Appendix E: Alternative Materials and Methods of Construction Design Report

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LAGUNA BEACH FIRE DEPARTMENT
Review of Planning/Zoning Concept Plans ONLY 9703

Completed By: James Brown **Title:** FM
10/1/21

Note: These plans are conceptually acceptable for minimum submittal requirements. Full compliance review required at Building Plan Check for CBC, CFC, and Municipal Codes.

August 25, 2021

City of Laguna Beach
Attention: Mr. James Brown, Fire Marshal
Mr. Dennis Bogel, Building Official
505 Forest Avenue
Laguna Beach, California 92651

Subject: Updated Request for Alternative Materials, and Methods of Construction Design for 385 Nyes Place, City of Laguna Beach, California

Dear Mr. Brown and Mr. Bogel:

In accordance with the 2019 California Fire Code (CFC), Chapter 1, Section 104.9, the applicant, Mr. Thomas Norris, is requesting an alternate method of fire protection for the proposed construction of a new multi-story, single-family residence on the vacant lot at 385 Nyes Place, Laguna Beach, California. This Alternate Materials, and Methods (AM&M) of Construction Design provides specific analysis of the property, which is constrained in terms of providing a full 195 feet of fuel modification zone (FMZ) on site. This AM&M provides information about the on-site available fuel modification, as well as an evaluation of the site's fire environment and risk and alternative means of fire protection for the inability of the residence to fully conform. The report addresses structural ignitability and ignition resistive building features, fire protection systems, and fuel modification. The project will be constructed to the 2019 California Fire Code and Building Code (Chapter 7A) as currently adopted by the City of Laguna Beach. Construction shall include enhanced ignition resistant features, automatic interior sprinklers, appropriate fire flow and water capacity, supporting infrastructure, and fuel modification areas.

Field assessments of the Project, including on-site and off-site, adjacent areas were conducted by a Dudek biologist and a fire protection planner on June 14, 2016 in order to document existing site conditions and determine potential actions for addressing the protection of structures proposed new single-family residence that cannot achieve 195 feet of FMZ around all side of the residence. A full 360 degree access pathway/stairway around all sides of the proposed residence will be required to allow firefighters to safely perform their job around the entire perimeter of the structure and a new fire hydrant is required to be installed closer to the proposed residence. An updated biological investigation was conducted on the project site in February 2021. The project's architect provided an updated plan set and details pertinent to Dudek's fire protection assessment for the field assessment. Evaluations of the property location and the area's topography, natural vegetation and fuel loading, closest fire hydrant location, fire department access, and general susceptibility to wildfire formed the basis of the site risk assessment. Representative site photographs were collected and are provided in Attachment 1: *Photograph Log*. Field observations were utilized to augment existing site data in formulating the recommendations detailed in this AM&M.

This AM&M demonstrates that the proposed new single-family residence, landscaping, and onsite fuel modification zones will be in compliance with applicable portions of the City of Laguna Beach (City) Municipal Code, Chapter 15.01 and the City's Landscape/Fuel Modification Guidelines and Maintenance Program (rev. December 2019). The project will also be consistent with the 2019 edition of the California Building Code (CBC), Chapter 7A; 2019 edition of the

California Fire Code (CFC), Chapter 49; and 2019 edition of the California Residential Code (CRC), Section 237 as adopted and amended by the City

1 Project Location

Site Address:	385 Nyes Place Laguna Beach, California 92651 APN# 656-169-27
Owner:	Mr. Thomas Norris
Building Construction Type:	Type VB, Fully Fire Sprinklered
Building Area (sq. ft.):	4,788 sq. ft.
Building Occupancy Type:	Multi-story, Single-family Residence (R-3)
Current Fire Protection Systems:	None

2 Project Background for AM&M

Project Description

The project is located at 385 Nyes Place in the City of Laguna Beach, California. The Proposed Project's location is illustrated in Figure 1, Vicinity Map. The project site lies within the northwest corner of Section 31 of Township 7 South and Range 8 West on Laguna Beach, California, U.S. Geological Survey (USGS), 7.5-minute quadrangle. The Project is approximately 0.3 mile east of the Pacific Ocean.

The building site is currently a 0.17-acre vacant lot. With the project, the lot which is currently supporting natural vegetative cover, will be converted from vacant to including a new code compliant, ignition resistive multi-level, single-family residence, with a studio/office, a street level two-car garage, a street level one-car garage, pool, and associated fuel modification with landscaping. All rooms within the new single-family residence and both garages, will be fitted with an automatic fire sprinkler system conforming to National Fire Protection Association (NFPA) 13D requirements.

The property and parcel immediately to the north of the property boundary are currently undeveloped and are comprised of a disturbed maritime chaparral-sagebrush vegetation type that was mapped by a Dudek biologist (Figure 2, Biological Resources Map) on June 14, 2016. An updated biological investigation was conducted on the project site on June 21, 2018 (Dudek 2018) and again on February 4, 2021 (Dudek, 2021). From a fire perspective, the vegetation communities' species composition and density did not change from 2016 to 2021.The subject residence is technically located in a Very high Fire Hazard Severity Zone (VHFHSZ) per LBFD and does have an "FM" (fuel modification) designation in the City's GIS mapping website: https://lagunabeach.maps.arcgis.com/apps/webappviewer/index.html?id=75a3aa3236c7475bb5e81925d130

a763&extent=-13123258.3471,3958953.8571,-13093447.906,3978502.6271,102100 (City of Laguna Beach 2021). The project area is within a potential "ember zone" from wildland fuels to the north and east in Aliso Canyon, but the property and structures are separated by existing and newly proposed residential homes and a ridgeline that extends up to Aliso Peak. The properties at the top of the ridgeline provide benefits in terms of buffering radiant heat from a wildfire, but not windblown embers from the east. As such, the property requires modification of natural vegetation at the WUI and an integrated landscape plan, including FMZs. The existing vegetation is patchy and discontinuous from a wildfire perspective. The most prevalent plant species on site are California Buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), Black sage (*Salvia mellifera*), and lemonadeberry (*Rhus integrifolia*). Lesser components include laurel sumac (*Malosma laurina*) and toyon (*Heteromeles arbutifolia*). Off-site, adjacent vegetation or fuels are similar to the fuels found on the project site. These fuel beds would represent the closest fuel sources once the site has been graded and the project has been constructed. The project proposes to remove and replace the existing plant material within the project boundaries, with an all new ignition resistive, fully-irrigated and maintained landscape throughout the site adhering to the Zone A fuel modification guidelines and will not include any of the City's "target species" found in the LBFD guidelines. Additional Fire Protection Measures are proposed for this project, as allowed by the LBFD, because the standard 195-foot-wide fuel modification zone is not achievable for the entire lot. No off-site FMZ is being recommended for this Project. The in-lieu measures are summarized on page 9 in the Compensating Fire Protection Measures section of this report.

Existing Lot Conditions

The property consists of one parcel (APN: 656-169-27) that is L-shaped in configuration (Figure 3, Location Map). The lot extends from Nyes Place approximately 113.6 feet uphill to the rear property line and then turns west for approximately 85 feet in width. The portion of property adjacent to Nyes Place is approximately 49 feet in length. Additionally, the western third of the Project site is a steep west-facing slope that tapers off to a moderately steep slope. The parcel is located at the entrance of a canyon (two unknown name drainages which converge downslope at Nyes Place) that begins upslope on a ridgeline in Arch Beach Heights. Figure 10 provides an illustrative topography relief map for the vicinity indicating the canyon terrain and steep slopes. The elevations on the Project site vary from approximately 128 feet above mean seal level (amsl) at the western property boundary along Nyes Place to roughly 200 feet amsl at the eastern property boundary of the lot. The property slopes primarily to the southwest at 30-45% grade. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fires burning uphill spread faster than those burning on flat terrain or downhill, as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Slope values were measured from site topographic maps and are presented in units of percent. For the fire behavior analysis, slope measurements used were 47% for the area immediately to the east and up canyon from the project site.

Additionally, the project site is located in an area with urban development in all directions. The neighboring residential properties in all directions vary in their existing condition with a mix of older and newer construction and ornamental landscaping. The adjoining, narrow property ("paper" street parcel) to the north and the privately owned property directly to the east of the project site are undeveloped with similar vegetation as found on site. Moulton Meadows Park is 0.6 mile east of the project and includes a largely isolated canyon vegetated with native plant communities and residential neighborhoods west of Balboa Avenue. These land uses/covers are located between the project and Aliso Canyon to the east. The attached Photograph Log (Attachment 1, Representative Photographs) provides various views of the vegetation on and adjacent to the parcel.

The project is accessed off Nyes Place, a gently sloping access road, which varies in width between 24 and 34 feet. This road intersects with South Coast Highway approximately 500 feet to the south.

Water service for the Proposed Project will be provided by the Laguna Beach County Water District (LBCWD) and fire flow will be consistent with LBFD requirements (Appendix B of the 2019 CFC) for a single-family residential development. There is a fire hydrant located on the north side of Nyes Place and approximately 362 feet north from the northwest corner of the subject property. The next closest fire hydrant is 391 feet at the southwest corner of Solana Way. The existing fire hydrant locations exceed the maximum allowable distance of 250 feet from a structure, therefore, a new fire hydrant will be installed in the City right-of-way, just north of the property (see Figure 4, Project Site Plan and Figure 11, Fire Department Site Access Plan Map for proposed new fire hydrant location). The applicant's architect has obtained and completed a Service Availability Letter (hydrant flow report) from the LBFD Fire Marshal and water purveyor (see Attachment 2 – *Completed Hydrant Flow Report).*

Post Construction Condition

The project will be accessed from Nyes Place, a 24- to 34-foot wide street with no parking allowed on either side of the street from the intersection of Nyes Place and South Coast Highway up to 405 Nyes Place, where the road widens to 34 feet and parking is allowed on both sides of the street. With the proposed project, the existing lot (7,709 sq. ft) will be transformed to include a new multi-level single-family residential structure, studio/office, street level two-car garage and street level one-car garage, conforming to the current ignition resistant fire and building codes, including the City's most recent code adoption. Property line setbacks are 5 feet to the north and south side yards; approximately a 5- foot setback to the west where the driveway joins the Nyes Place and 20 feet for the rear yard (east).

The new single-family residence, guest house/studio, garages, pool, and hardscape will be constructed on approximately 59 percent of the property site and will consist of a tri-level single-family residential structure occupying approximately 4,520 square feet (sq. ft.) of livable space, a studio/office (269 sq. ft.), combined three-car garages (754 sq. ft.) located on street level with driveway entrance from Nyes Place, and approximately 1,196 sq. ft. of elevated deck (Figure 4, Project Site Plan). Exterior materials will include smooth stucco, noncombustible and ignition-resistive horizontal/vertical siding (Figure 5, OSFM Listing 8140-2135:0500), and stone exterior walls. Windows on the WUI exposed sides (northern and eastern borders) of the single-family residence will include the installation of code-exceeding dual pane windows with both panes tempered glass; all sliding glass doors will also be dual pane with both panes tempered glass. All exterior doors will be self-closing fire rated exterior doors (excluding any sliding doors). A new noncombustible, Class A-fire rated roof and associated assembly will be installed, where there will be no attic or void spaces requiring ventilation to the outside environment and therefore, no exposure to embers. Exterior materials on the 2nd floor master bedroom deck and 3rd floor main view deck areas will be constructed with a noncombustible tile on concrete setting bed with waterproof membrane and thermally-modified ash deck boards (Figure 6, OSFM Listing 8110-2135:0100). The guardrails system proposed around the decks will be a 42-inch high noncombustible dual pane glass handrail system.

Additionally, an unimpeded, all-weather, noncombustible minimum three feet wide firefighter access pathway/stairway will be provided around all sides of the proposed residence for firefighters to safely perform their job around the entire perimeter of the structure (see Figures 7 through 10, Project Elevation Plans and Figure 11, Fire Department Site Access Plan). A new National Fire Protection Association (NFPA) 13D code exceeding, 4-head automatic interior fire sprinkler system will be installed within all rooms and void spaces of the residential house and studio/office, including all closets and bathrooms, and the street-level garages. Regardless of overhangs/roofs, exterior fire sprinkler head protection on all levels of the north and east sides of the residence that are exposed to the WUI, will be installed to augment the

enhanced interior fire sprinkler system. The modified system will function similarly to a system that provides structure protection, with a high degree of success confining or reducing fire spread to the room of origin, extending flashover, providing additional time for firefighter response, and minimizing firefighting resource demands. As such, the modified fire protection system will exceed the life safety function of a normal NFPA 13D The exterior fire sprinkler heads are required to comply with the 'Exposed Protection' requirements of NFPA 13, Sections 11.3.2 (including both subsections 11.3.2.1 and 11.3.2.2), which describe the design and installation standards that are required to be followed. A supervised fire alarm system will also be installed pursuant to NFPA 72 and LBFD standards and smoke detectors shall be installed at the ceiling of every room.

The *Preliminary Landscape Place* has been prepared by the Mestre Design Group - Landscape Architecture and includes ignition resistant, maintained landscaping in the front and back yards with low flammability, drought tolerant shrubs and groundcover approved by LBFD. Landscape plants 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 during the peak fire season. The landscaping will be routinely maintained and as needed per LBFD's VHFHSZ landscaping guidelines. Should future water availability issues be realized due to extended drought, the landscape will be limited to low density, drought tolerant species that do not facilitate fire ignition or spread

3 Fire Environment

Fire environments are dynamic systems and include many types of environmental factors. Fires can occur in any environment where conditions are conducive to ignition and fire movement. Areas of naturally vegetated open space, like that found adjacent to the 385 Nyes Place project, are typically comprised of conditions that may be favorable to wildfire spread. The three major components of fire environment are vegetation (fuels), climate, and topography. The state of each of these components and their interactions with each other determines the potential characteristics and behavior of a fire at any given moment. It is important to note that wildland fire may transition to urban fire if structures are receptive to ignition. Structure ignition depends on a variety of factors and can be minimized or prevented through a layered system of protective features, like those that will be provided for this project, including fuel modification directly adjacent the structure(s), application of known ignition resistive materials and methods, and suitable infrastructure for firefighting purposes. Understanding the existing wildland vegetation and urban fuel conditions on and adjacent the site along with the site's weather, topography and fire history are necessary to understand the potential for fire within and around the project.

The entire Laguna Beach coastal area is designated as a Local Responsibility Area -Very High Fire Hazard Severity Zone (VHFSHZ) by LBFD and California Department of Forestry and Fire Protection (CAL FIRE). This classification indicates that the terrain, fuels, weather and ignition sources combine to create an environment that would facilitate fire spread and presents a potential hazard to persons and property. Fires in this portion of Orange County may be affected by seasonal winds that result in fast moving, unpredictable wildfire.

The following description provides details regarding the site's fire environment and general risk from wildland fire.

- The Property at 385 Nyes Place is within an area subject to occasional weather extremes that may facilitate wildfire ignition and spread;

- WUI occurs on the northeast corner and northern boundary (narrow, undeveloped paper lot) of the project site and 0.6 mile to the east along a ridgeline above Aliso Creek canyon;
- Terrain within the vicinity of the project may facilitate the spread of fire due to steep, vegetation covered slopes;
- There is a potential risk from ember generated wildfires based on natural, unmaintained fuels to the northeast of the project's perimeter;
- Typical LBFD fuel modification Zones are not possible on site given the parcel size;
- Given the lack of heavy, consistent fuels in close proximity to the structure, combined with the structure's ignition resistance level following construction, the risk of wildfire damage to the structure is considered lower than the current condition; and
- The new residence, landscape, and hardscape will improve firefighter safety and defensible space on the parcel.

4 Fire Risk Assessment

Based on Dudek's assessment, it is expected that wildfires will have the possibility of occurring nearby this site post-development. Fires burning in the adjacent fuel beds often display moderate fire intensity and thresholds for spread that are observed to depend on environmental factors like wind or slope. The project site includes steep terrain, seasonally flammable vegetation and unpredictable wind patterns that all influence fire spread rates and behavior. There is no recorded history of fire directly near the project area, but that does not indicate that the fuels will not burn under the right conditions.

Fire history data provides valuable information regarding fire spread, fire frequency, ignition sources, and vegetation/fuel mosaics across a given landscape. Fire frequency, behavior, and ignition sources are important for fire response and planning purposes. One important use for this information is as a tool for pre-planning. It is advantageous to know which areas may have burned recently and, therefore, may provide a tactical defense position, what type of fire burned on the site, and how a fire may spread. According to available data from the CAL FIRE's Fire and Resource Assessment Program (CALFIRE FRAP 2018), six fires have burned in the vicinity of the property since the beginning of the historical fire data record (approximately 110 years). These fires, which occurred in 1961 (339 acres), 1979 (534 acres), 1993 (14,337 acres), 2002 (83 acres), 2016 Laguna Fire (47 acres), and 2018 Aliso Fire (175 acres) burned within approximately 3 miles of the Proposed Project site. The 2016 Laguna Fire more recently burned about 47 acres approximately 1.5 mile to the north and the 2018 Aliso Fire burned about 175 acres approximately 2.5 miles to the east near the Aliso Wood Canyon Park. The most serious wildland fire occurred in 1993 (Laguna Beach Fire) which destroyed or severely damaged 441 homes. The weather on October 27, 1993 included strong Santa Ana conditions with winds at 40 mph, gusts up to 92 mph, 78 degrees but with a relative humidity of only 6%–7%. The natural plants surrounding Laguna Beach only had a moisture level of about 4% (Gene Felder, Board Member, Laguna Beach Historical Society). No fires have burned through the proposed project site.

Dudek conducted a Fire Behavior Modeling Analysis for this Project (see Attachment 3 – BehavePlus Fire Behavior Modeling Analysis). To that end, two fire scenarios were evaluated, including one summer, onshore weather condition (southwest of Project site) and one extreme fall, offshore weather condition (north of the Project Site). Fuels and terrain beyond that distance can produce flying embers that may affect the project, but the proposed new single-family structure and surrounding landscape will be built to extreme ignition and ember resistant standards which will minimize the possibility of ignition. It is the fuels next to the FMZs and within the FMZs that would have the potential to affect the project's structure from a radiant and convective heat perspective as well as from direct flame impingement but based on the site's terrain and the building construction, the vertical separation between vegetative fuels and the site's structure is significant. The results of the modeling effort included anticipated values for surface fires (flame length (feet), spotting distance (miles), rate of spread (mph), and fireline intensity (Btu/ft/s)). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2008). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds.

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

Based on the BehavePlus analysis, worst-case fire behavior is expected in Maritime Chaparral-Sagebrush fuel beds along the north and northeast sides of the project site under Peak weather conditions (represented by 97th percentile, Scenario 1). The fire is anticipated to be a wind-driven fire downhill within the drainages running from the ridgetop above the project site. Under such conditions, expected surface flame lengths reach 45.5 feet with peak wind speeds of 50+ mph. Under this scenario, fireline intensities reach 22,853 BTU/feet/second with fast spread rates of 7.1 mph. Fires burning from the south or west of the project site and pushed by on-shore winds (Summer weather) exhibit fire behavior, with flame lengths reaching 15.4 feet, fireline intensities reaching 2,167 BTU/feet/second and a slower spread rate reaching 0.9 mph in chaparral-ornamental landscape fuel beds.

Vegetation management and/or alternative methods for reducing fire spread rates and fire intensity are important considerations for mitigating direct flame impingement on a structure. Burning embers during a wildfire represent the greatest risk to structures that are set back from wildland fuels. However, the proposed single-family residence will be hardened to minimize the possibility of ember intrusion (no exterior vents, self-closing exterior doors, and dual-tempered dual pane windows and sliding glass doors) and the landscape will be treated to minimize receptive fuels, thus minimizing the likelihood of ignitions. Wildfire may occur in the vicinity of the project and the homeowner will

need to be aware of fire safety procedures, maintain the property's landscapes and structural features, and develop a personal evacuation plan (See Section 8).

5 Fuel Modification

An important component of a fire protection system is the fuel modification zone (FMZ). FMZs are typically designed to gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones, restricted vegetation zones, and irrigated zones adjacent to each other on the perimeter of WUI exposed structures.

As mentioned, the property is located within 5 feet of (directly adjacent) undeveloped, vegetated land to the north and is considered to be within a WUI and "FM" (fuel modification) area, per definition of LBFD. As such, the property requires modification of natural vegetation at the WUI and an integrated landscape plan, including a fuel modification plan. As previously discussed, the proposed landscape plan includes removal of all highly flammable (target plants) species not consistent with the LBFD fuel modification guidelines and landscaping with ornamental plants suitable for the location (LBFD 2019).

A fuel modification zone is a strip of land where combustible vegetation has been removed and/or modified and partially or totally replaced with more adequately spaced, drought-tolerant, fire resistant plants in order to provide a reasonable level of protection to structures from wildland fire. A typical landscape/fuel modification installation in Laguna Beach consists of a 195-foot-wide zone comprised of a 20-foot setback zone (Zone A), a minimum 50-foot irrigated zone, (Zone B), and an additional 125-foot minimum of vegetation thinning zones (Zones C and D). Each zone will be required to meet the City of Laguna Beach Landscape/Fuel Modification Guidelines and Maintenance Program, Attachment 7 - Undesirable Plants Species (Target Species) list and remove all 'Target Species' currently planted within the zones. Based on the 0.17-acre size of the property and limited building area, it is not possible to achieve the City's standard fuel modification zone width on site. The available managed and maintained fuel modification area will convert all native fuels on the parcel to irrigated Zone A fuel modification zone and will be approximately 5 feet from the proposed structure to the northern property line and 20 feet from the easterly property line and native vegetation beyond. A minimum three-foot wide, noncombustible, all-weather concrete stairway will also be constructed along the residence's north side. The *Preliminary Landscape Plan* for the property includes removing the existing landscape within the development footprint and creating appropriate plant spacing through strategic plant positioning and providing water conserving irrigation to all plants. The development footprint (including all landscaped areas of the project) will be treated as LBFD Zone A requirements (LBFD 2019). New plantings will be maintained in a hydrated condition by a permanent, automatic irrigation system. There are no Zones B, C and D. The *Preliminary Landscape Plan* provides a detailed illustration of the proposed Zone A FMZ along with plant material and fire maintenance notes. Additional home and property wildfire protection is proposed in this AM&M report to compensate for the constrained fuel modification zone due to the property size. These fire protection features are detailed in the proposed Compensating Fire Protection Mitigation Measures section below.

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 LBFD. The homeowner shall be responsible for all vegetation management throughout the project site, in compliance with the requirements detailed herein and LBFD

requirements. Maintenance service records shall be provided to the LBFD Fire Marshal annually or as needed. ***To ensure ongoing maintenance to highly ignition resistant condition, fuel modification area vegetation management (Zone A landscaped Area) will be made a deed restriction for present and future property owners, as described herein.***

6 Compensating Fire Protection Features

Based on Dudek's assessment and the Development footprint for the project site, there is one area that does not fully conform with City Code or City Fire Department requirements: 1) Constrained 195-foot fuel modification width.

Given the potential fire hazard of the Project's location and the new single-family residence being built to the latest ignition resistive codes, including ignition resistive construction materials and an automatic interior sprinkler system with a code-exceeding 4-head hydraulic calculation, the 385 Nyes Place residence and street-level garages will include the following Alternative Materials and Methods for additional prevention, protection, and suppression in compensation for the absence of standard LBFD fuel modification zone and constrained firefighter access based on a site specific hazard assessment. The following customized fire protection and suppression measures are proposed for implementation:

1. **Constrained 195-Foot Fuel Modification Width:**

   Fuel Modification is constrained within the development footprint area. All landscaping within the development footprint will be to the City's Zone A requirements and will extend from each structure to the outer edge of the developed portions of the Preferred Project design.

   ### Zone A - Irrigated Zone (Structure to Property Boundary)

   The purpose of the Zone A is to provide a defensible space for fire suppression forces and to protect structures from radiant and convective heat of wildland fires. No combustible construction shall be allowed within the minimum 20-foot setback zone. This zone for the Project will include drought tolerant plant species and a highly efficient, irrigation system.

   ### Zone A - Specific Requirements

   - Removal of all existing target (highly flammable) plants/vegetation within the designated landscape area.
   - Replacement planting shall be only of species approved by the City.
   - Automatic irrigation systems to maintain healthy vegetation with high moisture content, especially during peak fire season. Irrigation system maintenance to occur as needed so that it is functioning as intended.
   - Pruning of foliage to reduce fuel load, vertical continuity, and removal of plant litter and dead wood. Maintenance will occur at a minimum annually and as needed.
   - Trees and tree form shrub species are not allowed within 10 feet of combustible structures (measured from the edge of a full growth crown).

- Trees and tree form shrub species are not allowed to extend beyond the property line (measured from the edge of a full growth crown).
- Individual tree and tree form shrub species or a maximum grouping of three plants are not allowed within 10 feet of adjacent tree species or groupings as measured from edge of a full growth crown.
- Special consideration should be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions.
- Maintenance including ongoing removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying fire resistant plantings, maintenance of the operations integrity and programming of the irrigation system, regular trimming to prevent ladder fuels will occur at least annually and as needed. This type of deed encumbrance vegetation and irrigation maintenance will be documented annually or as needed by present or future property owners. Records will be sent to LBFD Fire Marshal.
- No vines shall be permitted on combustible structures (e.g., Type V non-rated structure).
- No exposed wood will be allowed on the wildland exposed side(s) of the project's structure. Exceptions to allow pre-treated, fire retardant wood or heavy timber construction or a California State Fire Marshal's listed WUI product on some exterior wall or under-eave surfaces for nonstructural decorative treatments may be proposed for approval by LBFD.
- No combustible fences or gates will be allowed. Wood fences and gates using fire retardant treated wood products may be approved. No plant material (i.e., vines) will be allowed on the fence.
- Windows on the WUI exposed side (northern and eastern borders) of the structure shall be dual pane, both panes tempered. Dual pane, one pane tempered glass has been shown during testing and in after fire assessments to significantly decrease the risk of breakage and ember entry into structures. Therefore, requiring dual pane, both panes tempered is an important safety measure that directly mitigates potential issues caused by reduced fuel modification zones and limited setbacks from adjacent structures. *The window upgrade also exceeds the requirements of Chapter 7A of the CBC and provides additional protection for the structure's most vulnerable, exterior side.*
- The applicant will augment the interior fire sprinkler system for the residence with exterior heads for the north and east sides of structure. The exterior fire sprinkler heads will provide sufficient water flow to protect this side of the building against heat from natural vegetation on fire. Although permanently installed, the exterior heads will no longer be necessary to protect against wildfire when the adjacent vacant lot is developed or brush management is implemented, but may still provide benefits in the unlikely event of a structure fire.
- *A fire alarm system shall be installed in accordance with NFPA 72, Fire Protection Signaling System and LBFD requirements,* for monitoring the flow switch and inter-connection with the dwellings smoke detectors. *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 LBFD.*

- ***The sides of the structure facing the WUI will have exterior, self-closing fire rated doors, excluding sliding glass doors (sliders).*** All doors around the exterior of the structure, excluding the main entrance and sliding glass (sliders) doors, shall be self-closing and conform to the exterior door assembly standards addressed in CBC Chapter 7A, Section 704A.3.2.3.
- External dryer vents will be baffled or fitted with ember resistant mesh.
- Fuel modification will be pre-designed and installed by the Project developer.
- ***Since property ownership may occasionally change, it is recommended that the fire protection provisions, including all annual maintenance and testing requirements in this AM&M shall be recorded as a deed encumbrance against the property that will be subject to disclosure.*** Recording the FPP conditions notifies all future owners that there are approved fire protection measures that need to be followed or updated should changes be proposed for this property.

7 Supporting AM&M Justifications

As presented in this report, FMZ provided for the project on the north side is 5 feet wide and on the east side, approximately 20 feet wide. Despite the lack of full 195 feet FMZ width for the project, it is anticipated that the proposed structure will be able to withstand the short duration, low to moderate intensity fire and ember shower that is projected from off-site, adjacent fuels based on several factors, as discussed below. The following site-specific features, analysis, and discussion provide justification for approval of the proposed residential project at 385 Nyes Place.

Construction to Recent Codes

The Project is located within a VHFHSZ and near WUI area. The multi-level, single-family dwelling, studio/office, and garages will be built to the 2019 CBC (Chapter 7A) and Fire Codes, as adopted by the City of Laguna Beach. These codes adopted in 2007 and updated in 2010, 2013, 2016, and 2019, focus on minimizing radiant heat vulnerability and preventing embers from penetrating into structures, a leading cause for structure loss from WUI fires. Structures that include construction to Chapter 7A of the 2019 CFC, as this new residential structure will, have a higher probability of avoiding or reducing damage from wildfire. The 1993 Laguna Fire burned through northern portions of Laguna Beach and structures were lost. That fire moved quickly through the canyons, burning older, vulnerable structures. Embers penetrating structures were likely responsible for some of the structure losses. The new roof on the residence will be a class A-fire rated roof and associated assembly. With the proposed roof there are no attic or void spaces requiring ventilation to the outside environment and therefore, no exposure to embers. Upgraded windows (dual pane-dual tempered) on the WUI exposed sides (northern and eastern sides of the property will provide an added level of protection from breakage. All sliding glass doors will also be dual pane with both panes tempered glass. Exterior walls and appendages will be ignition resistive and ongoing landscaping maintenance requirements and restrictions will minimize the possibility of flammable plants or other landscape items from igniting and causing long-duration, high BTU sources directly touching the exposed sides of the structure. ***Additionally, interior sprinklers are required in all structures on this site and will be enhanced with the use of a 4 head calculation***. The result is a highly ignition resistant structure that includes low demand on firefighting resources due to minimal likelihood of structural fire and interior sprinklers, which are shown to be effective at

extinguishing interior fires 97% of the time, according to a 2010 National Fire Protection Association Study (U.S. Experience with Sprinklers and Other Automatic Fire Extinguishing Equipment). The structures have also been required to provide additional building features (See measures described above) to significantly decrease the risk of ember entry into structures or structure ignition from flame front (radiant heat transfer).

Fire Sprinkler System

The proposed single-family residence, studio/office, and garages will be provided with an NFPA 13D automatic internal fire sprinkler system with additional coverage. The upgraded fire protection system will exceed the life safety function of a normal NFPA 13D, when properly designed and installed. The upgraded system will function similarly to a system that provides structure protection, with a high degree of success confining or reducing fire spread to the room of origin, extending flashover, providing additional time for firefighter response, and minimizing firefighting resource demands

In addition, the sprinkler system will be enhanced by adding exterior fire sprinkler heads in the eave along the north side of the residence to provide functional equivalency for fuel modification, if brush management is not achievable in the vacant lot to the north of the project site. Installing heads underneath the roof eave, has been done on other structures with similar fuel modification constraints, are intended to function as a cooling and/or extinguishing tool to minimize likelihood of glazing failure or exterior wall ignition. The vegetation on this side of the structure will have a relatively fast burn rate and the sprinkler system with exterior heads will provide an additional layer of protection on the west side of the building.

The NFPA 13D system is required:

- To be designed by a licensed fire protection engineer or LBFD-approved sprinkler contractor
- To include, at a minimum, four head hydraulic calculation that addresses coverage in all accessible build up areas, closets, bathrooms, and garages.
- Include a minimum 1-inch meter, unless water flow calculations indicate a larger meter size
- To provide fire inspector's test value five feet above grade
- To install a fire sprinkler box in garage with wrench and three heads of each type used in design of fire sprinkler system
- To provide sufficient water supply as determined by fire sprinkler hydraulic calculations, which may require meter and piping to be increased in size. If fire flow is insufficient for the designed system, alternative options, such as a fire pump designed to boost fire flow, may be considered, to the approval of LBFD. Alternative options will be submitted to LBFD for approval before installation.
- Include any modifications deemed necessary by the fire protection engineer or contractor to function as intended.

Fire Detection and Alarm System

The residence will have electric-powered, hard-wired smoke detectors and a fire alarm system. These fire detection and alarm systems shall be installed in accordance with NFPA 72, Fire Protection Signaling System and LBFD 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 LBFD.

Structure Ignition

There are two primary concerns for structure ignition: 1) radiant and/or convective heat and 2) burning embers (NFPA 1144 2008, IBHS 2008, and others). Burning embers have been a focus of building code updates for at least the last decade, and new structures in the WUI built to these codes have proven to be very ignition resistant. Likewise, radiant and convective heat impacts on structures have been minimized through the Chapter 7A exterior fire ratings for walls, windows and doors. Additionally, provisions for modified fuel areas separating wildland fuels from structures have reduced the number of fuel-related structure losses. As such, most of the primary components of the layered fire protection system provided to the 385 Nyes Place residence are required by City and state codes, but are worth listing because they have been proven effective for minimizing structural vulnerability to wildfire and, with the inclusion of required interior sprinklers (required in the 2019 Building/Fire Code updates), of extinguishing interior fires, should embers succeed in entering a structure. Even though these measures are now required by the latest Building and Fire Codes, at one time, they were used as mitigation measures for buildings in WUI areas, because they were known to reduce structure vulnerability to wildfire. These measures performed so well, they were adopted into the code. The following project features are required for new construction in WUI areas and form the basis of the system of protection necessary to minimize structural ignitions as well as providing adequate access by emergency responders:

1. Planned and maintained fuel modification zone (all Irrigated Zone A)
2. Application of Chapter 7A, ignition resistant building requirements.
3. Minimum 1-hour rated exterior walls and doors.
4. Multi-pane glazing with two tempered panes (Windows on north and east sides of building will be dual pane both panes tempered glass); dual pane both panes tempered glass for sliding glass doors
5. NFPA 13D, code exceeding 4-head calc. interior automatic fire sprinkler system for occupancy type, along with the installation of a wet standpipe system.

Exterior Windows

A potentially vulnerable structure component with regard to radiant or convective heat exposure is a structure's windows. 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. 2003; Ramsay and Rudolph 2003; Cohen and Quarles 2011). Tests of various glazing products indicate that single pane, tempered glass failure may occur 120–185 seconds from exposure (University of California 2011; Manzello et al. 2007) but those tests include direct and constant heating that would not be experienced during a wildfire near the residence. 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 20-30 seconds for the grasses and maintained shrubs on the slope behind the structure), the loss of heat over distance, the fire-rated minimum 20-minute glazing specified for this project, wildfire heat and flame will be reduced and heat experienced by the windows from the wildland fire is not expected to be enough (in temperature or duration) to cause window failure.

Should a window fail, such as due to a neighboring parcel's natural vegetation or structure fire, the interior, automatic fire sprinklers (code-exceeding, NFPA 13D Fire Protection System) provide a level of protection and some ability to minimize fire spread beyond the room of origin (NFPA 13D is a life safety sprinkler system designed to provide residents the ability to exit the structure, however, during most wildfire events, residents will have been evacuated and the system may help contain a room fire caused by an ember through a failed window). However, Quarles et al. (2010) provides strong endorsement for tempered glass performance. His research and tests conclude that multi-pane (2–3 panes) with at least one pane tempered is well suited for wildfire exposures. He indicates that tempered glass is at least four times stronger and much more resistant to thermal exposures than normal annealed glass. The use of dual pane, both panes tempered glass on the north-facing side of the structure provides several benefits, with thermal exposure performance the most important for this study. ***Requiring both panes to be tempered provides an added level of protection appropriate for the fire environment at this project site.***

In summary, highly ignitable homes can ignite during wildland fires without fire spreading near the structure (Cohen 1995). However, this site will include the latest ignition resistant construction materials and methods for roofs, walls, vents, windows, appendages, along with highly managed landscape and fuel modification areas.

8 Additional Comments

The goal of the fire protection features, both required and those offered above and beyond the Codes, for the 385 Nyes Place single-family residence, studio/office, and garages will provide the structures with the ability to survive a wildland fire with little intervention of firefighting forces. Preventing structure ignition results in reduction of the exposure of firefighters and residents to hazards that may threaten personal safety, which also minimizes property damage and losses. Mitigating ignition hazards reduces the threat to structures and can help the fire department optimize the deployment of personnel and apparatus during a wildfire. The analysis in this AM&M report provides support and justifications for acceptance of the additional fire protection measures, including the installation of exterior fire sprinkler heads along the northern and eastern sides of the structure,, dual pane both panes tempered glass windows on the WUI exposed side of the residence, and a code-exceeding 4-head interior fire sprinkler system to the proposed single-family residence, studio/office, and garages based on site-specific fire environment.

It is important to note that the proposed single-family residence is not a shelter-in-place structure. It is recommended that the homeowners or other occupants who may reside at the residence at 385 Nyes Place adopt a conservative approach to fire safety. This approach must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go!" stance on evacuation[1]. Accordingly, occupants shall evacuate the residence and the area as soon as they receive notice to evacuate, or

[1] Information regarding Ready!Set!Go! program can be downloaded at http://lagunabeachcity.net

sooner, if they feel threatened by wildfire or Red Flag Warning[2] conditions when fire ignition and spread is facilitated. Fire is a dynamic and somewhat unpredictable occurrence and it is important for residents to educate themselves on practices that will improve their home survivability and their personal safety

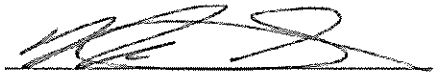
9 Limitations

This AM&M report does not provide guarantee that residents and visitors will be safe at all times because of the fire protection features it requires. There are many variables that may influence overall safety. This report provides requirements and recommendations for implementation of the latest fire protection features that have proven to result in reduced structure fire or wildfire related risk and hazard.

For maximum benefit, project contractors, engineers, designers, and architects are responsible for proper implementation of the concepts and requirements set forth in this AM&M report. Homeowners are responsible to maintain their structures and lots as required by this AM&M report, the applicable Fire Code, and the LBFD.

If you have any questions regarding this AM&M, please contact me at 760.642.8379.

Sincerely,



Noah Stamm
Fire Protection Planner/Fire Behavior Modeling/Urban Forester

Att: *Figures 1-12*
Attachment 1, Photograph Log
Attachment 2, LBFD Fire Hydrant Report
Attachment 3, Fire Behavior Modeling Summary

[2] Red Flag Warnings are issued by the National Weather Service when conditions are conducive to the formation of wildfires. Dry conditions combined with high winds and low humidity are the hallmarks of weather conducive to producing large wildfires.

10 Signatures

Requested by:

Marshall Ininns, Architect
MIDG Architects

Thomas Norris
Property Owner

Approved by City of Laguna Beach:

Dennis Bogel
Building Official

James Brown
Fire Marshal

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DUDEK

SOURCE: USGS 7.5 Minute Series Topographic Maps

FIGURE 1
Vicinity Map

385 Nyes Place AM&M Report

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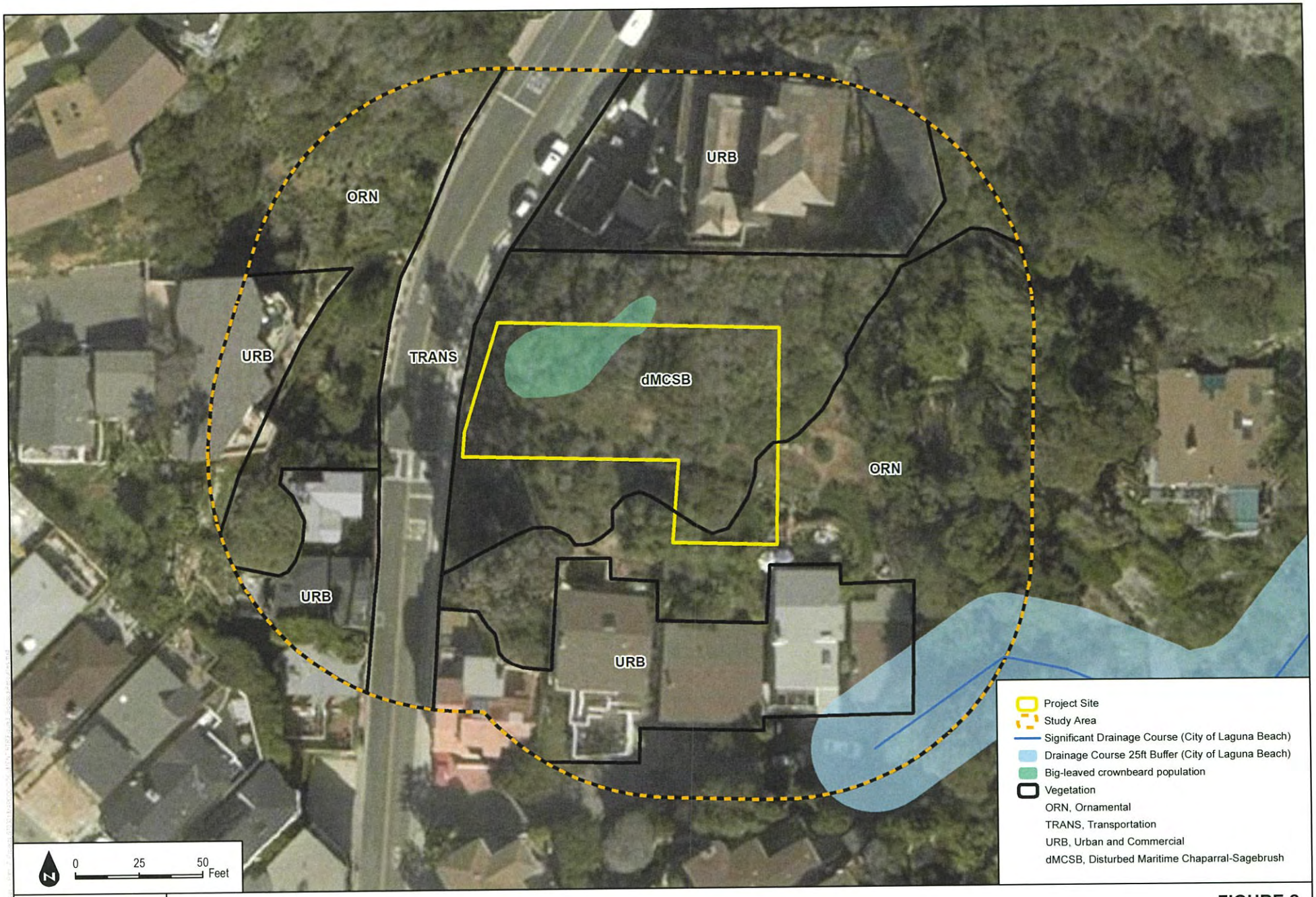

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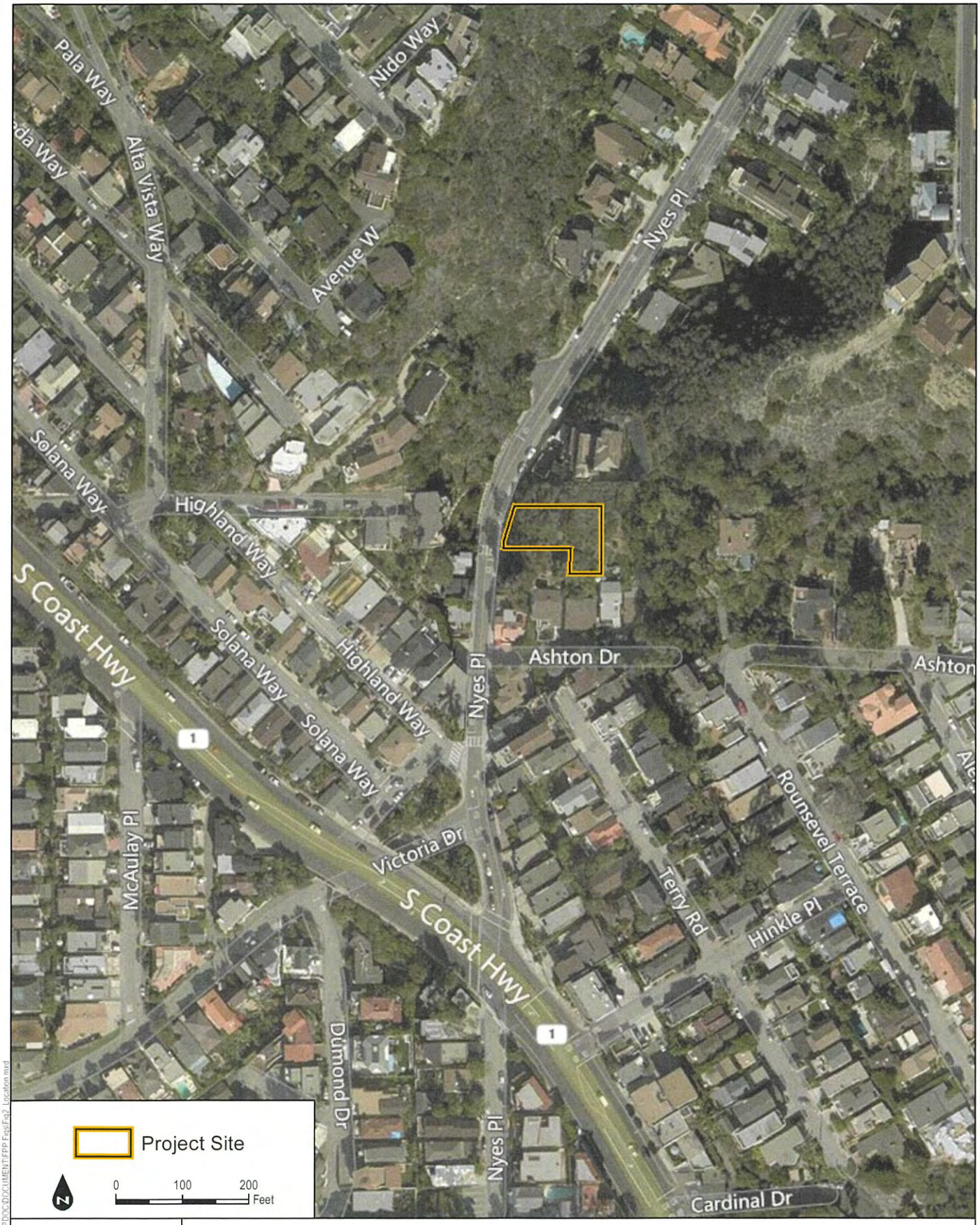
SOURCE: Bing Imagery, 2016; City of Laguna Beach, 2016.

FIGURE 2

Biological Resources Map

385 Nyes Place AM&M Report



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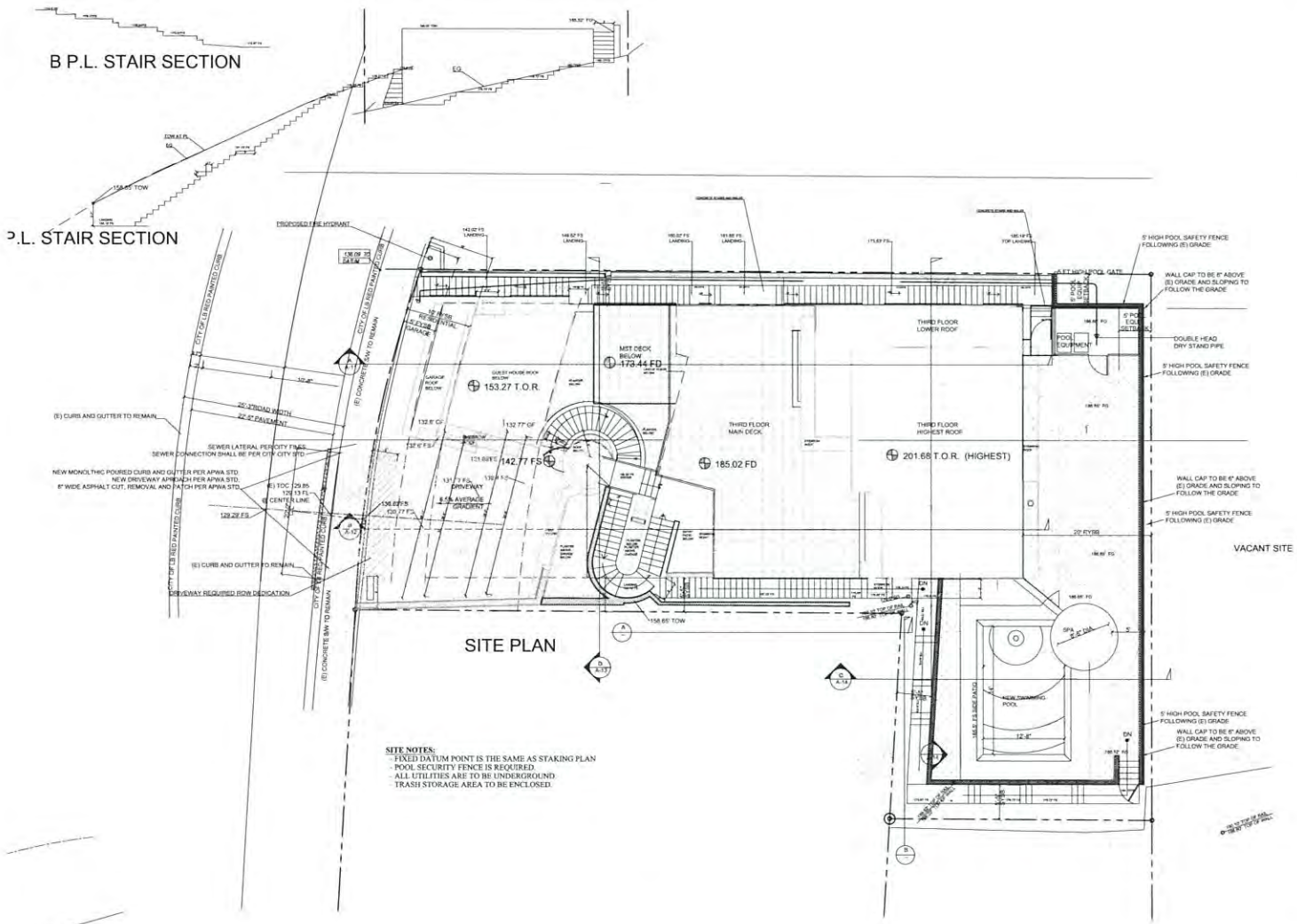
SOURCE: BING 2014

FIGURE 3
Location Map

385 Nyes Place AM&M Report


B P.L. STAIR SECTION
P.L. STAIR SECTION
SITE PLAN
VACANT SITE
153.27 T.O.R.
142.77 FS
185.02 FD
201.68 T.O.R. (HIGHEST)
MIST DECK BELOW 173.44 FD
THIRD FLOOR LOWER ROOF
THIRD FLOOR MAIN DECK
THIRD FLOOR HIGHEST ROOF
POOL EQUIPMENT
SPA
NEW SWIMMING POOL
5' HIGH POOL SAFETY FENCE FOLLOWING (E) GRADE
WALL CAP TO BE 6" ABOVE (E) GRADE AND SLOPING TO FOLLOW THE GRADE
DOUBLE HEAD DRY STAND PIPE
(E) CURB AND GUTTER TO REMAIN
SEWER LATERAL PER CITY FINES
NEW MONOLITHIC POURED CURB AND GUTTER PER APWA STD.
NEW DRIVEWAY APPROACH PER APWA STD.
6" WIDE ASPHALT CUT, REMOVAL AND PATCH PER APWA STD.
DRIVEWAY REQUIRED ROW DEDICATION
(E) CONCRETE SW TO REMAIN
CITY OF LB RED PAINTED CURB
PROPOSED FIRE HYDRANT
158.65' TOW
SITE NOTES:
- FIXED DATUM POINT IS THE SAME AS STAKING PLAN
- POOL SECURITY FENCE IS REQUIRED.
- ALL UTILITIES ARE TO BE UNDERGROUND.
- TRASH STORAGE AREA TO BE ENCLOSED.
LEGEND
(N) LIVING SPACE
(N) GARAGE / ELEVATOR SPACE
(N) EXTERIOR CONCRETE FLAT WORK
(N) INTERLOKING PAVERS
(N) FIRST FLOOR DECK
(N) PLANTED GROUND COVER
N
NORTH
OUTDOOR FIREPLACES, FIRE PITS, TORCHES, OUTDOOR BARBEQUES AND GRILLS (NON-FUEL MODIFICATION DESIGNATION): SHOW COMPLIANCE WITH THE FOLLOWING REQUIREMENTS AND NOTE ON THE PLANS:
A) MASONRY CHIMNEYS SHALL BE CONSTRUCTED ACCORDING TO THE 2013 CALIFORNIA BUILDING CODE. FACTORY BUILT CHIMNEYS SHALL BE INSTALLED IN ACCORDANCE WITH THE CALIFORNIA MECHANICAL CODE AND THE MANUFACTURES RECOMMENDATIONS. FACTORY BUILT FIREPLACE SHALL BE LISTED FOR USE.
B) SUCH DEVICE S, STRUCTURES OR EQUIPMENT SHALL NOT BE USED FOR THE DISPOSAL OF RUBBISH, TRASH OR COMBUSTIBLE MATERIALS.
C) SUCH DEVICES, STRUCTURES OR EQUIPMENT SHALL NOT BE LOCATED WITHIN 10' OF ANY COMBUSTIBLE STRUCTURE, COMBUSTIBLE MATERIAL OR VEGETATION.
D) ALL EXTERIOR FLAME PRODUCING DEVICES, STRUCTURES OR EQUIPMENT SHALL BE GAS BURNING ONLY.
E) ALL OUTDOOR BARBEQUES AND GRILLS SHALL BE INSTALLED AND OPERATED PER THE MANUFACTURES RECOMMENDATIONS.
SOLAR READY REQUIREMENTS FOR NEW CONSTRUCTION: ALL NEW BUILDINGS SHALL PROVIDE SOLAR-READY ROOF AREA TO FACILITATE THE INSTALLATION OF FUTURE SOLAR ENERGY EQUIPMENT.
A)SUCH SOLAR-READY ROOF AREA SHALL BE:
1. EITHER FLAT, OR SOUTH-FACING WITH A 33 PERCENT ROOF SLOPE (FOUR UNITS VERTICAL IN TWELVE UNITS HORIZONTAL) OR LESS;
2. UNSHADED;
3. FREE FROM OBSTRUCTIONS;
4. IN CONTIGUOUS AREAS OF NO LES S THAN 100 SQUARE FEET; AND
5. NOT OTHERWISE REQUIRED TO BE LEFT OPEN AND UNOBSTRUCTED IN ORDER TO ENSURE ADEQUATE FIRE OR LIFE-SAFETY PROTECTION, INCLUDING BUT NOT LIMITED TO REQUIRED CLEARANCES FOR FIREFIGHTING ACCESS.
B)MINIMUM SOLAR-READY ROOF SPACE REQUIRED:
i. SINGLE-FAMILY DWELLING: 250 SQUARE FEET, OR
ii. ALL OTHER BUILDINGS: 30 PERCENT OF THE TOTAL ROOF AREA.
SWIMMING POOLS AND SPAS: PLEASE NOTE ON THE PLANS THAT THE POOL WILL BE COVERED WHEN NOT IN USE AND THAT AN AUTOMATIC FILL DEVICE WILL NOT BE USED.
DUDEK
SOURCE: MARSHALL ININNS DESIGN GROUP, 2021
SCALE: 1/8" = 1'-0"
FIGURE 4
Project Site Plan
385 Nyes Place AM&M Report

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 8140-2135:0500

CATEGORY: 8140 -- EXTERIOR WALL SIDING AND SHEATHING FOR WILDLAND URBAN INTERFACE (W.U.I)

LISTEE: Thermory USA LLC1213 Wilmette Avenue, Suite 208, Wilmette, IL 60091
Contact: Mark Challinor (847) 256-8828
Email: mark@thermoryusa.com

DESIGN: Thermory Standard Ash Cladding. The product is a nominal 1 x 6 inch size tongue and grooved profile for horizontal and vertical installations. Refer to the manufacturer's installation instructions and product data sheets.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee name, Model number and SFM label.

APPROVAL: Listed as exterior wall siding and sheathing material for use in the Wildland Urban Interface areas. Refer to manufacturer's Installation Manual for details.

NOTE: Test Protocol SFM-12-7A-1

03-12-19 gt

Date Issued: **July 01, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,*** *M.E., F.P.E.*
Fire Engineering Division

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 8110-2135:0100

CATEGORY: 8110 -- DECKING FOR WILDLAND URBAN INTERFACE (W.U.I)

LISTEE: Thermory USA LLC1213 Wilmette Avenue, Suite 208, Wilmette, IL 60091
Contact: Mark Challinor (847) 256-8828
Email: mark@thermoryusa.com

DESIGN: Thermally-Modified Ash Deck Boards with dimensions of 3/4' x 5-7/8" or 1.02" x 5.7" with a maximum of 3/16" edge-to-edge spacing.
Refer to the manufacturer's installation instructions and product data sheets.

RATING: Class B Flame Spread

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee name, Model number, rating and SFM label.

APPROVAL: Listed as wood decking materials for use in the Wildland Urban Interface areas. Refer to manufacturer's Installation Manual for details.

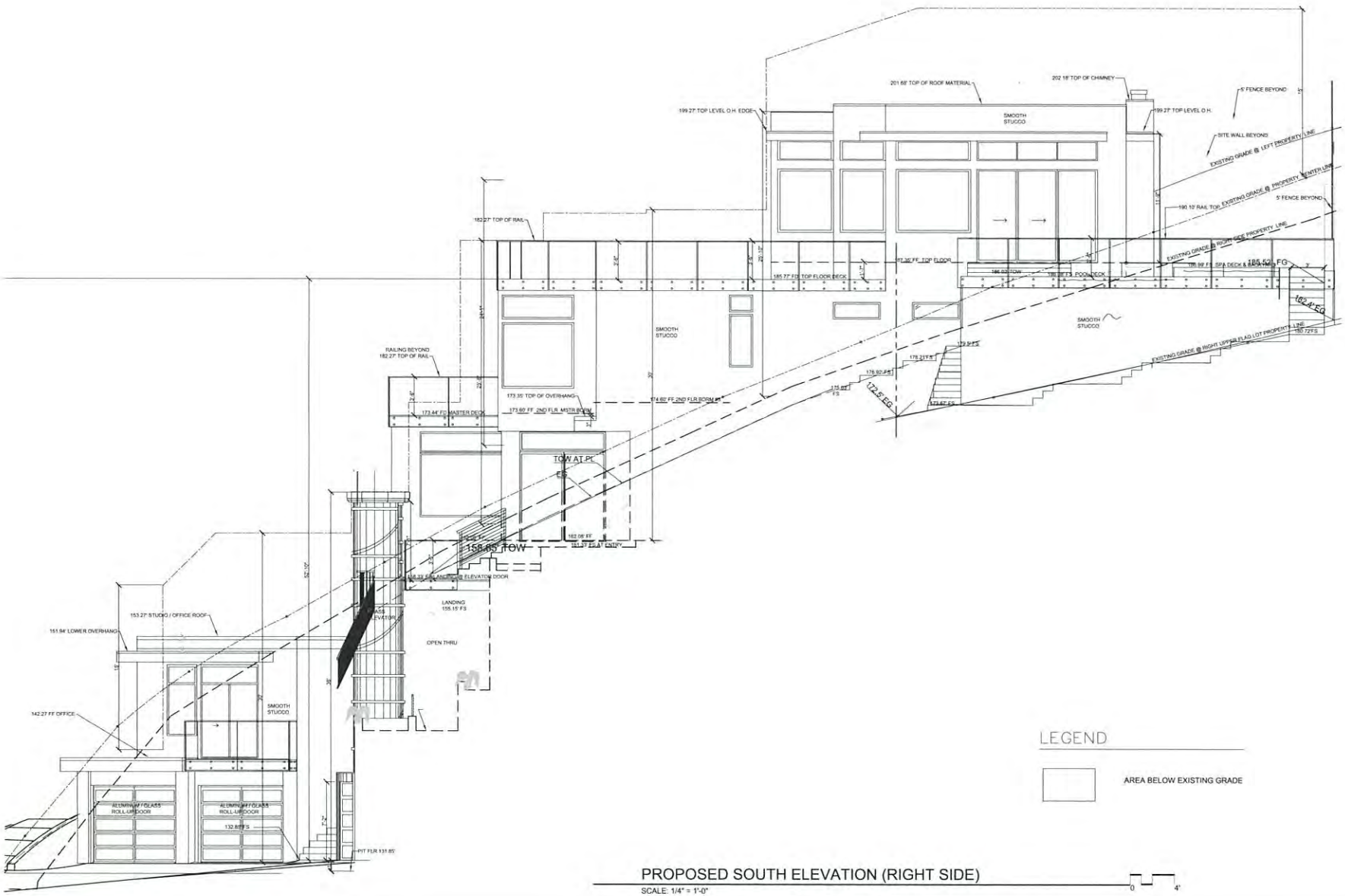
NOTE: Test Protocol SFM-12-7A-4A

09-25-13 gt

Date Issued: **July 01, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,*** *M.E., F.P.E.*

Fire Engineering Division



PROPOSED SOUTH ELEVATION (RIGHT SIDE)

SCALE: 1/4" = 1'-0"

0 4'

SOURCE: MARSHALL ININNS DESIGN GROUP, 2021

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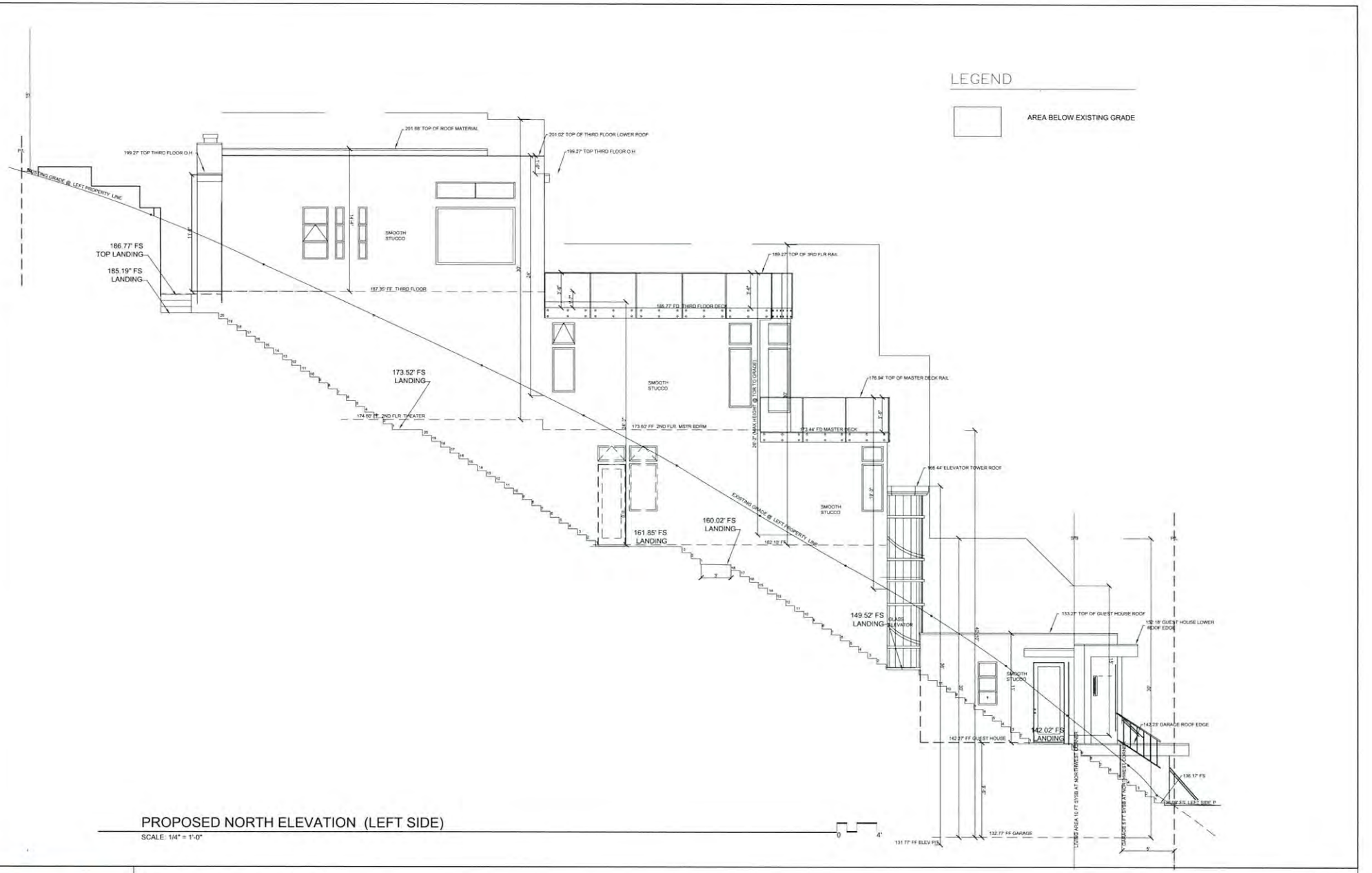
FIGURE 7
Proposed South Elevations
385 Nyes Place AM&M Report



PROPOSED NORTH ELEVATION (LEFT SIDE)

SCALE: 1/4" = 1'-0"

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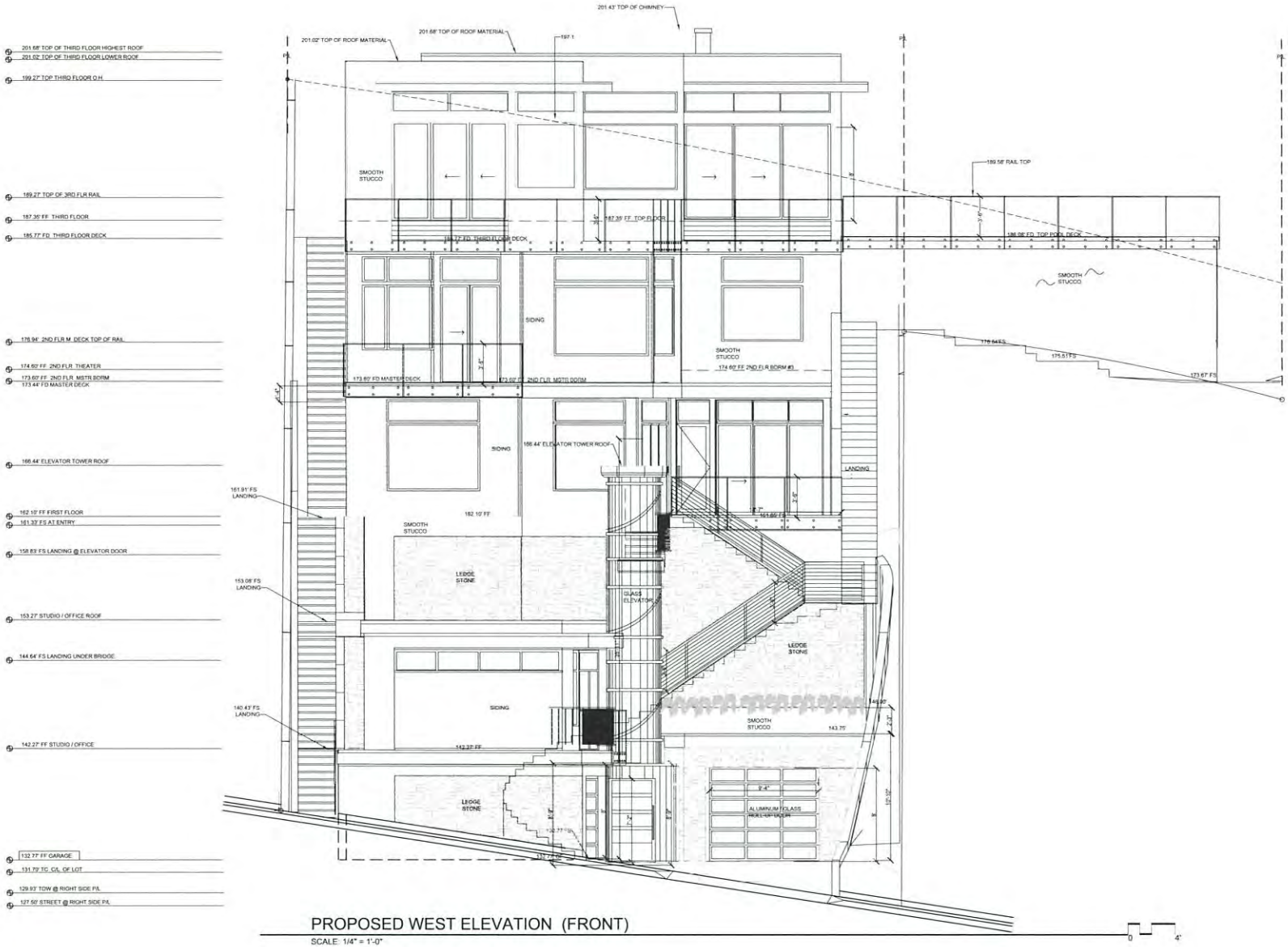
SOURCE: MARSHALL ININNS DESIGN GROUP, 2021

FIGURE 8
Proposed North Elevations
385 Nyes Place AM&M Report



PROPOSED WEST ELEVATION (FRONT)

SCALE: 1/4" = 1'-0"

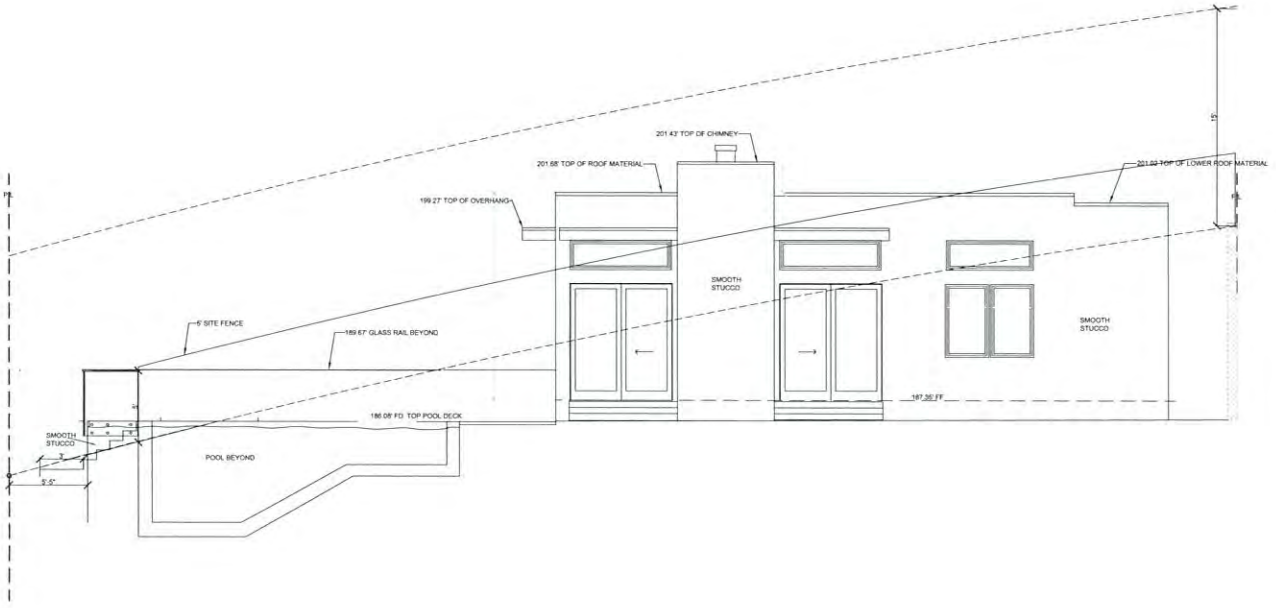
SOURCE: MARSHALL ININNS DESIGN GROUP, 2021

DUDEK

FIGURE 9

Proposed West Elevations

385 Nyes Place AM&M Report



PROPOSED EAST ELEVATION (REAR)

SCALE: 1/4" = 1'-0"

0 4'

DUDEK

SOURCE: MARSHALL ININNS DESIGN GROUP, 2021

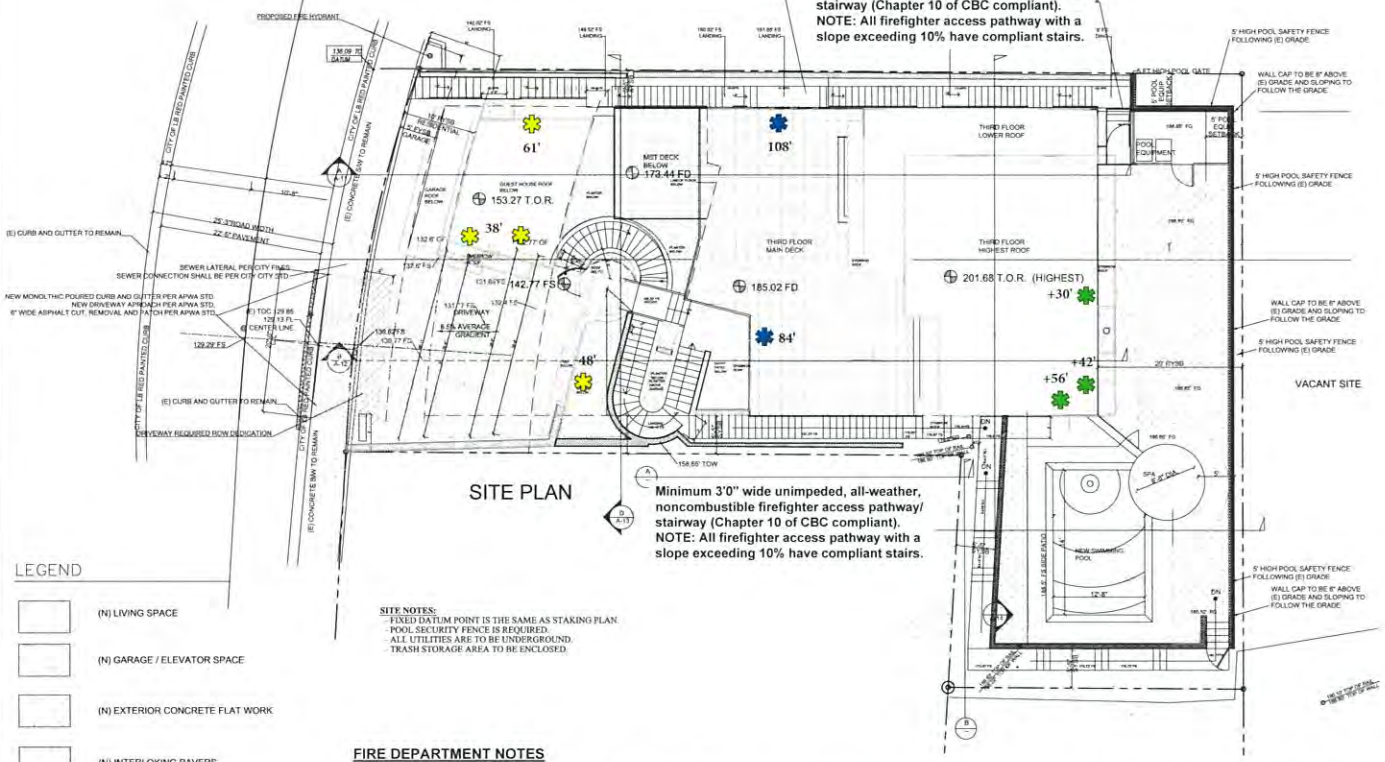
FIGURE 10

Proposed East Elevations

385 Nyes Place AM&M Report

CLOSEST EXISTING FIRE HYDRANT IS LOCATED ON THE NORTH SIDE OF NYES PLACE, APPROXIMATELY 362 FEET NORTH OF THE NORTHWEST CORNER OF THE PROPERTY.

PROPOSED NEW FIRE HYDRANT TO BE INSTALLED TO LBCWD STANDARDS.



SITE NOTES:
- FIXED DATUM POINT IS THE SAME AS STAKING PLAN.
- POOL SECURITY FENCE IS REQUIRED.
- ALL UTILITIES ARE TO BE UNDERGROUND.
- TRASH STORAGE AREA TO BE ENCLOSED.

LEGEND

- (N) LIVING SPACE
- (N) GARAGE / ELEVATOR SPACE
- (N) EXTERIOR CONCRETE FLAT WORK
- (N) INTERLOKING PAVERS
- (N) FIRST FLOOR DECK
- (N) PLANTED GROUND COVER
- LOWER LEVEL HOUSE ACCESS POINT
- MID LEVEL HOUSE ACCESS POINT
- UPPER LEVEL HOUSE ACCESS POINT
- PROPOSED NEW FIRE HYDRANT LOCATION
- ENGINE HOSE PULL WITHIN 150' FDC
- HOSE PULL BEYOND 150'
- EXTERIOR SPRINKLER HEAD LOCATIONS

FIRE DEPARTMENT NOTES

A. SEE COPY OF APPROVED AM&M REPORT FOR PROJECT SPECIFIC ALTERNATE METHODS AND MATERIALS COMPLIANCE.

B. A SEPARATE (DEFERRED) SUBMITTAL FOR FIRE SPRINKLERS IS REQUIRED. SYSTEM DESIGN MUST COMPLY WITH THE 2019 CFC AND 2019 NFPA 13D STANDARD. A FOUR HEAD CALCULATION FOR THE SYSTEM AND COVERAGE IN ALL SMALL ROOMS (CLOSETS, BATHROOMS, ETC.) REGARDLESS OF SIZE. PLANS MUST BE DESIGNED AND INSTALLED BY A QUALIFIED FIRE FIRE PROTECTION CONTRACTOR. PLANS SHALL BE SUBMITTED TO AND APPROVED BY THE LBFD WITH PERMIT ISSUED AND APPROPRIATE INSPECTIONS CONDUCTED.

C. EXTERIOR WALL MOUNTED FIRE SPRINKLER HEADS WILL BE INSTALLED ON ALL LEVELS OF THE NORTH AND EAST SIDES OF THE RESIDENCE THAT ARE EXPOSED TO THE WUI. TO AUGMENT THE ENHANCED INTERIOR FIRE SPRINKLER SYSTEM.

D. FIRE ALARM SYSTEM IS REQUIRED AND MUST BE DESIGNED AND INSTALLED BY A QUALIFIED ELECTRICAL CONTRACTOR. PLANS MUST INCLUDE MONITORING OF THE FIRE SPRINKLER SYSTEM (TAMPER AND FLOW SWITCHES) AND MONITORING OF THE SMOKE DETECTORS IN THE DWELLING. PLANS MUST BE SUBMITTED TO AND APPROVED BY THE LBFD WITH PERMIT ISSUED AND FINAL INSPECTION CONDUCTED.

E. ALL EXTERIOR FIREPLACES AND FIRE PITS MUST BE GAS FIRED ONLY AND MUST BE 10 FEET FROM ALL COMBUSTIBLE MATERIALS. NO SOLID FUEL IS ALLOWED PER THE LBFD MUNICIPAL CODE. FIREPLACES AND FIRE PITS MUST BE A MINIMUM OF 20 FEET FROM COMBUSTIBLE VEGEATION.

F. MAINTAIN JOBSITE SAFETY DURING CONSTRUCTION AS PER CHAPTER 33 OF THE 2019 CALIFORNIA FIRE CODE.

G. COMPLETE FIREFIGHTER ACCESS AROUND THE BUILDING IS REQUIRED, AND MUST BE IN COMPLIANCE WITH DRB APPROVED PLANS. SEE THIS SHEET FOR DETAILS. THIS IS SUBJECT TO FINAL FIRE INSPECTION AND REQUIRES APPROVAL PRIOR TO OCCUPANCY.

H. ADDRESS NUMBERS MUST BE PLACED ON THE EXTERIOR FACING THE STREET ADDRESSED TO. MINIMUM SIZE OF NUMBERS IS 4", AND THEY MUST CONTRAST WITH BACKGROUND.

I. FOR FIRE DEPARMENT INSPECTIONS, CALL 949-497-0352 AT LEAST 3 DAYS IN ADVANCE TO SCHEDULE.

J. A NEW FIRE HYDRANT IS REQUIRED, AND MUST BE INSTALLED PRIOR TO FINAL FIRE INSPECTION. FIRE HYDRANT TO BE INSTALLED PER LAGUNA BEACH COUNTY WATER DISTRICT STANDARDS. SEE THIS SHEET FOR LOCATION DETAILS.

K. THE FOLLOWING NONFIRE PROTECTION REQUIREMENTS ARE PART OF THE AM&MPROPOSAL FOR THIS PROJECT.
- ALL GLAZING IN DOORS AND WINDOWS MUST BE DOUBLE PANE WITH BOTH PANES TEMPERED.
- ALL 2ND AND 3RD LEVEL DECKS TO HAVE TILE ON CONCRETE SETTING BED.
- ALL PARTS OF THE PROPERTY ARE ZONE A, WITH VEGETATION TO BE IN COMPLIANCE WITH THE LBFD FUEL MODIFICATION STANDARD REQUIREMENTS.

ADDITIONAL FIRE NOTES

L. FIRE FLOW REQUIREMENTS SHALL COMPLY WITH 2019 CFC App. B.

M. ALL STAIRS DESIGNATED AS PART OF THE FIRE ACCESS ARE OF NON-COMBUSTIBLE CONSTRUCTION, AND IN COMPLIANCE WITH CBC CHAP. 10.

N. ALL FIREFIGHTER ACCESS PATH AREAS HAVE SLOPES LESS THAN 10%, EXCEPT FOR WHERE STAIRS ARE LOCATED.

O. ALL PORTIONS OF THE FIREFIGHTER ACCESS PATHS SHALL HAVE ALL-WEATHER SURFACES (CONCRETE, ASPHALT, PAVERS, STONE, OR D.G.).

P. THE HYDRANT REPORT IS REQUIRED PRIOR TO DRB / CDP PLAN APPROVALS. SEE INCLUDED FIRE HYDRANT REPORT.

Laguna Beach Fire Department
505 Forest Ave., Laguna Beach, CA 92651
(949) 497-0700

HYDRANT FLOW REPORT AND FIRE FLOW INFORMATION

Please complete Section A of this form (must be saved as an Adobe "pdf" document) and e-mail it to: **James Brown, LBFD Fire Marshal** — jfbrown@lagunabeachcity.net.

The LBFD will complete Section B and send to the Water Purveyor for completion of Section C. Once all Sections are complete, the LBFD will send a copy back to the requesting party via e-mail.

NOTE: Water Purveyors require a fee to be paid prior to completing Section C. Please contact them for payment information.

SECTION A: TO BE COMPLETED BY APPLICANT

Date of Request: 8.2.2021 Construction Type: VB Square Footage*: 4394 SF

Contact Name: MARSHALL ININNS ARCHITECT Project Address: 385 NYES PLACE

Data Requested for: ___ Fire Protection System Design** XX Fire Hydrant Flow Report (Check which apply)

*Square Footage must include all attached garages, carports and solid roof patio covers.

**Include estimated water (Fire Flow) needed for System Design: _____GPM

SECTION B: TO BE COMPLETED BY LAGUNA BEACH FIRE DEPARTMENT

As required by Appendix B of the 2019 CFC, the minimum Hydrant Flow is: 875 GPM for 1 hours at a minimum residual pressure of 20 PSI. Completed by: James Brown, Fire Marshal Date: 8/3/2021
Name and Title of LBFD Representative

Water Purveyor: ☒ BCWD ☐ SCWD

SECTION C: TO BE COMPLETED BY WATER PURVEYOR

The test shall be provided from the closest junction node on the same pressure system as the proposed project. **NOTE:** All water information is provided using the water purveyors' current hydraulic water model simulated under maximum day demand conditions. The pressure provided reflects at street level elevations unless noted otherwise.

Fire Flow Requested in Section A: _____GPM Static Press: _____PSI Residual Press.: _____PSI

Hydrant Flow Required by Section B: 2100 GPM at 20 PSI residual pressure

Junction Node location and elevation: 385 NYES PLACE/ELEV.136ft/NODE W-FIT-17-150

Elevation of water meter for project: 135ft. Center lot no meter.

Completed by: Eric Callahan Engineering Tech Date: 08-10-21
Name and Title of Water Purveyor Representative

SOURCE: MARSHALL ININNS DESIGN GROUP, 2021

DUDEK

FIGURE 11
Fire Department Site Access Plan
385 Nyes Place AM&M Report

DUDEK

SOURCE: Google Earth

FIGURE 12

Topo Relief Map

385 Nyes Place AM&M Report

Path: Z:\Projects\970301\MAPDOC\DOCUMENT\FPP Figs\Fig7_Topo Relief.mxd

Attachment 1

Photograph Log

385 Nyes Place
Photograph Log

Photograph 1. Street view of front portion of the project site (right-hand side of speed limit sign). A narrow city "paper" street, Highland Road, exists between the house under construction and project site. Photograph taken facing east.

Photograph 2. Street view of southwestern corner of the front portion of the project site. Photograph taken facing southeast.

Photograph 3. Photograph looking north standing in the eastern portion of the site, at the existing natural vegetation throughout the project site.

Photograph 4. Natural vegetative covered hillside northwest of the project site. The majority of the adjoining parcels have fuel modification zones below the structures.

Photograph 5. Photograph of existing single-family residential homes southwest of the project site.

Photograph 6. Photograph taken looking south down Nyes Place towards the project site's proposed driveway entrance.

Photograph 7. Photograph looking north/northeast up Nyes Place and the existing natural vegetation and single-family homes that line both sides of the street.

Photograph 8. View looking northeast along Nyes place. Note the fire hydrant in the photograph, which is the closest hydrant to the proposed house and approximately 362 feet to the north of subject parcel and in front of 426 Nyes Place.

Attachment 2

LBFD Fire Hydrant Report

Laguna Beach Fire Department

505 Forest Ave., Laguna Beach, CA 92651
(949) 497-0700

HYDRANT FLOW REPORT AND FIRE FLOW INFORMATION

Please complete Section A of this form (*must be saved as an Adobe "pdf" document*) and e-mail it to: **James Brown, LBFD Fire Marshal** --- jdbrown@lagunabeachcity.net.

The LBFD will complete Section B and send to the Water Purveyor for completion of Section C. Once all Sections are complete, the LBFD will send a copy back to the requesting party via e-mail.

NOTE: Water Purveyors require a fee to be paid prior to completing Section C. Please contact them for payment information.

SECTION A: TO BE COMPLETED BY APPLICANT

Date of Request: 8.2.2021 Construction Type: VB Square Footage*: 4394 SF

Contact Name: MARSHALL ININNS ARCHITECT Project Address: 385 NYES PLACE

Data Requested for: ____ Fire Protection System Design** XX Fire Hydrant Flow Report (Check which apply)

*Square Footage must include all attached garages, carports and solid roof patio covers.

**Include estimated water (Fire Flow) needed for System Design: _____GPM

SECTION B: TO BE COMPLETED BY LAGUNA BEACH FIRE DEPARTMENT

As required by Appendix B of the 2019 CFC, the minimum Hydrant Flow is: 875 GPM for 1 hours at a minimum residual pressure of 20 PSI. Completed by: James Brown, Fire Marshal Date: 8/3/2021

Name and Title of LBFD Representative

Water Purveyor ☒LBCWD ☐SCWD

SECTION C: TO BE COMPLETED BY WATER PURVEYOR

The test shall be provided from the closest junction node on the same pressure system as the proposed project.
NOTE: All water information is provided using the water purveyors' current hydraulic water model simulated under maximum day demand conditions. The pressure provided reflects at street level elevations unless noted otherwise.

Fire Flow Requested in Section A: _____GPM Static Press.: _____ PSI Residual Press.: _____ PSI

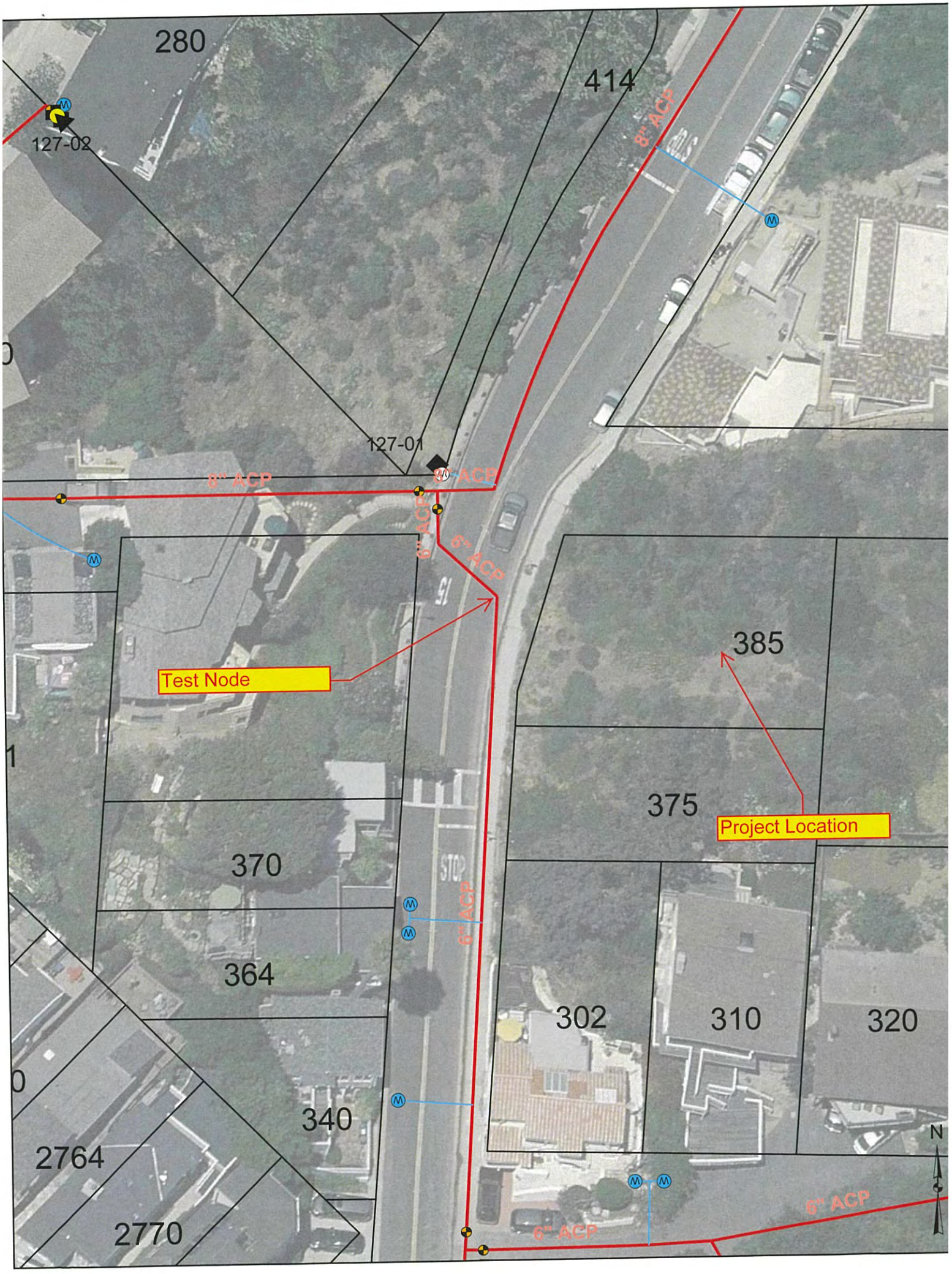
Hydrant Flow Required by Section B: 2100 GPM at 20 PSI residual pressure

Junction Node location and elevation: 385 NYES PLACE/ELEV.136ft/NODE W-FIT-17-150

Elevation of water meter for project: 135ft. Center lot no meter.

Completed by: Eric Callahan Digitally signed by Eric Callahan DN: cn=Eric Callahan, o=Laguna Beach County Water District, ou, email=ecallahan@lbcwd.org, c=US Date: 2021.08.10 14:34:02 -07'00' Engenieering Tech Date: 08-10-21

Name and Title of Water Purveyor Representative


280
414
127-02
127-01
8" ACP
8" ACP
8" ACP
6" ACP
6" ACP
6" ACP
6" ACP
6" ACP
Test Node
Project Location
385
375
370
364
340
302
310
320
2764
2770
STOP
15
N

Attachment 3

Fire Behavior Modeling Summary

ATTACHMENT 3
Fire Behavior Modeling Analysis
385 Nyes Place, Laguna Beach AM&M Project

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 (feet), spread rates (feet/minute), fireline intensities (BTU/feet/second), and spotting distance (miles), the BehavePlus 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:

- 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 385 Nyes Place (Project) Alternative Methods and Materials (AM&M) report in order to evaluate potential fire behavior for the vacant 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. Two fire scenarios were evaluated, including one summer (onshore winds, 50th percentile) weather conditions southwest of the Project site, and one more extreme fall (Offshore winds, 97th percentile) weather conditions north of the Project site. 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 FMZs and within the FMZs that would have the potential to affect the project's structure from a radiant and convective heat perspective as well as from direct flame impingement but based on the site's terrain and the building

construction, the vertical separation between vegetative fuels and the site's structure is significan. 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 Maritime Chaparral-Sagebrush along the north and northeast sides of the project site. 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 fuel model observed in the vicinity of the site that were subsequently used in the analysis for this project. Modeled areas include the intermix of coast sage scrub and mixed chaparral fuels (Fuel Model Sh5) found throughout the adjacent areas surrounding the Project site. A total of two fire modeling scenarios were completed for the Project area. These two sites were selected based on the strong likelihood of fire approaching from these directions during a Santa Ana wind-driven fire event (fire scenario 1) and an on-shore weather pattern (fire scenario 2). Fuel modification includes establishment of an all irrigated reduced Zone A interior landscape.

Table 1. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
FM4	Mixed Chaparral	Represented throughout the adjacent areas surrounding the Project	>6.0 ft.
Sh5	High Load Dry Climate Shrub	Represented throughout the adjacent areas surrounding the Project.	>4.0 ft.

Topography

Slope is a measure of angle in degrees from horizontal and can be presented in units of degrees or percent. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fire burning uphill spreads faster than those burning on flat terrain or downhill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. The onsite natural slope value was approximately 47%, measured around the perimeter of the project site from U.S. Geological Survey (USGS) topographic maps. Slope gradients for landscape areas are assumed to be flat (3%) or 50% (2:1 Manufactured slopes), as presented on the project's site plan.

Weather Analysis

Historical weather data for the Escondido region was utilized in determining appropriate fire behavior modeling inputs for the Project area. 50th and 97th percentile moisture values were

derived from Remote Automated Weather Station (RAWS) and utilized in the fire behavior modeling efforts conducted in support of this report. Weather data sets from the Aliso Laguna Station RAWS (ID number 045509) were utilized in the fire modeling runs.

RAWS fuel moisture and wind speed data were processed utilizing the Fire Family Plus software package to determine atypical (97th percentile) and typical (50th percentile) weather conditions. Data from the RAWS was evaluated from August 1 through November 30 for each year between 2015 and 2019 (extent of available data record) for 97th percentile weather conditions and from June 1 through September 30 for each year between 2015 and 2019 for 50th percentile weather conditions.

Following analysis in Fire Family Plus, fuel moisture information was incorporated into the Initial Fuel Moisture file used as an input in BehavePlus. Wind speed data resulting from the Fire Family Plus analysis was also determined. Initial wind direction and wind speed values for the five BehavePlus runs were manually entered during the data input phase. The input wind speed and direction is roughly an average surface wind at 20 feet above the vegetation over the analysis area. Table 2 summarizes the wind and weather input variables used in the Fire BehavePlus modeling efforts.

Table 2. BehavePlus Fire Modeling Inputs

Variable	Summer Weather (Onshore Winds)	Peak Weather (Offshore Winds)
Fuel Models	Sh5	Sh5
1h Moisture	7%	1%
10h Moisture	8%	3%
100h Moisture	14%	7%
Live Herbaceous Moisture	60%	30%
Live Woody Moisture	90%	60%
20-foot Wind Speed	12 mph (sustained winds)	16 mph (24 mph maximum sustained winds); 50 mph (gusty winds)
Wind Directions from North	225 degrees	45 degrees
Wind Adjustment Factor (BehavePlus)	0.4	0.4
Slope (uphill)	47%	47%

Note: [1] mph = miles per hour

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. Two focused analyses were completed, each assuming worst-case fire weather conditions for a fire approaching the project site from the north and southwest. One fire behavior variable was selected as an output 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. 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 3.

Table 3. 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: Peak, Fall off-shore wind, 47% slope, 24 mph maximum sustained winds with 50 mph wind gusts				
Fuel Model Sh5	31.6 (45.5)[3]	10,352 (22,853)	3.2 (7.1)	1.2 (2.5)
Scenario 2: Summer on-shore wind, 47% slope, 14 mph sustained winds				
Fuel Model Sh5	15.4	2,167	0.9	0.5

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

As presented in Table 3, wildfire behavior in non-treated Maritime Chaparral-Sagebrush fuel beds, modeled as Sh5 fuel model being fanned by 14 mph sustained, on-shore winds (fire scenario 2) would result in a fire spreading at 0.9 mph with 15.4 feet high flame lengths.

Worst-case fire behavior is expected in Maritime Chaparral-Sagebrush fuel beds along the north and northeast sides of the project site under Peak weather conditions (represented by 97th percentile, Scenario 1). The fire is anticipated to be a wind-driven fire downhill within the drainages running from the ridgetop above the project site. Under such conditions, expected surface flame lengths reach 45.5 feet with peak wind speeds of 50+ mph. Under this scenario, fireline intensities reach 22,853 BTU/feet/second with fast spread rates of 7.1 mph. Fires burning from the south or west of the project site and pushed by on-shore winds (Summer weather) exhibit fire behavior, with flame lengths reaching 15.4 feet, fireline intensities reaching 2,167 BTU/feet/second and a slower spread rate reaching 0.9 mph in chaparral-ornamental landscape fuel beds.

It should be noted that the results presented in Table 3 depict values based on inputs to the BehavePlus software. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis, but models provide a worst-case wildfire condition as part of a conservative approach. Further, this modeling analysis assumes a correlation between the project site vegetation and fuel model characteristics. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

The information in Table 4 pertains to interpretation of flame length and fireline intensity as it relates to fire suppression efforts.

Table 4. Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
Under 4 feet	Under 100 BTU/ft/s	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 to 8 feet	100-500 BTU/ft/s	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 to 11 feet	500-1000 BTU/ft/s	Fires may present serious control problems -- torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11 feet	Over 1000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

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