

HARMONY GROVE VILLAGE SOUTH

WILDFIRE RISK ANALYSIS

Harmony Grove Village South development area



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FIRE • EMERGENCY MANAGEMENT • ENVIRONMENTAL
OCCUPATIONAL SAFETY & HEALTH SERVICES

April, 2016

HARMONY GROVE VILLAGE SOUTH- WILDFIRE RISK ANALYSIS

The Site

The approximately 111-acre project is located in the unincorporated portion of San Diego County in the community of Harmony Grove, approximately 2.5 miles west of Interstate 15 (I-15) and approximately 2.6 miles south of State Route 78 (SR-78). The project site is bounded by Escondido Creek to the north, Country Club Drive to the west, and the Del Dios Highland Preserve to the south. The community of Elfin Forest lies several miles to the West. Existing rural residential developments are located to the west and to the east, consisting of 60 total units. The Harmony Grove Village, a 470 acre residential development, is currently under construction to the north. The Harmony Grove Spiritualist Camp is located along Escondido Creek, 1/2 mile west.

The project includes a mix of up to 457 residential units and approximately 1,400 residents, limited commercial, private recreational areas, manufactured slopes, landscaped areas, natural-appearing drainages, public trails, and biological open space that does not intermingle within the developed areas. It is our understanding that the applicant has proposed to comply with all County Building and Fire code requirements with the exception of provision of two routes of access/egress.

(Source: Harmony Grove Village South Fire Protection Plan-Draft, developed on behalf of the project proponent by Dudek of Encinitas, CA. March, 2015)

The Project Team and Analysis Approach

Rohde and Associates have assigned 5 staff members with over 180 years of collective wildfire experience in Southern California, including highly decorated and experienced wildfire commanders and a nationally recognized fire behavior analyst. This team conducted the analysis in two parts: development of a wildland fire assessment and tactical plan for the greater Harmony Grove community, using the County-wide standard assessment process and planning tools. The consultant has completed 70 similar plans throughout San Diego County on behalf of the San Diego County Fire Chiefs Association. Second, a site-specific analysis of the proposed Harmony Grove Village South project to answer specific written questions posed by the County of San Diego related to application of Building/Fire Code and requested variance to existing regulation. The team analyzed site data including:

- a. Harmony Grove Village South Fire Protection Plan-Draft, developed on behalf of the project proponent by Dudek of Encinitas, CA. March, 2015.
- b. County of San Diego High/Very High Fire Severity Zone data.
- c. San Diego County fuels and topographic mapping.
- d. State of California Forest Resource and Protection Program (FRAP) data.
- e. Fire history map data for the Harmony Grove region.

- f. Potential Fire behavior data produced by BehavePlus, FlamMap, and LANDFIRE applications.
- g. Wildland-Urban Interface Fire Emergency Response Plan (Draft), San Diego County Fire Chiefs Association, April 2016.

Fire Behavior Modeling Differences

The “BehavePlus” fire behavior model (1998/ updated 2002), was solely referenced by Dudek in the Harmony Grove Village South Fire Protection Plan-Draft in the development of assumptions for fire behavior for the proposed development site. This system was also considered by Rohde & Associates; however, additional analysis was performed using “LANDFIRE” and “FlamMap” (2006). The use of these additional systems have yielded several important contrasts in predicted fire behavior between these reports. The following information identifies factors influencing these differences.

BehavePlus, as used by Dudek, identifies fuel types by an older “13 type” fuels modeling system (1982), rather than by the more contemporary and detailed National “40 type” system (2004). This report uses the “40 type” system in its analysis as computed by LANDFIRE/FlamMap to analyze potential fire behavior. Wind factors calculated by systems used in this report also utilize a 20 year average of documented local weather conditions rather than the single wind input of the BehavePlus method.

LANDFIRE/FlamMap is a landscape/geospatial based system, in contrast to the simple “point source” model in BehavePlus. Fire behavior prediction for the plan area using BehavePlus was calculated only for a limited 4 geographic origins that assume fire spread along linear paths. In contrast, the analysis used in this report forecasts large fire behavior as it moves across landscapes, allowing for natural variability in its calculations, and includes advanced technical components such as fuel canopy density, height, and cover, slope, elevation, fuel condition, and wind-stream dynamics. These system factors, along with the multi-year weather data averaging, assists in overcoming known wind, crown fire and spread calculation weaknesses in the BehavePlus model, and improves fire behavior prediction accuracy.

Physical site inspection:

Three site inspections were performed in March and April 2016, including a group inspection on April 13, by consultant subject-matter-experts and senior representatives from Cal Fire- San Diego Unit, Rancho Santa Fe Fire Protection District, San Diego County Sheriff, and San Diego Gas and Electric Fire Coordinators for purposes of developing the Wildland-Urban Interface Fire Plan and assessing specific criteria for the proposed development site. This group’s collective input is cited in this report.

SITE ANALYSIS

The following specific questions were posed by the County of San Diego (in bold). Consultant response follows:

1. Describe the wildland fuels adjacent to the proposed site.

Site fuels assessment was conducted using contemporary data including San Diego County fire severity classification, fuel type, fire history, and related maps, in addition to physical site inspection. This wildland fuels assessment considered fuel beds that would contribute to overall fire intensity and severity on and adjacent to the proposed project site.

Evidence of the Cocos wildfire (2014) was prevalent both on a portion and adjacent to the proposed development site, including burn scars on legacy fuels, and the remains of structures (foundations and chimneys) both on the site (1 structure) and in the adjacent Harmony Grove Spiritual Camp (24 structures).

Looking south along Country Club Dr. into the area of proposed development



The primary fuel characteristics and fire behavior potential of the various fuel types in the area include:

Fuel Type SH7- Arid, very high load, dry climate shrub

Found on surrounding hillsides, heavy, continuous, old-age class mixed chaparral and coastal sage scrub averaging 12 feet in height, likely last burned in Harmony Grove fire of 1996, or an unnamed fire of 1943. Due to age and persistent drought, this fuel bed has a high dead biomass component. This area presents fire behavior potential for very high flame lengths (40-60+ feet), high thermal energy output, high rates of spread, and high to very high fire branding potential. The proposed development will abut this fuel bed. Fuel loading was estimated in excess of 40 tons/acre. All upslope areas within the proposed development site were found to replicate this condition.

Fuel Type GR2- Arid Grass-shrub mix:

Found on the valley floor in areas without recent grazing, consisting of grass and low sage scrub mix. This area presents fire behavior potential for moderate flame lengths (4-8 feet), high rates of spread, and low-moderate fire branding potential. Most of the lower elevation sites within the proposed development area exhibited this fuel type. Fuel loading was estimated to be 2-5 tons per acre with a 30% sage/70% grass mix. Some of the grass areas degraded to Fuel Type GR1 (Arid short grass, 1-2 feet), depending on the recency of wildfire, grazing, and other disturbance. Most of this fuel type coverage is slated for conversion to developed use.

Found along the north edge of the property, Escondido Creek is a riparian area that is characterized by riparian vegetation, including significant presence of non-native/invasives, including tamarisk eucalyptus, and castor bean, and mixed native willows. This area presents fire behavior potential for high rates of spread, high-very high flame lengths (30-40 feet), and moderate to high fire branding potential. Other areas of Escondido Creek to the project's west include Coastal Live Oak woodlands, intermixed with grass, chaparral and sage scrub, This area includes the creek crossing of Country Club Drive north of the development *site*.

2. Describe the fire history for the proposed site.

Fire history for the proposed development site was determined through review of historical fire data, subject-matter expert testimony, and site inspection.

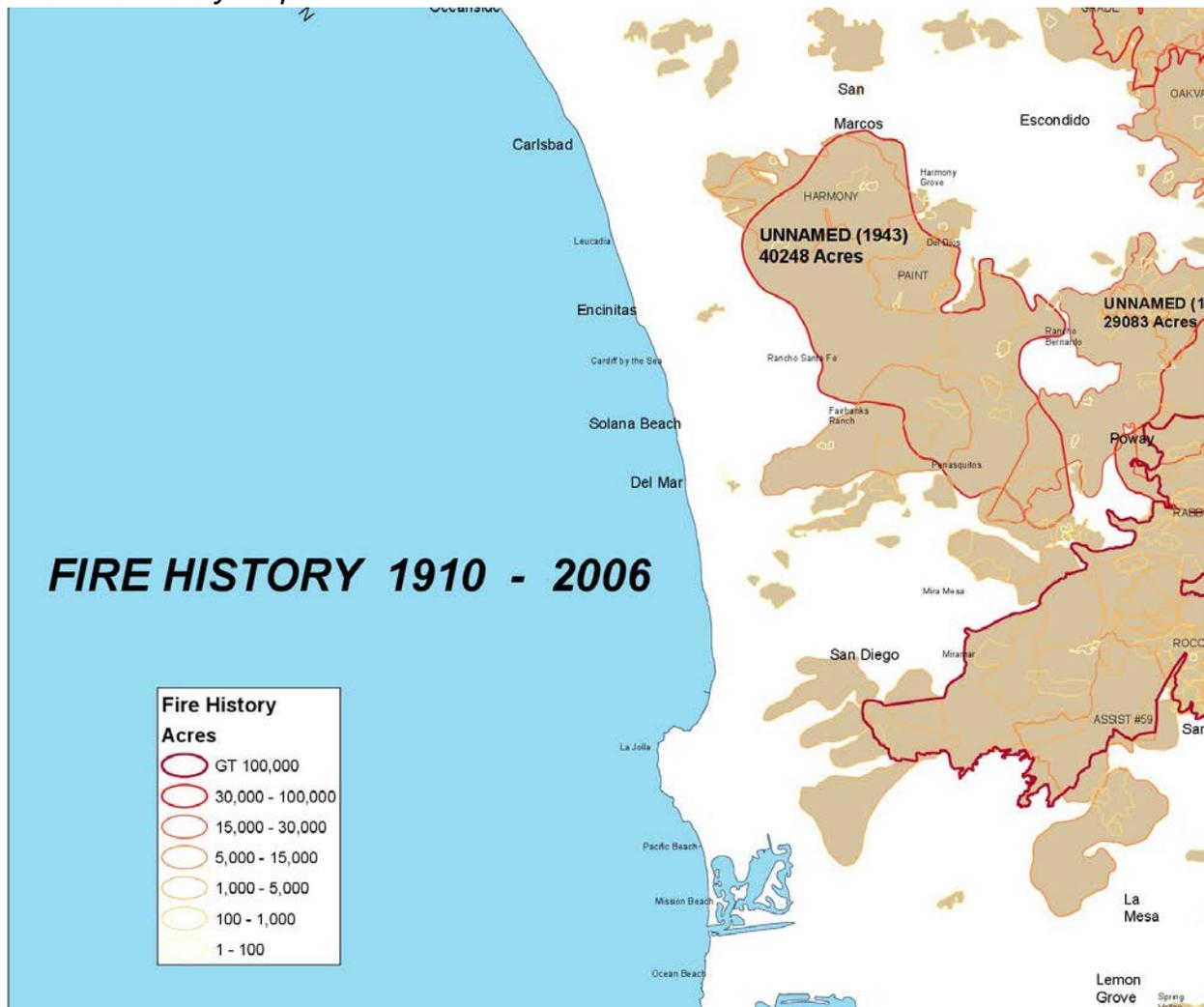
Remains of wildfire burned structure near proposed development entrance



A significant portion of the proposed development site was burned in the 2014 Cocos wildfire, which consumed 1,995 acres and burned 36 area homes. Evidence on the site indicates a legacy residential property was lost near the proposed entry to the

development. This site is currently represented by a fenced foundation and remaining chimney. An adjacent property also shows evidence of fire damage from the Cocos wildfire. The Harmony Grove Spiritualist Camp, 1/2 mile from the proposed development site, lost approximately 24 structures to the Cocos wildfire. The character of this camp was described as Bohemian and rustic, with little fuel modification, absent of protective clearance or construction, with little to no defensible space, and heavy fuels accumulations prior to the fire.

Local fire history map



The Harmony Grove region is within an historic wildfire corridor. Santa Ana wind driven fires typically begin east of the area and travel through Harmony Grove, and threaten Elfin Forest, San Marcos, Encinitas, Escondido, Carlsbad, Rancho Santa Fe, and other communities nearby. In addition to the 2014 Cocos wildfire, other regional historic wildfires in proximity to the proposed development site include: the Del Dios Fire of 1997 which consumed 3,000 acres, the 1996 Harmony Grove Fire caused one fatality

and consumed 125 homes and burned over 8,000 acres, the 1991 Paint Fire which burned 3,000 acres, and an unnamed fire in 1943 that burned 40,428 acres. The regional average fire return interval is 7 years, considering all historical wildfires within 3 miles radius*. Many of these fires denuded slopes of vegetation and flood cycles followed, which could impact Escondido Creek near the project site if feeder-watershed areas were burned.

* Source- California Department of Forestry and Fire Protection, FRAP

3. Describe the average and worst case fire weather conditions for both on-shore and Santa Ana wind scenarios for the proposed site.

Average worst-case fire weather for the proposed development site was developed using National Weather Service data for a 50 year period, and using the Goose Valley, CA Remote Automated Weather Station (RAWS) to develop representative climatology for the study. The RAWS site is located east of Escondido, CA. The data was prepared by a nationally licensed Fire Behavior Analyst.

Offshore Winds

The site is subject to seasonal Santa Ana winds, a foehn wind type which characteristically critically dries native vegetation, develops high wind speeds and low relative humidity, and spawns historic wildfires in the region. Critical fire weather episodes are typically associated with Santa Ana wind events. Santa Ana winds flow in an offshore, east or north east pattern and have occurred in every month of the year, but are characteristic of the September through February period. Santa Ana winds are influenced significantly by terrain, which locally funnels and intensifies winds. The Escondido Creek/San Elijo Canyon corridor is such a location, and has been identified as a location of frequent return intervals for high intensity wildfire. This area is frequently termed a “historical wildfire corridor. During Santa Ana wind events, the following average weather conditions have been recorded:

Max. Temp.- Offshore winds	Min. Relative Humidity (RH)- offshore winds	Average offshore wind speed	Average offshore gusts	Wind Azimuth
100-108 degrees	3-5%	30 MPH	50 MPH	45-86 degrees

Onshore Winds

The site is subject to a Mediterranean Climate with dry, warm summers, and brief, wet winters. This results in summer critical fire weather, especially in the late summer months from July through September, although critical fire weather periods have occurred in every month of the year. Summertime critical fire weather events are frequently associated with prolonged periods of warm-hot temperatures, low relative

humidity, low fuel moistures associated with seasonal drought, and moderate diurnal/onshore winds. While fire behavior can be critical under these conditions, wind speeds are typically less severe than during Santa Ana wind events. The following average onshore wind conditions have been recorded for the late summer period:

Max. Temp.- Onshore winds	Min. Relative Humidity (RH)- on-shore winds	Average onshore wind speed	Average onshore gusts	Wind Azimuth
100-105 degrees	3-5%	7 MPH	12 MPH	225 degrees

Climate Change

Climate is currently changing for the region, and disturbance has occurred in traditional Santa Ana wind periods, rainfall amounts and timing, summer peak temperatures and related factors. Examples of this change was the occurrence of a rare critical fire weather/Santa Ana wind period in May of 2014 which resulted in a wildfire series in San Diego County (including the Cocos Fire), and a multi-year critical drought episode. The ultimate final state of this change has not been determined, but available data suggests that drought and critical fire weather episodes will continue to occur during non-traditional periods.

4. Identify the likely paths of wildfire approach to the project.

Assessment of paths of wildfire approach was performed by analysis of historical fire trajectory, expert review of potential fire behavior factors, computer analysis of potential fire spread (BehavePlus, FlamMap and LANDFIRE) and field analysis by an interdisciplinary group of local emergency services senior staff.

Santa Ana Wind Driven Scenario

The City of Escondido (avg. elevation 700 feet) lies due east of the proposed project (site elevation- 600 feet), on the far side of a significant ridge rising between the two areas to 1,073 feet. This ridge has accumulations of old-age class, heavy mixed chaparral and coastal sage scrub. Fires starting near Escondido under Santa Ana wind conditions would gain strength and size as fire climbed this ridge in alignment with slope, winds, and fuels, causing the significant spotting/casting of firebrands into the proposed development site. Fire could approach the proposed community with a significantly wide front. The estimated fire travel time from Escondido to the proposed development site under historical average wind Santa Ana wind conditions would be 1-2.5 hours. Fire starting more proximal to the proposed development site could produce much shorter run times. The east and south facing exposures of the proposed development would be most significantly impacted by this scenario.

On-shore Wind Driven Scenario

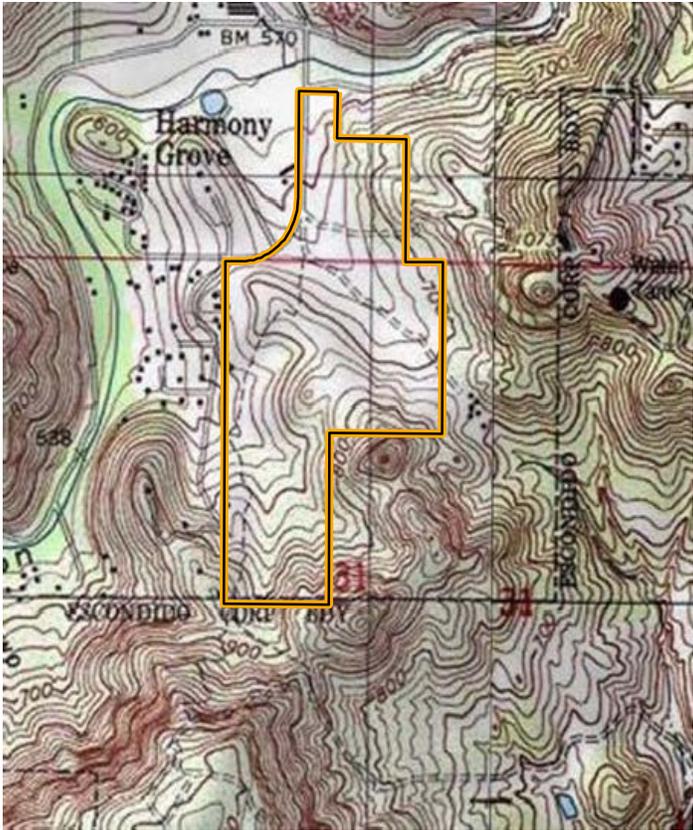
The Escondido Creek drainage/San Elijo Canyon lies immediately south-west of the project. This is a heavily fueled and steep canyon with converging drainages that pose significant fire development potential. Fire behavior analysis of this canyon indicates it is likely to present extreme fire behavior during critical fire weather episodes, and may burn aggressively from either onshore wind or offshore-Santa Ana wind condition. Extreme fire behavior would include development of fire whirls, intense energy release, long-range spotting, and high-intensity fire runs. In the case of an onshore wind scenario, fire could develop plume-dominated/fuel driven fire behavior and approach the proposed development site with extreme conditions and a wide front. This problem is exacerbated by the existence of approximately 40 legacy homes which are located in an intermix condition among these heavy fuels, immediately southwest of the project boundary. These properties off Cordrey Lane generally lack defensible space, has no Safety Zones, and are likely un-defendable against critical fire behavior. The potential loss of these homes may significantly contribute to fire intensity and fire branding immediately adjacent to the property boundary during high intensity wildfire.

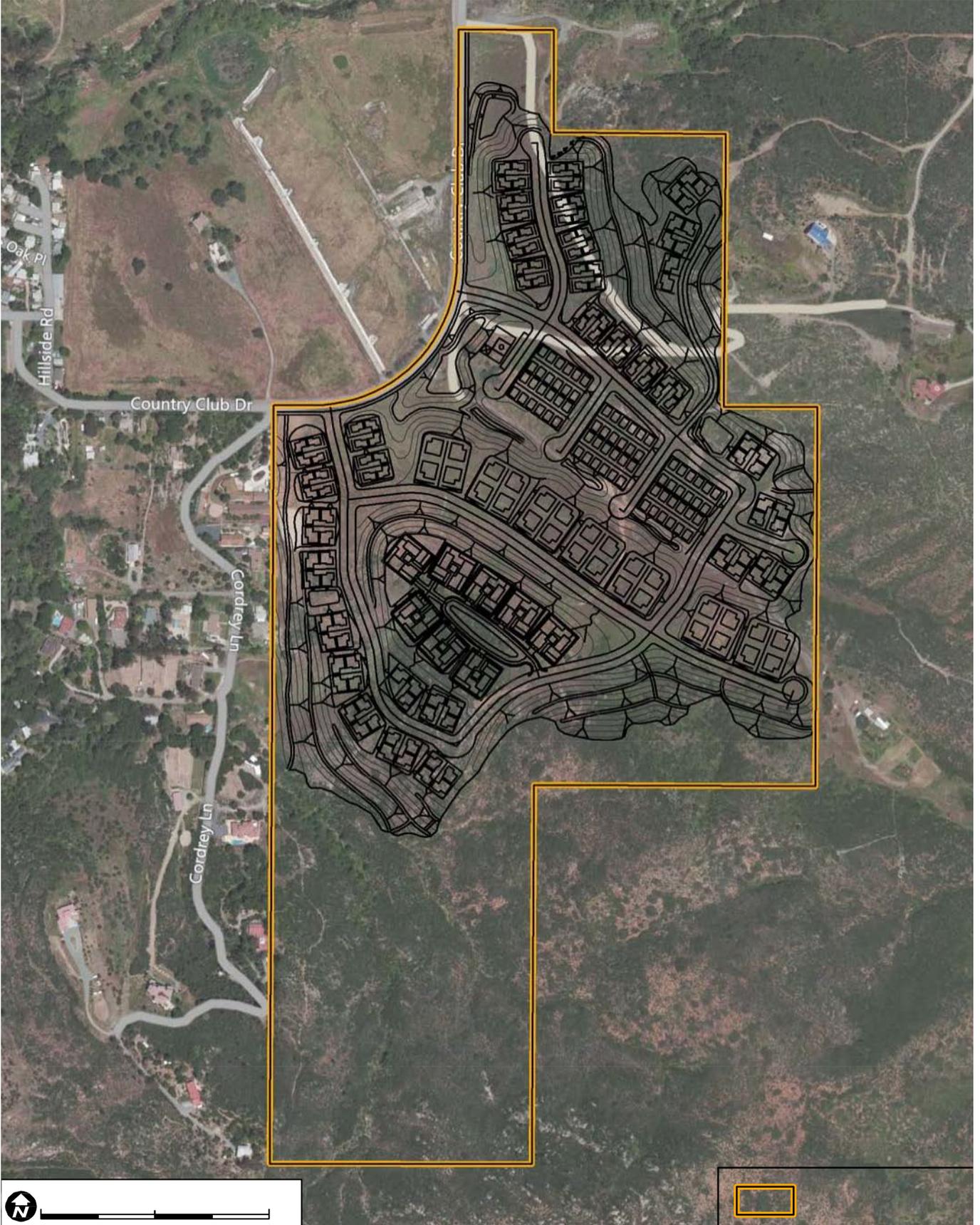
Fuel loading immediately north-west of the proposed development is currently short grass, and the site is occupied by an abandoned dairy. This condition would currently shield the upper end of the proposed development from many fire effects under onshore conditions, but the entire proposed development site could be subject to intense fire brand cast, and fire would likely traverse chaparral slopes above and around the south end of the development site, threatening the development's perimeter. The estimated fire travel time from mid-San Elijo Canyon to the proposed development site under historical average onshore wind conditions would be 1-2.5 hours. Fires initiating in the area of the Spiritualist camp could be at the development's perimeter in minutes, but may not have sufficient run distance and burning time to develop dangerous fire behavior.

5. What are the peak fire intensities expected on the development's perimeter? (Describe expected fire exposure).

The site plan for the proposed development indicates the project would abut heavy chaparral fuels on the east, south, and south-west sides of the site. The site would abut grass and degraded grass fuels on the upper west and north sides. The north side would be close to riparian fuels in Escondido Creek.

Proposed siting, Harmony Grove Village South-
Images source: Dudek; Harmony Grove Village South Fire Protection Plan





Adjacency to chaparral fuel beds

Critical exposure would exist to chaparral fuels over approximately 2/3 of the proposed project site. This includes particularly vulnerable sites within the south 1/3, and all along the east perimeter of the project. The site includes locations which could be subject to extensive fire behavior and long flame lengths, including flame lengths averaging 30-60 feet. This condition could present direct flame and radiant energy impingement potential in addition to heavy spotting/fire branding on the proposed development and emphasizes the need for fuels modification in any area which abuts chaparral fuels. This zone should be absent of native fuels and composed of plants which are listed as acceptable to the San Diego County Fire Marshal for combustion resistance.

In the south 1/3 of the project, additional consideration should be given to the effects of up to 50% slope on accentuating flame length production. This area could produce flame lengths in excess of 60 feet. In this area, additional fuels reduction is recommended, external to the 100 foot basic fuel modification zone. An additional 50 foot fuels modification zone is recommended on slopes with uphill runs into development, for a total fuel modification of 150 feet. Native fuel loads should be reduced and thinned in both volume, spacing, height, and through reduction of ladder fuels to reduce crown fire potential. Currently, the applicant has proposed 75 feet of fuel modification and 25 feet of additional thinning for a total of 100 feet.

Adjacency to grass fuels

The north-west and northern portions of the project include exposure to grass fuels. These fuels were assessed to present flame length potential of 4-8 feet, plus additional radiant heat energy transfer. The riparian area along Escondido Creek has the potential for flame lengths of 30-60 feet. Setbacks here are recommended consistent with the county standard of 100 feet. Road widths on the west side of the project should be included in the calculation of this setback. Similar conditions have been promoted by the applicant in the Draft Harmony Grove Village South Fire Protection Plan.

Fuels Modification Maintenance

All fuel modification proposals should be conditioned for maintenance in perpetuity, including watering, removal of dead materials, maintenance of plant types, and control of biomass volumes. Similar conditions have been promoted by the applicant in the Draft Harmony Grove Village South Fire Protection Plan.

Escape Route Protection

The project applicant has proposed 20 feet of clearance on the sides of the primary escape route. This should be adequate given the short grass fuels adjacent to the road and a maximum expected flame lengths of 2-4 feet.

6. What is the maximum spotting potential into the proposed community from nearby wildfire?

Heavy chaparral fuel accumulations lie both east and west of the proposed development. Prevalent winds and slope are also in alignment to maximize fire potential, and the potential exists for heavy spotting/fire branding into the development site from either on-shore or off-shore wind driven scenarios. Casting of fire brands was estimated using FlamMap and LANDFIRE and expert review by a nationally certified Fire Behavior Analyst, using past fire history and average weather to predict casting distance. Results indicated that in offshore wind driven scenarios, branding would be expected at greater than 3/4 mile, and greater than 1/4 mile for onshore conditions. This can be exacerbated by the effects of slope, as well as the potential development of plume dominated-fuel driven fire behavior. In the latter, the greatest potential for plume domination exists from onshore-wind driven fires developing in the San Elijo Canyon area, due to very heavy fuels accumulations there. In this case, fire branding would be extensive, and may travel as much as a mile ahead due to the heavy lifting of burning products into a vertically high smoke column.

In either wind scenario, heavy fire branding is predicted into the proposed development site. Since branding may travel a minimum of 1/4 mile and as much as 1 mile ahead, the entire proposed development site would therefore be subject to significant fire branding.

National fire research by the Cohen (2008) and Manzello (2014)* have identified that fire brand casting is a principal factor in ignition of structures in the wildland-urban interface. This consideration should cause regulators to consider extensive protection from fire branding for the proposed development in structural design, use and placement of ornamental vegetation, placement and design of structural features such as decks, gazebos, and external structures, and related features subject to ignition by fire branding.

Given the potential for heavy fire branding, it is recommended that primary structural components such as protection of attic vents, eaves, roofing materials, adjacency and type of external structures, and ornamental vegetation be given focused consideration by the San Diego County Fire Marshal. The applicant has proposed adoption of non-native plant pallets and external structural controls, however additional hardening of attics on primary structures is recommended.

* 1. "The Wildland Urban Interface Fire Problem", Jack Cohen, Forest History Today, Fall, 2008

2. Manzello, S.L., 2014. Enabling the Investigation of Structure Vulnerabilities to Wind- Driven Firebrand Showers in Wildland-Urban Interface (WUI) Fires. Fire Saf. Sci. 11 IBHS, 2014

7. Identify recommended routes for travel for wildfire escape from the proposed development. Can civilian's escape be compromised by fire movement along these routes?

Site access and egress using existing and proposed roads was reviewed by expert consultants and local emergency services senior representatives through both planning document review and site inspection.

Primary access to the proposed development was identified as Country Club Dr, which requires approximately 800 feet travel from the proposed development entrance north-bound to reach an intersection with Harmony Grove Rd. Routes of continued egress from that intersection include both east and west bound Harmony Grove Rd., continued travel north on Country Club. Dr., or use of Harmony Grove Village Parkway to the north. Analysis of these routes is as follows:

POTENTIAL EVACUATION ROUTES

Harmony Grove Rd.

This route has critical exposures to heavy wildland fuels in both directions from the intersection of Country Club Dr., and poses severe entrapment potential during wildfire movement. This danger begins immediately east bound (towards Escondido) and approximately 1/2 mile west (towards Elfin Forest). Similar routes have contributed to numerous deaths to wildfire exposure in San Diego County. (Wildcat Canyon, Cedar Fire, 2003). There is also potential for long range spotting to develop fire related obstructions on this road well ahead of the main fire. The road will also be subject to downed power lines, rock fall and related hazards. Outside of the area of Harmony Grove Village, no safety zones are located along this road. This road is not recommended for fire evacuation. In the case its use is determined as a dangerous last resort, it should first be scouted by public safety staff, and monitored closely for immediate closure during use.

Country Club Dr.

This route is recommended to be the primary route of evacuation for the proposed development. The route travels north towards Escondido, and presents minor exposure to short grass (with short flame length potential) immediately north of Harmony Grove Village 1. This route is the safest and quickest route to safety to access suburban and urban areas to the north, requiring 1.8 miles and 3 min. travel at average road speeds to reach suburban safety. It is the consultant's understanding that this road will be enhanced to 3 lanes for 800 feet from the development entrance to the intersection with Harmony Grove Rd. as part of the development, with a new bridge built over Escondido Creek. The applicant's proposal also includes "Opticom" utilization of the Country Club Dr./Harmony Grove Rd. intersection.

Per traffic engineering standards cited by Dudek, this improvement will provide capacity for 1,828 vehicles/hour. It appears however that the report did not include legacy users of this route in addition to the proposed additional use. Given the proposed development size of 457 units + 60 legacy housing units = 517 dwelling units x 4 cars per unit (avg.), provides a demand of 2,068 cars per hour on this road, or slightly in excess to the carry capacity of 1,972 cars/hour cited by Dudek after proposed improvements. Rohde & Associates believes the 4 cars/household cited by Dudek may be a high calculation, and using a more modest calculation of 3.5 cars/household, our calculation yields a result of 1,809 vehicles/hr., or well within the carrying capacity of the enhanced roadway.

Harmony Grove Village Parkway

This route is an east-bound turn from Country Club Dr. towards Escondido, approximately 1/4 mile north of the intersection of Country Club Dr. and Harmony Grove Rd. Once east bound on Harmony Grove Village Parkway, safety is 1.5 miles and 3 minutes travel time at average road speeds to suburban/urban areas off Citracado Parkway. The road traverses through tract homes initially, but presents an area of risk where the bridge over Escondido Creek offers brief exposure to heavy wildland fuels, however the burn-out time for these fuels may be 15 minutes and the duration of any required closure could be short. This condition would only pose risk during extreme fire behavior, and should be acceptable during lesser fire events. Consultants and public safety staff evaluators recommend this route as the alternate escape route.

Summary of Escape Route Availability

Consultant staff and public safety staff who reviewed the site agreed that 4 routes of escape, two with strong viability and two that may be dangerous, exist for evacuation from the proposed project site. Harmony Grove Rd. is not recommended for evacuation use. Country Club Dr. and Harmony Grove Village Pkwy. Offer good escape alternatives. (This recommendation considers the proposed road and bridge improvements on Country Club Dr. as proposed by the applicant).

Concern had been expressed that only one route was proposed for access/egress to the proposed development site rather than the code required construction of two, and that a variance would be requested/required for the project to move forward. In contrast, the consultant staff and public safety officials who participated in the field tour of the site unanimously agreed that the site has 4 potential routes of egress during evacuation, two with strong viability. All participants expressed comfort that the proposed variance for the 800 foot single access road was acceptable.

8. Is there potential for a shelter-in-place mandate due to threats along evacuation routes?

The potential demand for Shelter-In-Place was reviewed by expert consultants and local emergency services senior representatives through both planning document review and site inspection.

This potential requirement is derived primarily from either high intensity wildfire threats to escape routes, or the rapid onset of high intensity wildfire which denies civilians an opportunity for escape. This later condition is a likely scenario for the planning site given the potentially short time for a major wildfire to approach and surround the proposed development. This risk exists for fires coming from either an east or west direction, or for fires which originate in the Harmony Grove community.

Shelter-in-Place options may be initiated by public safety personnel, but are also selected by civilians who find themselves trapped within a rapidly moving fire environment. Some of these civilians may have already initiated vehicular evacuation but may be forced into an available safety zone. Others include infirmed or elderly populations who may not have the ability to move from their original location.

Several shelter-in-place options are available and are proposed as part of the greater Harmony Grove Village development. They include:

1. Parklands- (Currently unnamed), Intersection of Country Club Dr. and Harmony Grove Rd. (North side of Escondido Creek). A large community park has recently been constructed at this intersection which offers significant parking area and grass fields sufficient to provide refuge from nearby fires during moderate to high severity wildfire events. Extreme wildfire events may require evacuees to reposition within this park to avoid heat pulses. This park is less than 1 minutes' travel time from the entrance to the proposed development and offer strong support for emergency shelter-in-place needs.

2. Shelter within Harmony Grove developed areas- Two options exist here.

- a. The larger Harmony Grove Village 1 offers safety within interior tract streets and is a short travel distance from the proposed development. The tract is approximately 1.5-2 minutes travel from the proposed development entrance. Safety is available within the middle of this larger tract even during extreme fire behavior events, despite the potential for structural ignition on the development's exterior or ignition of some interior homes due to spotting/fire branding.

- b. Shelter within Harmony Grove Village South: This smaller proposed tract will retain some potential for structural ignition of perimeter homes during extreme fire behavior, or

potential ignition through spotting/fire branding of interior homes, even with the proposed fire code mitigations, consistent with similar risk in other San Diego County fire resistive communities. Concern exists here for populations who may be under very short notice or unable to move to shelter. A proposal has been made by the developer for a community center which could also serve as a safe refuge. The size of this facility is currently proposed at 5,000 square feet with a capacity for 330 people. This facility is proposed by the applicant to be stocked with situational awareness and emergency supplies. The consultant team felt that given the availability of viable evacuation routes, and other community shelter-in-place assets, that the proposed single facility meets expected needs.

In summary, the consultant team and reviewing public safety officials felt comfortable that shelter-in-place needs will be met by the project as proposed by the applicant.

9. Does the potential exist for civilian entrapment/critical direct threat due to wildfire within the proposed development?

Consultant staff and public safety officials reviewing the site agree that the significant potential exists for civilian entrapment within the tract during extreme fire behavior conditions if certain fuels management and structural hardening against wildfire is not incorporated into the planned development. History has proven that fire resistive structures meeting modern code requirements may still be lost to critical fire behavior. Serious fire exposure potential exists on the development's perimeter where it abuts chaparral fuels. Additionally, study has identified considerable fire branding potential throughout the Harmony Grove Village South development site.

To mitigate this risk, the consultant recommends full compliance with County's wildland-urban interface building construction standards. This will include enhanced fuel modification, creation of a Safety Zone within the community center, and structural exterior limitations on decks, gazebos, free standing structures, and other similar combustible structures and storage. Additional hardening of structural attic vents against firebrands is recommended.

10. What is the recommended siting, size, and capacity for Temporary Safe Refuge or Safety Zones within and adjacent to the proposed development?

Existing community infrastructure is available within adjacent public parklands and housing tracts (identified in response to question 8) that contribute to Safety Zone demands.

The proposed community center/fire Safety Zone is proposed for 5,000 square foot size with a capacity of 330 people. Given the availability and access to other community Safety Zone assets, this is felt by the consultant team to be adequate to address proposed development needs.

Since 60 legacy homes located to the south and west of the proposed development have no Safety Zones in the vicinity of their residences, and Country Club Dr. also provides egress for these residents, it is likely these residents will use the same evacuation routes and Safety Zones identified for use by Harmony Grove Village South, and will view the proposed development site itself as an opportunity for safe refuge.

11. What is the recommended fire/law resource allocations for wildfire structural defense within the proposed development, given expected fire behavior and community design? Will the addition of the proposed development compromise fire protection, evacuation, or other public safety components within the greater Harmony Grove community?

The Harmony Grove subdivision development has included construction of a new fire station facility within Harmony Grove. This facility is anticipated to be staffed by the Rancho Santa Fe Fire Protection District upon LAFCO annexation approval, expected in July of 2016. Rancho Santa Fe will assume primary responsibility for structure fire protection and emergency medical services, and Cal Fire will maintain primary responsibility for wildfire protection. The San Diego County Sheriff will retain primary law enforcement responsibilities, with local jurisdiction maintained by rural deputies assigned to the San Marcos Sub-Station. Highway traffic jurisdiction will continue to be managed by the California Highway Patrol.

Regional resource response to potential wildfires requires vast and multi-agency resources to mount effective and rapid defense against aggressive wildfire threats, and will include assets such as handcrews, dozers, helicopters, and airtankers, in addition to many ground engine companies. Law enforcement deployment would similarly require response from multiple agencies to manage evacuation, traffic, and security. Both fire and law agencies within the area possess diverse and robust resources and organization for addressing fires within the proposed development area.

Like most of San Diego County, fires in Harmony Grove may occur under the most adverse weather conditions, and likely occur during times of regional fire siege of multiple large fires when resource availability is compromised and limited. The proposed development's compliance with San Diego County Wildland-Urban Interface fire codes, and the proposed enhancements contained within this report will significantly reduce the resource deployment requirements for structural defense to the proposed project.

The proposed project was evaluated for fire service protection demands as part of the greater Harmony Grove community. Recommendations for resource deployment were

included in the completed emergency services Wildland Urban Interface Fire Emergency plan. With proposed mitigations, good results from structural defense efforts may be expected in the proposed development, similar to those of other modern fire resistive communities in San Diego County.

12. Does community water supply infrastructure/systems adequately address fire flow demands for the proposed development during wildfire? Will the pumping infrastructure be safe from fire effects?

Fire flow data was received from the County of San Diego for system performance expected in the Harmony Grove South proposed development. The consultant review found system performance to be consistent with storage, fire flow, and distribution standards for suburban communities. 5,000 GPM will be the intended available fire flow with a minimum 40 PSI. Fire hydrants will be available every 300 feet in the project. In addition to fire flow, the applicant has committed that all residences in the proposed development will be equipped with residential fire sprinklers.

Planning for redundancy of power supply is recommended to ensure backup power in the case of utility disruption. This is usually provided through generator power delivery. This is recommended to ensure fire flows are maintained and reservoirs are capable of refilling under major emergency fire conditions.

Backup plans should be undertaken by the water authority to maintain electronic visualization of systems should primary telemetry be interrupted by power loss.

Pump rooms and their related structures and exterior areas should be maintained free of materials which are ignitable by fire branding and constructed/reinforced against fire exposure. Fuels clearance from these critical facilities should be maintained and inspected by the County for compliance.

Parking/access controls are recommended to maintain fire apparatus access to fire hydrants, and maintain adequate access and turning radius within the proposed development. Compliance with applicable fire and building code relating to these concerns has received the commitment of the applicant.

Summary

The applicant's proposed mitigations appear consistent with good practice to mitigate fire risks in the proposed Harmony Grove Village South development, with the following caveats:

- a. Additional fuel modification is recommended where slope and the presence of chaparral fuels accentuates fire behavior potential.

b. Additional hardening of attic vents and other openings of structures to fire branding is recommended due to spotting/fire branding potential for this site, in addition to removal of community interior native vegetation, the use of approved fire restive plantings, controls on exterior combustible structures, and additional improvements cited in the applicant's Draft Fire Protection Plan and the Fire/Building Code.

c. This study supports the notion that adequate escape routes and safety zones are provided within the proposal, and that variance for two access routes should be considered in consideration for the 800 foot fire hardened/fuel modified access on Country Club Dr. and the placement of the proposed safety zone-structure within the community.

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April, 2016