Appendix K

Fire Assessment Summary Letter

27372 CALLE ARROYO
SAN JUAN CAPISTRANO, CALIFORNIA 92675
T 949.450.2525 F 949.450.2626

April 17, 2020 11092

Chief Chris Jensen
Murrieta Fire and Rescue
41825 Juniper Street
Murrieta, California 92562

Subject: *Fire Assessment Summary Letter for Costco/Vineyard II Retail Development Project – Murrieta, California*

Dear Chief Jensen:

This letter provides a summary of Dudek's fire protection planning review, fire behavior modeling, and effective fuel modification zone (FMZ) buffers for portions of the proposed Murrieta Costco/Vineyard II Retail Development Project (project) site that abut the open space area to the north. Dudek has provided this fire behavior analysis as a stand-alone document to evaluate the site's fire behavior and proposed development FMZ (all Zone A – Irrigated Landscape Zone). Our analysis summarized herein is based on project-related information provided by Costco and the Retail Development Advisors (Applicants), a field assessment, and the project site's modeled fire behavior.

Project Location

The project site is located in the northern portion of the City of Murrieta (City), in Riverside County. The approximately 26.3-acre undeveloped property is comprised of Assessor's Parcel Numbers 392-290-025, 392-290-026, 392-290-028, and 392-290-029, and portions of 392-270-033, 392-270-030, and 392-290-051. Specifically, the project site is located in the northeast corner of Antelope Road and Clinton Keith Road, east of Interstate (I) 215 (Figure 1, Project Location). The general vicinity surrounding the project site consists of residential and commercial development, a high school, and vacant land. Single- and multi-family residential developments occur adjacent to the site on the east and vacant, undeveloped land occurs adjacent to the north. Vacant land abuts the southern boundary, with Clinton Keith Road south of the project site and Vista Murrieta High School south of Clinton Keith Road. Antelope Road forms the western site boundary, with I-215 immediately west of Antelope Road. Vacant Land occurs east of I-215 and west of Antelope Road. The vacant lands to the south and west of the project site have been approved for future commercial development, while the vacant lands to the north, although nothing has been submitted, is zoned for future commercial development. The proposed project site is located within Township 6 South, Range 3 West in the southwest quarter of Section 35 within the U.S. Geological Survey 7.5-minute Murrieta quadrangle map.

The proposed project would involve construction of a new retail development consisting of a Costco Wholesale warehouse and fuel station, a fitness center, a major retail pad, four small retail shops, one restaurant, one drive-through fast food restaurant, two detention basins, and associated parking. The project site is characterized as an active sand and gravel mass grading operation with low-elevation hills and open excavations. Elevations range from approximately 1,510 to 1605 feet above mean sea level. Attachment 1 provides representative photographs of the project site.

Fire History

The Project Area, like all of Riverside 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. Fire history is an important component of wildfire analysis. Wildfire history information can provide an understanding of fire frequency, fire type, most vulnerable project areas, and significant ignition sources, amongst others. CAL FIRE's Fire and Resource Assessment Program (FRAP) database was used to evaluate the Project's fire history. FRAP summarizes fire perimeter data dating to the late 1800's, but which is incomplete due to the fact that it includes only fires over 10 acres in size and has incomplete perimeter data, especially for the first half of the 20th century (Syphard and Keeley 2016). However, the data does provide a summary of recorded fires and can be used to show whether large fires have occurred in the project area, which indicates whether they may be possible in the future. Per the recorded fire history database, the site has not been subject to wildfire (CAL FIRE FRAP 2019). Recorded wildfires within 5 miles range from 31 acres (2007 Wright Fire) to 24,434 acres (1993 California Fire) (refer to Figure 2, Fire History Map).

Vegetation Communities and Land Covers

The project study area consists of six vegetation communities and three land cover types: California buckwheat scrub, disturbed California buckwheat scrub, fourwing saltbush scrub, chamise–black sage chaparral, chamise–California buckwheat, Mediterranean California naturalized annual and perennial grasslands grassland, spreading grounds and detention basins, disturbed habitat, and developed land (Dudek, Draft EIR, 2019). Figure 3, Biological Resources Map, illustrates the distribution of vegetation communities and land covers, and Table 1 provides a summary of each land cover's extent within the study area.

Table 1. Vegetation Communities and Land Covers within the Project Site, Off-Site Grading Area, and Associated Study Area

Vegetation Community/Land Cover	Acreage
California Buckwheat Scrub	13.32
Disturbed California Buckwheat Scrub	0.87
Disturbed Fourwing Saltbush Scrub	0.65
Chamise–Black Sage Chaparral	0.32
Chamise–California Buckwheat	0.94
Mediterranean California naturalized annual and perennial grasslands	3.45
Disturbed Habitat	31.51
Developed Land	21.00
Total	**72.08***

Source: Appendix C.
Note: * 72.08 acres represents the project parcel, the off-site grading area, and the natural habitat within a 500-foot buffer (i.e., the associated study area.) The proposed project includes the 26.3-acre project site and 2.46 acre off-site grading area.

California Buckwheat Scrub

The California buckwheat (*Eriogonum fasciculatum*) vegetation association is an open to continuous shrub layer where California buckwheat typically dominates. The shrub layer often occurs in two separate strata: low shrubs at 0–2 meters tall and tall shrubs at 1–5 meters tall. A variety of native or non-native species may make up the herb layer, and emergent trees only infrequently occur (Klein and Evens 2006).

California buckwheat scrub is located in the northern portion of the study area on the east side of Antelope Road. A small portion of California buckwheat scrub intersects with the western portion of the off-site grading area. This vegetation community is dominated by California buckwheat with low cover of black sage (*Salvia mellifera*).

Disturbed California Buckwheat Scrub

Disturbed California buckwheat vegetation community occurs on the east side of the project site and the steep slopes on the east and west sides of Antelope Road. The vegetation community on the eastern side of the project site is primarily dominated by California buckwheat; however, it also contains low cover of deerweed (*Acmispon glaber*) and tree tobacco (*Nicotiana glauca*) with an understory comprised of common Mediterranean grass (*Schismus barbatus*) and bare ground. The vegetation community along either side of Antelope Road and the southwestern portion of the buffer is heavily disturbed due to artificially incised slopes associated with the mass grading operation activities on the project site and the grading of Antelope Road. Scattered California buckwheat occurs along the slopes in addition to intermittent black sage. The herbaceous layer contains a low cover of non-native grasses, but is mostly comprised of bare ground.

Disturbed Fourwing Saltbush Scrub

The fourwing saltbush scrub alliance is not recognized within the *Vegetation Alliances of Western Riverside County*, but it is described in a *Manual of California Vegetation, 2nd Edition* as being either dominated or co-dominated by fourwing saltbush (*Atriplex canescens*) in the shrub canopy (Sawyer et al. 2009). The shrub canopy is typically open or intermittent with a variable herbaceous layer comprised of seasonal herbs or non-native grasses. Emergent trees may also be available at a low cover. Associated shrub species include burrowbush (*Ambrosia dumosa*), allscale saltbush (*Atriplex polycarpa*), and bush seepweed (*Suaeda nigra*) (Sawyer et al. 2009).

Within the study area, a disturbed form of this vegetation community occupies a small section of the eastern side of the project site, directly adjacent to the disturbed habitat of the former mass grading operations. This community is dominated by fourwing saltbush, but also contains a low cover of California buckwheat. The understory is composed of non-native grasses and bare ground.

Chamise–Black Sage Chaparral

The chamise–black sage chaparral vegetation community is co-dominated by chamise (*Adenostoma fasciculatum*) and black sage with an intermittent to continuous canopy within the shrub layer. The shrub layer may occur in two separate strata: low shrubs at 0.5 to 2 meters tall and taller shrubs 1 to 5 meters tall (Klein and Evens 2006).

This vegetation community is located within the southern portion of the study area. It is comprised primarily of chamise and black sage, but also contains some California buckwheat (*Eriogonum fasciculatum*) and a sparse understory of non-native grasses.

Chamise–California Buckwheat Association

The chamise–California buckwheat vegetation association is either dominated or co-dominated by chamise and California buckwheat with a shrub layer of open to continuous canopy. The shrub layer may occur in two separate strata: low shrubs at 0 to 2 meters tall and taller shrubs 0.5 to 5 meters tall. Trees may occur at trace cover, and the herbaceous layer typically remains open to intermittent (Klein and Evens 2006).

This association occurs in small patches on the western side of the study area, outside of the project site. These patches are comprised primarily of chamise, but are also co-dominated by a continuous presence of California buckwheat. The herbaceous layer is comprised of non-native grasses.

Mediterranean California Naturalized Annual and Perennial Grassland

As defined by Klein and Evens (2006), Mediterranean California Naturalized Annual and Perennial Grassland is usually dominated by annual grasses and herbs of various assortments that are in upland habitats. Specifically, red brome (*Bromus madritensis* ssp. *rubens*) or ripgut brome (*B. diandrus*) are abundant with other non-native and native species.

Non-native grassland occupies the western side of the study area, outside of the project site. This vegetation community is comprised primarily of weedy species including, but not limited to, brome species (*Bromus* sp.), short-podded mustard (*Hirschfeldia incana*), common Mediterranean grass, dove weed (*Croton setiger*), prickly wild lettuce (*Lactuca serriola*), and common cryptantha (*Cryptantha intermedia*). A single blue elderberry (*Sambucus nigra* ssp. *caerulea*) is located on the southwestern side of the study area, and several Peruvian peppertrees (*Schinus molle*) are clustered at the northwestern edge of the study area; however, neither of these trees warranted their own vegetation community due to the small scale of their cover.

Developed Land

Although not recognized by the *Vegetation Alliances of Western Riverside County* (Klein and Evens 2006), "developed land" refers to areas that have been constructed on or disturbed so severely that native vegetation is no longer supported. Developed land includes areas with permanent or semi-permanent structures, pavement or hardscape, landscaped areas, and areas with a large amount of debris or other materials.

The portions of the study area mapped as developed include active construction taking place in the southern portion of the study area directly south of the project site and associated roads within the study area. The construction south of the project site is not depicted on the most recent aerial photography; therefore, the aerial used for project figures does not display this development.

Disturbed Habitat

Although not recognized by the *Vegetation Alliances of Western Riverside County* (Klein and Evens 2006), the classification of disturbed habitat is due to the predominance of bare ground and compacted soils with a sparse covering of non-native plant species, and other disturbance-tolerant plant species. Oberbauer et al. (2008) describes disturbed habitat as areas that have been physically disturbed by previous human activity and are no longer recognizable as a native or naturalized vegetation association but that continue to retain a soil substrate.

Disturbed habitat is located within the majority of the project site and off-site grading area in locations where mass grading operations previously occurred. This land cover encompasses the majority of the mass grading operation activities and is primarily composed of bare ground; however, the northeastern side of the project site also contains a low cover of tree tobacco, deerweed, and short-podded mustard. In addition, there are two individual mulefat (*Baccharis salicifolia*) plants within the project site, but these individuals did not warrant their own vegetation community due to the small scale of their cover.

Analysis Methods

The purpose of this fire analysis letter is to analyze the proposed design features and require additional fire protection measures or alternatives that are being presented as mitigation to allow for the reduced fuel modification along the northern property boundary. To complete this analysis, Dudek Fire Protection Planners evaluated the native vegetation within the project's study area and its fire behavior in the open space area to the north, as well as the untreated native vegetation to the west. Two wildfire scenarios were selected for analysis, depicting untreated, native vegetation fuelbed conditions within the native vegetation areas to the north and west. Because the area to the north is privately owned, there is a possibility the open space area will be developed in the future, which will eliminate the need for a fuel modification zone to the north. Additionally, the open space land to the west is currently proposed for future commercial development and a Notice of Preparation (NOP) has been submitted to the City of Murrieta. It is not known when construction will begin, however, once construction does begin, it will augment the need for an interim, off-site FMZ to the west.

In order to evaluate potential fire behavior along the northern and western edges of the Project site, Dudek conducted the following tasks:

1. Analyzed historical wind and weather data from remote automated weather stations (RAWS) using the FireFamily Plus software package.
2. Modeled potential fire behavior based on an assumed mature, grasslands-sage scrub plant community using the BehavePlus fire behavior modeling software package. Fire behavior modeling outputs included those for surface fires (flame length, fireline intensity, fire spread rate, and spotting distance).

The following sections present a background on fire behavior modeling, our technical approach (including identification of assumptions and data sources), and the results of our modeling efforts. This analysis is based on a specific site fuel assessment; on- and off-site topographic features; proposed Costco/Vineyard II Retail Development Architectural Plans (February 2019); and historical fire regimes for the Murrieta area. Assumptions of wildfire behavior are based on Dudek's experience evaluating natural landscapes, conducting technical analyses and assessments, and preparing fire protection planning documents for commercial development projects within the Cities of Murrieta, Temecula, and Wildomar.

Fire Behavior Modeling

Fire Behavior Modeling Background

Although fire behavior models have some limitations, they can still provide valuable estimated fire behavior predictions, which can be used as a tool in the decision-making process. In order to make reliable estimates of fire behavior, and interpret fire spread models, one must understand the relationship of fuels to the fire environment and be able to recognize the variations in these fuels, and have experience with wildland fires or applicable knowledge of how fire reacts in similar 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 topography (slope, aspect, and elevation), weather (wind, air temperature) and seven principal fuel characteristics: fuel loading, fuel size, fuel shape, compactness, horizontal continuity, vertical arrangement, and moisture content and chemical properties.

The seven fuel characteristics help define the 13 standard fire behavior fuel models (Anderson 1982). 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 on the site determines which fuel models should be applied in modeling efforts. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models:

Grasses	Fuel Models 1 through 3
Brush	Fuel Models 4 through 7
Timber	Fuel Models 8 through 10
Logging Slash	Fuel Models 11 through 13

In addition, the aforementioned fuel characteristics were utilized in the development of 40 additional fire behavior fuel models (Scott and Burgan 2005) developed for use in BehavePlus modeling efforts. These 40 additional models were designed to be more applicable to the Southern California vegetation and fuels, while attempting to improve the accuracy of the standard 13 fuel models outside of severe fire season conditions, and to allow for the simulation of fuel treatment prescriptions.

The following describes the distribution of fuel models among general vegetation types for the new 40 fuel models:

Grass	Models GR1 through GR9
Grass/Shrub	Models GS1 through GS4
Shrub	Models SH1 through SH9
Timber Understory	Models TU1 through TU5
Timber Litter	Models TL1 through TL9
Slash Blowdown	Models SB1 through SB4

Fire Behavior Modeling Inputs

Dudek utilized the BehavePlus software package to analyze the potential fire behavior for the project site. As is customary for this type of analysis, two fire scenarios were evaluated, including an off-shore, wind-driven fire (Santa Ana conditions) approaching the northern property boundary of the project site within the grass/shrub open space area to the north and an on-shore, wind driven fire approaching the western property boundary within the grassy/shrub area to the west, with assumptions made for the pre-project slope and fuel conditions. The location of the fire scenarios and summary of fire modeling inputs are presented in Figure 4, BehavePlus Fire Behavior Analysis Map. The following summarizes the inputs, data sources, and assumptions for the fire behavior modeling analysis:

Weather and Wind Analysis: Historical weather data for the region was utilized in determining appropriate fire behavior modeling inputs for the project site. For this analysis, 97th percentile (extreme offshore wind conditions) and 50th percentile (onshore wind conditions) fuel moisture and wind speed values were derived from Santa Rosa Plateau Remote Automatic Weather Station (RAWs) data and utilized in the fire behavior modeling efforts conducted in support of this report. The Santa Rosa Plateau RAWS[1] is located at approximately 8.9 miles southwest of the project site.

To determine weather-related modeling inputs, RAWS fuel moisture and wind speed data were processed utilizing the FireFamily Plus software package, assuming typical (50th percentile) and atypical (97th percentile) weather conditions. Data from the RAWS was evaluated from June 1 through November 30 for each year between 1998 and 2018. Data derived from this analysis included 1-hour, 10-hour, and 100-hour fuel moistures, live herbaceous moisture, live woody moisture, and 20-foot sustained wind speed. 50th and 97th percentile wind speeds and fuel moisture data was used in the BehavePlus fire behavior modeling scenarios. The 50th and 97th percentile wind speeds are commonly used for fire behavior modeling to represent typical and extreme fire weather conditions. The wind data is derived from historical weather data, resulting in realistic depictions of future wind events.

Terrain: Slope gradients for natural slopes range from 5% to 18% (15% average slope gradient used in fire modeling scenario 1 and 8% average slope grade used in scenario 2) and graded slopes are assumed to be 50% (2:1 manufactured slopes).

Fuels: Vegetation types, which were derived from the field assessment for the project site and the Draft Costco/Vineyard Phase II Retail Development Project EIR (Dudek 2019), were classified into a fuel model. This value was used in the modeling analysis for the fuel type within the project's study area. Based on the location of the modeling scenarios, Scott and Burgan (2005) fuel models were assigned for the BehavePlus fire behavior modeling runs for existing conditions as follows: fuel model Sh2 (Moderate Load, Dry-Climate Shrub) for sage scrub along western property boundary; fuel model Sh5 (High Load, Dry Climate Shrub) for sage scrub at top of slope; and fuel model Gs2 (Moderate load, Dry Climate Grass-Shrub) for grass/sage shrub. Further, while past disturbances (e.g., grass and brush clearance for fuel reduction) have altered fuel beds on some areas of the property, modeling efforts presented herein assume more mature stand conditions for the grass--sage scrub habitats. Attachment 1 provides representative photographs of the fuel types and plant spacing in each fire scenario.

[1] Santa Rosa Plateau RAWS: Latitude: 33°31'43"; Longitude: 117°13'50"; Elevation 1,980 feet amsl

Table 2. Fuel Model Characteristics

Fuel Model	Description	Tons/acre; Btu/lb.	Fuel Bed Depth (Feet)
Sh2	Moderate load, Dry-climate shrub	2.0 tons/acre; 8,000 Btu/lb.	<3.0
Sh5	High load, Dry climate shrub	5.0 tons/acre; 8,000 Btu/lb.	<5.0
Gs2	Moderate load, dry climate grass-shrub	3.0 tons/acre; 8,000 Btu/lb.	<3.0

Table 3 summarizes the weather, terrain, and fuels variables used in the BehavePlus fire behavior modeling analysis.

Table 3. BehavePlus Fire Behavior Modeling Inputs

Model Variable	97th Percentile Weather (Off-Shore Wind)	50th Percentile Weather (On-Shore Wind)
Weather		
1 h[1] fuel moisture	1%	3
10 h fuel moisture	2%	6
100 h fuel moisture	5%	9
Live herbaceous moisture	30%	50
Live woody moisture	60%	104
20 ft. wind speed	18 mph[2] sustained winds (50 mph peak gusts)	21 mph Sustained winds
Wind adjustment factor (WAF)[3]	0.4	0.4
Terrain		
Natural Slope	15%	8%
Fuel Model		
Fuel Models	Sh5 and Gs2	Sh2 and Gs2

Notes:

1 h = hour

2 mph= Miles per hour

3 The WAF is a value between 0 and 1 and is used to adjust the wind speed measured 20 feet above the vegetation to midflame wind speed. The WAF depends on sheltering from the wind. If fuels are not sheltered from the wind (as in this project), the WAF is a function of fuel bed depth. If fuels are sheltered from the wind, WAF is not affected by the surface fuel model. The adjustment of 20-foot wind to midflame wind depends on overstory sheltering and also on ability of wind to penetrate the canopy due to location on the slope and adjacent overstory.

Fire Modeling Results

An analysis utilizing the BehavePlus software package was conducted to evaluate fire behavior variables and to objectively predict flame lengths, fire intensities, fire spread rates, and fire spotting distances. The BehavePlus fire behavior modeling system (Andrews, Bevins, and Seli 2008) was used for two fire modeling scenarios and incorporated observed pre-development fuel types representing the dominant on-site vegetation moderate load, dry climate grass-shrub (Fuel Model Gs2); moderate load, dry-climate shrub (Fuel Model Sh2); and high load, dry

climate shrub (Fuel Model Sh5), measured slope gradients, and wind and fuel moisture values derived from RAWs data. The modeling scenario locations were selected to better understand the fire behavior that may be experienced on or adjacent the site. Identification of the modeling runs (fire scenarios) locations are presented graphically in Figure 4. The BehavePlus fire modeling worksheets have been provided as Attachment 2, BehavePlus Modeling Run (97th Percentile Weather), and Attachment 3, BehavePlus Modeling Run (50th Percentile Weather). The results of fire behavior modeling effort for pre--project conditions are presented in Table 4.

Table 4. Costco Murrieta BehavePlus Fire Behavior Model Results Existing Conditions[1]

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: Average Slope-15%, 97th Percentile Weather Conditions (Untreated Fuels) – Fire from the North				
Fuel Model Gs2	10.5' (20.6')	950 (4,059)	1.0 (4.2)	0.4 (1.4)
Fuel Model Sh5	26.0' (44.9')	6,774 (22,127)	2.1 (6.8)	0.8 (2.4)
Scenario 2: Average Slope-8%, 50th Percentile Weather Conditions (Untreated Fuels) – Fire from the West				
Fuel Model Gs2	7.6'	466	0.6	0.4
Fuel Model Sh2	5.3'	212	0.1	0.3

[1] All table values in parenthesis represent peak gusts of 50 mph.

Fire Behavior Summary

As presented in Table 4, a worst-case wildfire being fanned by 50 mph, offshore winds (fire approaching from the north) in untreated sage scrub habitat (Fuel Model Sh5) would result in a fire spreading at approximately 6.8 mph with highest flame length values reaching approximately 45 feet in specific portions of the property. Maximum spotting distance for an offshore wind-driven fire is projected to occur at 2.4 miles, downwind. Additionally, a worst-case wildfire being fanned by 21 mph sustained, on-shore winds (fire approaching from the west) in untreated grass/scrub habitat (Fuel Model Gs2) would result in a fire spreading at approximately 0.6 mph with highest flame length values reaching approximately 7.6 feet in specific portions of the property. Maximum spotting distance for an offshore wind-driven fire is projected to occur at 0.4 miles, downwind

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

Fuel Modification Zones

Cohen (1995) performed structure ignition fire research studies that suggest, as a rule-of-thumb, larger flame lengths and widths require wider fuel modification zones to reduce structure ignition. For example, valid Structure Ignition Assessment Modeling results indicate that a 20-foot-high flame has minimal radiant heat to ignite a structure (bare wood) beyond 37 feet (horizontal distance). Whereas, a 70-foot-high flame requires about 130 feet of clearance to prevent structure ignitions from radiant heat (Cohen and Butler 1996). For this fire study example, bare wood was used, which is more combustible unlike the fire rated split face concrete masonry unit (CMU) and textured insulated metal panel exterior wall designs to be implemented on the Costco Warehouse building. For this project, assuming 45-foot flame lengths, reduced fuel modification zones are justifiable for limited areas.

Per Section 15.24.290 of the Murrieta Municipal Code (as well as CFC Chapter 49 Section 4906 and 4907; California Public Resources Code, Section 4291; and California Government Code Section 51182), a 100-foot FMZ is required around structures in fire hazard areas, to the extent possible (i.e., not beyond the property line). Based on the site plan, the majority of the project site achieves 100 feet or more of on-site FMZ, which consists of asphalt roadways and parking stalls, and a fully irrigated landscape with City and Murrieta Fire and Rescue (MFR) approved plant species. However, conceptual building footprints partially protrude into the 100 feet FMZ along the northern boundary, more specifically, the Project's property boundary provides an area between 64 and 100 feet of structural setback from offsite fuels. The northwestern portion of the Costco Warehouse development provides approximately 64 feet of achievable on-site fuel modification. Additionally, the open space land west of the Costco Warehouse development, on the western side of Antelope Road, is proposed for future commercial development. A NOP has been submitted to the City, but it is not known when construction will begin. As such, a 20-foot on-site Costco building setback and the 40-foot wide Antelope Road make up a 60-foot "No Build Easement" on the western side of the Costco development, which will be used as the interim FMZs until such a time that the property to the west is developed and the wildfire hazard is mitigated. Once construction of the proposed development to the west begins, it will augment the western FMZs. Figure 5 illustrates the configuration of the on-site FMZs along the northern boundary and the interim FMZs along the western boundary of the Costco/Vineyard Phase II Retail Development footprint. For the areas achieving less than 100 feet of on-site FMZ, the proposed building construction design features will include fire-rated split-face CMU and textured insulated metal panel exterior walls along the north side of building, an National Fire Protection Association (NFPA) 13 Commercial Fire Sprinkler System, and fire rated exterior doors, along with asphalt roadways and parking, and a fully irrigated landscape with drought-tolerant, fire resistive plantings, would provide adequate separation and radiant heat protection from a wildfire.

Proposed Mitigation Measures

As previously mentioned, due to site constraints, it is not possible to achieve the full 100 feet FMZ width for a portion of the northern side and the western side of the Costco structure. As such, this Fire Assessment Summary Letter details both required elements for constructing a building in a high fire hazard area, as well as additional measures that will be implemented to mitigate for the non-conforming fuel modifications zones. These measures are customized for this site based on the analysis results and focus on providing functional equivalency as a City defined, full fuel modification zone.

The following required and additional mitigation measures will be implemented to "mitigate" potential structure fire exposure related to the provided reduced FMZs for the northern and western portions of the development.

1. The proposed building construction will consist of Underwriters Laboratories (UL) Approved Fire-Rated 8-inch split face CMU and textured insulated metal panel exterior walls along the northern side of the building. It should be noted, exterior walls composed of hollow CMU having a nominal thickness of 8-inches or greater may have a 2-hour fire rating, but can be classified as 4-hour when the hollow spaces are completely filled with grout or a material such as clay slate, slate, or sand;
2. The building is required to have an interior NFPA 13 Commercial Fire Sprinkler System be installed to NFPA installation standards. A supervised fire alarm system will also be installed pursuant to NFPA 72 and MFR standards and smoke detectors shall be installed at the ceiling throughout the Costco building and in every room;
3. Areas requiring ventilation to the outside environment will require either ember-resistant roof vents or a minimum 1/16-inch mesh and shall not exceed 1/8-inch mesh for side ventilation (see 2019 CBC Chapter 7A Section 706A-Vents, or then current edition). All vents used for this project will be approved by MFR;
4. Two fully enclosed metal trash compactors will be located along the north side of the Costco building. The enclosed metal trash compactors would prevent embers falling onto Class A fuels (e.g., paper) and igniting them. Additionally, the trash compactors will be placed behind an 8-inch split-face CMU exterior wall and metal gate;
5. The 30-foot by 25-foot loading area (two spaces) located along the north side of the Costco building are not covered and are dedicated for small delivery trucks;
6. A fully irrigated landscape planted with drought-tolerant, fire resistive plants per Attachment 4, created by Cummings Curley and Associates, Inc., will be planted within all FMZs. No undesirable, highly flammable plant species shall be planted, as listed in Attachment 5. The landscaping will be routinely maintained and will be watered by an automatic irrigation system that will maintain healthy vegetation with high moisture contents that would prevent ignition by embers from a wildfire;
7. Crowns of mature trees, with the exception of Oak trees, located within defensible space shall maintain a minimum horizontal clearance of 10 feet for fire resistant trees and 30 feet for non-fire resistive trees. Mature trees shall be pruned to remove limbs to maintain a vertical separation of three times the height of the lower vegetation or 6 feet, whichever is less, above the ground surface adjacent to the trees. Dead wood and litter shall be regularly removed from trees. Ornamental trees shall be limited to groupings of 2-3 trees with canopies for each grouping separated horizontally as described in Table 5 below (City of Murrieta Municipal Code, Chapter 15.24.290, Section 4907);

Table 5. Fuel Model Characteristics

Percent of Slope	Required Distances Between Edge of Mature Tree Canopies [1]
0 to 20	10 feet
21 to 40	20 feet
41 plus	30 feet

1. Determined from canopy dimensions as described in Sunset Western Garden Book (current edition)

8. The new commercial design also provides an unimpeded, all-weather pathway (minimum three feet wide) on all sides of the Costco building for firefighter access around the entire perimeter of the structure;
9. Any architectural projections or construction, such as canopies, on the north side of the Costco building and within the 100-foot fuel modification zone shall be of non-combustible construction, only.
10. Until such a time that the property to the west is developed and the wildfire hazard is mitigated, a 20-foot on-site Costco building setback and the 40-foot wide Antelope Road make up a 60-foot "No Build Easement" on the western side of the Costco development, which will be used as the interim FMZs.

In addition to the above mentioned design features, Dudek recommends the following additional fire protection enhancement be required to provide further justification for the reduced FMZ along portions of the northern boundary of the Costco/Vineyard Phase II Retail Development:

1. Automatic or self-closing doors shall be installed around the northern side of the Costco building and conform to the exterior door assembly standards addressed in CBC Chapter 7A, Section 704A.3.2.3.

Fuel Modification Zone Reduction Justifications

An important component of a fire protection system for this Project is the provision for ignition resistant construction and modified vegetation buffers. The structure ignition resistance standards detailed in the 2019 California Fire Code and Chapter 7A of the 2019 California Building code, or then current editions, will enable the structures to withstand the type of wildfire that may occur in the fuels outside the development footprint. Fuel modification zone requirements and fully irrigated landscapes with drought-tolerant, fire resistive plantings, will provide a reasonable level of wildfire protection to the ignition resistant structure (see Attachment 4 for acceptable plants within the on-site FMZ's). Additionally, undesirable, highly flammable plant species shall not be planted in fuel modification zones, as listed in Attachment 5. Fire behavior modeling, as previously presented, was used to predict flame lengths and was not intended to determine sufficient fuel modification zone widths. However, the results of the fire modeling provide important fire behavior projections, which is key supporting information for determining buffer widths that would minimize structure ignition and provide "defensible space" for firefighters.

Based upon Dudek's analysis of the project, the enhanced building features, including an 8-inch split-face CMU and textured insulated metal panel exterior walls along the northern side of the building, along with the commercial interior fire sprinkler system, would provide a functional safety equivalency of a 100-foot fuel modification zone and would be the equivalent or a better level of fire protection as placing an 8-foot non-combustible fire wall along the northern boundary.

Conclusion and Limitations

This analysis and its fire protection justifications are supported by fire science research, results from previous wildfire incidents, and fire agencies that have approved these concepts. The Costco development's design features, asphalt roads and parking stalls, and a fully irrigated landscape, with drought-tolerant, fire resistive plant species and no undesirable plant material, along with the additional required fire protection measure, would provide a level of safety equal to a 100-foot wide FMZ.

Our analysis does not provide a guarantee that all visitors will be safe at all times. There are many variables that may influence overall safety. It is recommended that the proposed development maintain a conservative approach to fire safety. This approach must include maintaining the landscape and structural components according to the appropriate standards described in this report and required by the current fire and building codes. Wildfire is a dynamic and somewhat unpredictable occurrence and it is important that developments and subsequent business owners plan in conjunction with the City's Preparedness Program, which will improve overall safety.

If you have any questions regarding our fire analysis and recommendations, please contact me at 760.642.8379.

Sincerely,

Noah Stamm
Dudek Fire Protection Planner

Michael Huff
Principal/Senior Fire Protection Planner

Att.: *Figures 1–5*
Attachment 1, Fuels Type Photo series
Attachment 2, Dudek's BehavePlus Modeling Runs (97th Percentile Weather)
Attachment 3, Dudek's BehavePlus Modeling Runs (50th Percentile Weather)
Attachment 4, Plant Pallet
Attachment 5, Prohibited Plant List

References

Andrews, Patricia L.; Collin D. Bevins; and Robert C. Seli. 2008. BehavePlus fire modeling system, version 3.0: User's Guide. Gen. Tech. Rep. RMRS-GTR-106 Ogden, Utah: Department of Agriculture, Forest Service, Rocky Mountain Research Station. 132p.

California Department of Forestry and Fire Protection (CALFIRE). 2019. Fire Resource and Assessment Program (FRAP) Maps. Obtained GIS database at http://frap.fire.ca.gov/data/frapgismaps-subset.

Cohen, J.D. 1995. Structure ignition assessment model (SIAM). In: Weise, D.R.; Martin, R.E., technical coordinators. Proceedings of the Biswell symposium: fire issues and solutions in urban interface and wildland ecosystems. 1994 February 15–17; Walnut Creek, California. Gen. Tech. Rep. PSW-GTR-158. Albany, California: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 85–92.

Cohen, J.D. and Butler, B.W. 1996. Modeling potential ignitions from flame radiation exposure with implications for wildland/urban interface fire management. In: Proceedings of the 13th conference on fire and forest meteorology. October 27-31; Lorne, Victoria, Australia. Fairfield, Washington: International Association of Wildland Fire.

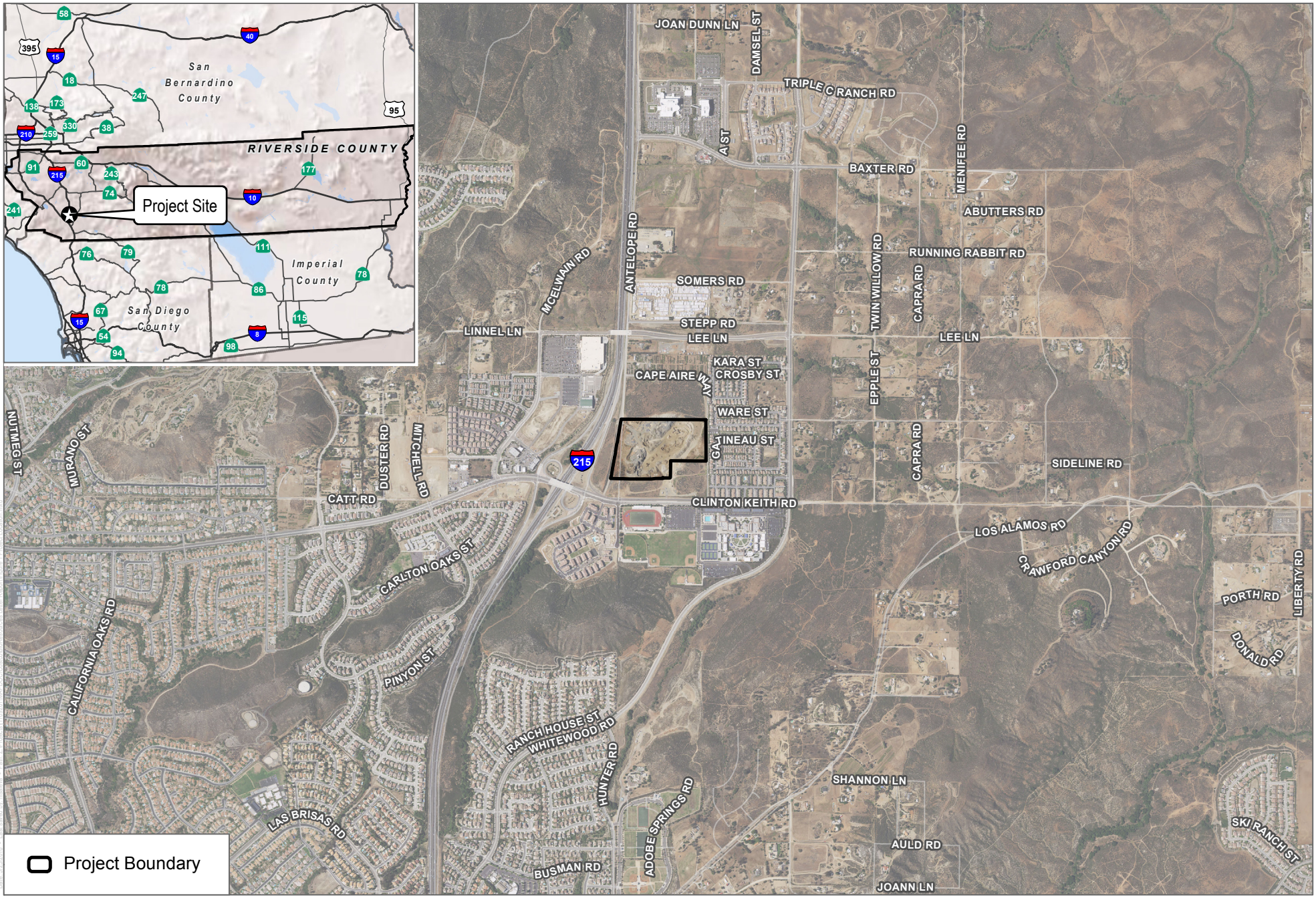
Dudek. 2019. Draft Environmental Impact Report for Costco/Vineyard Phase II Retail Development Project. April 2019.

FRAP (Fire and Resource Assessment Program). 2018. CAL FIRE Fire Resource and Assessment Program. California Department of Forestry and Fire Protection. Accessed July 1, 2019. http://frap.cdf.ca.gov/.

Klein, A., and J. Evens. 2006. *Vegetation Alliances of Western Riverside County, California*. Final report prepared for the California Department of Fish and Game Habitat Conservation Division. Sacramento, California: California Native Plant Society. Published August 2005; revised April 2006. Accessed May 2018. www.cnps.org/cnps/vegetion/pdf/wriv_vegetation_ cnpsfinalreport_April2006.pdf.

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

Syphard A.D., and J.E. Keeley. 2016. "Historical Reconstructions of California Wildfires Vary by Data Source." International Journal of Wildland Fire 25(12):1221–1227. https://doi.org/10.1071/WF16050.



SOURCE: NAIP 2016

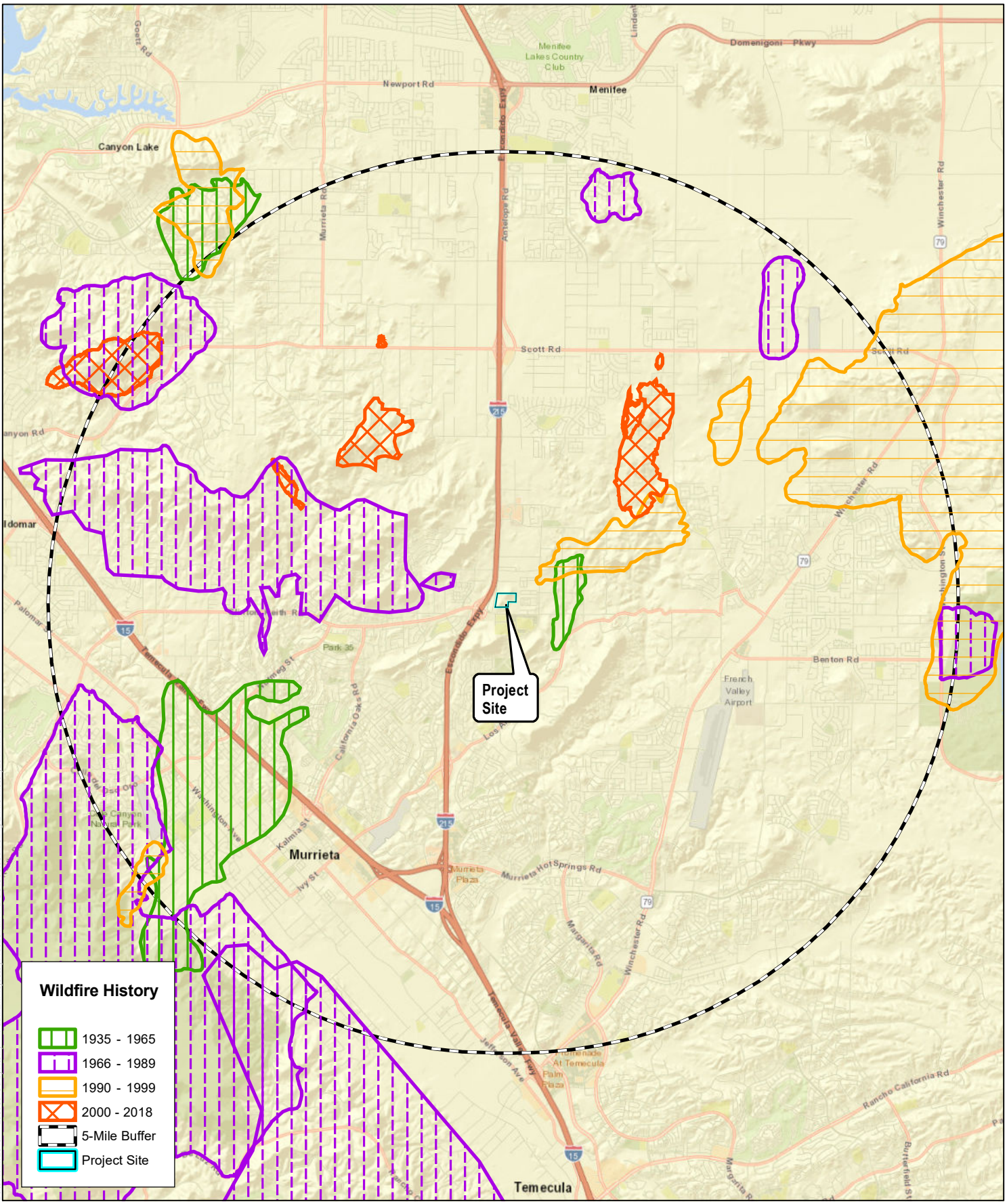
DUDEK

0 1,000 2,000 Feet

FIGURE 1

Project Location

Fire Protection Technical Report for the Costco/Vineyard II Retail Development Project



SOURCE: BASE MAP- ESRI; FIRE DATA-CAL FIRE 2017

DUDEK

0 1 2 Miles

FIGURE 2

Fire History Map

Fire Protection Technical Report for the Costco/Vineyard II Retail Development Project

SOURCE: DigitalGlobe 2018

DUDEK

0 250 500 Feet

FIGURE 3

Biological Resources

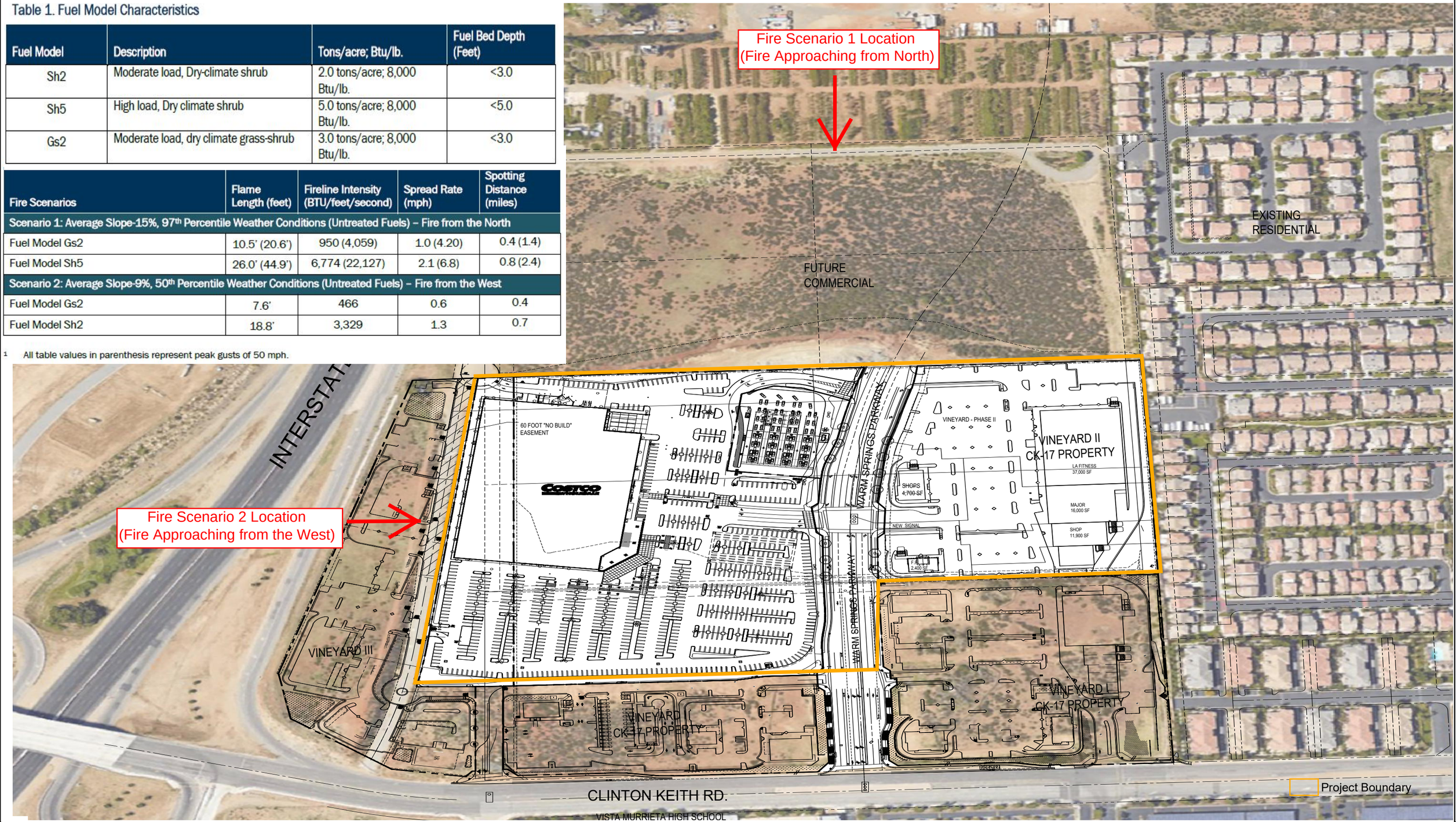
Fire Protection Technical Report for the Costco/Vineyard II Retail Development Project

Table 1. Fuel Model Characteristics

Fuel Model	Description	Tons/acre; Btu/lb.	Fuel Bed Depth (Feet)
Sh2	Moderate load, Dry-climate shrub	2.0 tons/acre; 8,000 Btu/lb.	<3.0
Sh5	High load, Dry climate shrub	5.0 tons/acre; 8,000 Btu/lb.	<5.0
Gs2	Moderate load, dry climate grass-shrub	3.0 tons/acre; 8,000 Btu/lb.	<3.0

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: Average Slope-15%, 97th Percentile Weather Conditions (Untreated Fuels) – Fire from the North				
Fuel Model Gs2	10.5' (20.6')	950 (4,059)	1.0 (4.20)	0.4 (1.4)
Fuel Model Sh5	26.0' (44.9')	6,774 (22,127)	2.1 (6.8)	0.8 (2.4)
Scenario 2: Average Slope-9%, 50th Percentile Weather Conditions (Untreated Fuels) – Fire from the West				
Fuel Model Gs2	7.6'	466	0.6	0.4
Fuel Model Sh2	18.8'	3,329	1.3	0.7

[1] All table values in parenthesis represent peak gusts of 50 mph.

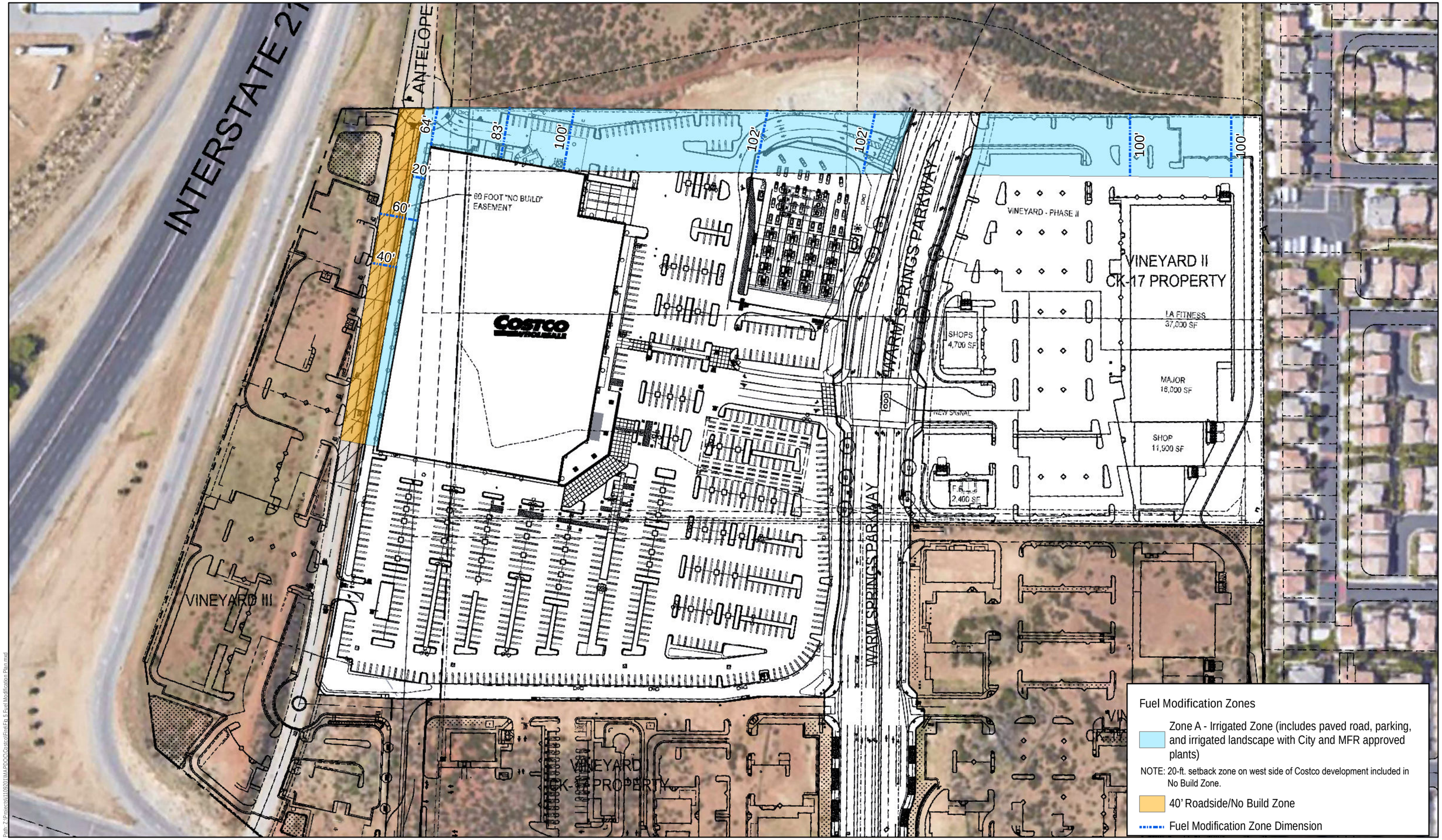


DUDEK 0 400 800 Feet

FIGURE 4

BehavePlus Analysis Map

Fire Protection Technical Report for the Costco/Vineyard II Retail Development Project



Path: Z:\Projects\s1100201\MAP\DOC\Costco\Final\Fig 5 Fuel Modification Plan.mxd

SOURCE: DEVELOPMENT PLAN-FUSCOE 2019

DUDEK

0 30 60 120 Feet

FIGURE 5

Fuel Modification Map

Fire Protection Technical Report for the Costco/Vineyard II Retail Development Project

Attachment 1

Site Photographs

Costco/Vineyard II Retail Development Project Fuels Photo Series

SEPTEMBER 2019

Attachment 1

Costco/Vineyard II Retail Development Project
Fuels Photo Series

Photograph 1. Photograph illustrates the grass-shrub terrain and fuels modeled in fire scenario #1 on the north side of the proposed commercial development. Photograph taken facing southeast standing along Antelope Road.

Photograph 2. Photograph illustrates the grass-shrub terrain and fuels modeled in fire scenario #1 on the north side of the proposed commercial development. Photograph taken facing northeast standing along Antelope Road.

Costco/Vineyard II Retail Development Project
Fuels Photo Series

Photograph 3. Photograph illustrates the grass-shrub terrain and fuels modeled in fire scenario #1 on the north side of the proposed commercial development. Photograph taken facing south along the eastern side of the proposed commercial development. Note the existing residential community east of the project site.

Photograph 4. Photograph illustrates the sage-shrub terrain and fuels modeled in fire scenario #1 on the north side of the proposed commercial development. Photograph taken facing south.

Costco/Vineyard II Retail Development Project
Fuels Photo Series

Photograph 5. Photograph illustrates proposed secondary access route off of Antelope Road and fuels located to the west of the Costco building. Photograph taken facing south.

Photograph 6. Photograph illustrates grading activities occurring on project site. Photograph taken facing southeast.

Costco/Vineyard II Retail Development Project
Fuels Photo Series

Photograph 7. Photograph illustrates graded hillside directly adjacent to the northern property line that is proposed to be irrigated and planted with City and MFR approved plants. Photograph taken facing east.

Attachment 2

BehavePlus Inputs (97th Percentile)

Inputs: SURFACE, SPOT

Description		Scenario 1 - Untreated Fuels, 97th Percentile

Fuel/Vegetation, Surface/Understory

Fuel Model		gs2, sh5

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	1
10-h Fuel Moisture	%	2
100-h Fuel Moisture	%	5
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	60

Weather

20-ft Wind Speed	mi/h	18, 50
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	0

Terrain

Slope Steepness	%	15
Site Aspect	deg	0
Ridge-to-Valley Elevation Difference	ft	85
Ridge-to-Valley Horizontal Distance	mi	.10
Spotting Source Location		VB

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

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

Wind is in specified directions [SURFACE].

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

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

Output Variables

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

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

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

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

Notes

Costco Murrieta - Untreated Fuels, 97th Percentile

Head Fire

Surface Fire Rate of Spread (mi/h)

Fuel Model	20-ft Wind Speed mi/h	
	18	50
gs2	1.0	4.2
sh5	2.1	6.8

Costco Murrieta - Untreated Fuels, 97th Percentile

Head Fire

Surface Fireline Intensity (Btu/ft/s)

Fuel Model	20-ft Wind Speed mi/h	
	18	50
gs2	950	4059
sh5	6774	22127

Costco Murrieta - Untreated Fuels, 97th Percentile

Head Fire

Surface Fire Flame Length (ft)

Fuel Model	20-ft Wind Speed mi/h	
	18	50
gs2	10.5	20.6
sh5	26.0	44.9

Costco Murrieta - Untreated Fuels, 97th Percentile

Head Fire

Spot Dist from a Wind Driven Surface Fire (mi)

Fuel Model	20-ft Wind Speed mi/h	
	18	50
gs2	0.4	1.4
sh5	0.8	2.4

Discrete Variable Codes Used
Costco Murrieta - Untreated Fuels, 97th Percentile

Fuel Model

122	gs2	Moderate load, dry climate grass-shrub (D)
145	sh5	High load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

VB	Valley Bottom

Attachment 3

BehavePlus Inputs (50th Percentile)

Inputs: SURFACE, SPOT

Description		Scenario 2 - Untreated Fuels, 50th Percentile

Fuel/Vegetation, Surface/Understory

Fuel Model		gs2, sh5

Fuel/Vegetation, Overstory

Downwind Canopy Height	ft	4
Downwind Canopy Cover		Open

Fuel Moisture

1-h Fuel Moisture	%	3
10-h Fuel Moisture	%	6
100-h Fuel Moisture	%	9
Live Herbaceous Fuel Moisture	%	50
Live Woody Fuel Moisture	%	104

Weather

20-ft Wind Speed	mi/h	21
Wind Adjustment Factor		0.4
Wind Direction (from north)	deg	270

Terrain

Slope Steepness	%	8
Site Aspect	deg	0
Ridge-to-Valley Elevation Difference	ft	48
Ridge-to-Valley Horizontal Distance	mi	.10
Spotting Source Location		VB

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

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

Wind is in specified directions [SURFACE].

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

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

Output Variables

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

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

Surface Fire Flame Length (ft) [SURFACE]

(continued on next page)

Input Worksheet (continued)

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

Notes

Scenario 2 - Untreated Fuels, 50th Percentile

Head Fire

Fuel Model	Surface Fire Rate of Spread mi/h	Surface Fireline Intensity Btu/ft/s	Surface Flame Length ft	Surface Fire Spot Dist mi
gs2	0.6	466	7.6	0.4
sh5	1.3	3329	18.8	0.7

Discrete Variable Codes Used
Scenario 2 - Untreated Fuels, 50th Percentile

Fuel Model

122	gs2	Moderate load, dry climate grass-shrub (D)
145	sh5	High load, dry climate shrub (S)

Downwind Canopy Cover

Open	Open

Spotting Source Location

VB	Valley Bottom

Attachment 4

Plant Palette

Costco Murrieta Plant Pallet

Prepared by CCA, Inc. Landscape Architectures

September, 2019

SITE TREES

Arbutus u. `Marina / Marina Strawberry Tree
Lagerstroemia x `Watermelon Red` / Crape Myrtle
Quercus ilex / Holly Oak
Ulmus parvifolia `Drake` / Drake Evergreen Elm

STREET AND PARKING LOT TREES

Platanus x acerifolia `Columbia` / London Plane Tree

SITE SHRUBS

Caesalpinia gilliesii / Yellow Bird of Paradise
* Callistemon viminalis `Little John` / Dwarf Bottle Brush
Dianella caerulea `Cassa Blue` / Cassa Blue Flax Lily
Juncus mexicanus / Mexican Rush
Leucophyllum frutescens `Gr. Cloud` / Green Cloud Texas Ranger
Rosa `Carpet Red` / Red Ground Cover Rose

SITE VINES

Macfadyena unguis-cati / Yellow Trumpet Vine

SITE GROUNDCOVER

Baccharis pilularis / Baccharis pilularis "Pigeon Point"

* signifies introduced (non-native) species

NOTES:

1. *Dwarf Bottle Brush shrub is allowed because it is a dwarf variety of the *Callistemon spp.,* that is drought tolerant, fire resistive, and is not found under the shrub and ground cover section of the prohibited plant list.

INTENTIONALLY LEFT BLANK

Attachment 5

Prohibited Plant List

Attachment 5
Examples of Prohibited Plants

Botanical Name	Common Name	Comment*
Trees		
Abies species	Fir	F
Acacia species (numerous)	Acacia	F, I
Agonis juniperina	Juniper Myrtle	F
Araucaria species (A. heterophylla, A. araucana, A. bidwillii)	Araucaria (Norfolk Island Pine, Monkey Puzzle Tree, Bunya Bunya)	F
Callistemon species (C. citrinus, C. rosea, C. viminalis)	Bottlebrush (Lemon, Rose, Weeping)	F
Calocedrus decurrens	Incense Cedar	F
Casuarina cunninghamiana	River She-Oak	F
Cedrus species (C. atlantica, C. deodara)	Cedar (Atlas, Deodar)	F
Chamaecyparis species (numerous)	False Cypress	F
Cinnamomum camphora	Camphor	F
Cryptomeria japonica	Japanese Cryptomeria	F
Cupressocyparis leylandii	Leyland Cypress	F
Cupressus species (C. fobesii, C. glabra, C. sempervirens,)	Cypress (Tecate, Arizona, Italian, others)	F
Eucalyptus species (numerous)	Eucalyptus	F, I
Juniperus species (numerous)	Juniper	F
Larix species (L. decidua, L. occidentalis, L. kaempferi)	Larch (European, Japanese, Western)	F
Leptospermum species (L. laevigatum, L. petersonii)	Tea Tree (Australian, Tea)	F
Lithocarpus densiflorus	Tan Oak	F
Melaleuca species (M. linariifolia, M. nesophila, M. quinquenervia)	Melaleuca (Flaxleaf, Pink, Cajeput Tree)	F, I
Olea europea	Olive	I
Picea (numerous)	Spruce	F
Palm species (numerous)	Palm	F, I

Attachment 5
Examples of Prohibited Plants

Botanical Name	Common Name	Comment*
Pinus species (P. brutia, P. canariensis, P. b. eldarica, P. halepensis, P. pinea, P. radiata, numerous others)	Pine (Calabrian, Canary Island, Mondell, Aleppo, Italian Stone, Monterey)	F
Platycladus orientalis	Oriental arborvitae	F
Podocarpus species (P. gracilior, P. macrophyllus, P. latifolius)	Fern Pine (Fern, Yew, Podocarpus)	F
Pseudotsuga menziesii	Douglas Fir	F
Schinus species (S. molle, S. terebenthifolius)	Pepper (California and Brazilian)	F, I
Tamarix species (T. africana, T. aphylla, T. chinensis, T. parviflora)	Tamarix (Tamarisk, Athel Tree, Salt Cedar, Tamarisk)	F, I
Taxodium species (T. ascendens, T. distichum, T. mucronatum)	Cypress (Pond, Bald, Monarch, Montezuma)	F
Taxus species (T. baccata, T. brevifolia, T. cuspidata)	Yew (English, Western, Japanese)	F
Thuja species (T. occidentalis, T. plicata)	Arborvitae/Red Cedar	F
Tsuga species (T. heterophylla, T. mertensiana)	Hemlock (Western, Mountain)	F
Groundcovers, Shrubs & Vines		
Acacia species	Acacia	F, I
Adenostoma fasciculatum	Chamise	F
Adenostoma sparsifolium	Red Shanks	F
Agropyron repens	Quackgrass	F, I
Anthemis cotula	Mayweed	F, I
Arbutus menziesii	Madrone	F
Arctostaphylos species	Manzanita	F
Arundo donax	Giant Reed	F, I
Artemisia species (A. abrotanium, A. absinthium, A. californica, A. caucasica, A. dracunculus, A. tridentata, A. pynocephala)	Sagebrush (Southernwood, Wormwood, California, Silver, True tarragon, Big, Sandhill)	F
Atriplex species (numerous)	Saltbush	F, I
Avena fatua	Wild Oat	F
Baccharis pilularis	Coyote Bush	F

Attachment 5
Examples of Prohibited Plants

Botanical Name	Common Name	Comment*
Bambusa species	Bamboo	F, I
Bougainvillea species	Bougainvillea	F, I
Brassica species (B. campestris, B. nigra, B. rapa)	Mustard (Field, Black, Yellow)	F, I
Bromus rubens	Foxtail, Red brome	F, I
Castanopsis chrysophylla	Giant Chinquapin	F
Cardaria draba	Hoary Cress	I
Carpobrotus species	Ice Plant, Hottentot Fig	I
Cirsium vulgare	Wild Artichoke	F,I
Conyza bonariensis	Horseweed	F
Coprosma pumila	Prostrate Coprosma	F
Cortaderia selloana	Pampas Grass	F, I
Cytisus scoparius	Scotch Broom	F, I
Dodonaea viscosa	Hopseed Bush	F
Eriodictyon californicum	Yerba Santa	F
Eriogonum species (E. fasciculatum)	Buckwheat (California)	F
Fremontodendron species	Flannel Bush	F
Hedera species (H. canariensis, H. helix)	Ivy (Algerian, English)	I
Heterotheca grandiflora	Telegraph Plant	F
Hordeum leporinum	Wild barley	F, I
Juniperus species	Juniper	F
Lactuca serriola	Prickly Lettuce	I
Larix species (numerous)	Larch	F
Larrea tridentata	Creosote bush	F
Lolium multiflorum	Ryegrass	F, I
Lonicera japonica	Japanese Honeysuckle	F
Mahonia species	Mahonia	F
Mimulus aurantiacus	Sticky Monkeyflower	F
Miscanthus species	Eulalie Grass	F
Muhlenbergia species	Deer Grass	F
Nicotiana species (N. bigelovii, N. glauca)	Tobacco (Indian, Tree)	F, I
Pennisetum setaceum	Fountain Grass	F, I
Perovskia atroplicifolia	Russian Sage	F
Phoradendron species	Mistletoe	F

Attachment 5
Examples of Prohibited Plants

Botanical Name	Common Name	Comment*
Pickeringia montana	Chaparral Pea	F
Rhus (R. diversiloba, R. laurina, R. lentii)	Sumac (Poison oak, Laurel, Pink Flowering)	F
Ricinus communis	Castor Bean	F, I
Rhus Lentii	Pink Flowering Sumac	F
Rosmarinus species	Rosemary	F
Salvia species (numerous)	Sage	F, I
Salsola australis	Russian Thistle	F, I
Solanum Xantii	Purple Nightshade (toxic)	I
Silybum marianum	Milk Thistle	F, I
Thuja species	Arborvitae	F
Urtica urens	Burning Nettle	F
Vinca major	Periwinkle	I

*F = flammable, I = Invasive

NOTES:

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