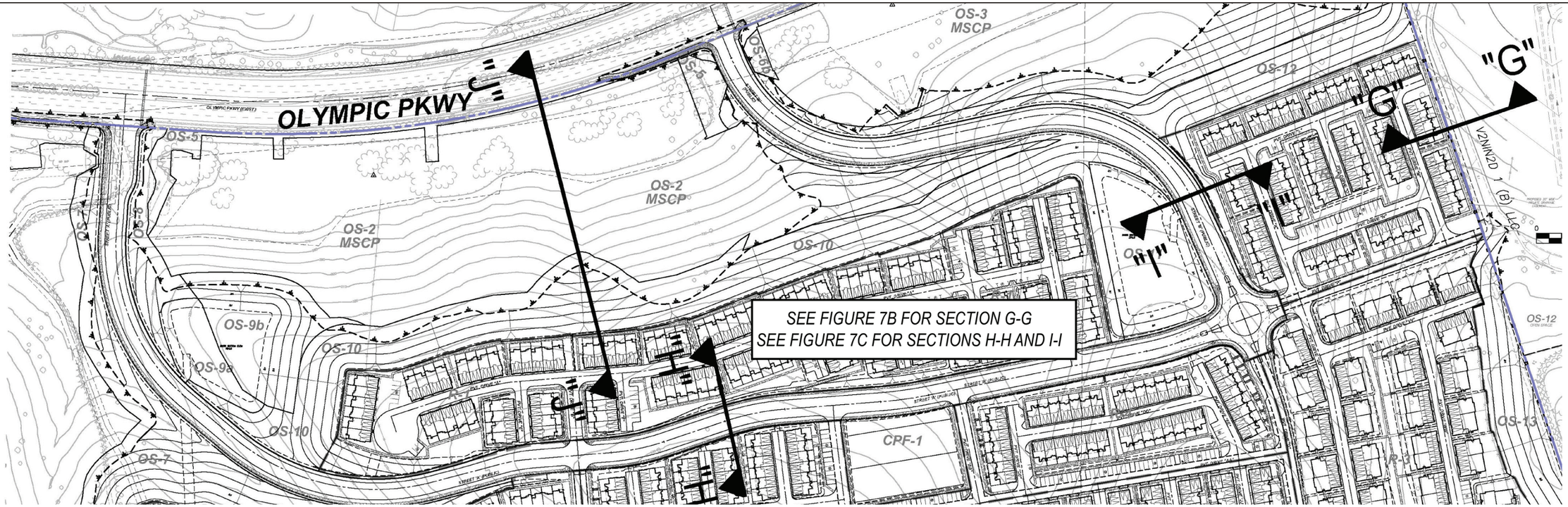

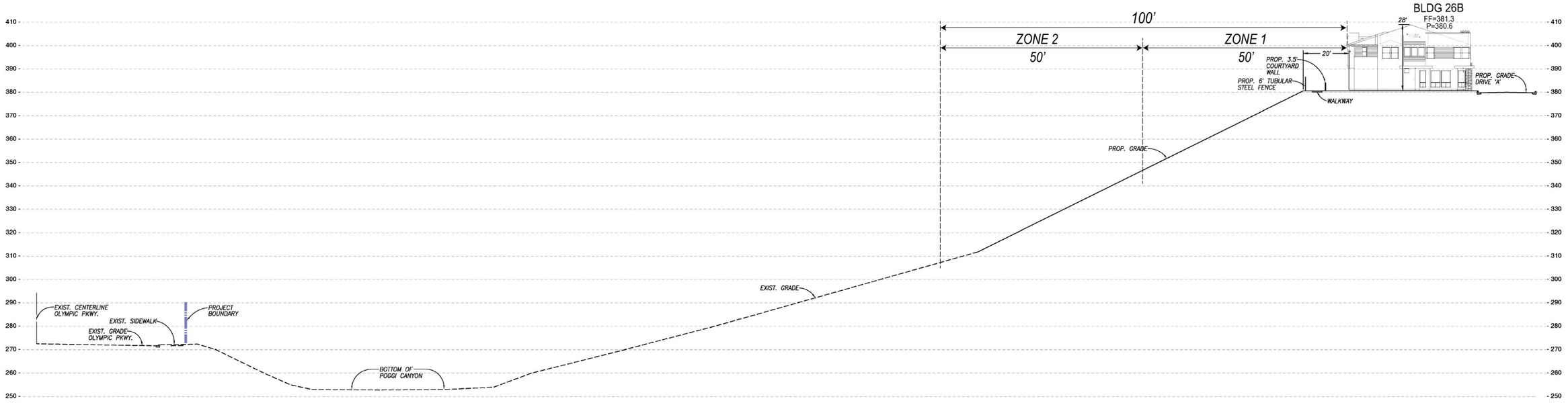

SECTION "J-J"
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SOURCE: HUNSAKER & ASSOCIATES, INC. 2020

FIGURE 7D
Fuel Modification Zone Cross Sections
Fire Protection Plan for the Sunbow PA 23 Project

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5.4.4.1 Additional Structure Protection Measures Non-Conforming Lots

The following additional measures (Alternative Materials and Methods) will be implemented to "mitigate" potential structure fire exposure related to the provided FMZs for buildings along the southern edge of the Project Site. The additional mitigation measures listed below will be implemented only to the walls of the structures that face the open space areas adjacent to the Project site. In order to provide compensating structural protection in the absence of a full FMZ, and in addition to the multi-family residences being built to the latest ignition resistant codes and will be protected with a NFPA 13R fire sprinkler system, these structures will also include the following features for additional fire prevention and protection:

1. Provide exterior glazing in windows (and sliding glass doors, garage doors, or decorative or leaded glass doors) facing the open space areas to be dual pane with both panes tempered glass, exceeding the fire-building code requirement;
2. No eave overhangs and combustible construction in portion of yards facing natural open space areas.
3. 1-hour rating (Type X- 5/8-inch thickness of gypsum) behind con-combustible covering (stucco, fiber cement siding) for a facade facing the open space areas to the east and south.
4. Propose to conduct a formal landscaping plan review for structures with a façade facing open space area. Landscape plans would be reviewed and approved by CVFD; and
5. Annually hire a 3rd party inspector to evaluate whether designated FMZ areas meet the requirements of this FPP.
6. Provide a non-combustible 6-foot-tall, masonry, block or view wall at the property line on the south and east sides of the Proposed Project to provide a physical, non-combustible barrier that would deflect heat and flame and would capture ground-blowing embers before they reached the Proposed Project's developed areas.

   The Proposed Project's slopes to the south provide an opportunity to place a non-combustible, six-foot-tall, heat-deflecting wall (or view wall with lower 1 to 2 feet block wall and upper 4 to 5 feet dual pane, one pane tempered glazing) to provide additional deflection for these lots to compensate for the reduced fuel modification zones.

Heat-deflecting landscape or view walls will be incorporated along the southern property boundary (Figure 7B through 7D). The landscape walls provide a vertical, non-combustible surface in the line of heat, fumes, and flame travel toward the Project Site. When buildings are set back from slopes, and a wall is placed at the top of slope, flames spreading up those slopes are deflected vertically where cooling occurs, reducing the effects of convective heat on the structure. Similarly, a significant percentage of the embers that are blowing along the surface or above the surface are captured by the wall where they fall to the ground and burn out. The duration of radiant heat impact on the downhill facing side of the house 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.

The FPP's direction that heat-deflecting landscape view walls of masonry construction with fire-rated glazing is too general and does not adequately guide builders on what glass product is acceptable. This analysis relies on previous fire behavior modeling for adjacent fuels and terrain and basis recommendations for glazing on Cohen's structure ignition research as well as typical vegetation heat output and duration.

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 have regularly approved these walls as

acceptable Alternative Materials and 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."

The wall glass could be subject to radiant or convective heat from a wildland fire. Therefore, it is worthwhile to examine the structure ignitability modeling, independent ignition experiments, and case studies and compare them with the project. Cohens' (1995) structure ignitability model (SIAM) assesses ignitability of bare wood when exposed to a continuous heat source. The model assumes a worst-case condition of a constant 1,700 degrees (F). However, a constant, maximum heat source is typically not the case during a wildfire due to the movement of a fire, non-uniform vegetation distribution, and the lack of a uniform, constant flame front especially when FMZs are provided. Further, a flame temperature of 1,700 degrees (F) is considered to be higher than would be experienced by the fuels adjacent to the landscape fire walls based on the type of fuels found adjacent the site (grasslands, coastal sage and chaparral vs. Cohen's timber fuel). However, 1,700 degrees is a valid temperature for testing to ensure that potential temperature extremes are considered, as confirmed by Pyne, et. al., (1996)[1] who found that flaming combustion typically occurs in wildland fuels between flame temperatures of 1466-2186 degrees (F). For comparison, Dennison (2006)[2] studied the heat signatures from a Southern California wildfire that was burning oak woodlands, dense chaparral, sparse chaparral, and grasslands. Results from this study indicate that the maximum temperature commonly observed was 2,200 degrees (f) and associated with the dense, higher fuel load oak and chaparral vegetation while cooler {980 to 1340 degrees (F)} and smaller fires were associated with the mixed chaparral and grasslands (like those found adjacent to the landscape wall). Flame temperatures lower than those associated with chaparral/grassland would be expected at this site due to the 100-foot wide FMZs.

The analysis conducted for this report indicates that the provided FMZ adequately separates the structures from the short-duration heat and flame associated with a fire burning toward the structure in the off-site, adjacent fuels (FMZ). Similarly, the landscape fire walls, which would be situated directly adjacent to the FMZ, would be subject to higher flame temperatures, but for a short duration. The typical duration of large flames from burning vegetation is on the order of 1 minute and up to several minutes for larger fuels at a specific location (Cohen 1995; Butler et.al., 2004[3], Ramsay and Rudolph 2003[4], Cohen and Quarles 2011[5])). Tests of various glazing products indicate that single pane, tempered glass failure may occur between 120 and 185 seconds from exposure (University of California 2011[6]; Manzello, et. al. 2007[7]) but those tests include direct and constant heating that would not be experienced during a wildfire adjacent the walls due to the ongoing fuel maintenance and plant separation. Depending on the heat applied and the type of glass used in the various studies, the cracking/failure time varied. However, given the short duration of maximum heat (likely 60 to 90 seconds for the largest maintained shrubs found on or adjacent the project), the loss of heat over distance, and the dual pane, one pane tempered glazing (or equivalent) in the landscape fire wall, wildfire heat and flame will be lower intensity, short duration, and distant enough that heat experienced by the windows from the wildland fire are not expected to cause failure of both panes. However, should a wall window fail, the setbacks associated with rear and/or side yards and the ignition resistant structures, including dual pane, one pane tempered windows in each structure, would not be expected to be subject to direct flame impingement or extended heat exposure due to the FMZ and setbacks. Quarles, et. al. (2010)[8] provides strong endorsement for tempered glass performance. His research and tests conclude that multi-pane (2 to 3 panes) with at least one pane tempered is well-suited for wildfire exposures. He indicates that tempered glass is at least four times stronger and much more resistant to thermal exposures than normal annealed glass.

The use of code required dual pane, one pane tempered glass provides several benefits, with thermal exposure performance the most important for this study.

Dudek has utilized the preceding findings and the evaluations that resulted in the CBC, Chapter 7A "Materials and Construction Methods for Exterior Wildfire Exposure" along with the typical vegetation fire resident burn/heat output timeframes to justify the use of Chapter 7A fire ratings for landscape fire wall glass. This recommendation has been accepted by numerous fire agencies and allows the use of "fire rated" glass in the landscape fire walls meeting any of the following approved specifications:

- Be constructed of multi-pane glazing with a minimum of one tempered pane meeting the requirements of Section 2406 Safety Glazing, or
- Have a fire-resistance rating of not less than 20 minutes when tested according to NFPA 257, or
- Be tested to meet the performance requirements of SFM Standard 12-7A-2.

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6 Homeowner's Wildfire Education Program

The Proposed Project's residents will be provided a proactive educational component disclosing the potential wildfire risk and this report's requirements as part of their purchase documents. Property owner will be required to sign notice of receiving this information during escrow. This educational information must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go" stance on evacuation.

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7 Conclusion

This FPP has been prepared for the Sunbow II, Phase 3 Project. It is submitted in compliance with City requirements. The recommendations in this document meet fire safety, building design elements, infrastructure, fuel management/modification, and landscaping recommendations of the applicable codes. The recommendations provided in this FPP have been designed specifically for the Proposed Project development in order to protect human life based on the best available science and code requirements. The Proposed Project's fire protection system includes a redundant layering of protection materials, measures, and methods that have been shown through post-fire damage assessments to reduce risk.

Fuel modification would occur throughout the site and includes 100-foot wide zones on the north and west project-perimeter areas, varying widths on the south perimeter bolstered by additional measures and structure hardening, and an interim zone on the west until that site is developed. Proposed Project access roadways will include 30 feet of FMZ on either side. The fuel modification zones will be maintained and inspected annually; removing all dead and dying materials and maintaining appropriate horizontal and vertical spacing. In addition, plants that establish or are introduced to the FMZ that are not on the approved plant list will be removed so that the FMZs function as intended by reducing fire spread rates and intensity. Landscaping within the Proposed Project will conform to fire safe plant palettes, planting densities and spacing (per Zone 1).

The site improvements are designed to facilitate emergency apparatus and personnel access to all portions of the site. Roads and driveways meeting the code width standards and including fire engine turnarounds provide access to within 150 feet of all sides of every building. On-site water availability and flow will be consistent with City requirements. These features along with the ignition resistance of all buildings, the interior fire sprinkler systems, and the pre-planning, training and awareness will assist responding firefighters through prevention, protection and suppression capabilities.

Ultimately, it is the intent of this FPP to recommend the construction of structures that are defensible from wildfire and, in turn, do not represent significant threat of ignition source for the adjacent native habitat. During extreme fire conditions, there are no guarantees that a given structure will not burn. Fire safety measures identified in this report are designed to reduce the likelihood that fire would impinge upon the proposed structures. Wildfires may occur in the area that could damage property or harm persons. However, implementation of the recommendations in this FPP will substantially reduce the risk associated with this Proposed Project's supplemental wildfire hazard location.

This FPP recommends that the Project maintains a conservative approach to fire safety. This approach must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go!" stance on evacuation. This Project is not considered a shelter-in-place community, but this approach to public safety may be utilized by incident managers as a contingency to an unsafe evacuation. Accordingly, evacuation of the site and the area should occur according to pre-established evacuation decision points, or as soon as notice to evacuate is received, which may vary depending on many environmental and other factors, whichever is more conservative. Fire is a dynamic and somewhat unpredictable occurrence and it is important for anyone living at the Proposed Project to educate themselves on practices that will improve safety.

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8 Limitations

This FPP does not provide a guarantee that all residents and visitors will be safe at all times because of the enhanced fire protection features it requires. There are many variables that may influence overall safety. This FPP provides requirements and recommendations for implementation of the latest fire protection features that have proven to result in reduced wildfire related risk and hazard. Even then, fire can compromise the fire protection features through various, unpredictable ways. The goal is to reduce the likelihood that the system is compromised through implementation of the elements of this FPP and a regular occurring maintenance program.

For maximum benefit, the developer, contractors, engineers, and architects are responsible for proper implementation of the concepts and requirements set forth in this report. Homeowners are responsible to maintain their structures and lots as required by this report, the applicable City Fire and Building Codes, and the CVFD Fire Prevention Division's Engineering Safety Detail and Specification Sheets.

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Appendix A

Representative Site Photographs

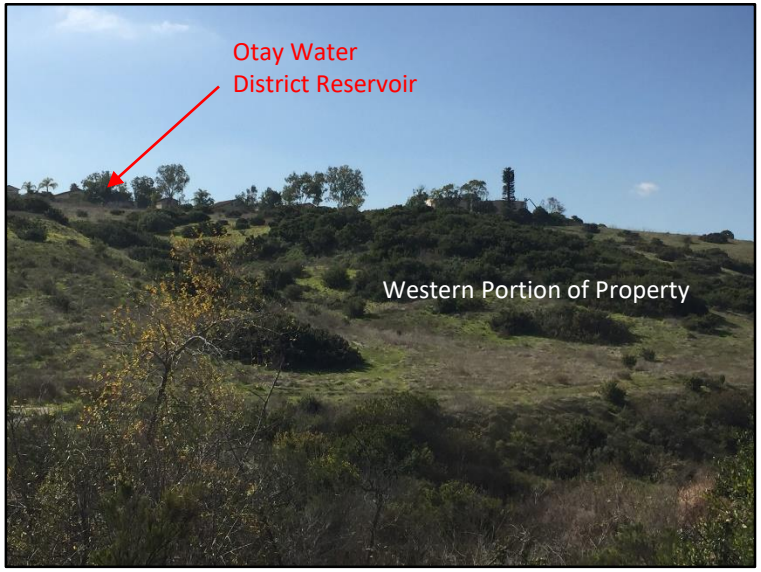
Sunbow II, Phase 3 Project
Fuels Photo Series

PHOTOGRAPHS TAKEN JANUARY 2020

Appendix A

Sunbow II, Phase 3 Project
Fuels Photo Series

Photograph 1. Photograph illustrates the terrain and grasslands-sage scrub fuels modeled in fire scenarios #1 and #4. Note Otay Landfill in background.



Photograph 2. The grasslands and sage scrub covered slope in Photo #2 represents the terrain and fuel types modeled in the western portion of the property for fire scenario #3.

Sunbow II, Phase 3 Project
Fuels Photo Series

Photograph 3

Photograph 4

Photographs 3 (looking east) and 4 (looking west) show the Poggi Creek /wetland area immediately south of Olympic Parkway. The steeper slope on the background of the photo would be the northern edge of the fuel modification and residential development. This Project area was modeled in fire scenario #4.

Appendix B

BehavePlus Fire Behavior Analysis

BehavePlus Fire Behavior Modeling

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

Fire behavior modeling includes a high level of analysis and information detail to arrive at reasonably accurate representations of how wildfire would move through available fuels on a given site. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, and fireline intensities, the BehavePlus 5.0.5 fire behavior modeling system was applied using predominant fuel characteristics, slope percentages, and four representative fuel models observed on site.

Predicting wildland fire behavior is not an exact science. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather and the limits of weather forecasting. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire prevention planning information.

To be used effectively, the basic assumptions and limitations of BehavePlus must be understood.

First, it must be realized that the fire model describes fire behavior only in the flaming front. The primary driving force in the predictive calculations is dead fuels less than one-quarter inch in diameter. These are the fine fuels that carry fire. Fuels greater than one inch have little effect while fuels greater than three inches have no effect on fire behavior.

Second, the model bases calculations and descriptions on a wildfire spreading through surface fuels that are within six feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.

Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.

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

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

The seven fuel characteristics help define the 13 standard fire behavior fuel models (Anderson 1982) and the five custom fuel models developed for Southern California (Weise 1997). According to the model classifications, fuel models used in BehavePlus have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Observation of the fuels in the field (on site) determines which fuel models should be applied in BehavePlus. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models and the custom Southern California fuel models:

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

In addition, the aforementioned fuel characteristics were utilized in the recent development of 40 new fire behavior fuel models (Scott and Burgan 2005) developed for use in BehavePlus modeling efforts. These new models attempt to improve the accuracy of the standard 13 fuel models outside of severe fire season conditions, and to allow for the simulation of fuel treatment prescriptions. The following describes the distribution of fuel models among general vegetation types for the new 40 fuel models:

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

BehavePlus software was used in the development of the Sunbow II, Phase 3 Project (Project) Fire Protection Plan (FPP) 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.

BehavePlus Fuel Model Inputs

Dudek utilized BehavePlus software to evaluate fire behavior potential for the project site. Four fire scenarios were evaluated, including two onshore winds conditions and two more extreme offshore winds conditions. 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.

Vegetation/Fuel Models

To support the fire behavior modeling efforts conducted for this FPP, the different vegetation types observed adjacent to the site were classified into the aforementioned numeric fuel models. Dudek analyzed fire behavior for the fuels adjacent to the property in all directions. As is customary for this type of analysis, the terrain and fuels directly adjacent to the proposed development and fuel modification zones (FMZ) 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. Fuel beds, including Diegan coastal sage scrub and grasslands would be adjacent to the structures in the proposed development. These fuel types can produce flying embers that may affect the Project, but defenses have been built into the structures to prevent ember penetration. Table 1 provides a description of the two fuel models observed in the vicinity of the site that were subsequently used in the analysis for this Project. Modeled areas include the Diegan coastal sage scrub (Fuel Model Sh5) and non-native/native grasslands (Fuel Model Gr4). A total of four fire scenarios were completed for the Project area. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 5 of the FPP. These sites were selected based on the strong likelihood of fire approaching from these directions during a Santa Ana wind-driven fire event (fire scenarios 1 and 2) and an on-shore weather pattern (fire scenarios 3 and 4). Dudek also conducted modeling of the site for post-Fuel Modification Zones' (FMZ) recommendations for this project (Refer to Table 2 for post-FMZ fuel model descriptions). Fuel modification includes establishment of irrigated and thinned zones on the periphery of the Project. For modeling the post-FMZ treatment condition, fuel model assignments were re-classified for the FMZ 1 (Fuel Model 8, irrigated landscape) and FMZ 2 (Fuel Model Gr1, cut grasses and Fuel Model Sh1, 50% thinned brush).

Table 1. Existing Fuel Model Characteristics

Fuel Model	Description	Location	Fuel Bed Depth (Feet)
Gr4	Moderate Load, Dry Climate Grasses (untreated fuel bed)	Throughout property	<2.0
Sh5	Diegan Coastal Sage Scrub (untreated fuel bed)	Throughout property	>4.0

Table 2. Fuel Model Characteristics – Post-Project Fuel Modification Zones

Fuel Model	Description	Location	Fuel Bed Depth (Feet)
FM8	irrigated landscapes	Fuel Modification Zone 1	<3.0
Gr1	cut grasses	Fuel Modification Zone 2	<0.5
Sh1	50% thinning of shrubs	Fuel Modification Zone 2	<3.0

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. Natural slope values ranging from 5% to 34% were measured around the perimeter of the Project site from U.S. Geological Survey (USGS) topographic maps.

Weather Analysis

In order to evaluate specific weather variables for the Project area, data from the San Miguel Remote Automated Weather Station (RAWS) was analyzed. The San Miguel RAWS is the closest weather station, located approximately 5.6 miles due northeast of the Project site, in a similar inland position and estimated to include consistent weather conditions as the Project area. The location and available data range for the San Miguel station is: Latitude: 32.68611; Longitude: -116.97833; Elevation: 425 feet; Data years: 2002 to 2018.

Utilizing the FireFamily Plus v. 4.0.2 (FireFamily Plus 2008) software package, data from the San Miguel RAWS was processed and analyzed to determine 50th (typical) and 97th (extreme) percentile wind and fuel moisture conditions to be used in the fire behavior modeling efforts conducted for the Project area. Fuel moisture information was analyzed and directly inputted into the focused BehavePlus runs discussed, below. Two separate wind scenarios were analyzed and incorporated into the BehavePlus model: summer fire (50th percentile values from June 1 to August 31) with 12 mph onshore winds, and fall fire (97th percentile values from September 1 to November 30) with 50 mph winds (representing maximum wind gust speed). The use of 50 mph winds in modeling efforts is intended to represent wind gusts rather than sustained maximum wind speeds. The maximum RAWS wind speed for the San Miguel RAWS during the 97th percentile weather period (September 1 to November 30) was 19 mph, which represents a 10-minute average wind speed, not the maximum gust speed. As BehavePlus presents a static representation of fire behavior, the inclusion of gust speed is appropriate to evaluate worst-case fire behavior outputs. Table 3 presents the weather and fuel moisture input variables used for all fire behavior modeling conducted for this FPP.

Table 3. Weather and Fuel Moisture Variables

Model Variable	50th Percentile	97th Percentile
1h Moisture	8%	2%
10h Moisture	9%	3%
100h Moisture	15%	8%

Table 3. Weather and Fuel Moisture Variables

Model Variable	50th Percentile	97th Percentile
Live Herbaceous Moisture	59%	30%
Live Woody Moisture	118%	60%
20-foot Wind Speed	12 mph	19 mph (50 mph gusts)
Slope Steepness	7% to 15%	5% to 34%
Wind Adjustment Factor (BehavePlus)	0.4	0.4
Wind Direction	Onshore	Offshore/Santa Ana conditions

Fire Modeling Scenarios

Based on slope and fuel conditions, four different fire scenarios (Refer to Figure 5 of FPP for locations of each fire scenario) were evaluated for the project site, including:

- **Scenario 1**: 97th percentile weather with offshore, strong east winds and a fall fire burning in grassland-sage scrub fuels along the eastern edge of the project site. This area is moderately steep (15% slope), with potential ignition sources along nearby surface streets (e.g., Olympic Parkway) and adjacent landfill operations. Fire in this area would be moving uphill toward the proposed Project. It should be noted that portions of the area included under Scenario 1 is planned for future development. Therefore, the modeled fire behavior is only relevant for the existing, non-developed condition.
- **Scenario 2**: 97th percentile weather with offshore wind and a fall fire burning in predominately grasslands along the southern edge of the project site. This area is relatively flat (7% slope), with potential ignition sources from landfill operations and activities on City of Chula Vista's undeveloped property to the south.
- **Scenario 3**: 50th percentile weather with onshore wind and a summer fire burning in grassland and coastal sage scrub shrub cover along the western edge of the project site. This area is moderately steep (15% slope), with potential ignition sources from nearby surface streets (Olympic Parkway and Brandywine Avenue) and the adjacent residential communities.
- **Scenario 4**: 50th percentile weather with onshore wind and a summer fire burning in grassland and willow-sage scrub cover along the northern edge of the project site. This area is similar in environmental setting as scenario 3, except for steeper slopes reaching up to 34%. Fire in this area would be moving upslope toward the project site.

Fire Behavior Modeling Analysis

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, east, south, and west. Four fire behavior variables were selected as outputs from the BehavePlus analysis conducted for the project site, and include flame length (feet), rate of spread (mph), fireline intensity (BTU/feet/second), and surface fire spotting distance (miles). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities (See Table 6). 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. The results of fire behavior modeling analysis are presented in Table 4.

Based on the BehavePlus analysis, worst-case fire behavior is expected in coastal sage scrub fuels along the eastern edge of proposed project development (Scenario 1) during a strong wind-driven fire event (97th percentile weather). Under this scenario, a fire originating east of Sunbow II, Phase 3 Project site and pushed by winds from the east results in flame lengths reaching 41.3 feet and fireline intensities reaching 18,451 BTU/feet/second and a spread rate of 2.3 mph. Spotting distance for this extreme fire weather scenario reaches 2.3 miles. A grass (i.e., flashy, fuel type) fire would have a rapid rate of spread of 14.0 mph with flames reaching 33.4 feet high. It should be noted that portions of the area included under Scenario 1 is planned for future development. Therefore, the modeled fire behavior is only relevant for the existing, non-developed condition.

In comparison, a wildfire being fanned by an onshore breeze (i.e., 50th Percentile Weather Condition for Scenarios 3 and 4) is expected to generate flame lengths of 8.1 for a grass fire and 11.7 for a fire burning in sage scrub habitat. A fire under higher fuel moistures and lower wind speeds would be of a low to moderate fire intensity (i.e., 540 to 1,190 BTU/feet/second) and a slower spread rate of less than 1.0 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, are calculated at 0.4 mile (Onshore wind) compared to 2.3 miles for an offshore wind condition.

Table 4. BehavePlus Fire Behavior Modeling Results - Existing Conditions

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph[1])	Spotting Distance[2] (miles)
Scenario 1: grasslands-sage scrub; east facing , 15% slope, 50 mph offshore winds				
Fuel Model Gr4	33.4	11,616	14.0	2.0
Fuel Model Sh5	41.3	18,451	6.2	2.3
Scenario 2: grasslands-scattered shrubs; south-facing, 7% slope, 50 mph offshore winds				
Fuel Model Gr4	33.3	11,575	14.0	2.0
Scenario 3: sage scrub-grasslands; north-facing, 15% slope, 12 mph onshore winds				
Fuel Model Gr4	8.1	540	0.82	0.3
Fuel Model Sh5	11.7	1,190	0.54	0.4
Scenario 4: willow-sage scrub (5% slope) and grasslands, on north-facing slopes, 34% slope, 12 mph onshore winds				
Fuel Model Gr4	8.1	531	0.53	0.3
Fuel Model Sh5	11.5	1,155	0.80	0.4

Notes:
1 mph = miles per hour
2 Spotting distance from a wind driven surface fire.

As previously mentioned, Dudek conducted modeling of the site for post-FMZ fuel recommendations for this project. Fuel modification includes establishment of irrigated and thinned zones on the periphery of the project's residences and roads. Proposed fuel modification zones include establishment of minimum 50-foot wide irrigated zone (Zone

1) and one or two, 50-foot wide thinned zones (Zone 2= 50% thinned brush and Zone 3= 30% thinned brush) on the periphery of the project site, beginning at the rear lot line. For modeling the post-FMZ treatment condition, the fuel model assignments for coastal sage scrub-willow scrub were re-classified according to the specific fuels management (e.g., irrigated, fire resistive landscaping vs. 50% thinned native brush) treatment.

As depicted in Table 5, the FMZ areas experience a significant reduction in flame length and intensity. The 41.3-foot flame lengths predicted for coastal sage scrub during pre-treatment modeling for fire scenarios 1 and 2 are reduced to approximately 9.5 feet at the outer edges of the FMZ (Zone 2) and to less than three feet by the time the inner portions of the FMZ (Zone 1) are reached. During onshore weather conditions, a fire approaching from the west towards the development footprint would be reduced from 33.3-foot tall flames to less than 2 feet tall in Zones 1 and 2 with low fire intensity and spotting distances due to the higher live and dead fuel moisture contents. These reduction of flame lengths and intensities are assumed to occur within the full 100 to 150 feet of fuel modification. As such, the proposed minimum 100-foot FMZ width would be approximately two to three times, depending on which side of the development a fire comes from, as wide as the calculated flame lengths.

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

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph[1])	Spotting Distance (miles[2])
Scenario 1: Fuel treatments on east-facing, 15% slope, 50 mph offshore winds				
Fuel modification zone 1 (FM8)	2.6	45	0.13	0.3
Fuel modification zone 2 (Sh1)	9.5	760	1.3	0.8
Scenario 2: Fuel treatments on south-facing, 7% slope, 50 mph offshore winds				
Fuel modification zone 1 (FM8)	2.6	45	0.13	0.3
Fuel modification zone 2 (Gr1)	3.1	67	1.3	0.4
Scenario 3: Fuel treatments on north-facing, 15-50% slope[3], 12 mph onshore winds				
Fuel modification zone 1 (FM8)	1.0	5	0.02	0.1
Fuel modification zone 2 (Sh1)	0.6	2	0.02	N/A
Scenario 4: Fuel treatments on north-facing, 5-50% slope[3], 12 mph onshore winds				
Fuel modification zone 1 (FM8)	1.0	5	0.21	0.1
Fuel Modification zone 2 (Sh1)	0.6	2	0.02	N/A
Fuel Modification zone 2 (Gr1)	1.7	18	0.16	0.1

Notes:
1 mph = miles per hour
2 Spotting distance from a wind driven surface fire.
3 50% slope = 2:1 manufactured slope

Note: The fire behavior results described herein depict values based on inputs to the BehavePlus software. Localized changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis, but assumed (averaged) across the landscape based on the available data resolution. Further, this modeling analysis assumes a correlation between the available vegetation data and fuel model characteristics. Recent fire activity may temporarily alter fuel beds, but fire behavior modeling efforts conducted for this project assume natural succession of burned areas to more mature stand conditions, resulting in a conservative (near worst-case) estimate of fire behavior. Since fire behavior for a given location will be affected by many factors, including unique

weather patterns, small-scale topographic variations, or changing vegetation patterns, modeling results are applicable as a basis for planning, but need to be considered in context with other site variables.

The information in Table 6 presents an interpretation of these fire behavior variables as related to wildland fire suppression efforts.

Table 6. Wildland Fire Suppression Guidelines

Flame Length (feet)	Fireline Intensity (Btu/ft/s)	Interpretations
Under 4	Under 100	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4–8	100–500	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.
8–11	500–1,000	Fires may present serious control problems—torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11	Over 1,000	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Source: BehavePlus 5.0.2 fire behavior modeling program (Andrews, Bevins, and Seli 2004)

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Appendix C

Proposed Project Slope Planting and FMZ Tree List

APPENDIX C: PRELIMINARY PLANT PALETTE

SHADE TREES
AGONIS FLEXUOSA / PEPPERMINT TREE
CERCIDIUM X `DESERT MUSEUM` / THORNLESS PALO VERDE
JACARANDA MIMOSIFOLIA / JACARANDA
METROSIDEROS EXCELSA / NEW ZEALAND CHRISTMAS TREE
PROSOPIS G. 'LESLIE ROY' / LESLIE ROY MESQUITE

ACCENT TREES
CERCIS CANADENSIS `FOREST PANSY` / FOREST PANSY REDBUD
CHILOPSIS LINEARIS / DESERT WILLOW
HANDROANTHUS IMPETIGINOSUS / PINK TRUMPET TREE
RHUS LANCEA / AFRICAN SUMAC

PALM TREES
PHOENIX DACTYLIFERA / DATE PALM

BIO-BASIN TREES
ALNUS RHOMBIFOLIA / WHITE ALDER
SALIX LASIOLEPIS / ARROYO WILLOW

STREET TREES
HANDROANTHUS IMPETIGINOSUS / PINK TRUMPET TREE
METROSIDEROS EXCELSA / NEW ZEALAND CHRISTMAS TREE
PROSOPIS G. 'LESLIE ROY' / LESLIE ROY MESQUITE

SHRUB/ GROUNDCOVER PLANTING
AGAVE SHAWII / COASTAL AGAVE
AGAVE X `BLUE FLAME` / BLUE FLAME AGAVE
AGAVE X `BLUE GLOW` / BLUE GLOW AGAVE
ALOE VERA / MEDICINAL ALOE
ALOE X `BLUE ELF` / ALOE
ASPARAGUS MEYERI / FOXTAIL FERN
BACCHARIS PILULARIS `TWIN PEAKS` / TWIN PEAKS COYOTE BRUSH
CALLIANDRA CALIFORNICA / RED BAJA FAIRY DUSTER
CISTUS X PURPUREUS / ORCHID ROCKROSE
DIANELLA TASMANICA / FLAX LILY
ERIGERON KARVINSKIANUM / SANTA BARBARA DAISY
FESTUCA CALIFORNICA / CALIFORNIA FESCUE
FICUS PUMILA / CREEPING FIG
GALVEZIA JUNCEA / BAJA SNAPDRAGON
GALVEZIA SPECIOSA `FIRECRACKER` / BUSH SNAPDRAGON
GREVILLEA X `NED KELLY` / NED KELLY GREVILLEA
IVA HAYESIANA / SAN DIEGO POVERTY WEED
LEUCADENDRON X `SAFARI SUNSET` / CONEBUSH
LEUCOPHYLLUM FRUTESCENS `GREEN CLOUD` TM / GREEN CLOUD TEXAS RANGER
LEYMUS CONDENSATUS `CANYON PRINCE` / NATIVE BLUE RYE
MISCANTHUS SINENSIS `ADAGIO` / ADAGIO MAIDEN GRASS[2]
MUHLENBERGIA CAPILLARIS / PINK MUHLY GRASS[2]
PHILODENDRON X `XANADU` / CUT-LEAF PHILODENDRON

PITTOSPORUM SPP. / PITTOSPORUM SPECIES – except PITTOSPORUM UNDULATUM / VICTORIA BOX
PITTOSPORUM TENUIFOLIUM / TAWHIWHI
RHAMNUS CALIFORNICA `EVE CASE` / CALIFORNIA COFFEEBERRY
ROSMARINUS OFFICINALIS 'PROSTRATUS' / CREEPING ROSEMARY
SALVIA SONOMENSIS / CREEPING SAGE
SALVIA LEUCOPHYLLA 'POINT SAL SPREADER' - POINT SAL PURPLE SAGE
SENECIO MANDRALISCAE `BLUE CHALK STICKS` / SENECIO
SESLERIA AUTUMNALIS / AUTUMN MOOR GRASS
WESTRINGIA FRUTICOSA `BLUE GEM` / COAST ROSEMARY

BASIN SHRUB / GROUNDCOVER PLANTING
CAREX PRAEGRACILIS / CALIFORNIA FIELD SEDGE
IVA HAYESIANA / SAN DIEGO POVERTY WEED
JUNCUS MEXICANUS / MEXICAN RUSH
LEYMUS CONDENSATUS / GIANT WILD RYE
LEYMUS TRITICOIDES / CREEPING WILD RYE

TURF (SOD)
DROUGHT TOLERANT HYBRID BERMUDA

ENHANCED SHRUB / GROUNDCOVER PLANTING
AGAVE X `BLUE FLAME` / BLUE FLAME AGAVE
AGAVE X `BLUE GLOW` / BLUE GLOW AGAVE
ALOE VERA / MEDICINAL ALOE
CAREX SPP. / SEDGE
CISTUS X PURPUREUS / ORCHID ROCKROSE
DIANELLA TASMANICA / FLAX LILY
ERIGERON KARVINSKIANUM / SANTA BARBARA DAISY
FESTUCA CALIFORNICA / CALIFORNIA FESCUE
GALVEZIA SPECIOSA `FIRECRACKER` / BUSH SNAPDRAGON
GREVILLEA X `NED KELLY` / NED KELLY GREVILLEA
LEUCADENDRON X `SAFARI SUNSET` / CONEBUSH
LEYMUS CONDENSATUS `CANYON PRINCE` / NATIVE BLUE RYE
MISCANTHUS SINENSIS `ADAGIO` / ADAGIO MAIDEN GRASS[2]
MUHLENBERGIA CAPILLARIS / PINK MUHLY GRASS[2]
PHORMIUM SPP.
PITTOSPORUM TENUIFOLIUM / TAWHIWHI
RHAMNUS CALIFORNICA `EVE CASE` / CALIFORNIA COFFEEBERRY
ROSMARINUS OFFICINALIS 'PROSTRATUS' / CREEPING ROSEMARY
SALVIA SONOMENSIS / CREEPING SAGE
SENECIO MANDRALISCAE `BLUE CHALK STICKS` / SENECIO
SESLERIA AUTUMNALIS / AUTUMN MOOR GRASS
WESTRINGIA FRUTICOSA `BLUE GEM` / COAST ROSEMARY

STREETSCAPE SHRUBS/ GROUNDCOVER
AGAVE SHAWII / COASTAL AGAVE
AGAVE X `BLUE FLAME` / BLUE FLAME AGAVE
BACCHARIS PILULARIS `TWIN PEAKS` / TWIN PEAKS COYOTE BRUSH
CISTUS X PURPUREUS / ORCHID ROCKROSE
DIANELLA TASMANICA / FLAX LILY
GALVEZIA SPECIOSA `FIRECRACKER` / BUSH SNAPDRAGON
IVA HAYESIANA / SAN DIEGO POVERTY WEED
LEYMUS CONDENSATUS `CANYON PRINCE` / NATIVE BLUE RYE

MUHLENBERGIA CAPILLARIS / PINK MUHLY GRASS[2]
PHORMIUM SPP.
RHAMNUS CALIFORNICA `EVE CASE` / CALIFORNIA COFFEEBERRY
ROSMARINUS OFFICINALIS 'PROSTRATUS' / CREEPING ROSEMARY
SALVIA SONOMENSIS / CREEPING SAGE
WESTRINGIA FRUTICOSA `BLUE GEM` / COAST ROSEMARY

SLOPE PLANTING AND FUEL MODIFICATION ZONE TREES[3]
RHUS LANCEA / AFRICAN SUMAC[2]
HETEROMELES ARBUTIFOLIA / TOYON[2]

SLOPE SHRUB/ GROUNDCOVER PLANTING IN FUEL MODIFICATION ZONES[3]
ACANTHOMINTHA ILICIFOLIA/SAN DIEGO THORNMINT[1]
AMBROSIA CHENOPODIFOLIA/ SAN DIEGO BURSAGE[2]
ASTER CHILENSIS 'POINT SAINT GEORGE'/ CALIFORNIA ASTER[1]
BACCHARIS PILULARIS `TWIN PEAKS` / TWIN PEAKS COYOTE BRUSH[1]
BAHIOPSIS LACINIATA/SAN DIEGO SUNFLOWER[2]
ACALYPHA CALIFORNICA / CALIFORNIA COPPERLEAF[2]
BERGEROCACTUS EMORYI/VELVET CACTUS[1]
CISTUS SALVIIFOLIUS 'PROSTRATUS' - SAGELEAF ROCKROSE[1]
CORETHROGYNE FILAGINIFOLIA / SILVER CARPET[1]
CYLINDROPUNTIA PROLIFERA / COAST CHOLLA[1]
DEINANDRA CONJUGENS/OTAY TARPLANT[1]
DUDLEYA PULVERULENTA / CHALK LETTUCE[1]
DUDLEYA LANCEOLATA/LANCE-LEAF DUDLEYA[1]
ENCELIA CALIFORNICA / CALIFORNIA ENCELIA[2]
EPILOBIUM CANUM VAR. LATIFOLIUM 'EVERETT'S CHOICE'[1]
EUPHORBIA MISERA / CLIFF SPURGE[1]
ISOMERIS ARBOREA / BLADDERPOD[2]
IVA HAYESIANA / SAN DIEGO POVERTY WEED[2]
LUPINUS SUCCULENTUS / ARROYO LUPINE[2]
LYCIUM CALIFORNICUM / CALIFORNIA BOX THORN[2]
MALACOTHAMNUS FASCICULATUS / BUSH MALLOW[2]
MYOPORUM PARVIFOLIUM / MYOPORUM[1]
SALVIA LEUCOPHYLLA 'POINT SAL SPREADER' - POINT SAL PURPLE SAGE[1]
SALVIA SONOMENSIS / CREEPING SAGE[1]
STIPA DIEGOENSIS/SAN DIEGO NEEDLEGRASS[1]
STIPA LEPIDA/FOOTHILL NEDDLEGRASS[1]
STIPA PULCHRA / PURPLE NEEDLE GRASS[1]
OPUNTIA LITTORALIS / SHORE CACTUS[1]
OPUNTIA ORICOLA / CHAPARRAL PRICKLYPEAR[1]
RHAMNUS CROCEA / REDBERRY[2]
RHUS INTEGRIFOLIA / LEMONADE BERRY[2]
RIBES SPECIOSUM / FUCHSIA FLOWERING GOOSEBERRY[2]
SIMMONDSIA CHINENSIS / JOJOBA[2]
WESTRINGIA FRUTICOSA `MUNDI` / MUNDI COAST ROSEMARY[1]

SHRUB/ GROUNDCOVER PLANTING (NON-SLOPE) IN FUEL MODIFICATION ZONES SHRUBS[3]
AGAVE SHAWII / COASTAL AGAVE[1]
AGAVE X `BLUE FLAME` / BLUE FLAME AGAVE[1]
AGAVE X `BLUE GLOW` / BLUE GLOW AGAVE[1]
ALOE VERA / MEDICINAL ALOE[1]
ALOE X `BLUE ELF` / ALOE[1]

ALOE 'CYNTHIA GIDDY'/CYNTHIA GIDDY ALOE[1]
ASTER CHILENSIS 'POINT SAINT GEORGE'/ CALIFORNIA ASTER[1]
BACCHARIS PILULARIS `TWIN PEAKS` / TWIN PEAKS COYOTE BRUSH[1]
CISTUS SALVIIFOLIUS 'PROSTRATUS' - SAGELEAF ROCKROSE[1]
CORETHROGYNE FILAGINIFOLIA / SILVER CARPET[1]
DIANELLA TASMANICA / FLAX LILY[1]
DIANELLA REVOLUTA 'BABY BLISS'/ BABY BLISS FLAX LILY[1]
EPILOBIUM CANUM VAR. LATIFOLIUM 'EVERETT'S CHOICE'[1]
ERIGERON GLAUCUS/SEASIDE DAISY[1]
ERIGERON KARVINSKIANUM / SANTA BARBARA DAISY[1]
FESTUCA CALIFORNICA / CALIFORNIA FESCUE[1]
FURCRAEA FOETIDA 'MEDIOPICTA'[1]
HELIANTHEMUM 'BELGRAVIA ROSE' / BELGRAVIA ROSE[1]
LEYMUS TRITICOIDES 'LAGUNITA' / LAGUNITA WILD RYE[1]
MYOPORUM PARVIFOLIUM / MYOPORUM[1]
OTHONNA CAPENSIS - LITTLE PICKLES[1]
ROSMARINUS OFFICINALIS 'PROSTRATUS' / CREEPING ROSEMARY[1]
SALVIA SONOMENSIS / CREEPING SAGE[1]
SENECIO MANDRALISCAE `BLUE CHALK STICKS` / SENECIO[1]
SESLERIA AUTUMNALIS / AUTUMN MOOR GRASS[1]
WESTRINGIA FRUTICOSA `MUNDI` / MUNDI COAST ROSEMARY[1]

BIOLOGICAL RESTORATION AREAS SHRUBS / GROUNDCOVER[4]
ACMISPON GLABER VAR. GLABER / COASTAL DEERWEED
ARTEMISIA CALIFORNICA/CALIFORNIA SAGEBRUSH
BAHIOPSIS LACINIATA/SAN DIEGO SUNFLOWER
BLOOMERIA CROCEA / COMMON GOLDER STAR
BERGEROCACTUS EMORYI/VELVET CACTUS
CORETHROGYNE FILAGINIFOLIA / SAND ASTER
CONVOLVULUS SIMULANS / SMALL-FLOWERED BINDWEED
CYLINDROPUNTIA PROLIFERA / COAST CHOLLA
DICHELOSTEMMA CAPITATUM SSP. CAPITATUM / BLUE DICKS
DEINANDRA CONJUGENS/OTAY TARPLANT
ERIOGONUM FASCICULATUM VAR. FASCICULATUM/FLAT-TOP BUCKWHEAT
ERIOPHYLLUM CONFERTIFLORUM / GOLDDEN YARROW
ESCHSCHOLZIA CALIFORNICA / CALIFORNIA POPPY
EUPHORBIA MISERA / CLIFF SPURGE
GRINDELIA CAMPORUM / RAYLESS GUMPLANT
ISOCOMA MENZIESII VAR. DECUMBENS / DECUMBENT GOLDENBUSH
ISOMERIS ARBOREA / BLADDERPOD
LASTHENIA CORONARIA / ROYAL GOLDFIELDS
LUPINUS BICOLOR / MINIATURE LUPINE
LYCIUM CALIFORNICUM / CALIFORNIA BOX THORN
MELICA IMPERFECTA / COAST RANGE MELIC
SISYRINCHIUM BELLUM / BLUE-EYED GRASS
STIPA DIEGOENSIS/SAN DIEGO NEEDLEGRASS
STIPA LEPIDA/FOOTHILL NEDDLEGRASS
STIPA PULCHRA / PURPLE NEEDLE GRASS
OPUNTIA LITTORALIS / SHORE CACTUS
RHUS INTEGRIFOLIA / LEMONADE BERRY
SIMMONDSIA CHINENSIS / JOJOBA
YUCCA SCHIDIGERA / MOHAVE YUCCA

GENERAL NOTES:

TREE SIZES: 15-GALLON (15%), 24” BOX (60%), 36” BOX (20%), 48” BOX (5%)
SHRUB AND GROUNDCOVER SIZES: 5-GALLON (30%), 1-GALLON (70%)
RESTORATION SHRUB AND GROUNDCOVER SIZES: 1-GALLON (100%), OVERSEED ALL AREAS WITH SEED BLEND OF SAME SPECIES

FOOTNOTES:

1. LOW GROWING VARIETY OF SPECIES ABLE TO BE PLANTED IN FUEL MODIFICATION ZONE 1 AND 2.
2. LOW GROWING VARIETY OF SPECIES ABLE TO BE PLANTED IN FUEL MODIFICATION ZONE 2.
3. SEE PROJECT FIRE PROTECTION PLAN FOR ADDITIONAL INFORMATION. PLANTING MUST BE IMPLEMENTED IN ACCORDANCE WITH CHULA VISTA FIRE DEPARTMENT’S FUEL MODIFICATION GUIDELINES SUMMARIZED WITHIN THE FIRE PROTECTION PLAN.
4. SEE PROJECT BIOLOGICAL RESTORATION PLAN FOR ON-SITE PLANTING SPECIFICATIONS (TIMING, SPECIES, AND SIZE) WITHIN RESTORATION AREA.

Appendix D

Prohibited Plant List

Prohibited Trees

Botanical Name	Common Name	Resource
Abies species	Fir trees	S
Acacia species	Acacia	D,H,S
Agonis juniperina	Juniper myrtle	S
Araucaria species	Norfolk Island Pine	S
Callistemon species	Bottlebrush	D,H
Cedrus species	Cedar	D,H,S
Chamaecyparis species	False cypress	S
Conifers	Evergreen trees	D,H
Cryptomeria japonica	Japanese cryptomeria	S
Cupressocyparis leylandii	Leylandii cypress	S
Cupressus forbesii	Tecate cypress	S
Cupressus glabra	Arizona cypress	S
Cupressus sempervirens	Italian cypress	S
Cupressus species	Cypress	D,H
Eucalyptus species	Eucalyptus	D,H,S
Eucalyptus	Eucalyptus species	K
*Juniperus species***	Juniper	D,H
Larix species	Larch	S
Palmae species	Palms	D,H,S
Parkinsonia aculeata	Mexican palo verde	K
Pinus species	Pine	D,H,S
Pittosporum undulatum	Victorian box	K
Podocarpus species	Fern pine	S
Prunus caroliniana	Carolina cherry laurel	K
Prunus lyonil	Catalina cherry	K
Pseudotsuga menziesii	Douglas fir	S
Quercus engelmannii	Engelmann oak	K
Quercus suber	Cork Oak	K
Schinus molle	California Pepper Tree	H
Tamarix species	Tamarix	C
Taxodium species	Cypress	S
Taxus species	Yew	S
Tsuga species	Hemlock	S
Washingtonia filifera	California Fan Palm	D,H

Prohibited Groundcovers, Shrubs, and Vines

Botanical Name	Common Name	Resource
Acacia species	Acacia	D,H,S
Achillea millefolium	Common yarrow	K
Adenostoma fasciculatum	Chamise	D,H,S
Adenostoma sparsifolium	Red shanks	D,H,S
Aeonium decorum	Aeonium	K
Aeonium simsii	NCN	K
Ajuga reptans	Carpet bugle	K
Anthemis cotula	Mayweed	H
Aptenia cordifolia x 'red apple'	Red apple	K
Arbutus menziesii	Madrone	H
Arctostaphylos species	Manzanita	H
Artemisia pycnocephala	Beach sagewort	K
Artemisia californica	California sagebrush	H,S
Artemisia caucasica	Caucasica artemisia	H
Artemisia pycnocephala	Sandhill sage	H
Arundo donax	Giant cane	C
Atriplex species	Saltbush	H
Atriplex canescens	Four-wing saltbush	K
Atriplex lentiformis ssp. *breweri*	Brewer saltbush	K
Baccharis pilularis consanguinea	Chaparral bloom	H
*Baccharis species**	Coyote bush	D,H
Bambusa species	Bamboo	S
Bougainvillea species	Bougainvillea	H
Brassica nigra	Black mustard	H
Brassica rapa	Yellow mustard	H
Cardaria draba	Hoary cress, perennial peppergrass	H
Carpobrotus species	Ice plant, hottentot fig	H
Carpobrotus chilensis	Sea fig ice plant	K
Chrysanthemum leucanthemum	Oxeye daisy	K
Cirsium vulgare	Wild artichoke	H
Conyza canadensis	Horseweed	H
Coprosma pumila	Prostrate coprosma	S
Cortaderia selloana	Pampas grass	HC
Crassula lactea	NCN	K
Crassula multicava	NCN	K
Crassula ovata	Jade tree	K
Crassula tetragona	NCN	K
Cytisus spp.	Scotch broom, French broom, etc.	D,H,C
Delosperma 'alba'	White trailing ice plant	K
Dodonaea viscosa	Hopseed bush	S
Drosanthemum floribundum	Rosea ice plant	K
Drosanthemum hispidum	NCN	K

Prohibited Groundcovers, Shrubs, and Vines

Botanical Name	Common Name	Resource
Drosanthemum speciosum	Dewflower	K
Eriogonum fasciculatum	Common buckwheat	H,S
Eschscholzia mexicana	Mexican poppy	K
Fremontodendron species	Flannel bush	H
Gaillardia x grandiflora	Blanketflower	K
Gazania hybrids	South African daisy	K
Gazania rigens leucolaena	Trailing gazania	K
Hedera helix	English ivy	H
Helix canariensis	English ivy	K
Heterotheca grandiflora	Telegraph plant	H,S
Hypericum calycinum	Aaron's beard	K
*Juniperus species***	Juniper	D,S
Lactuca serriola	Prickly lettuce	H
Lampranthus aurantiacus	Bush ice plant	K
Lampranthus filicaulis	Redondo creeper	K
Lampranthus spectabilis	Trailing ice plant	K
Limonium pectinatum	NCN	K
Limonium perezii	Sea lavender	K
Lonicera japonica	Japanese honeysuckle	S
Lonicera japonica 'halliana'	Hall's Japanese honeysuckle	K
Lotus corniculatus	Bird's foot trefoil	K
Mahonia species	Mahonia	H
Malephora luteola	Trailing ice plant	K
Malosma laurina	Laurel sumac	D,H
*Miscanthus species*****	Eulalie grass	S
*Muhlenbergia species******	Deer grass	S
Nerium oleander	Oleander	K
Nicotania bigelovii	Indian tobacco	H
Nicotania glauca	Tree tobacco	H
Ophiopogon japonicus	Mondo grass	K
Osteospermum fruticosum	Trailing African daisy	K
Penstemon spectabilis	Beard tongue	K
Pennisetum setaceum	Fountain grass	C
Perovskia atriplicifolia	Russian sage	H
Pickeringia 'montana'	Chaparral pea	S
Plantago sempervirens	Evergreen plantain	K
Portulacaria afra	Elephant's food	K
Potentilla tabernaemontani	Spring cinquefoil	K
Rhamnus alaternus	Italian buckhorn	K
Rhus diversiloba	Poison oak (worker/firefighter safety)	H
Rhus lentii	Pink flowering sumac	H
Ricinus communis	Castor bean	H

Prohibited Groundcovers, Shrubs, and Vines

Botanical Name	Common Name	Resource
Romneya coulteri 'white cloud'	White cloud matilija poppy	K
*Rosmarinus species****	Rosemary	S
Salsola australis	Russian thistle	H
*Salvia species*****	Sage	H,S
Sedum acre	Goldmoss sedum	K
Sedum album	Green stonecrop	K
Sedum confusum	NCN	K
Sedum lineare	NCN	K
Sedum x rubrotinctum	Pork and beans	K
Senecio serpens	NCN	K
Solanum xantii	Purple nightshade (toxic)	H
Silybum marianum	Milk thistle	H
Tamarix spp.	Tamarisk	K
Tecomaria capensis	Cape honeysuckle	K
Thuja species	Arborvitae	S
Trifolium hirtum 'hyron'	Hyron rose clover	K
Trifolium fragiferum 'o'connor's	O'Connor's legume	K
Urtica urens	Burning nettle	S
Verbena species	Verbena	K
Vinca major	Periwinkle	H
Vinca minor	Dwarf periwinkle	K
Vulpia myuros 'zorro'	Zorro annual fescue	K
Yucca species	Yucca	D,K

Notes:

1. Various documents are referenced as sources for plant material information in this list of prohibited plant material. The titles of some of those reference documents suggest that some of the plant materials may be somewhat "Fire Retardant" or "Fire Resistant." It must be understood that under various fire conditions, all plants will burn. Accordingly, some seemingly "Fire Retardant" or "Fire Resistant" plants appear in this Prohibited Plant List.
2. Plant species included on this Prohibited Plant List that also occur on the Landscape Concept Plan may be used in limited quantities in interior locations, with approval of the Chula Vista Fire Department (CVFD). Notwithstanding any other descriptors, the preparers of this document have determined that plants on this Prohibited Plant List shall not be used within the Fuel Modification Zones within this Project.
3. All vegetation used in Fuel Modification Zones and elsewhere in this development shall be subject to approval of the CVFD's Fire Marshal.
4. Any deviations from the Prohibited Plant List must be submitted to the CVFD's Fire Marshal for approval.

* *Baccharis spp.* are prohibited except *Baccharis pilularis* 'Twin Peaks' which can be planted within Zones 1 and 2
** *Juniperus spp.* are prohibited except *Juniperus procumbens* ''nana' which can be planted within Zones 1 and 2
*** *Rosemarinus spp.* are prohibited except *Rosemarinus prostrates* which can be planted within Zones 1 and 2
**** *Salvia spp.* are prohibited except *Salvia sonomensis and Salvia leucophylia* which can be planted within Zones 1 and 2
***** *Miscanthus spp.* are prohibited except *Miscanthus sinesis* 'Adagio' which can be planted within Zone 2
****** *Muhlenbergia spp.* are prohibited except *Muhlenbergia capillaris* which can be planted within Zone 2

Sources:

C: City of Chula Vista, Fire Retardant and/or Drought Tolerant Plant List, Landscape Manual, November 1994
D: Dudek, Otay Ranch, Village 4 South – Fire Protection Plan, September 2017
H: Hunt Research Corporation Report, Otay Ranch, Village 7/2 - Fire Protection Plan, June 14, 2005
S: County of San Diego, Suggested Plant List for Defensible Space, http://www.sdcounty.ca.gov/dplu/dos/UndesirablePlants.pdf

K: Appendix K, City of Chula Vista MSCP Subarea Plan: San Diego County Fire Chief's Association Fuel Modification Zone Plant List, July 15, 1997