

L. FIRE DEFENSE ANALYSIS



Appendices

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FIRE DEFENSE ANALYSIS

Task 1: Draft review of existing and proposed future development in Anaheim Hills.

INTRODUCTION

Anaheim Hills is an upscale, mountainous community within the City of Anaheim. The average population per household in Anaheim is 3.34 persons. For comparison, the average is 4.55 in Santa Ana. The current, built upon area is bordered by the 55 freeway on the west, the 91 freeway on the north and the 241 freeway on the east. The currently developed portions of Anaheim Hills are classified as a "Special Protection Area" by the Fire Department. In addition, there is a significant amount of vacant land east of the 241 to the Riverside County line. This land is proposed to be developed by the Irvine Company and will be in the City. This undeveloped area is classified as a "Very High Fire Hazard Severity Zone" by the Fire Department.

The predominant current use is that of upscale, single-family detached dwellings of a low to medium density. The structures appear to have been constructed, beginning at the west end along the 55 freeway, in the 1960's. Most structures in Anaheim Hills appear to have been constructed since 1980. The type of construction is predominately wood frame. Most exteriors are stucco. Many older structures have wood roofs. Most new structures have tile roofs.

In addition to the single-family residences, there is a large multi-family apartment complex, "The Cascades" on the east end, off Santa Ana Canyon Road. This structure appears to be wood frame. It has a stucco exterior. It does not appear to have fire sprinkler systems. There is a major shopping center, "the Festival" on Santa Ana Canyon west of Weir. In addition, there are some smaller centers that appear to be Type III, "tilt-up" masonry construction. The Fire Department reports that all shopping centers have fire sprinkler systems. Anaheim Hills contains some commercial/professional buildings that also appear to be type III, tilt-up construction. In addition, there are parks, schools and residential uses. There are no trailer parks or high-rise buildings. There are no rail yards, lumberyards, or large storage occupancies.

The majority of Anaheim Hills, west of the 241, is built upon. The area east of the 241 is planned for low to medium density housing, schools, and some general commercial along the freeways. This undeveloped area is classified as a "Very High Fire Hazard Severity Zone" by the Fire Department.



FIELD OBSERVATIONS

The consultant made an extensive tour and inspection of Anaheim Hills. The following observations have been made:

- Very upscale and clean neighborhoods were observed. There are no deteriorated, low-income neighborhoods, or densely constructed neighborhoods.
- Heavy traffic was observed on the main arteries. This can cause delays in emergency response. The busiest intersections appear to be Santa Ana Canyon, Weir Canyon and Imperial Highway.
- Steep, windy roads were observed. Such roads will slow down response of Fire Engines.
- Narrow on-site roads were observed in condominium and apartment projects.
- Many wood roofs were seen on structures. This presents a significant fire hazard, and potential for ignition of a structural conflagration.
- Newer homes have tile roofs which will resist a certain amount of fire.
- While there are several areas in the Anaheim Hills with extensive amounts of flammable, ornamental shrubbery, most of these areas are maintained under our Special Protection Area requirements for clearance to structures and roadways.¹
- Fire Hydrant spacing in new tracts appears acceptable. Hydrants are required at 300' intervals. Spacing in some older tracts is lacking.
- Hydrant spacing at the Festival shopping center complies with all current AFD requirements.²
- Main arterial routes through Anaheim Hills are limited to several main roads. Beyond those roads, emergency response must be through residential developments. The main access roads are limited to Santa Ana Canyon, Weir Canyon, Serrano Road, Anaheim Hills Road, Imperial Highway, and Nohl Ranch Road. This can result in delayed response. In the event of a major wildland fire, the lack of main arterial highways and feeders results in the need for emergency vehicles to respond through relatively narrow, winding streets in subdivisions. Such streets can become clogged with people trying to escape as fire crews try to enter the area.
- There are high voltage power lines running through Anaheim Hills east of Imperial Highway.
- Numerous communities are gated. Gated communities can delay emergency response by at least two minutes. Two minutes can be critical during a medical emergency or structural fire.

¹ Per the Anaheim Fire Department; Memo dated August 22, 2003

² Per the Anaheim Fire Department; Memo dated August 22, 2003



- There is a very high fire hazard presented by the chaparrals on the hillsides, and other vegetation within common areas. Fire spread models were conducted for this vegetation, including the vegetation types east of the 241. The modeling was done on a computerized fire spread modeling program called BEHAVE, which is used by many fire agencies for fire behavior prediction. The model is based upon actual fire history and observations. The modeling assumed a BEHAVE Fuel Model 4, which represents chaparral of the density observed at Anaheim Hills, and a Fuel Model 3 which represents grass which is 3' high. The results of the modeling are as follows

Fuel Model 4: Chaparral

This model utilized input criteria which represent the type of weather and winds, commonly referred to as Santa Ana or Santana (devil) winds, which occur during fire season (typically June to the first significant rain in November). Such "fire weather" is typically characterized by several days of hot dry weather and high winds resulting in low fuel moisture in vegetation. The model focused on the Fuel Model 4 vegetation on the hills east of Freeway 241, and other hills in east Anaheim Hills. The wind was assumed to be 50 MPH at a 20' height (30 MPH at ground level). The fire will most likely burn towards Anaheim Hills from out of county areas to the east/northeast and be a wind-driven fire.

The results indicate that a worst-case fire could spread at the rate of 2,029' per minute. This would equal a speed of 23 mph. Flame lengths would reach 96.4'. The heat released on the fire line would be 116,724 BTU/ft/second, which is extremely hot. The fire would result in ignition of fires 4.2 miles ahead of the main fire due to airborne burning debris. This means that a major fire burning in the east end of Anaheim Hills could start other fires on wood roofs or in ornamental vegetation, in the middle of Anaheim Hills. In one hour, a worst-case fire could spread to 31,558 acres if there is no intervention. A structural conflagration would probably result and could destroy hundreds of homes. The structural loss could be similar to that which occurred in Laguna Beach, Santa Barbara, Glendale, Malibu, and San Diego County in recent years.

Fuel Model 3: Grass 3' High

This model predicts the type of fire which could occur in grassy areas where grass is 3' high. This model uses inputs which reflect "fire weather" in fire season. A wind speed of 50 mph at a 20' elevation is used. The flame lengths would be 42.4'; the amount of heat released on the fire line would be 19,541 BTU/ft/sec. The rate of spread would be 1,196' per minute (13.5 mph). This fire could spread to 15,612 acres in one hour if no intervention occurs. Fires can be ignited 2.2 miles ahead of the main fire due to burning debris which is airborne, and which lands on wood roofs or in ornamental vegetation.

These models are meant as a guide to predicting potential worst-case fire spread. Actual fire spread and flame lengths may vary. However, it is obvious that there is a very high potential for a major wildland fire to occur and to result in major vegetation and property loss, and perhaps



City of Anaheim General Plan & Zoning Code Update

injury and death, in Anaheim Hills. The risk of such a fire can be quantified as a moderate probability/high consequence event. As the unmodified vegetation continues to age and as the population increases in the area, the fire risk will increase.

Steps should be taken by the City, without delay, to mitigate this risk by intensifying requirements for all new development in Anaheim Hills. This should include:

- Intensified fire resistive building construction features
- Fire sprinklers in all new or significantly remodeled structures
- Enforcement of defensible space requirements
- Encouraging the homeowners of homes with wood roofs to replace them with a fire resistive roof
- Requirements for Fire Protection Plans for all new development.
- Creation and implementation of a community-wide Vegetation Management Plan, which results in requirements for proper vegetation modification on an ongoing basis on all private lots, common areas and open space.

The last major wildland fire in Anaheim hills was the "Stagecoach Fire" in 1995. This fire burned 700 acres. Prior to that fire, the Gypsum Canyon fire occurred in 1982 and burned 16,800 acres (a major fire). In 1967, the Paseo Grande Fire, which began in Corona, burned through portions of this area, and also burned into Irvine, Orange Park and Villa Park. Many homes were lost in that fire. 48,639 acres were burned. This was a major conflagration. In 1948, the Green River fire burned 47,000 acres. This fire history indicates a major fire occurs about every 15.6 years in or near to Anaheim Hills. The average acreage burned is 28,534. At this rate, the next major wildland fire in Anaheim Hills could occur within the next 10 years and could destroy 28,534 acres or more.

- Various new developments have Vegetation Management Zones around the perimeter. However, extensive amounts of ornamental shrubbery present a hazard on and around individual lots, and along streets. There are some common area open spaces which are not being maintained and therefore present a fire hazard to abutting structures. Examples can be found on Weir Canyon road and on Serrano.
- There is an over abundance of street trees, such as eucalyptus, which can serve to spread fire to structures and to impede response or evacuation.
- There is an older area along Santa Ana Canyon west of Imperial to Nohl Ranch, and along the 55 freeway, which has a significant amount of wood roofs, Eucalyptus and grass. This area is very vulnerable to fire.
- There are structures, with wood roofs, which are near Weir Canyon Wilderness Park and are thus exposed to a potential wildland fire from that park.



City of Anaheim General Plan & Zoning Code Update

- The current water supply is from the City water system which is a combination of three pump stations, and reservoirs located in various pressure zones. The water department states that they have emergency power provisions on all pumps. The needed fire flow, as required by Fire Code and the Fire Department ranges from 1,500 GPM for 2 hours, at 20 PSI for residential occupancies under 3,600 square feet to 4,000 GPM at 20 PSI for 4 hours at the Festival shopping center. Needed fire flows for the other shopping centers, and commercial buildings are generally 3,000 GPM for three hours assuming protection by Fire Sprinklers for any occupancy over 5,000 square feet. Per the AFD, fire flow availability at the Festival shopping center complies with all current AFD requirements.³
- There are numerous single and multi-family residential occupancies that have fire sprinklers installed in the Anaheim Hills area.⁴
- Fire station locations and staffing will be discussed in task 3.

CURRENT NEW DEVELOPMENT REQUIREMENTS

The current Fire Department development requirements are as follows:

1. Appendix 11-A of the Fire Code:

Appendix 11-A primarily addresses vegetation, spark arrestors, and other outdoor fire hazards. It requires “firebreaks” (vegetation modification) for a distance of 30’ to 100’ from structures, and 10’ from roadsides.

2. Fire Sprinklers when required by the Fire Code or Building Code.

The Code requirements are minimal and not adequate for Anaheim Hills. The City had a sprinkler ordinance requiring sprinklers in any occupancy over 500 square feet, but it was rescinded in 1995. Due to the high fire hazard risk, long responses, and fire weather conditions, all new structures and all significantly remodeled structures should have fire sprinkler systems.

3. Fire hydrant requirements are as per the Fire Code Appendix 111-B. The Fire Department requires fire hydrants to be at 300’ intervals (600’ is allowed if all structures have internal sprinkler systems).

4. Fire flow requirements are as per the Fire Code Appendix 111-A. The Fire Department requirements are 1,500 GPM at 20 PSI for 2 hours for residences up to 3,600 square feet. Above that size, required flows increase based upon square footage. For example, a 10,000 square foot house would require 2,750 GPM (1,375 GPM if equipped with internal fire sprinklers. Major commercial occupancies such as

³ Memo dated August 22, 2003

⁴ Per the Anaheim Fire Department; Memo dated August 22, 2003



City of Anaheim General Plan & Zoning Code Update

- the festival shopping center require as much as 8,000 GPM for 4 hours (4,000 GPM if equipped with fire sprinklers).
5. Roads are as required by the Fire Code: The requirement is 20' unobstructed width and 13'6" clear height. Roads should be at least 24' wide unobstructed by parking.
 6. Roofs in Anaheim Hills are required to be Class A rated.
 7. Plainly visible addressing is required on all structures.
 8. LPG tanks are regulated as to labeling, vegetation clearances and crash posts.
 9. The Fire Department has a Fuel Modification Plan and maintenance requirements for new development in Anaheim Hills, which is referred to as a "Special Protection Area". The plan requires a 170' fuel modification zone around the perimeter of developments and in common areas. Such perimeter zones can be observed around new developments. However, the maintenance is questionable in some locations. In addition, as stated previously, there were some common areas observed, where no modification is being maintained.

The Fire Department has not adopted any intensified construction requirements for Anaheim Hills even though it is designated as a "Special Protection Area". This should be done based upon the risks presented.

The Building Department requires Class A rated roofs. Class A roofs offer the highest fire resistance of currently available roofing materials. There are no specific, intensified, building requirements based upon the high fire hazard area.

The Anaheim Fire Department protects Anaheim Hills with two fire stations in Anaheim Hills: Station 9 at Nohl Ranch and Canyon View, and Station 10 at Sycamore park, on Monte Vista off Weir Canyon. In addition, Fire Station 8 is close by but north of the 91 freeway. In addition, fire companies from adjoining agencies can be summoned to respond to significant fires. Orange City Station 8 is close to Anaheim Hills. It is located on the extension of Imperial Highway. Automatic aid response is also available from nine other fire stations in the general area. However, they are further away from Anaheim Hills. These include three stations in Yorba Linda and Station 3 in Orange. If a major fire occurs, fire companies from throughout Orange County and the state can be requested. However, response times are lengthy. The fire suppression capability will be discussed in Section 3.

TARGET RESPONSE AREAS

The Fire Department has identified nine target response areas in Anaheim Hills. These target areas represent the concerns by the Fire Department for the occurrence of a significant fire in these areas. The areas are shown on the following page:



City of Anaheim General Plan & Zoning Code Update

Target Area/Thomas Guide grid#	First due Fire Engine	Estimated number of needed fire units	Number of structures
1. Mohler Loop: 770/J1	Station 10; Weir Canyon	30 engines, 2 helicopters, 4 handcrews	262. 110 on perimeter
2. Pelanconi Park; 770/E3 ⁵	Anaheim Hills Station 9	30 engines, 2 helicopters, 2 hand crews	329. 119 on perimeter.
3. Pathfinder/Stagecoach 770/E4, F4, G4	Anaheim Hills Station 9	30 engines, 2 helicopters, 2 handcrews	349. 94 on perimeter
4. Quintana. 770/G2	Anaheim Hills Station 9	26 engines, 2 helicopters, 3 hand crews.	26. 12 on perimeter
5. Old bridge. 770/H1	Weir Canyon Station 10	15 engines, 1 helicopter, 1 hand crew	70 on perimeter
6. Eucalyptus. 770/J1	Weir Canyon Station 10	15 engines, 2 helicopters, 2 hand crews	15. 12 on perimeter
7. Hummingbird. 770/J2	Weir Canyon Station 10	25 engines, 2 helicopters, 2 handcrews	54. 47 on perimeter
8. Hidden Canyon. 771/A4	Anaheim Hills Station 9	12 engines, 2 helicopters, 2 hand crews	87. 24 on perimeter
9. Walnut Canyon reservoir. 770/A4	Anaheim Hills Station 9	7 engines, 1 helicopter, 1 hand crew	173. 40 on perimeter

⁵ Worst-case target area per Fire Department: Pelanconi Park (based upon the number of perimeter structures and resources needed)



RECOMMENDATIONS

Based upon the risks identified in this section, the following recommendations are made:

Structural Safeguards For All New And Remodeled Structures:

The City should consider adopting an ordinance or amending the Fire Code, or taking whatever other legal action is deemed appropriate to require the following type of construction features in all new or significantly remodeled structures.

1. One-hour fire rated wall system for the exterior walls (if vegetation management inadequate).
2. Tempered glazing in windows and doors.
3. Internal fire sprinkler system designed to proper standards and approved by the Fire Department.
4. Exclusion of eaves, or boxing in of eaves with 1-hour construction.
5. Approved spark arrestor in chimney (visible from grade)
6. Class A, non-wood roof system.
7. Tile roof filled at ends to eliminate entrance of sparks, etc.
8. No vents facing wildland vegetation, when vegetation management is inadequate.
9. Approved steel screen on vents.
10. Noncombustible rain gutters and spouts.
11. No flammable wood, foam, plastic, etc. on exterior walls.
12. No non-fire rated vinyl or plastic window or door assemblies.
13. Non-wood garage doors.
14. Heavy steel window and door screens.
15. One-hour rated or heavy timber for any patio or deck.
16. Enclosed ends on decks and wooden patios.
17. No decks overhanging slopes.
18. No skylights.
19. Wooden exterior doors to be solid core (1 3/4" minimum.). Glazing to be tempered.
20. Install water faucets and hose on all sides of house.
21. Install fire truck connection on swimming pool drain line.
22. No canvas awnings.



Vegetation Management:

1. Continue to implement the three vegetation management programs (weed abatement, hazardous reduction for existing homes, and fuel modification for new development) as established for the wildland section. Sprinklers should be required on all new or significantly remodeled structures in the wildland areas of Anaheim Hills. Also implement special construction requirements to help prevent the spread of fire when homes are near a wildland area, including, but not limited to: double-paned windows, enclosed decks, and boxed eaves.⁶
2. Actively enforce current Fire Code requirements for vegetation management and elimination of ornamental shrubbery on all properties.

Public Education:

Intensify public education efforts to encourage all owners of existing structures with wood roofs, and flammable siding to replace roofs with Class A non-wood roof systems, and eliminate any flammable siding materials.

Fire Protection Plans:

All new development and all new or significantly remodeled structures in Anaheim Hills should be required to submit a Fire Protection Plan, as required by Article 86 of the 2000 edition of the Uniform Fire Code, to the Anaheim Fire and Planning Departments. Such plan should set forth in detail the proposed construction, infrastructure, fire protection systems, and fire stations, if necessary, to mitigate the local fire risk in the area where the development or construction is occurring. Such plans should be to the approval of the Anaheim Fire Department and Planning Departments.

⁶ Per the Anaheim Fire Department; Memo dated August 29, 2001

