EXHIBIT D

Appendix D Safety Element

Appendix D-1 Wildfire Assessment

prepared by

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Table of Contents

Tables

Figures

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Introduction

This technical appendix to the General Plan Safety Element describes wildfire conditions present in the City of Calabasas. It includes a description of wildfire fundamentals, identifies wildfire hazard designations for Calabasas, describes citywide conditions related to slope and aspect, vegetation, weather and atmosphere, and wind pattern, presents existing emergency response facilities, and identifies areas of varying wildfire risk in the areas surrounding Calabasas. Information throughout this appendix is supported by the Wildfire Assessment prepared for the General Plan Update by TSS Consultants (see City of Calabasas General Plan Update Final Program Environmental Impact Report, Appendix E).

Wildfire Fundamentals

A wildfire is an uncontrolled fire in an area containing combustible fuel types, primarily vegetation formations and structures. Wildfires differ from other fires in that they take place outdoors in areas of grassland, woodlands, brushland, scrubland, peatland, and other wooded areas, such as landscaping zones parks and conservation areas, that provide combustible materials. Buildings may become involved if a wildfire spreads into developed areas in Calabasas or surrounding communities. The land uses in Calabasas include rural-residential, high density residential, commercial, industrial, services, and community facilities. The primary factors that increase an area's susceptibility to wildfire include slope and topography, vegetation type and condition, and weather and atmospheric conditions.

A significant part of western Los Angeles County is developed urban area situated near rugged topography with highly flammable vegetation. The County of Los Angeles experiences wet winters and warm, dry summers that dry out vegetation. During the fall, Santa Ana winds, known for the dry air and high wind speeds originating in the deserts north and east of Los Angeles County, sweep west into the county and further desiccate vegetation. Historically, fires that burn more than 1,000 acres have occurred in the County about every one to three years, with the most recent being the Woolsey Fire (November 2018) which burned 96,949 acres (County of Los Angeles 2019).

The indirect effects of wildland fires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capacity to absorb moisture and support life. Regions of dense dry vegetation, particularly in canyon areas and on hillsides, pose the greatest potential for wildfire risks.

Wildfire has three basic elements that need to be considered when determining its associated risk level: how and where its ignition occurred; how and why it moves across a landscape from its point of ignition; and what is the fire's nature upon arrival at a location important to the City. In general, a fire's nature is defined by eight behavioral characteristics:

1. Direction of the advance of the fire front
2. Speed of the advance of the fire front (rate of spread)
3. Mechanism causing the advance
4. Duration at any one location
5. Fuelbed structure-related consumption of fuels

6. Flame length
7. Intensity
8. Gaining control

A fire front's direction of travel is primarily determined by wind direction (long-term prevailing winds more temporal variations), geographic aspect, and condition of the fuels in the advance direction. The speed of a fire front's advance is typically a result of combinations of conditions including wind speed, terrain slope percentage and the nature of combustible fuels at the site of the currently burning material and on lands in the advance direction of the fire.

Wildfires advance by two principal mechanisms, combustion resulting from radiant heating, and remote ignition resulting from ember production. The length of time a wildfire stays at one location is primarily determined by the size classes of the material being consumed. Grass formations are dominated by low volumes of very "fine" fuels (small size classes) and, depending on the level of dryness, can be consumed, with the fire advancing, in a matter of minutes. In grassland situations fires tend to have lower intensities and can advance by radiant heating effectively only through vegetation types with similar fuel sizes. Grassland fires are generally not aided significantly by the ember process as the small fuel particles are completely consumed before traveling significant distances. On the other hand, tree-dominated formations have significantly greater volumes of available fuel and a far greater quantity of larger-sized pieces. Fires can remain at these locations for days, often weeks, and sometimes months (on heavily wooded conifer sites). These fires burn with very high intensities (in the realm of 1,800°F) and can effectively advance through adjacent vegetation characterized by all fuel size types. Fires burning in these more heavily wooded types can also produce larger ignited fuel particles that can travel significant distances before being completely consumed, and if the still-burning particle lands in a location with available fuels, it can start another fire (referred to as a "spot" fire) well in advance of the original fire front.

Fires burn where fuels are available. Fires in grasslands burn at one level set by the height of the grass, while fires in brushlands can burn surface fuels and typically consume the stems and leafy crowns to the full height of the plants. Fires in tree formations have a much more complex pattern of movement based primarily on the continuity (or "connectedness") of the fuels. In these stands there are typically three distinct layers of fuels, arranged vertically, surface, stems and trunks, and the crown composed of branches, twigs, and leaves. The continuity of fuels is important to consider in both horizontal and vertical directions. If a fire enters a stand and is advancing only as a surface fire it will continue this manner of advance if there is high horizontal fuel connectivity. However, if there is also a high degree of vertical continuity (provided by fuels referred to as "ladder fuels") then a fire can move into the crown as well as involving the entire stand structure.

Flame lengths are generally determined by the volume of fuels burning, the amount of time to total consumption, and the height of the species comprising the formation. Grassland produces flame lengths typically ranging from one to three feet as they are composed of low volumes of fine materials that are consumed quickly. Flame lengths are at their maximum when the material is dry. Brush formations can produce flame lengths from 4 to 10 feet. Native oak-dominated hardwood formations can generate 20- to 40-foot flame lengths and stands of exotics, such as *Eucalyptus globulus* or *E. cinerea,* or dense conifer stands, over 100 feet. Flame length is important as it sets the distance over which radiant heating-related combustion can occur.

The temperature achieved in a wildfire is directly related to the amount of cellulosic material available for consumption. Grasslands have very low amounts and attain lower temperatures but woodland, characterized by large amounts of highly concentrated cellulosic material, can attain temperatures on the order of 1,800 degrees Fahrenheit.

Gaining control over a wildfire's behavioral character is the objective of response efforts. Grassland fires, burning in low fuel volume, rapid consumption, and at a single level are the easiest to bring under control. On the other end, fires that are burning in high fuel volumes, full spectrum size classes, and entire stand structure involvement, can require days, weeks, even months, to bring under complete control.

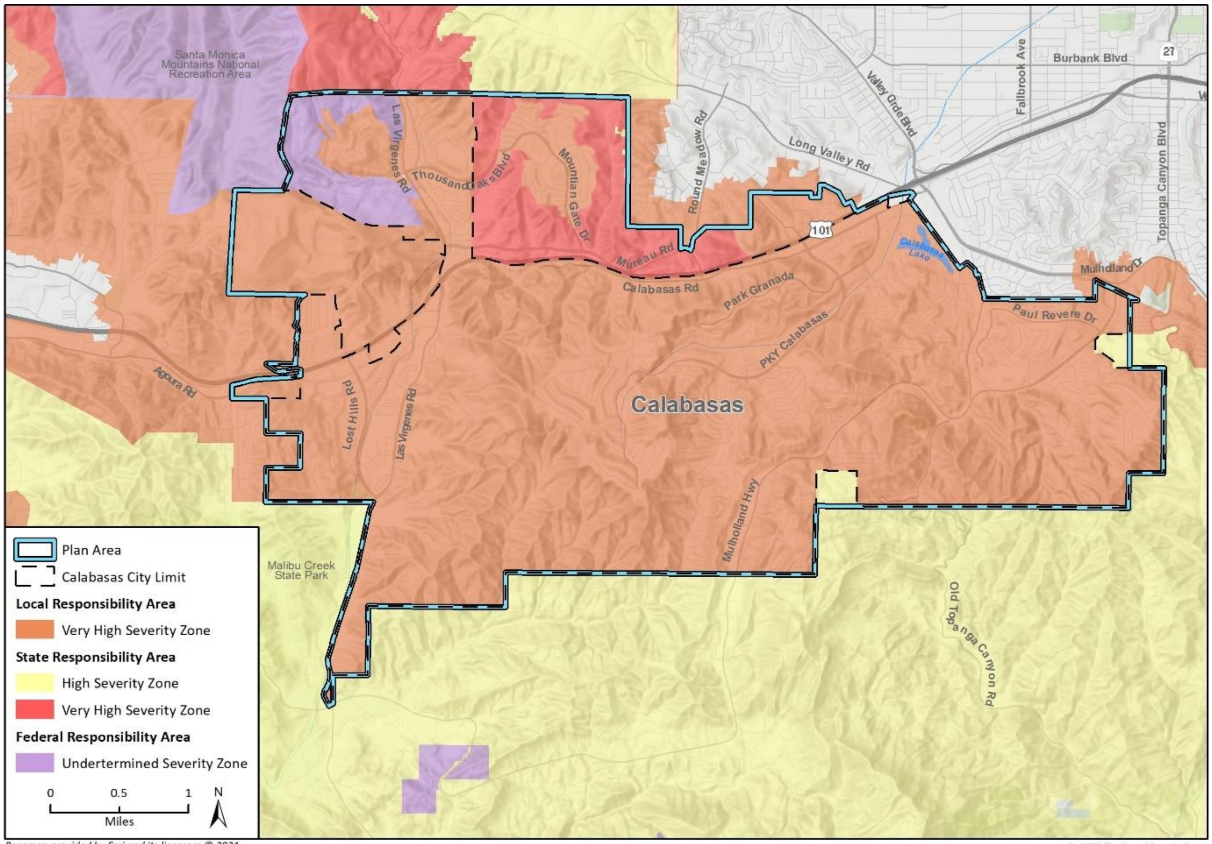
Wildfire Hazard Designations

In California, responsibility for wildfire prevention and suppression is shared by local (cities and counties), state, and federal agencies depending on jurisdiction. Federal agencies are responsible for federal lands in Federal Responsibility Areas (FRA). The State of California has determined that some non-federal lands in unincorporated areas with watershed value are of statewide interest and have classified those lands as State Responsibility Areas (SRA). CAL FIRE manages SRAs. All incorporated areas and unincorporated lands not in FRAs or SRAs are classified as Local Responsibility Areas (LRA).

While nearly all of California is subject to some degree of wildfire hazard, there are specific features that make certain areas more hazardous. CAL FIRE is required by law to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors (Public Resources Code 4201-4204, California Government Code 51175-89). As described above, the primary factors that increase an area's susceptibility to fire hazards include slope, vegetation type and condition, and atmospheric conditions. CAL FIRE maps fire hazards based on zones, referred to as Fire Hazard Severity Zones (FHSZ). There are three levels of severity: 1) Moderate FHSZs; 2) High FHSZs; and 3) Very High FHSZs. Only the Very High FHSZs are mapped for LRAs. Each of the zones influence how people construct buildings and protect property to reduce risk associated with wildland fires. However, none of the fire zones specifically prohibit development or construction. To reduce fire risk under State regulations, areas within Very High FHSZs must comply with specific building and vegetation management requirements intended to reduce property damage and loss of life in those areas. Figure 1 illustrates the entirety of Calabasas is designated as a Very High FHSZ (City of Calabasas 2015).

CAL FIRE's Fire and Resource Assessment Program (FRAP) has classified the surrounding areas of Calabasas as being a High and Very High FHSZ within an SRA, as well as Cheseboro and Palo Comado Canyon being within an FRA (CAL FIRE 2020).

Figure 1 Calabasas Fire Hazard Severity Zones



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Sources provided by City of Calabasas, 2018; CalFire 2020

Post-fire Slope Instability and Drainage Pattern

The topography of Calabasas contains multiple hillsides, significant ridgelines, as well as vertical slopes and steep canyons (City of Calabasas 2015). Landslides in these areas may result from heavy rain, erosion, removal of vegetation, seismic activity, wildfire, or combinations of these and other factors.

Wildfire can affect drainage and soil stability in two different ways:

1. Removal of the portions of vegetation which grow above ground which causes a loss of evapotranspiration capacity, and
2. Alteration of the nature of surface soils.

Without vegetation cover, water that enters the soil will not be removed via transpiration, resulting in increased potential for soil liquefaction and mass rotational movement (landslides). These landslides generally reach the drainage system which lead to flow blockages and deposition of sediments.

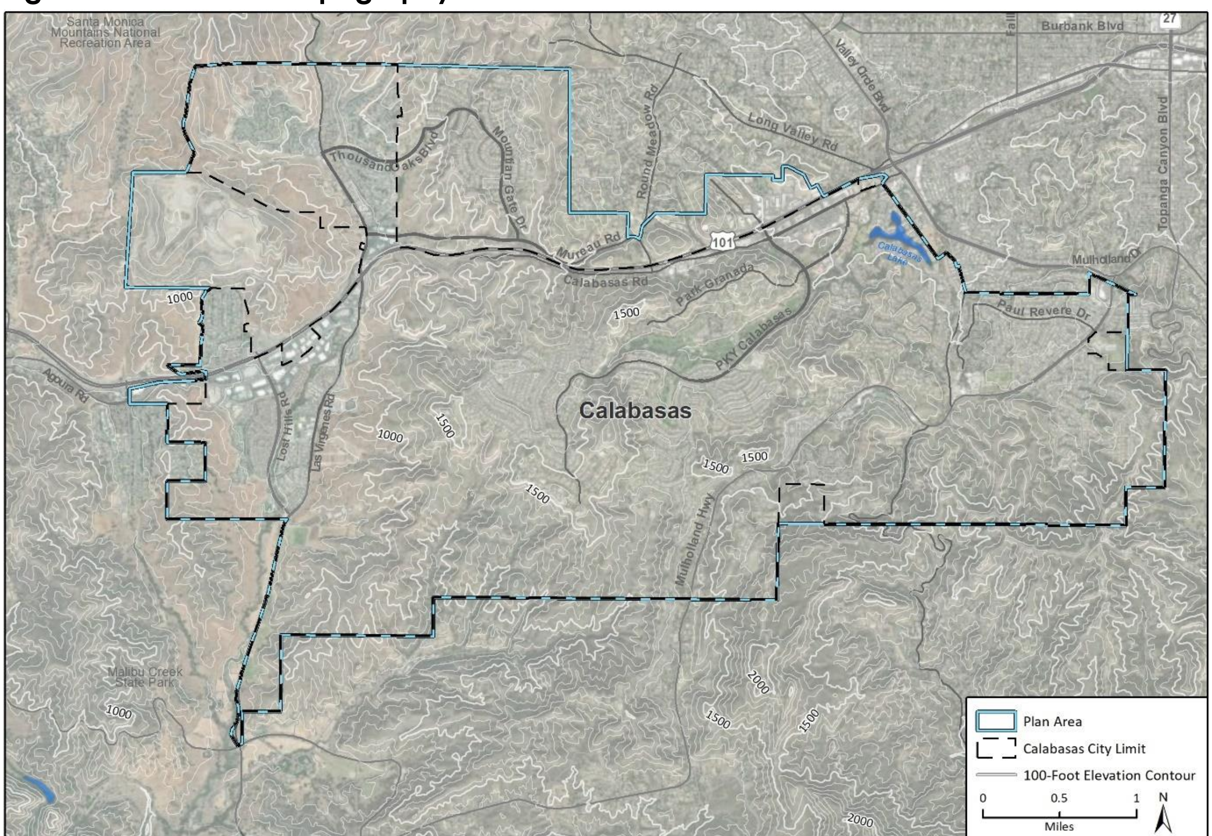
Depending on a wildfire’s heating intensity and residence time, the chemistry of the soil surface can be altered to significantly restrict permeability and infiltration into the lower portions of the profile. The result is increased surface runoff that can result in undesirable changes to a stream’s hydrograph and increased levels of sediment deposition.

Citywide Conditions

Hillside Slope and Aspect

Calabasas lies at the base of the northern facing slope of the Santa Monica Mountains. The City is located approximately five miles north of the east-west oriented primary ridge line of the mountain range as shown in the topography in Figure 2. The portions of the City located on the northern-facing slope of the Santa Monica Mountains are characterized by highly dissected branching drainage patterns with a wide range of slopes (0 -90 percent). Elevation changes within the City limits, on a north-to-south trend line, start at approximately 1,000 feet (AMSL) along U.S. 101 to 1,500 feet AMSL along the southern City limits. The soil resource across the City is comprised of five principal soils series: Balcom ,Gazos, Linne, Nipolomol, and Topanga. In terms of soil slippage rating the key factor is slope; Balcom silty clay loam, Linne-Los Ossos Association, and Xerorthents-Urban-Balcom, and Xerorthents-Urban-Gazos. Associations are rated as "high" when slopes exceed 30 percent. In addition, there are occurrences of fluvaquents (un-consolidated fluvial deposits) and Xerorthents (soils with a dominantly xeric moisture regime) in and around the city. The Xerorthents are generally located on low slope classes and have been, historically, the sites of urban development. The City is largely developed and aims to avoid building on hillsides and slopes to prevent wildfire and seismic related hazards (City of Calabasas 2015).

Figure 2 Calabasas Topography



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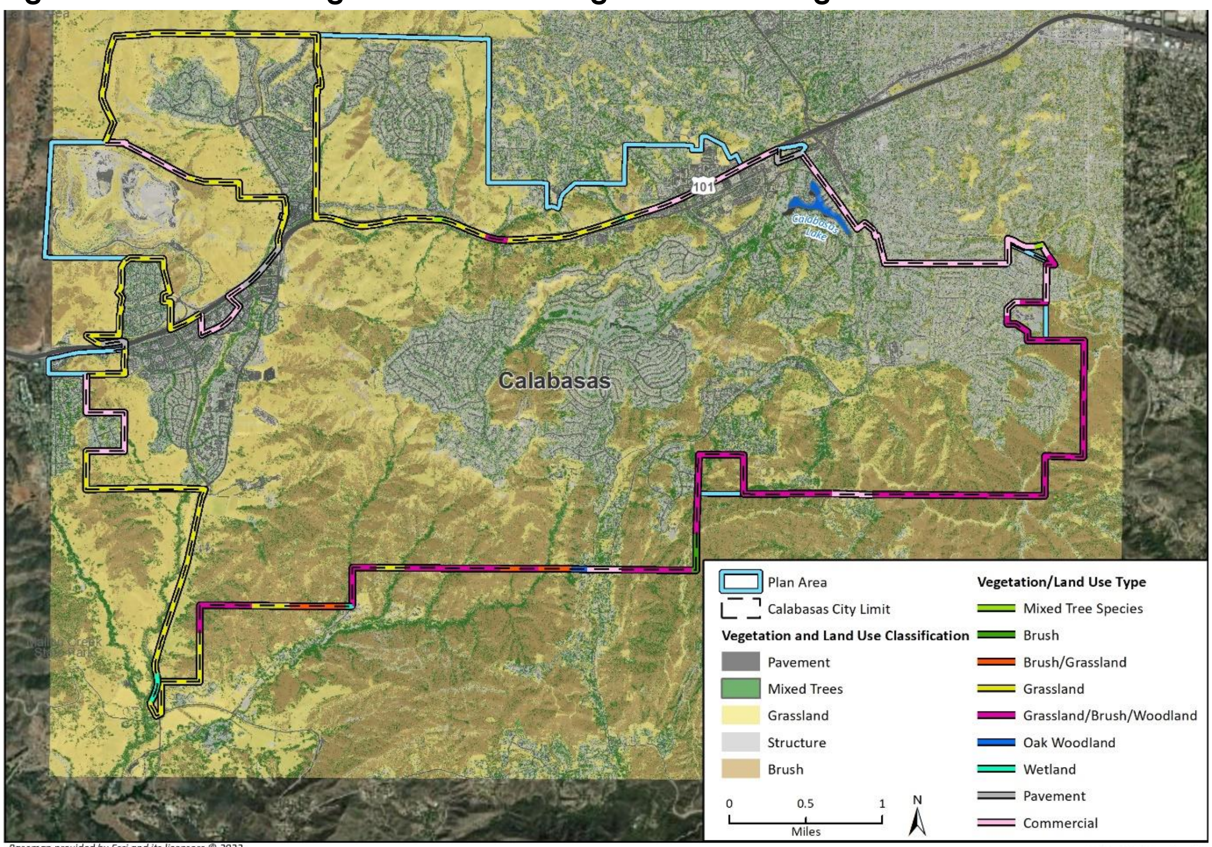
Additional sources provided by City of Calabasas 2018, 2021; USGS 2021.

Vegetation

The City of Calabasas includes predominantly developed areas such as commercial and residential buildings, roads, and parking lots, situated among rolling hills and thousands of acres of open space. Eleven different vegetation and existing land use categories are present surrounding the Plan Area and shown in Figure 3. The two highest land use categories that make up the Plan Area boundary include grassland (approximately 42 percent) and grassland/brush/oak woodland (approximately 27 percent). Each vegetation and existing land use category has different wildfire behaviors characterized by susceptibility to ignition; rates of fire-front advance across surfaces occupied by a particular land use; nature (surface, crown, full structure involvement); intensity; and residence time. A comparative wildfire risk index associated with each of the vegetation and land use category is provided in Table 1.

Figure 3 Calabasas Vegetation and Existing Land Use Categories



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Sources provided by City of Clabasas, 2021
Imagery classifed based ob NAIP, 2020

Table 1 Vegetation and Land Use Types – Risk Factor and Boundary Distances

Vegetation/Land Use Type	Risk Factor	Percent of Boundary Distance
Pavement	1	2%
Residential Development	1	11%
Commercial/Institutional	1	11%
Agriculture	1	1%
Grassland	2	42%
Brush/Grassland	3	2%
Wetland	3	1%
Brush	4	0.9%
Oak Woodlands	5	0.4%
Grassland/Brush/Oak Woodlands	5	27%
Mixed Tree Species	5	0.6%

Weather and Atmosphere

The Western Regional Climate Center maintains a weather monitoring station in Thousand Oaks, approximately 10.3 miles west of Calabasas. According to data collected at this weather station, most precipitation is received from November through March, with an average annual rainfall of approximately 16.5 inches (U.S. Climate Data 2021). May through September is the driest part of the year and coincides with what was traditionally considered the fire season in California. However, increasingly persistent drought and climatic changes in the state have resulted in drier winters. Fires during the autumn, winter, and spring months are becoming more common (Western Regional Climate Center 2021).

Wind Pattern

A significant influencer of wildfire behavior is wind; its direction of flow, speed, temperature, and degree of aridity. There are four weather stations that provide wind data for Calabasas. Table 2 presents data from the four stations and includes the primary wind source directions (PWD) and average wind speed (AWS). The data has been further broken out into two seasonal periods: March to October (which roughly corresponds to the fire season) and the wetter months between November and April.

The Plan Area is subject to Santa Ana winds, which are strong dry offshore winds that affect southern California in autumn and winter. They can range from hot to cold, depending on the prevailing temperatures in the source regions, the Great Basin, and upper Mojave Desert (Tufts University 2018). The winds are known for the hot dry weather (often the hottest of the year) that occur in the fall and are infamous for fanning regional wildfires. Wildfire smoke produced from combustion of natural biomass contains thousands of individual compounds, including particulate matter, carbon dioxide, water vapor, carbon monoxide, hydrocarbons and other organic chemicals, nitrogen oxides, and trace minerals that can be carried in the wind. As shown in Table 2, prevailing winds from west to east and east to northeast could push a potential wildfire and wildfire smoke through areas of low fuel volumes and to areas with substantial development.

Table 2 Wind Data

	Seasonal Period			
	March – October		November – April	
Station	PWD	AWS (mph)	PWD	AWS (mph)
Simi Valley	East/Northeast	5-10	East	7-10
Malibu Canyon	South	10-20	South	10-20
Calabasas-Stunt Ranch	West/Northwest	2-5	West/Northwest	1-5
Topanga Raws	South	7-15	North	7-10

PWD = wind source direction, AWS = average wind speed, mph = miles per hour

Emergency Response Facilities

Calabasas is served by three LACFD stations and the Los Angeles County Sherriff's Department (LACSD) Malibu/Los Hills Sheriff's Station, which provide immediate emergency assistance to the Plan Area. In addition, three more LACFD stations are within distance of the Plan Area to provide assistance during a wildfire event. Table 3 includes a list of emergency response facilities that serve the Plan Area, including their distance to the center of the City, and Figure 4 shows locations of the facilities.

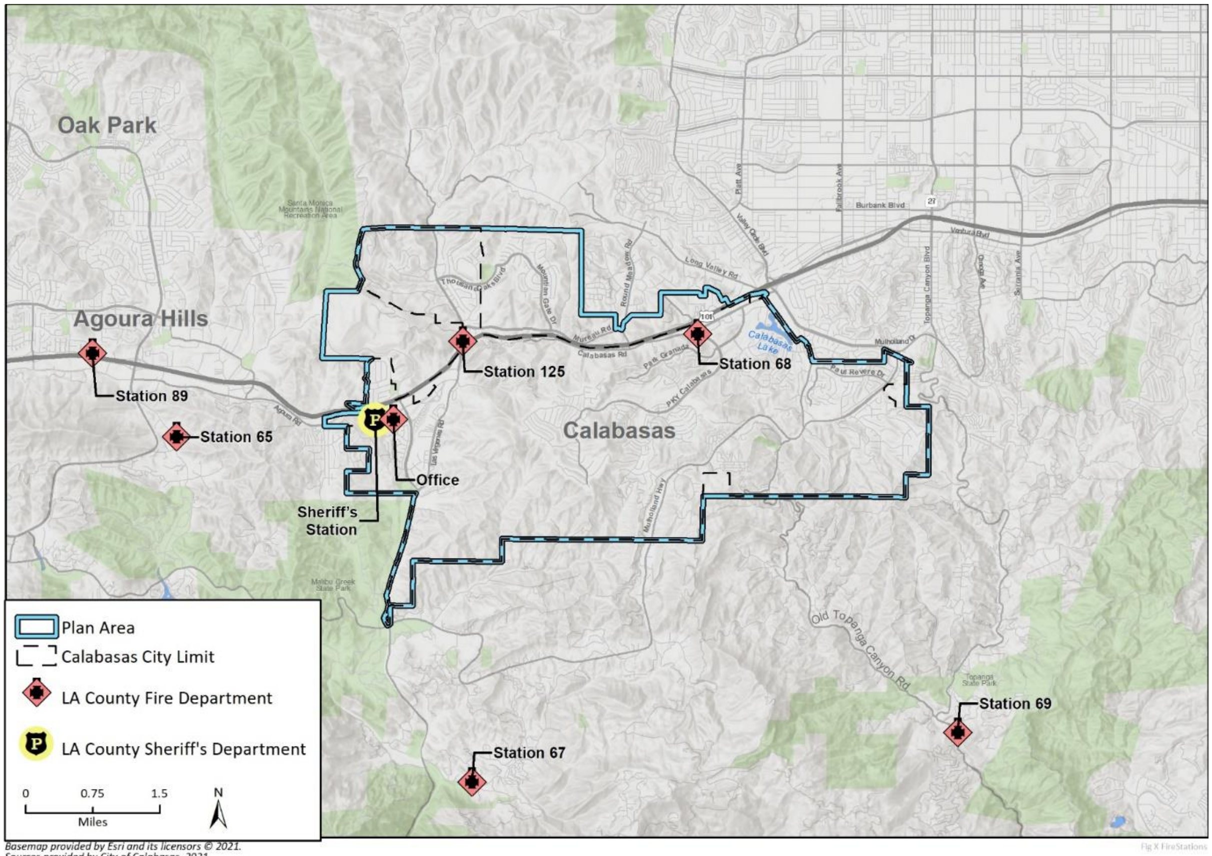
Table 3 Emergency Response Facilities Serving Calabasas

Station Number	Physical Address	Distance to Center of City (miles)	Roads Utilized
125	5215 Las Virgenes Road Calabasas	3.0	Las Virgenes Road; VFW; Mureau Road; Calabasas Road
68	24130 Calabasas Road, Calabasas	0.5	Calabasas Road
67	25801 Pluma Road, Calabasas	8.8	Pluma Rd; Las Virgenes Road, VFW, Mureau Road; Calabasas Road
89	29575 Canwood Street, Agoura Hills	7.7	Canwood Street; VFW, Las Virgenes Road; Mureau Road; Calabasas Road
69	401 S. Topanga Boulevard, Topanga	9.0	S. Topanga Canyon Boulevard; Mulholland Drive; Calabasas Road
65	4206 Cornell Road, Agoura Hills	8.1	Cornell Road; Kanan Road; VFW; Las Virgenes Road; Mureau Road; Calabasas Road
LACSD	27050 Agoura Road, Calabasas	4.2	Agoura Road; Las Virgenes Road; VFW; Mureau Road; Calabasas Road

VFW = Ventura Freeway

Source: TSS Consultants 2021, Appendix E

Figure 4 Emergency Response Facilites Serving Calabasas



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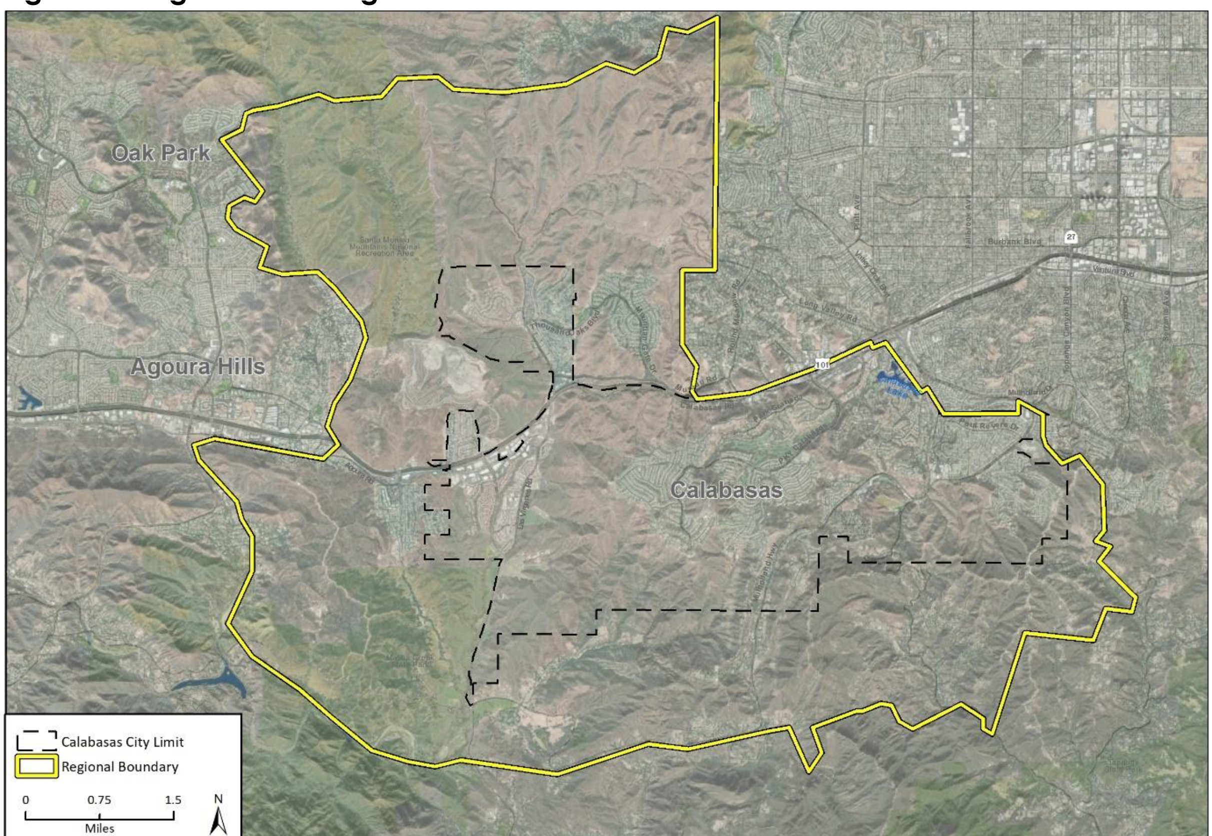
Sources provided by City of Calabasas, 2021

Wildfire Risk in the Regional Planning Area

A 18,577-acre Regional Planning Area, as shown in Figure 5, was analyzed to examine wildfire risk to Calabasas resulting from regional wildfire behavior conditions. The Regional Planning Area includes lands adjacent to approximately three quarters of the City limits. The northeastern quadrant surrounding the City was excluded from analysis because it has been fully developed as part of the City of Los Angeles. The examination was completed using satellite imagery and it was determined that the Regional Planning Area includes slopes ranging from 5 to 90 percent with an average slope of 25 percent. In addition to slope, wind speed and direction, and vegetation type contribute to wildfire risk in Calabasas. Wind direction for Calabasas is north, southwest, northeast, and southeast. Vegetation types surrounding the City susceptible to wildfire include: annual grasses and forbs, chapparal, scrublands, oak dominated woodlands, oak savannah, and mixed tree formations in drainages.

Figure 5 Regional Planning Area



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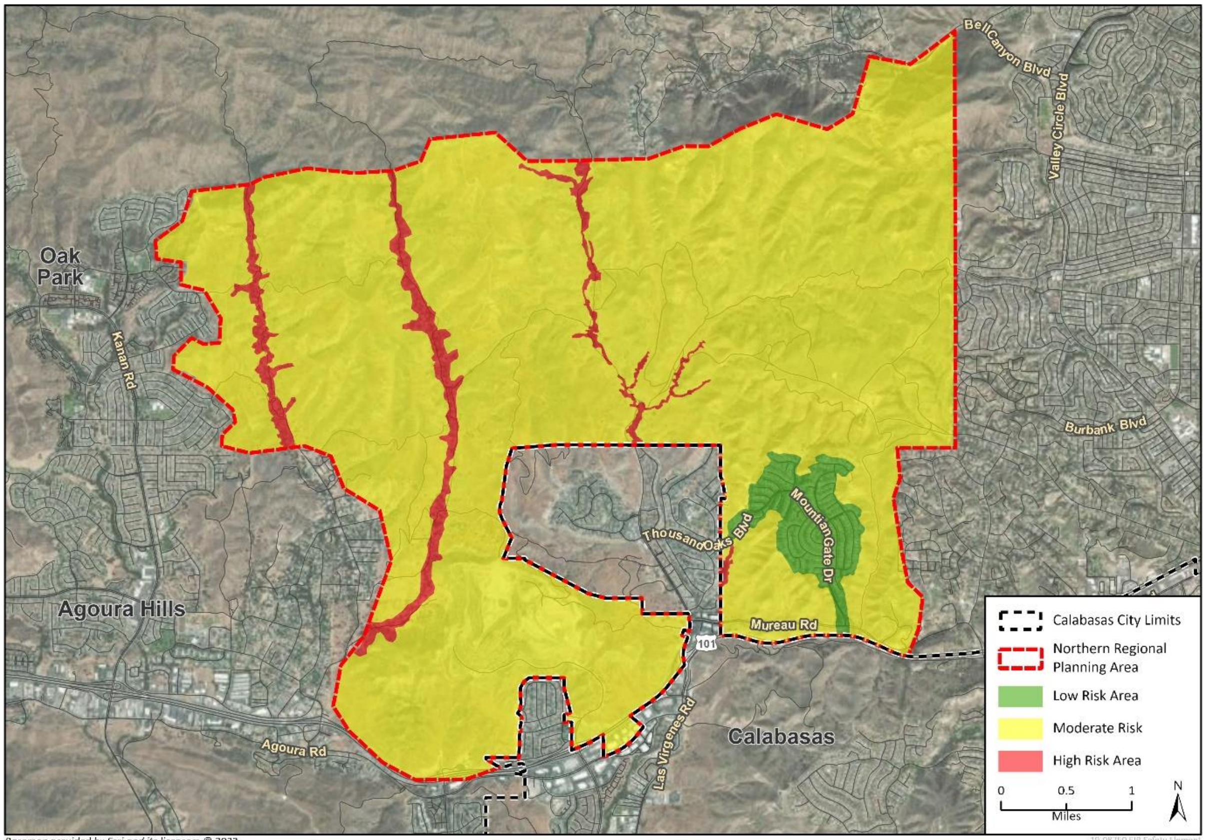
Based on this evaluation, the northern portion of the Regional Planning Area, located above the Ventura Freeway, has a low-to-moderate wildfire risk level with watercourses that have high risk levels. As shown in Figure 6 Northern Regional Plan Area Wildfire Risk, high risk areas are depicted in red, moderate risk areas are depicted in orange, and low risk areas are depicted in green.

Figure 6 Northern Regional Planning Area Wildfire Risk



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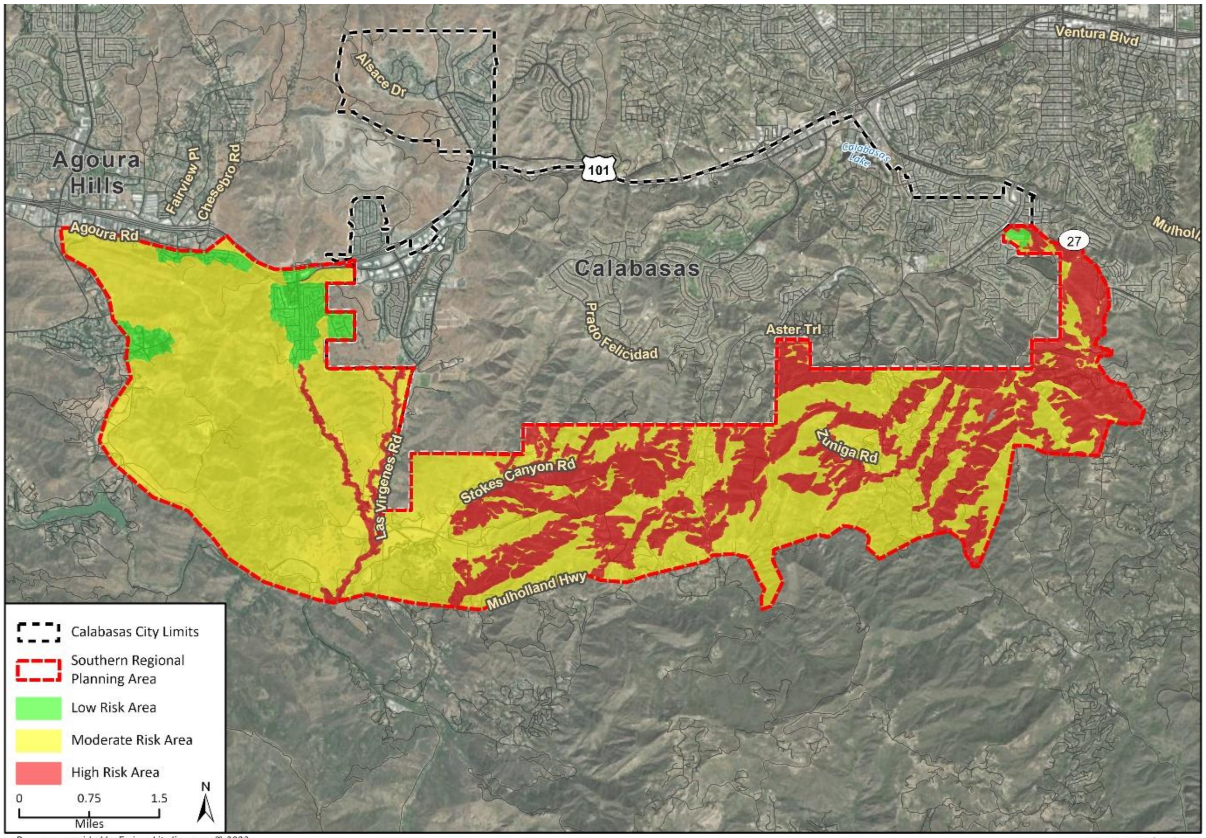
Sources provided by City of Calabasas, 2022; TSS Consultants, 2022

Located below the Ventura Freeway on its western end, and below the southern City limits boundary, the southern portion of the Regional Planning Area is characterized by areas of low, medium, and high wildfire risk levels. Figure 7 shows low risk areas with green shading, areas posing moderate risk levels in yellow shading, and high risk areas shaded in red.

Figure 7 Southern Regional Planning Area Wildfire Risk



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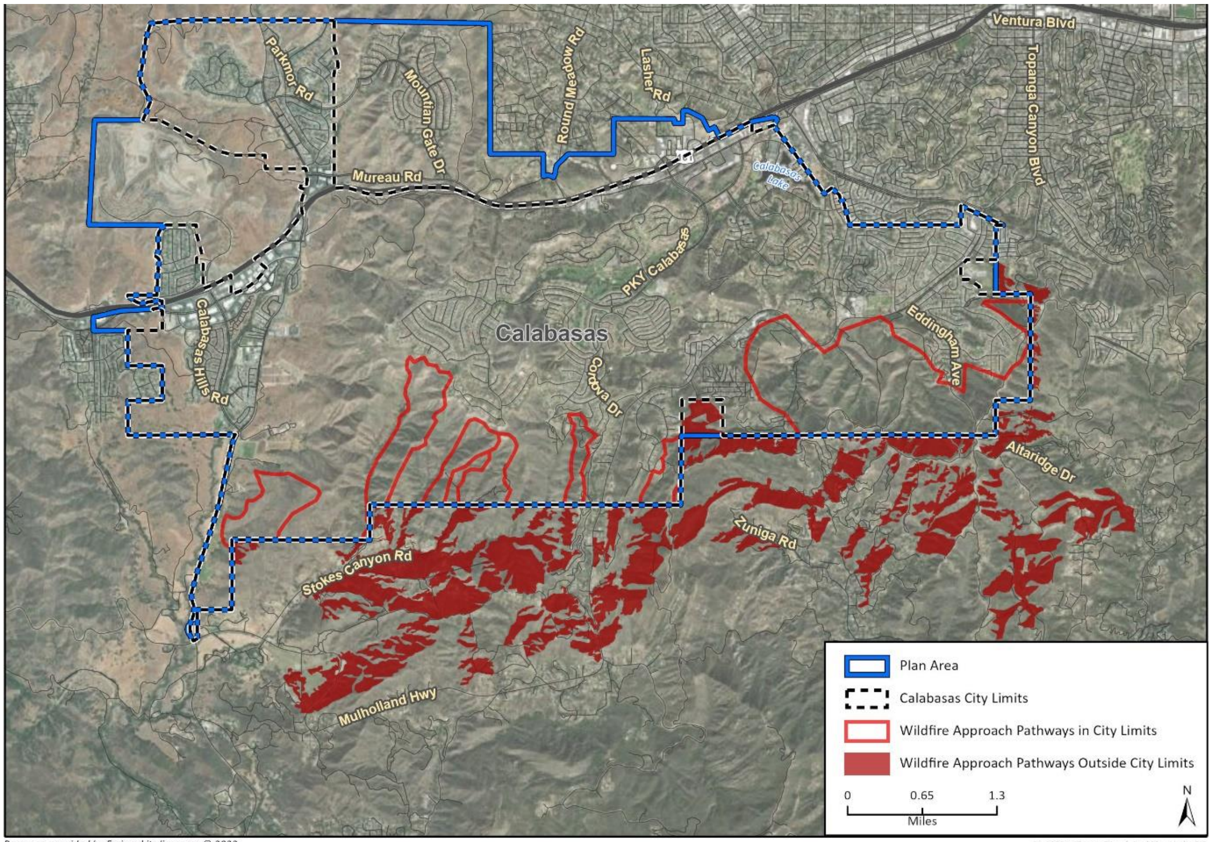
Sources provided by City of Calabasas, 2022; TSS Consultants, 2022

Additional analyses were conducted to identify potential pathways that wildfire could follow to reach the City boundary in the area to the south and southeast of the City. These areas were identified in consideration of the following aspects:

- These lands have a relatively high percentage of ground cover by vegetation types that once ignited could produce dangerous fire behavior.
- The predominant direction of prevailing winds during fire season is from the south.
- Fire history maps show a majority of the wildfires in recent history (except Woolsey fire) ignited to the south of the City and advanced north.

Vegetation types that could play a role as wildfire moves from the south toward the City were mapped. Vegetation units mapped were typically comprised of dense-to-moderately dense mixed oak stands and brush, with minor areas of grassland. Figure 8 shows the locations of dangerous vegetation types to the south and southeast of the City.

Figure 8 Dangerous Vegetation Types Located Adjacent to Calabasas



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Regional and Local Plans

Emergency Response and Evacuation Plans

Los Angeles County Operational Area Emergency Response Plan

The County of Los Angeles developed an Emergency Response Plan (ERP) to ensure the most effective allocation of resources for the maximum benefit and protection of the public in time of emergency. The ERP does not address day-to-day emergencies or the well-established and routine procedures used in coping with them. Instead, the operational concepts reflected in the ERP focus on potential large-scale disasters such as emergency situations associated with natural and man-made disasters and technological incidents that can generate unique situations requiring an unusual or extraordinary emergency response. The purpose of the ERP is to incorporate and coordinate all the facilities and personnel of County government, along with the jurisdictional resources of the cities and special districts within the County, into an efficient Operational Area organization capable of responding to any emergency using a Standard Emergency Management System, mutual aid, and other appropriate response procedures. The goal of the ERP is to take effective life safety measures and reduce property loss, provide for the rapid resumption of impacted businesses and community services, and provide accurate documentation and records required for cost-recovery (County of Los Angeles 2012).

County of Los Angeles Disaster Route Maps

Disaster routes in Los Angeles County are defined as freeway, highway or arterial routes pre-identified for use during times of crisis. These routes are utilized to bring in emergency personnel, equipment, and supplies to impacted areas in order to save lives, protect property and minimize impact to the environment. During a disaster, these routes have priority for clearing, repairing and restoration over all other roads. Disaster Routes are not evacuation routes. Although an emergency may warrant a road be used as both a disaster and evacuation route, they are completely different. An evacuation route is used to move the affected population out of an impacted area. Generally, Interstate and State highways are designated as Primary Disaster Routes and major arterials as Secondary Disaster Routes (Los Angeles County Department of Public Works 2008; 2021).

Malibu/Lost Hills Sherriff's Station Natural Disaster and Evacuation Plan

The Lost Hills Sherriff's Station Evacuation Plan describes the operational procedures, personnel responsibilities, and administrative instructions associated with a safe and successful evacuation of Calabasas and the surrounding mountainous area in the event of a disaster or wildfire hazard event. The Plan describes the roles of Sheriffs personnel and local and regional agencies, including the Los Angeles County Fire Department, in the evacuation process (Lost Hills Sherriff's Station, Undated).

School Disaster Preparedness Plans

Each school within the Las Virgenes Unified School District has developed a disaster preparedness plan which identifies the process to evacuate staff and students due to an emergency event, including a potential natural disaster such as a wildfire event. Protocols regarding transport, aid, supplies, communications, student release, and overall safety procedures are identified, including responsible personnel and operational procedures to ensure a safe and efficient evacuation process (Bay Laurel Elementary School 2021) (Calabasas High School Undated).

City of Calabasas Emergency Preparedness Guide

The City of Calabasas' Emergency Preparedness Guide serves as a handbook for resident's individual awareness, family preparedness, and self-sufficiency for potential catastrophes or emergencies. The guide covers how to develop a family plan for emergencies, what to pack in emergency kits, and basic first aid. To prevent fires and react to wildland fires the Emergency Preparedness Guide outlines fire hazard reduction requirements, brush clearance guidelines, a preparedness checklist for wildfire, and evacuation information. Sector maps include in the Emergency Preparedness Guide indicate first aid unit locations during an emergency (City of Calabasas 2019).

Hazard Mitigation Plans

County of Los Angeles All Hazard Mitigation Plan

The All Hazard Mitigation Plan (AHMP), updated in 2019, for the County of Los Angeles assesses risk posed by natural hazards and develops a mitigation action plan for reducing those risks. The AHMP provides an overview of the planning process, outlines public involvement in that planning, and incorporates existing plans. The AHMP identifies the community it impacts before identifying eight hazards, including wildfire, and their given risks. Those hazards and associated risks are addressed in the AHMP's mitigation strategy (County of Los Angeles 2019

Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2018

The Las Virgenes-Malibu Council of Governments (LVMCOG) developed the Multi-Jurisdictional Hazard Mitigation Plan to ensure a more thorough Hazard Mitigation Plan (HMP) among the cities of Westlake Village, Agoura Hills, Hidden Hills, Calabasas, and Malibu. The HMP provides a framework for pre-emptive planning of hazards by combining efforts, identifying common threats, and establishing regional mitigation strategies that allows for mutual participation and more effective use of resources. The LVMCOG aims to accomplish the HMP's main goal of protecting life, property, and environment through the following:

- Implementing activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to hazards;
- Reducing losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards; and
- Encouraging preventative measures for existing and new development in areas vulnerable to hazards (LVMCOG 2018).

The LHMP is updated on a five-year cycle to maintain eligibility for funding through FEMA. The next anticipated update to the LHMP is 2023 (Las Virgenes-Malibu Council of Governments 2018).

Wildfire Mitigation Plans

Los Angeles County Fire Department 2021 Strategic Fire Plan

The Los Angeles County Fire Department (LACFD) 2021 Strategic Fire Plan outlines goals and strategies to improve fire protection throughout Los Angeles. The Plan outlines pre-fire management strategies, tactics, and projects centering around fuel reduction and vegetation management. Notably, the Plan identifies a critical area adjacent to Calabasas for a possible fuel reduction project. The project would require collaboration between public agencies and private landowners to implement wildfire mitigation strategies near Las Virgenes Road and the 101 Freeway, where many wind-driven fires have jumped the freeway and continued towards the Pacific Ocean (County of Los Angeles 2021).

Santa Monica Mountains Community Wildfire Protection Plan

The Santa Monica Mountains Community Wildfire Protection Plan provides guidance to local fire safe councils, private landowners, land management agencies, and local emergency service providers on strategies to reduce wildfire risks and mitigate the impacts wildfire hazards have on communities, developments, and wildlands in the Santa Monica Mountains. The Plan focuses identifying and prioritizing wildfire mitigation and prevention efforts that reduce long-term threats of wildfire on the communities in the Santa Monica Mountains. The Plan describes opportunities for public engagement and community collaboration between neighborhoods, community partners, agencies, and service providers (County of Los Angeles & Ventura County 2013).

The Plan consolidates a collection of community recommended hazard mitigation projects within the planning area. The following objectives and project descriptions were specifically proposed for the City of Calabasas:

- Improve evacuation success
  - Develop a comprehensive plan for the evacuation of large animals during wildfire events
- Improve house-out defensible space
  - Initiate a community-wide fire hazardous tree removal program

Resilience Plans

Our Climate Crisis: A Guide for SoCal Communities in the Wildland Urban Interface

The Our Climate Crisis: A Guide for SoCal Communities in the Wildland Urban Interface is a climate vulnerability assessment and resilience plan developed by the Malibu Foundation. The Malibu Foundation engaged a project advisory committee of stakeholders from local agencies, representatives from NGOs and private organizations, local and regional agencies, and residents. The Report includes an assessment of local climate hazards of concerns, critical infrastructure vulnerabilities, and social vulnerabilities, and identifies emergency communications and climate resilience strategies. The Report specifically evaluates the Santa Monica Mountains wildland-urban interface cities of Malibu, Agoura Hills, Calabasas, Hidden Hills, Westlake Village, Topanga, the Pacific Palisades, Sunset Mesa, and adjacent unincorporated communities.

The Malibu Foundation evaluated and mapped the following assets and their vulnerabilities to climate hazards, including wildfire risk: community assets, emergency response resources, swimming pools, housing, building heat performance index, evacuation routes, and roadways and debris flows. The Report assessed vulnerabilities for the following populations, communities, and sites: older adults, day laborers/domestic workers/caregivers, mobile home communities, the business community, the unhoused community, and sacred Native American sites (The Malibu Foundation 2022).

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EXHIBIT D
(PART 2)

Emergency Evacuation Traffic Assessment

Prepared for:
City of Calabasas

May 2022

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FEHR PEERS

Table of Contents

Appendices

List of Figures

List of Tables

Introduction

This emergency evacuation traffic assessment evaluates traffic operations during various emergency evacuation scenarios for the City of Calabasas as part of the City's Safety Element Update, Circulation Element Update, and on-going emergency evacuation planning efforts. The assessment identifies key evacuation roadways, operational constraints, and policy recommendations for the Safety Element, Circulation Element, and local and regional coordination for emergency evacuation. The methodology and recommendations are consistent with the requirements outlined in Assembly Bill (AB) 747[1], AB 1409[2], and Senate Bill (SB) 99[3].

Limitations and Restrictions

This document is intended to provide an assessment of roadway capacity during various evacuation scenarios. Please note that emergency evacuation can occur due to any number of events. Additionally, any emergency movement is unpredictable because it has an element of individual behavior related to personal risk assessment for each hazard event as the associated evacuation instructions are provided. As such, this assessment is intended to provide the City with a broad understanding of the capacity of the transportation system during an evacuation scenario; it does not provide a guarantee that evacuations will follow modeling that is used for analysis purposes, nor does it guarantee that the findings are applicable to any or all situations.

Moreover, as emergency evacuation assessment is an emerging field, there is no established standard methodology. Fehr & Peers has adopted existing methodologies in transportation planning that, in our knowledge and experience, are the most appropriate. Nevertheless, such methodologies are necessarily limited by the tools and data available and the budgetary and time constraints in the scope of work, and by current knowledge and state of the practice.

While this assessment should help the City better prepare for hazard related events and associated evacuations, the City should take care in planning and implementing any potential evacuation scenario. Fehr & Peers cannot and does not guarantee the efficacy of any of the information used from this assessment as such would be beyond our professional duty and capability.

[1] CA Government Code Section 65302.15(a)
[2] CA Government Code Section 65302.15(a)
[3] CA Government Code Section 65302(g)(5)

Background

A variety of events can cause the need for evacuation. In the City of Calabasas, the most likely hazards requiring evacuation include:

- Earthquake
- Flooding
- Hazardous Material Spillage
- Landslide
- Wildfire

These hazards, and several other hazards not directly linked to emergency evacuation, are identified in the City's Safety Element and the Las Virgenes-Malibu Council of Governments (LVMCOG) Multi-Jurisdictional Hazard Mitigation Plan, of which the City is a participating jurisdiction.

Legislative Requirements

The State recently passed legislation that requires additional review of accessibility and evacuation routes when specific elements of the General Plan or other emergency planning documents, such as a Hazard Mitigation Plan, are completed or updated by a local agency. The three legislative requirements specific to emergency evacuation and the transportation system are described below:

- ***SB 99 (2019) –*** Requires review and update of the safety element to include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes. In essence, this legislation assists in identifying neighborhoods and households within a hazard area that have limited accessibility. This analysis was conducted separately as part of the Safety Element Update. The results are included in Attachment A of the report for reference.
- ***AB 747 (2019) –*** Requires that the safety element be reviewed and updated to identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios. This analysis is the focus of this report.
- ***AB 1409 (2021) –*** Requires that the safety element be reviewed and updated to identify evacuation locations under a range of emergency scenarios. Although this requirement was passed as the evacuation analysis was already in progress, evacuation locations were considered in the analysis.

Report Organization

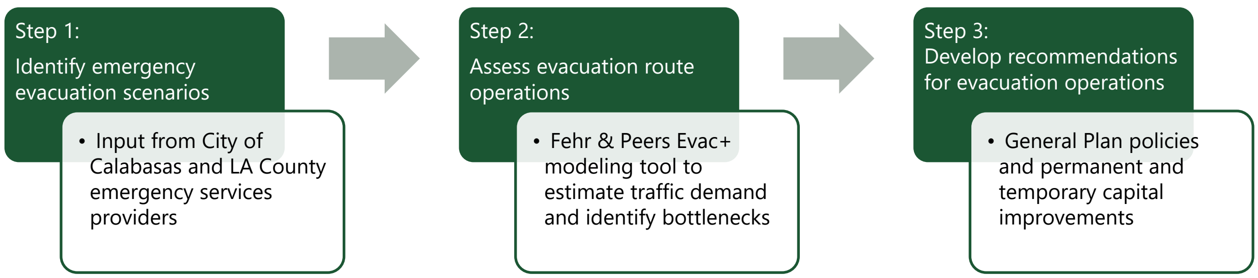
The remainder of this report is organized as follows:

- Approach and Methodology
- Scenario Development and Modeling
- Conclusions and Recommendations

Approach and Methodology

This analysis focused on evaluating evacuation operations during several emergency scenarios in accordance with AB 747 and AB 1409. The methodology outlined in Figure 1 was applied to analyze four emergency scenarios intended to reflect a range of potential evacuation events.

Figure 1 – Emergency Evacuation Analysis Process



Identify Emergency Evacuation Scenarios

There is a wide range of potential emergency scenarios with varying levels of complexity that could occur in Calabasas. Four evacuation scenarios were identified and analyzed to reflect a range of potential emergency scenarios. The scenarios were developed by referencing existing documents, such as the Safety Element and LVMCOG Local Hazard Mitigation Plan, recent events, such as the Woolsey Fire After Action Report, and input from City of Calabasas staff and LA County emergency services providers, such as the County Fire Department, Sheriff's Department, and Office of Emergency Management. All scenarios were analyzed with a horizon (future) year of 2030 to include the Calabasas 2021 – 2029 Housing Element update housing opportunity sites. The remaining evacuation area reflects growth forecasted in the Southern California Association of Governments (SCAG) travel demand model, which is described in further detail in the Emergency Evacuation Operations Analysis section below. Table 1 describes the four evacuation scenarios and Figures 2 – 5 illustrate the four evacuation scenarios analyzed as part of this assessment.

Table 1 – Emergency Evacuation Scenarios

Evacuation Criteria	Scenario			
	Scenario 1: Regional Fire Evacuation	**Scenario 2: Calabasas Citywide Fire Evacuation (Night-time)**	**Scenario 3: Local Evacuation along Las Virgenes Road due to Earthquake with Liquefaction**	**Scenario 4: Calabasas Citywide Fire Evacuation (Morning Commute Period)**
Description	Large regional fire, such as the Woolsey Fire, requiring a regional evacuation.	Wildfire requiring local evacuation with heavy smoke limiting visibility.	Earthquake causes liquefaction* along Las Virgenes Road, and the intersection of Las Virgenes Road & Agoura Road is closed. A sub-set of Malibu residents evacuate north on Malibu Canyon Road to Las Virgenes Road due to a tsunami hazard.	Wildfire requiring local evacuation.
Area	Woolsey Fire footprint, including Calabasas, Agoura Hills, Thousand Oaks, and Malibu	Calabasas	Neighborhoods along Las Virgenes Road and Malibu Canyon Road in Calabasas and Malibu.	Calabasas
Time	1:00 AM – 3:00 AM	1:00 AM – 3:00 AM	1:00 AM – 3:00 AM	7:00 AM – 9:00 AM
Population	122,000	31,000	13,000	31,000
Households	43,000	11,000	4,000	11,000
Vehicles	79,000	22,000	8,000	22,000
Routes	Area north of Mulholland Highway evacuates along US-101, which has 50% capacity to reflect limited visibility due to darkness and smoke. Area south of Mulholland Highway (e.g. Malibu) evacuated along Pacific Coast Highway	All vehicles travel east on US-101 South due to smoke restricting ability to travel west on US-101 North. US-101 has 50% capacity to reflect limited visibility due to darkness and smoke.	Agoura Road & Las Virgenes Road intersection closed due to landslide. Vehicles use Lost Hills Road to evacuate along US-101, which has 50% capacity to reflect limited visibility due to darkness.	Vehicles can travel east or west on US-101. US-101 has full capacity in order to isolate effects of peak period commute travel.
Distribution	40% westbound, 60% eastbound	100% eastbound	30% westbound, 70% eastbound	40% westbound, 60% eastbound

*Liquefaction occurs when soil grains in loose, saturated silty, sandy, or gravel soils attempt to rearrange themselves in a denser configuration when subjected to strong earthquake ground motions. Liquefaction can result in landslides and/or damaged utilities and structures supported by shallow or deep foundations.

Figure 2 – Scenario 1: Regional Fire Evacuation

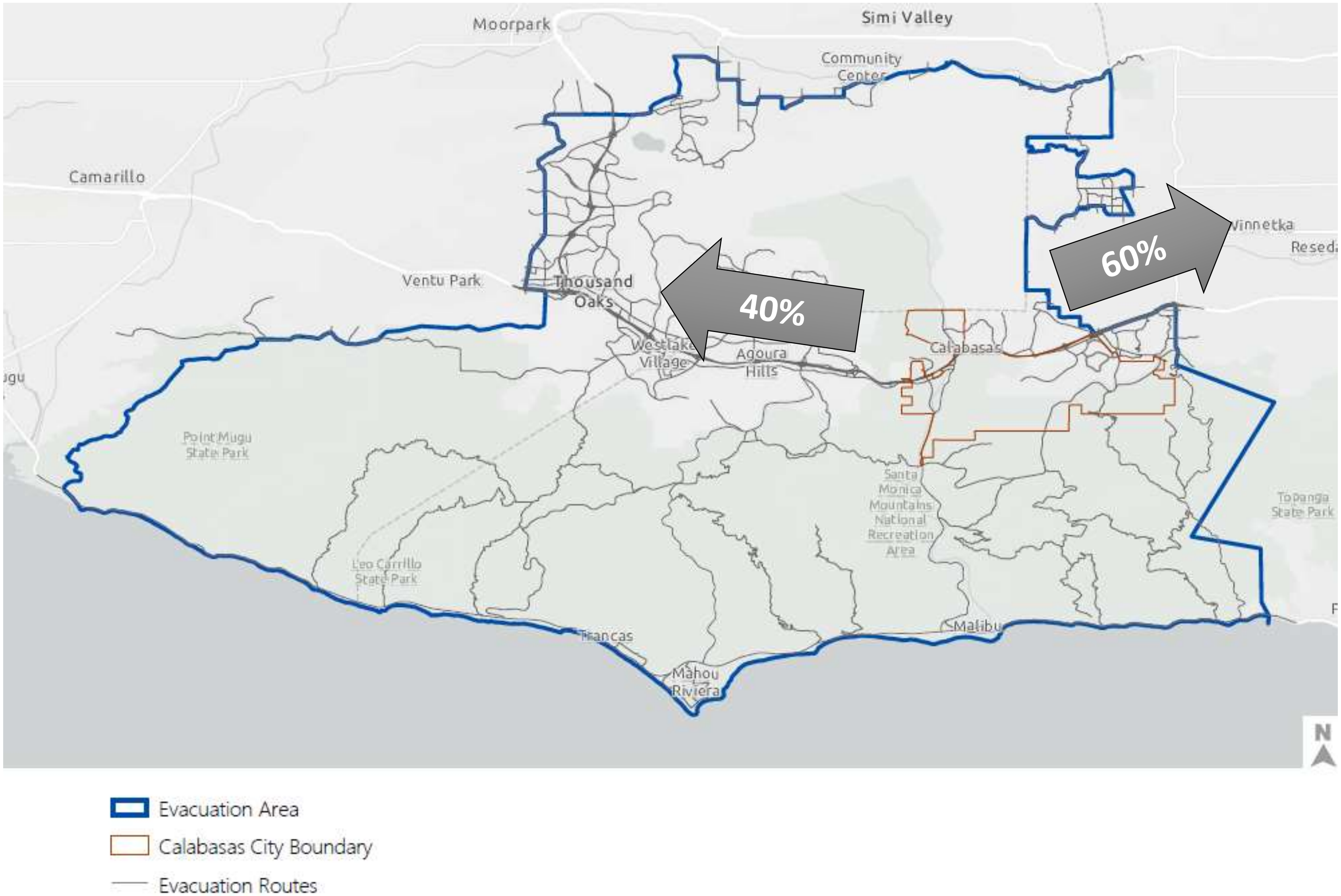


Figure 3 – Scenario 2: Calabasas Citywide Fire Evacuation with US-101 North Closed (Night-time)

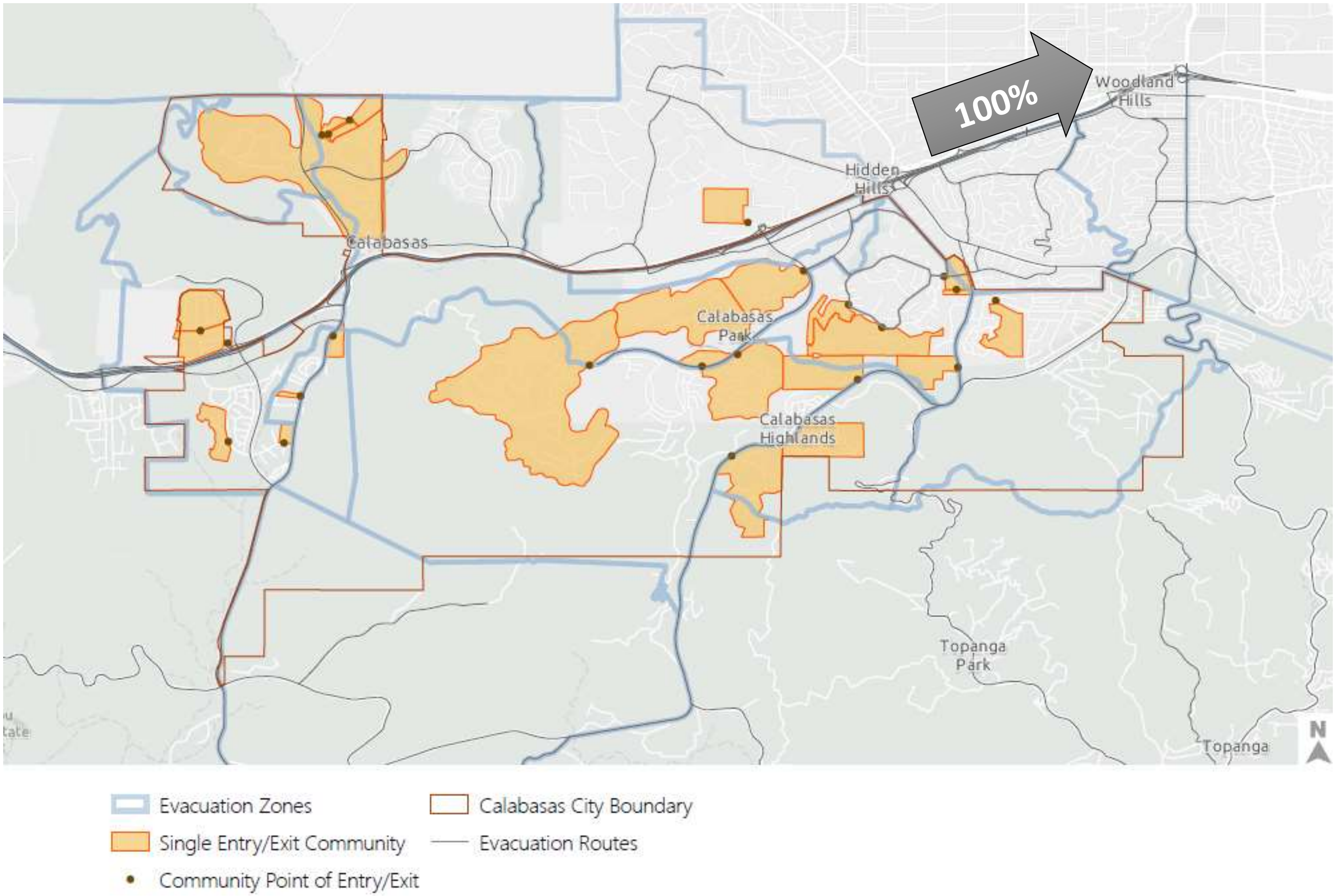


Figure 4 – Scenario 3: Local Evacuation along Las Virgenes Road due to Earthquake with Liquefaction

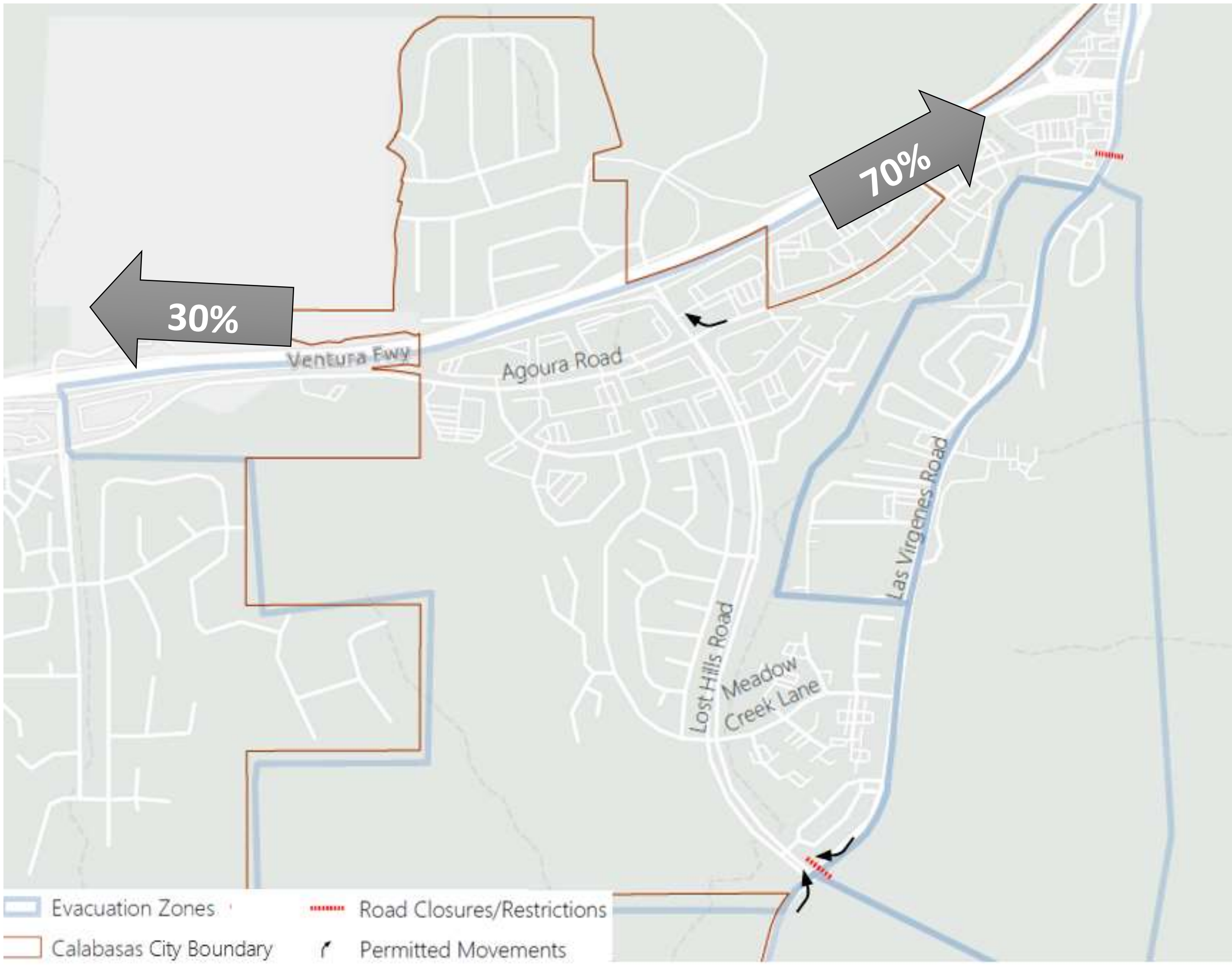
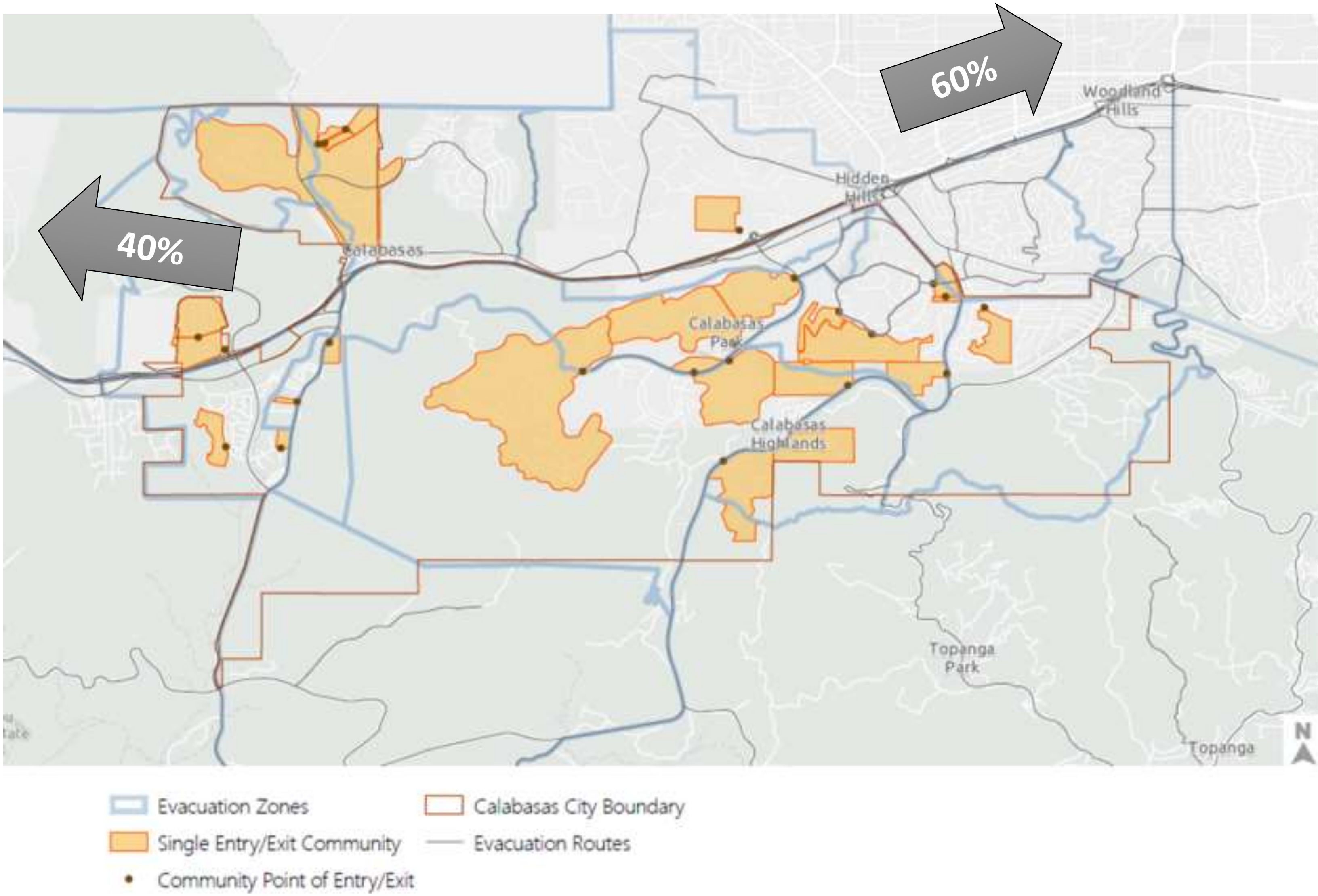


Figure 5 – Scenario 4: Calabasas Citywide Fire Evacuation (Morning Commute Period)



Identify Emergency Evacuation Routes

Since the City of Calabasas is located in the foothills of the Santa Monica Mountains, the city is bound by topography with a limited number of evacuation routes to the US-101 freeway. The City of Calabasas provides an evacuation route map with key evacuation routes as part of their Public Safety & Emergency Preparedness information (see Attachment B for the City's Evacuation Route Map):

- Las Virgenes Road
- Mulholland Drive/Valley Circle Boulevard
- Topanga Canyon Boulevard
- US-101

The Calabasas Circulation Element identifies seven intersections and roadway corridors that are critical to overall vehicle movement in Calabasas:

- Old Topanga Canyon Road/Mulholland Highway
- Calabasas Road/Parkway Calabasas
- Lost Hills Road
- Las Virgenes Road
- Agoura Road
- Thousand Oaks Boulevard
- Mureau Road

These roadway corridors were the focus of the evacuation analysis as critical roadways to access the US-101 and evacuate the City and adjacent areas.

Emergency Evacuation Operations Analysis

The emergency evacuation operations analysis was conducted using the Fehr & Peers Evac+ tool, which is a modeling workflow that extracts the study area from the SCAG travel demand model to estimate vehicle demand and levels of congestion on 15-minute intervals during an evacuation window. The Evac+ workflow can be broken down into three steps:

1. Prepare the sub-area network representing the study area and the associated background trip tables.
2. Estimate evacuation trips during the evacuation event.
3. Dynamically assign trips, based on congestion, to the sub-area network in 15-minute intervals.

The following sections discuss each of these steps.

EVAC+ Step 1: Sub-Area Network and Trip Tables

Supply and demand are two major aspects of any travel demand modeling exercise. In a travel demand model, the demand is usually derived from people having to perform some activity, for example going to work or evacuating during a wildfire. The resulting travel demand can be estimated from socioeconomic data of the individuals whose travel constitutes such demand. Supply is based on roadway capacity and travel speeds that determine how many vehicles can go through a certain section of the roadway per unit of time. The total travel taking place during an evacuation period is estimated as the sum of background travel, the kind that will happen irrespective of an evacuation, and evacuee vehicles that will enter the roads because there has been an evacuation order creating the need to travel. To obtain anticipated background travel for the analysis year (2030), the SCAG model was run with the Calabasas Housing Element Update opportunity sites. Since the entire SCAG area is too large to work with for the purposes of this analysis, a subset of the SCAG model area that covers the Woolsey Fire footprint, which is the largest geography covered in the evacuation scenarios, was extracted to analyze evacuation operations. The sub-area spans from the northern end of State Route 23 to the north, the western border of Thousand Oaks to the west, Pacific Coast Highway to the south, and Topanga Canyon Boulevard to the east.

The sub-area extraction includes roadways, trip tables, and transportation analysis zones (TAZs). The trip tables contain all the vehicular trips by trip purpose (e.g. work) between each of the TAZs and external gateways, which are primarily freeways and large arterials at the edge of the sub-area network that serve as a proxy for trips that start in and depart the sub-area. A conventional travel demand model looks at trip patterns aggregated in time periods. The SCAG model includes the following time periods: AM peak hour (AM: 6 AM to 9 AM), Midday (MD: 9 AM to 3 PM), PM peak hour (PM: 3 PM to 7 PM), Evening (EVE: 7 PM – 9 PM), and Night (NT: 9 PM to 6 AM). These standard time periods are too large to assess travel patterns and roadway operations during an evacuation with a large number of trips entering the roadway network at once. Therefore, the trip tables were disaggregated into 15-minute time periods to allow traffic assignment in 15-minute intervals.

EVAC+ Step 2: Estimate Evacuation Trips

Vehicle Travel Demand

TAZs were used to represent neighborhoods and estimate evacuation travel demand with the number of trips per household. Each TAZ includes socioeconomic information based on census data, such as population, household size, number of employees, auto-ownership, and other factors that could affect the number of vehicles per household used during an evacuation. Since the SCAG model does not provide granular information regarding driver's license holders in a household, an Auto Utilization Factor was calculated based on the household size and number of vehicles ownership that is reflected in the socioeconomic data within the SCAG dataset (which is derived from household census data). It was assumed that some households with more than two vehicles would not be able to utilize all vehicles during an evacuation event (e.g., homes with three or four vehicles but only two licensed drivers).

Due to the nature of the SCAG model, travel by public transit, other shared modes (i.e., vanpool), or walking/biking were not considered in the operations analysis. This estimate also assumes that the zero vehicle households would require outside assistance. Evacuation needs for people without access to a vehicle were incorporated as part of the recommendations.

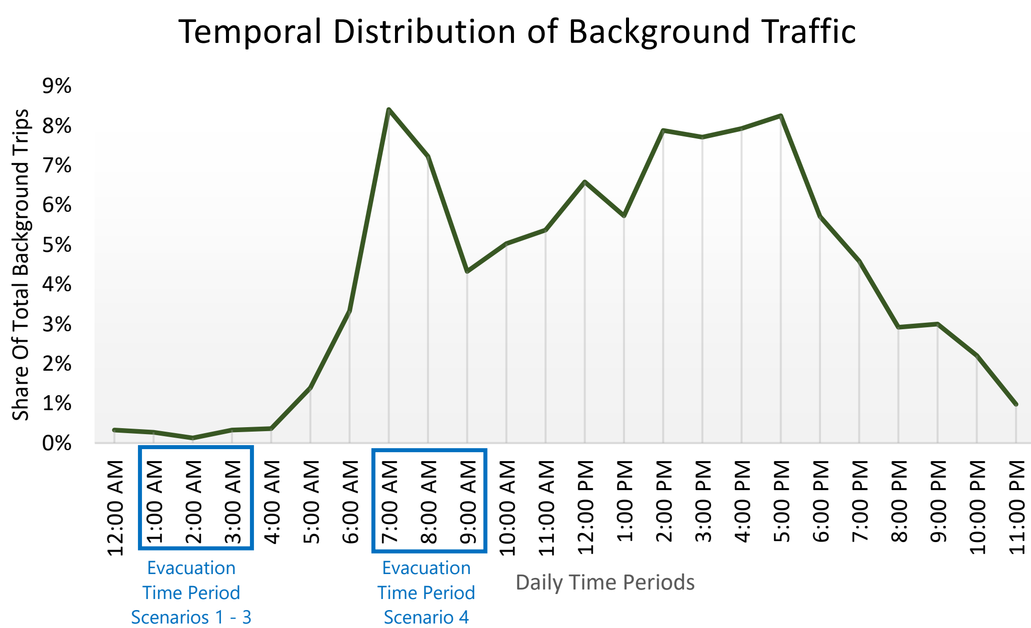
Evacuation Traffic

The SCAG model is a 24-hour model with travel behavior changing depending on the time of day. When an evacuation order is issued, the starting point for evacuees is based on the estimated travel for typical daily activity. For example, an evacuation event during the middle of the night would create an evacuation trip for most that would begin at their residence and end at an evacuation destination either within or external to Calabasas. Conversely, an event that occurs during the middle of the day (when children are in school) could add trips (a trip home to pick up pets or belongings, a trip to pick up children at school or a school evacuation site, and then a trip to the ultimate evacuation destination). This analysis assumed residents were evacuating directly from their home without making any return trips.

Background Traffic

Background traffic is associated with trips traveling to or from evacuation zones and is taken directly from the travel model for a typical day, then distributed over each hour of the day. Trips that do not end in evacuation zones go about their normal activity regardless of if the evacuation order has been given. Trips that would have traveled to the evacuation zone after the evacuation order is given do not travel and stay in the original zone. This assessment assumed an evacuation event during the middle of the night (1:00 – 3:00 AM) for Scenarios 1 - 3 to replicate the Woolsey Fire and minimize the number of variables between the three scenarios. Scenario 4, Calabasas Citywide Fire Evacuation, assumed an evacuation event during the morning commute period (7:00 – 9:00 AM) to maximize the population evacuating from residential neighborhoods and to also capture commute background traffic on the area roadways associated with typical commute travel patterns including heavy travel demand on US-101. Figure 6 illustrates the temporal distribution of background traffic for the evacuation scenarios.

Figure 6 – Temporal Distribution of Background Traffic in the SCAG Model



Evacuation Departure Time

The departure time leaving the evacuation zones varies by the time and type of the event. For events where ample notice is given or a household/family unit is already together, less time is needed to prepare for the evacuation. On the other hand, where little notice of an event or when the household/family unit is not together, the time required to prepare for an evacuation is typically longer as residents may need to pack belongings, collect their animals, and conduct other coordination before beginning their evacuation trip.

Evacuation Time Window

The evacuation time window is the time between when the evacuation starts and how many hours the evacuation zones will require to be fully evacuated, based upon the evacuation order. This assessment assumed that residents were evacuating within a two-hour evacuation window with the majority of trips evacuating in the second hour of the evacuation period as shown in Table 2. Although this is the assumed distribution for the EVAC+ model, emergency scenarios are often unpredictable, and driver behavior can be disorderly. Additionally, evacuation events are not linear (e.g., even distribution during the evacuation time period), and it is anticipated that evacuees would vacate at a rate that more closely resembles a bell curve from the time that the evacuation order is issued (as shown in Figure 7 and Table 2). This is consistent with other research on short-notice evacuation events as documented in the Approach to Modeling Demand and Supply for a Short-Notice Evacuation (Noh, Chiu, Zheng, Hickman, and Mirchandani, Transportation Research Record No. 2091) and the Florida Statewide Hurricane Evacuation Model / TIME (Roberto Miguel, AICP, December 9, 2015) presentation (although that distribution was for a much longer evacuation time window due to advanced warnings of hurricanes).

The capacity assessment of the network also changes the time needed for an evacuation. For example, scenarios where a 2-hour time window is assumed for evacuation (generally representing the time from evacuation order to the time most people begin their trip to leave the area), the total time needed for complete evacuation can be longer due to congestion and total distance traveled through and out of the area.

Figure 7 – Temporal Distribution of Evacuation Trips

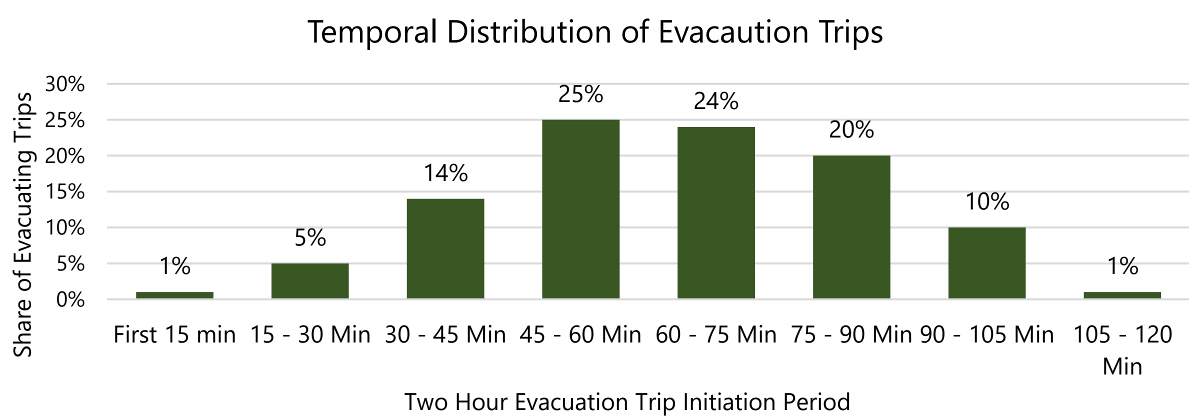


Table 2 – Temporal Distribution of Evacuation Trip Initiation for Evacuation Scenarios

Evacuation Analysis Period		Share of Evacuation Trips
Scenario 1 – 3	Scenario 4	
1:00 AM – 1:14 AM	7:00 AM – 7:14 AM	1%
1:15 AM – 1:29 AM	7:15 AM – 7:29 AM	5%
1:30 AM – 1:44 AM	7:30 AM – 7:44 AM	14%
1:45 AM – 1:59 AM	7:45 AM – 7:59 AM	25%
2:00 AM – 2:14 AM	8:00 AM – 8:14 AM	24%
2:15 AM – 2:29 AM	8:15 AM – 8:29 AM	20%
2:30 AM – 2:44 AM	8:30 AM – 8:44 AM	10%
2:45 AM – 2:59 AM	8:45 AM – 8:59 AM	1%

Evacuation Destination

Trips departing evacuation zones are allocated to shelters (i.e., hotels or large gathering spaces) or model gateways representing the destinations outside of the model area. The capacity of each shelter within the model area and the shelter opportunities represented at the gateways are used to determine the destinations of evacuation trips. An iterative process is used to assign evacuation trips to shelters without resulting in the shelters being overcapacity. If overcapacity, the additional trips are assigned to shelters outside of the model areas represented by the gateways. Table 3 describes the evacuation destination distribution for Calabasas under each scenario.

Table 3 – Calabasas Evacuation Destinations

Evacuation Destination	Scenario 1: Regional Fire Evacuation	Scenario 2: Calabasas Citywide Fire Evacuation (Night)	Scenario 3: Local Evacuation along Las Virgenes Road due to Earthquake with Liquefaction	Scenario 4: Calabasas Citywide Fire Evacuation (AM)
Hotels (Internal to study area)	0% Destination hotels are external to study area.	0% Destination hotels are external to study area.	5% Hotels in Calabasas and Agoura Hills	0% Destination hotels are external to study area.
Shelters & Stadiums (internal to study area)	0% Destination shelters and stadiums are external to study area	0% Destination shelters and stadiums are external to study area	25% Calabasas: AC Stelle Middle School, Calabasas High School, and Civic Center Agoura Hills: Agoura High School and residential neighborhoods near Agoura High School as a proxy for evacuating to local family/friends	0% Destination shelters and stadiums are external to study area
East Gateway	60%	100%	40%	60%
West/North Gateway	40%	0%	30%	40%
South Gateway	0%	0%	0%	0%

EVAC+ Step 3: Dynamic Trip Assignment

Trips were assigned using the EVAC+ tool. The EVAC+ tool relies on the Transportation Analysis Zones (TAZs) and existing roadway network extracted from the Southern California Association of Governments (SCAG) travel demand model. Where needed, additional roadway details were added to the network model to better reflect the possible routes people would take to evacuate. The tool references trip tables for areas outside of the study area to form the "background" traffic estimates on the roadways not affected during an evacuation event. Areas affected by the evacuation event are then processed through the EVAC+ tool trip estimator to forecast the number and sequencing of trips that occur due to the event.

The sub-area extracted network and new trip tables are then input into a Dynamic Traffic Assignment (DTA) model. A DTA model estimates traffic and levels of congestion on 15-minute intervals and, as linkcongestion builds (roads fill with cars), it dynamically reassigns traffic to less congested routes. This process helps identify congested locations on the network that should be considered during an evacuation event.

Emergency Evacuation Assessment

The EVAC+ tool, as described in the Approach and Methodology section, was used to estimate traffic conditions and operations during each of the four evacuation scenarios. The results of each scenario are described in the following sections.

Scenario 1: Regional Fire Evacuation

Scenario 1 was modeled after the Woolsey Fire, which was documented in the *County of Los Angeles After Action Review of the Woolsey Fire Incident*[4]. The After Action Report notes that the City of Calabasas received a voluntary evacuation on November 8, 2018 at 3:30 PM followed by a mandatory evacuation notice on November 9, 2018 at 1:35 AM. This analysis scenario defined an evacuation window of 1:00 – 3:00 AM to simulate the study area evacuating on short notice.

Evacuation distribution was estimated using StreetLight data, which is a data platform that provides origin-destination patterns, traffic count estimates, and other mobility metrics using data from location-based services, such as mobile devices and GPS units. A StreetLight data origin-destination analysis was conducted for the Woolsey evacuation period (November 9, 2018 from 1 to 4 AM). The origin-destination analysis assessed the number of trips originating from Calabasas TAZs and traveling to TAZs in the SCAG region. The destination TAZs were aggregated to calculate an approximate distribution of 40% of trips traveling westbound on the US-101 North and 60% of trips traveling eastbound on the US-101 South.

Figure 9 illustrates the results for Scenario 1. As illustrated by the changing thickness (volumes) of the roadway segments, the evacuation activity follows the bell curve of the two-hour evacuation period with 45 percent of evacuees departing in the first hour and 55 percent of evacuees departing in the second hour. This scenario also demonstrates the sensitivity of the US-101 freeway as the main exit route for Calabasas and the surrounding region. Agoura Road, Mureau Road, and Calabasas Road are roadways within Calabasas that are parallel to the US-101 and may be seen as an alternative route to bypass traffic and congestion on the freeway.

Scenario 2: Calabasas Citywide Fire Evacuation (Night-time)

Scenario 2 modeled a citywide evacuation due to a localized fire with evacuation traffic limited to traveling eastbound on the US-101 south to the Los Angeles area due to hazardous conditions on the US-101 North (locally westbound). Figure 10 illustrates the results for Scenario 2. Similar to Scenario 1, Scenario 2 illustrates the importance of US-101 and parallel routes to facilitate evacuation out of the city. Given that the number of evacuating vehicles is lower than Scenario 1, the demand on US-101 builds up slower and dissipates faster in this scenario.

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[4] County of Los Angeles, *After Action Review of the Woolsey Fire Incident*, November 17, 2019.

Scenario 3: Localized Evacuation along Las Virgenes Road due to Earthquake with Liquefaction

Scenario 3 modeled a localized evacuation on the US-101 after an earthquake for Calabasas communities along Las Virgenes Road due to liquefaction and for Malibu residents along Malibu Canyon Road due to a tsunami hazard warning[5]. Figure 8 illustrates the liquefaction zones in the region identified in the LVMCOG Local Hazard Mitigation Plan. In some cases, Malibu residents would not be able to travel north on Malibu Canyon Road and Las Virgenes Road due to hazardous road conditions or closures. However, Scenario 3 accounted for evacuees from Malibu to capture the potential for additional evacuation demand on roadways in the City of Calabasas. This scenario assumed that the intersection of Las Virgenes Road & Agoura Road would be closed due to liquefaction. Therefore, vehicles traveling north on Malibu Canyon Road/Las Virgenes Road would be directed to turn left at the Las Virgenes Road & Lost Hills Road intersection. Communities along Las Virgenes Road between Agoura Road and Lost Hills Road would be directed to travel south and turn right on Lost Hills Road to then travel north towards the US-101. Lastly, communities along Agoura Road between Las Virgenes Road and Lost Hills Road would be directed to travel west on Agoura Road and turn right at Lost Hills Road. These road closures/restrictions and permitted turn movements are illustrated in Figure 4 under the Approach and Methodology section (Page 7).

Figure 8 – Liquefaction Zones in the Las Virgenes Malibu Council of Governments Region

Map 49: Liquefaction Zones

Figure 11 illustrates the results for Scenario 3. As congestion on Las Virgenes Road builds, some of the vehicles traveling north on Malibu Canyon Road turn on Piuma Road to connect to Mullholland Highway via Cold Canyon Road. Given that this evacuation scenario is even more localized than Scenario 2, the US-

[5] Liquefaction occurs when soil grains in loose, saturated silty, sandy or gravel soils attempt to rearrange themselves in a dense configuration when subjected to strong earthquake ground motions. Liquefaction can result in landslides and/or damaged utilities and structures supported by shallow or deep foundations.

101 freeway does not have congestion until around 2:00 AM. Although access to the US-101 is also important in this scenario, the key challenge is managing evacuation traffic when there are limited evacuation routes for a localized evacuation due to topography.

Scenario 4: Calabasas Citywide Fire Evacuation (Morning Commute Period)

Scenario 4 modeled a citywide evacuation due to a localized fire during the AM peak hour (7:00 AM – 9:00 AM). This scenario had no capacity reductions or travel restrictions on the US-101 to isolate the effects of peak period commute travel on evacuation travel. The AM peak hour was analyzed because most residents would still be at home resulting in a high evacuation demand compared to a PM peak hour where many residents would be away from home.

Figure 12 illustrates the results for Scenario 4. Unlike the other three scenarios, Scenario 4 has roadway congestion on local roads and the US-101 before the citywide evacuation notice is issued as vehicles are already on the road traveling to work and other destinations as part of a "normal" weekday. As the evacuation period begins, local roadways become increasingly congested and the US-101 is heavily impacted with congestion given the significant influx of vehicles evacuating Calabasas. Similar to Scenario 1, given the high number of vehicles on the road, the congestion does not dissipate until after the evacuation period is over.

Scenario 4 Alternative (Scenario 4B)

Given that Calabasas is heavily dependent on the US-101 for not only typical travel but also evacuation travel, Scenario 4 was also modeled without regional through traffic to test how evacuation operations would improve if upstream and downstream traffic on the US-101 was restricted in response to an evacuation event/order. This modified scenario had an approximate 35 percent reduction in the number of vehicles traveling on the US-101. With the reduction in regional through traffic on US-101, this scenario still shows the US-101 experiencing heavy traffic and congestion. However, the local roadways in Calabasas do not get as congested because evacuating vehicles can get on the US-101 more efficiently. Restricting pass-through travel for vehicles that do not need to evacuate would require coordination with neighboring jurisdictions and with Caltrans on how to best manage traffic flows on US-101.

Figure 9 – Results for Scenario 1: Regional Fire Evacuation

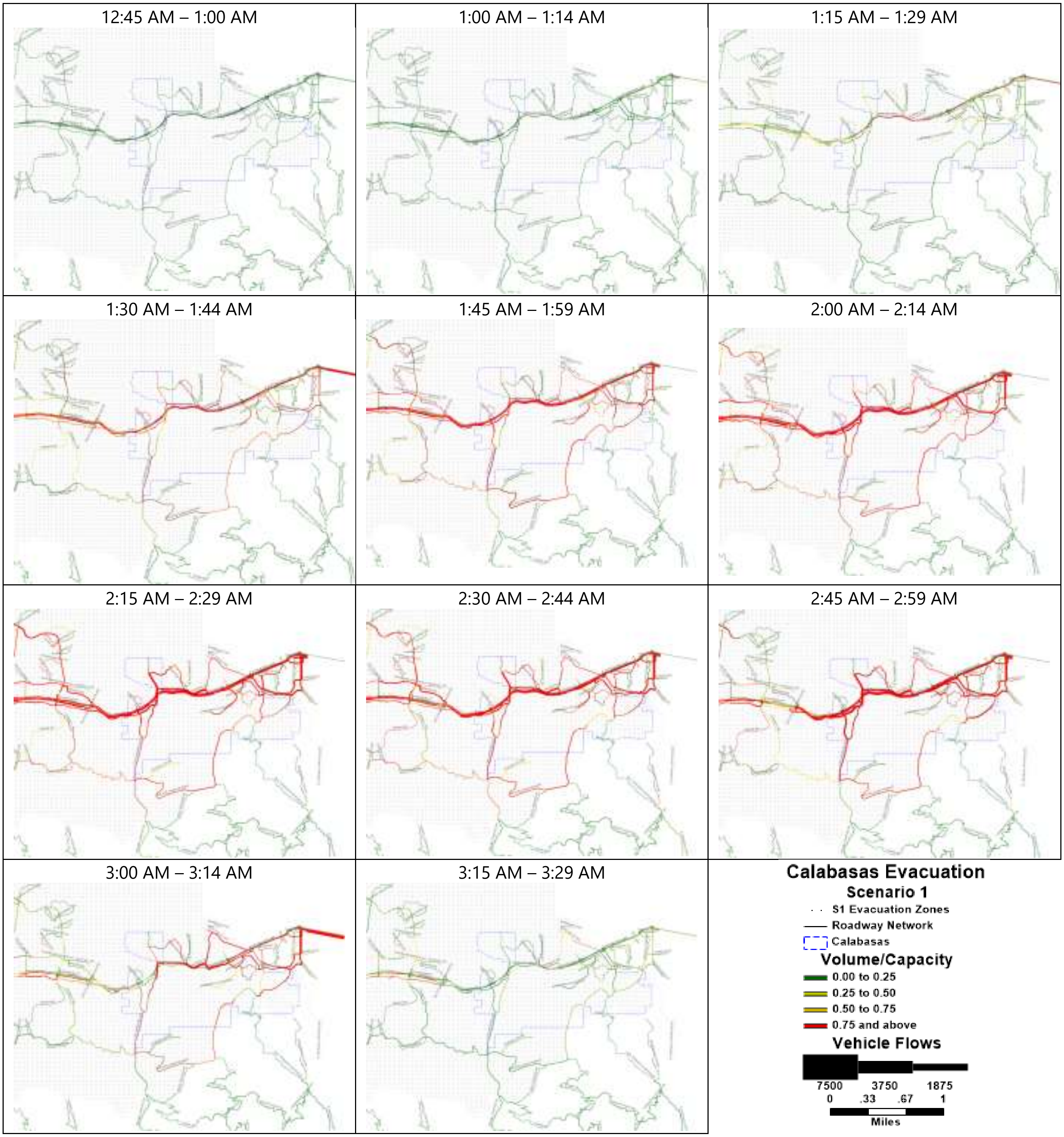


Figure 10 – Results for Scenario 2: Calabasas Citywide Fire Evacuation (Night-time)

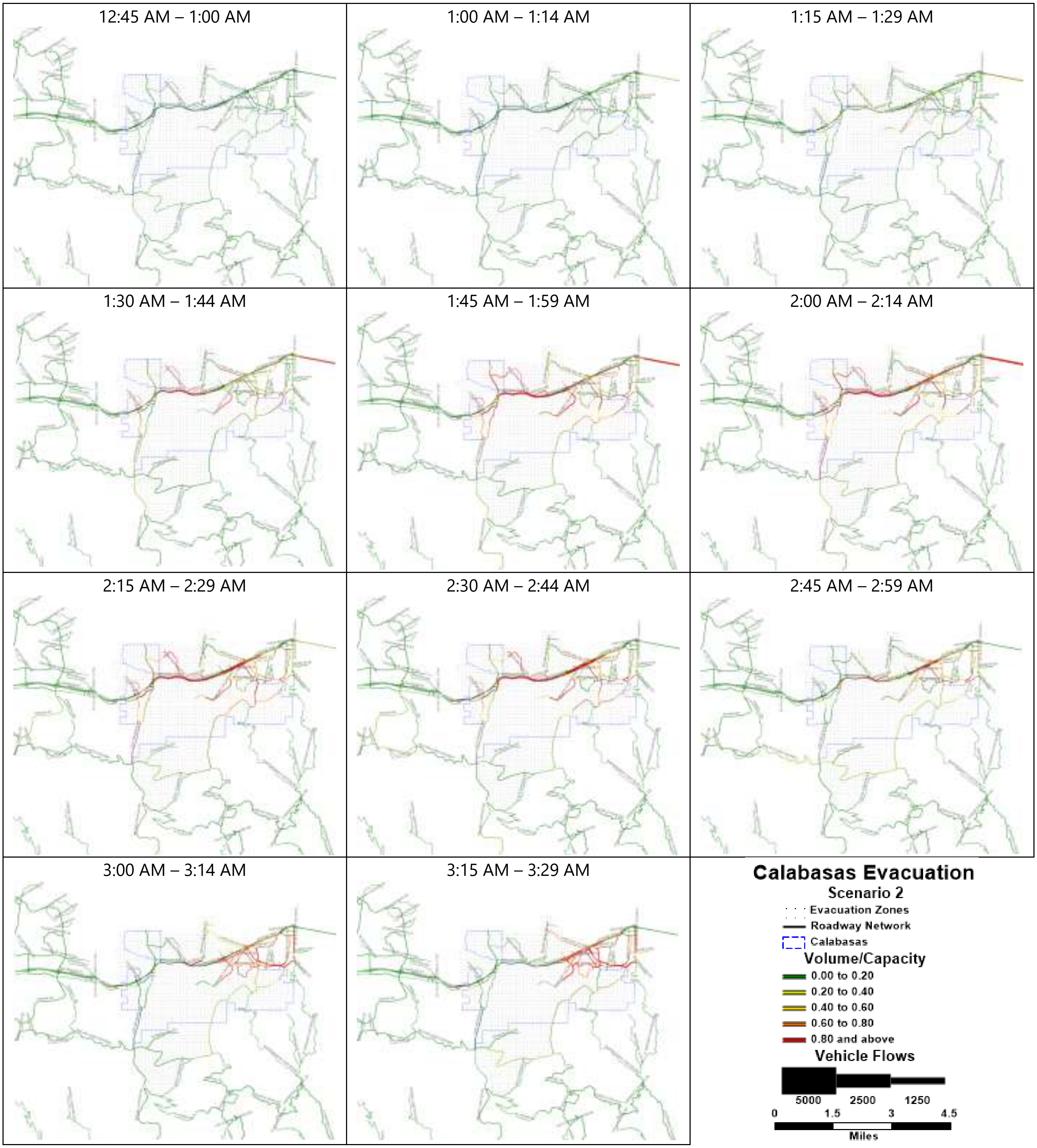


Figure 11 – Results for Scenario 3: Localized Evacuation along Las Virgenes Road due to Earthquake with Liquefaction Evacuation

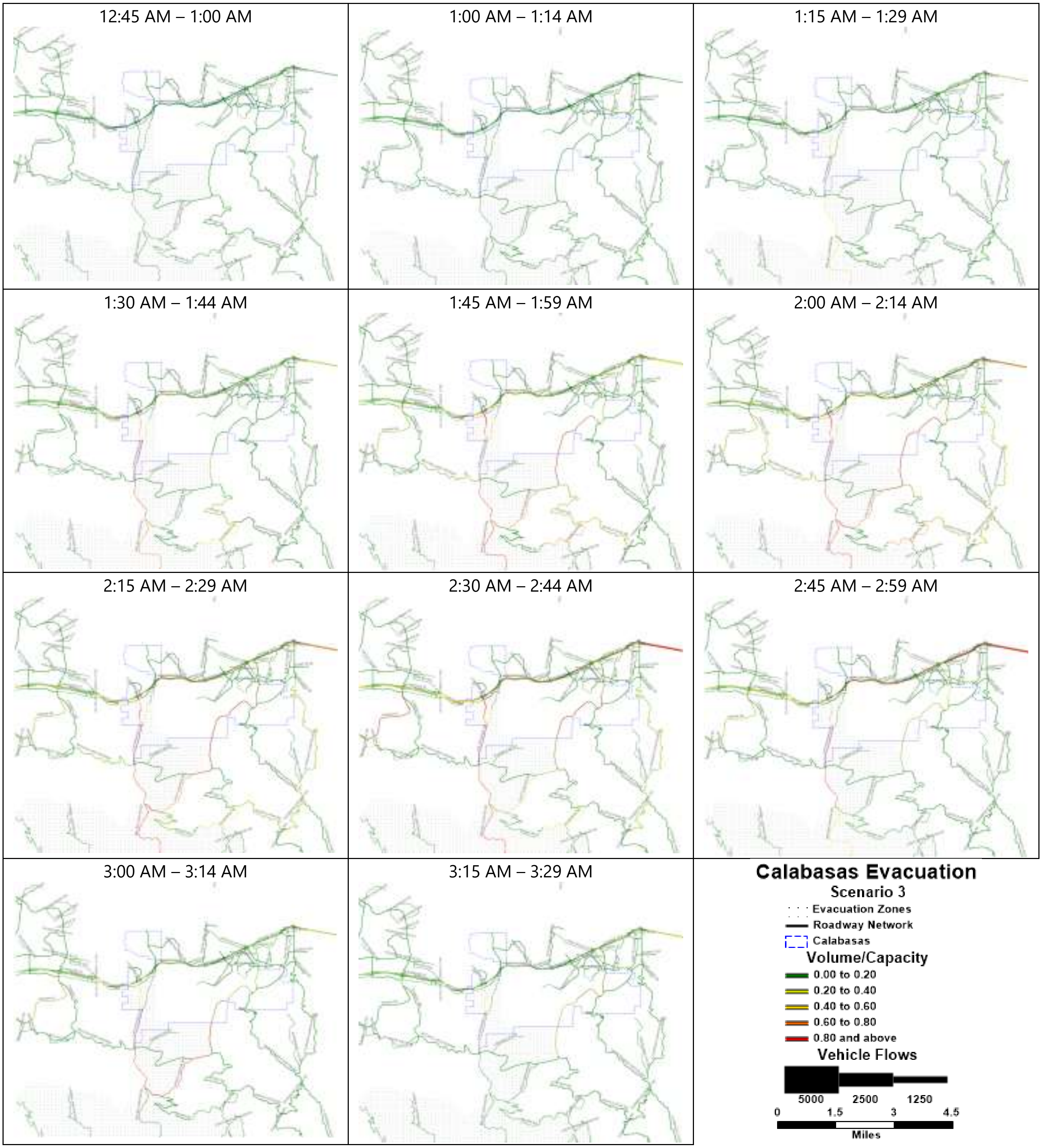


Figure 12 – Results for Scenario 4: Calabasas Citywide Fire Evacuation (Morning Commute Period)

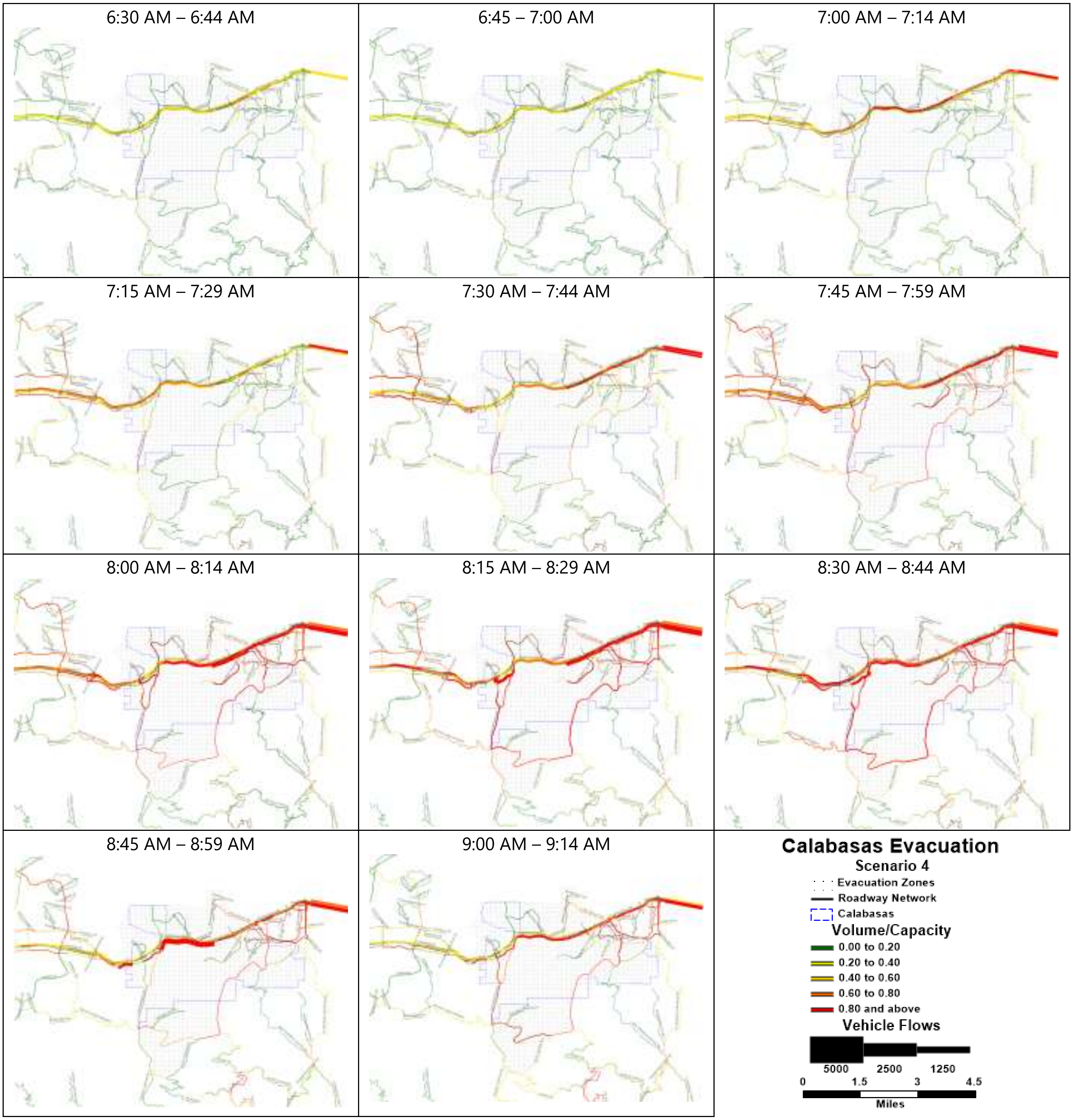
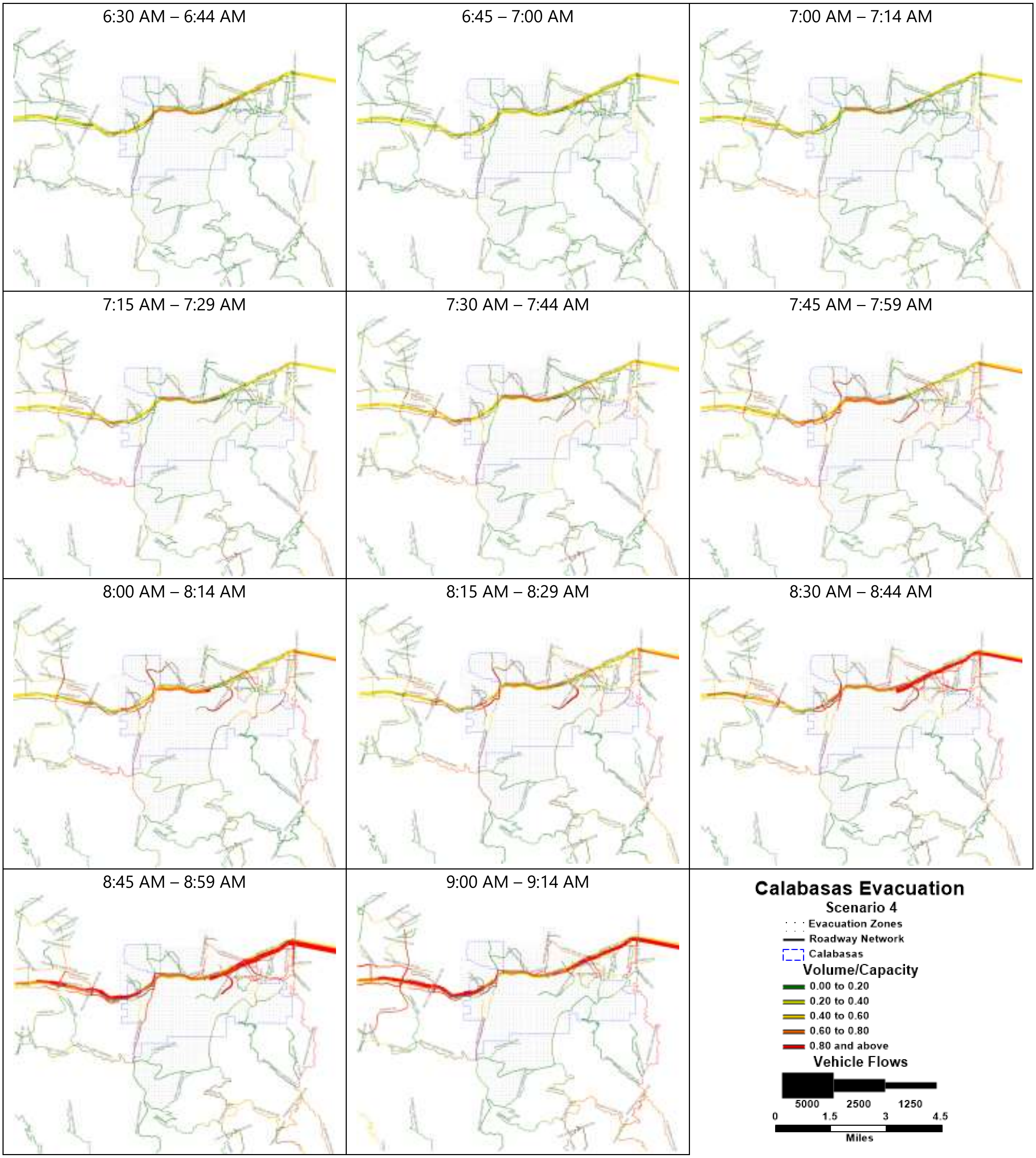


Figure 13 – Results for Scenario 4B: Calabasas Citywide Fire Evacuation (Morning Commute Period) with Restricted Upstream and Downstream Freeway Access



Recommendations

Given topographic constraints, the City of Calabasas has limited options to manage evacuation demand during an emergency scenario. The four emergency evacuation scenarios analyzed as part of this emergency evacuation assessment highlight the significance of the US-101 as a key regional evacuation route and the importance of protecting local roadways for people in Calabasas to evacuate as vehicles on the US-101 may see local parallel roads as alternative routes to avoid congestion.

Despite these constraints and challenges, the City can build on the local and regional coordination that has been taking place by local agencies and residential groups to incorporate additional strategies that improve the efficiency of evacuation operations. These strategies can be organized into three categories:

1. Demand-side: when, how, and where people evacuate in an emergency.
2. Supply-side: the physical and operational infrastructure that facilitate an emergency evacuation.
3. Information-side: how information is shared and received in an emergency.

Safety Element of the Calabasas 2030 General Plan

Based on the findings of the evacuation assessment, the City's Safety Element has been updated to incorporate policies that address demand-side, supply-side, and information-side strategies to improve emergency evacuation operations.

Demand-Side Policies

- Policy VII-55: Regularly evaluate the availability and anticipated demand for community facilities to serve as evacuation centers or designated cooling or smoke relief center during emergencies. Designate such facilities and regularly maintain them to comply with industry standards. Establish solar photovoltaic systems and battery storage for evacuation centers and other critical facilities in the event of power outages.
- Policy VII-69: Consider the needs of vulnerable populations in the city, such as senior housing facilities and schools, and others without access to a personal vehicle in City evacuation plans.
- Policy VII-70: Encourage residents to evacuate in a timely manner to reduce last-minute evacuations and concentrated demand on the roadway network. Coordinate with the school district to build awareness regarding school evacuation protocols which include sheltering in place or evacuating off-site using school buses.
- Policy VII-71: Issue mandatory evacuation orders and release evacuees by pre-designated zones to manage roadway congestion. Anticipate school district evacuation needs as part of evacuation orders.
- Policy VII-72: Issue mandatory evacuation orders based on characteristics of the hazard, such as fire spread characteristics.

- Policy VII-73: Encourage residents to take only one or two vehicles (based on household size) to reduce the number of evacuating vehicles. Offer offsite parking facilities to safely store secondary vehicles in advance of an emergency event.
- Policy VII-74: Close routes upstream from the hazardous area to decrease demand on key evacuation routes.
- Policy VII-75: Coordinate with Caltrans to manage freeway lanes restricting vehicles already on the freeway to travel on the inner lanes and reserving the outer lanes for vehicles entering the freeway.
- Policy VII-78: Use high-capacity public transit vehicles to reduce the use of single occupancy vehicles and increase the number of evacuees.

Supply-Side Policies

- Policy VII-56: Ensure that the LACFD has completed access to all locations in the City, including gated communities and critical infrastructure.
- Policy VII-59.a: Develop and employ evacuation alternatives and/or alternative emergency access routes in neighborhoods that have single ingress/egress.
- Policy VII-59.b: Develop and maintain evacuation options for vulnerable populations, including residents with mobility challenges.
- Policy VII-59.d: Designate safety zones or shelter-in-place locations as potential places of refuge when evacuation routes become blocked.
- Policy VII-60: Require new development to provide adequate access (ingress, egress) and a minimum of two roadways with widths and lengths in compliance with California Building Code Chapter 7A requirements.
- Policy VII-64: Maintain emergency roadways and improve them as necessary and appropriate to ensure ongoing serviceability.
- Policy VII-66: Future roadway design, especially in areas that have less accessibility and on key evacuation routes, should consider evacuation capacity and consider design treatments such as painted medians (instead of raised medians) or other treatments that could assist in creating reversible lanes and facilitate additional capacity in an evacuation event scenario.
- Policy VII-67: Evacuation event signal timing should be periodically reviewed and updated to provide additional evacuation capacity. Incorporate Caltrans in the City's emergency operations center protocol to develop emergency evacuation signal timing for freeway on and off-ramps.
- Policy VII-68: Continue coordinating with nearby jurisdictions, the Las Virgenes-Malibu Council of Governments (LVMCOG) and Los Angeles County Office of Emergency Management on developing strategies to address freeway congestion on the US-101 freeway which functions as the main evacuation route in the region.
- Policy VII-79: Restrict parking periodically (e.g., on red flag days) along critical evacuation routes.
- Policy VII-85: Coordinate with Southern California Edison to implement an aggressive electrical undergrounding plan with a focus on critical evacuation roadways.

Information-Side Policies

- Policy VII-46: Provide bilingual (English and Spanish) public health, emergency preparedness, and evacuation information and signage to citizens through libraries, the City website, radio, schools, and other social media platforms.
- Policy VII-47: Develop and distribute educational materials to residents and businesses on evacuation planning and routes and the standards and requirements for vegetation clearance and maintenance of defensible space. Focus outreach on vulnerable populations, such as senior, young children, and individuals with physical disabilities.
- Policy VII-49: Provide Community Emergency Response Training (CERT) to increase disaster preparedness training to the community at the neighborhood level.
- Policy VII-59.c: Designate and publicize evacuation routes; include existing pedestrian pathways.
- Policy VII-61: Conduct regular evacuation trainings with single-access community HOAs and residents; encourage residents in single-access communities to maintain emergency supplies for at least 3 - 10 days.
- Policy VII-63: Improve coordination between frontline emergency personnel, CERP, EPIC, media sources, and the school district to ensure accurate and clear information is being disseminated.
- Policy VII-80: Provide evacuees with guidance on safe and efficient routes along with dynamic rerouting information to decrease travel times and reduce congestion on highly traveled roads (for example, GPS-routing systems).
- Policy VII-81: Monitor traffic using intelligent transportation system (ITS) technology to identify accidents and problem areas, determine the effectiveness of responses, and change responses as needed.
- Policy VII-82: Establish a redundant and resilient communications system to ensure uninterrupted emergency operations and communications such as through solar photovoltaic systems and battery storage, phone/text alerts, radio, sirens/loudspeaker, and signage.

Circulation Element of the Calabasas 2030 General Plan

Safety Element Policy VII-66 recommends that future roadway design should consider evacuation capacity and consider design treatments that could facilitate additional capacity in an evacuation scenario. The Circulation Element includes a table of potential circulation enhancements on critical intersections and roadway corridors (Table VI-1). As those projects are implemented, the City can take emergency access into consideration. Examples of emergency access considerations are noted in Table 4.

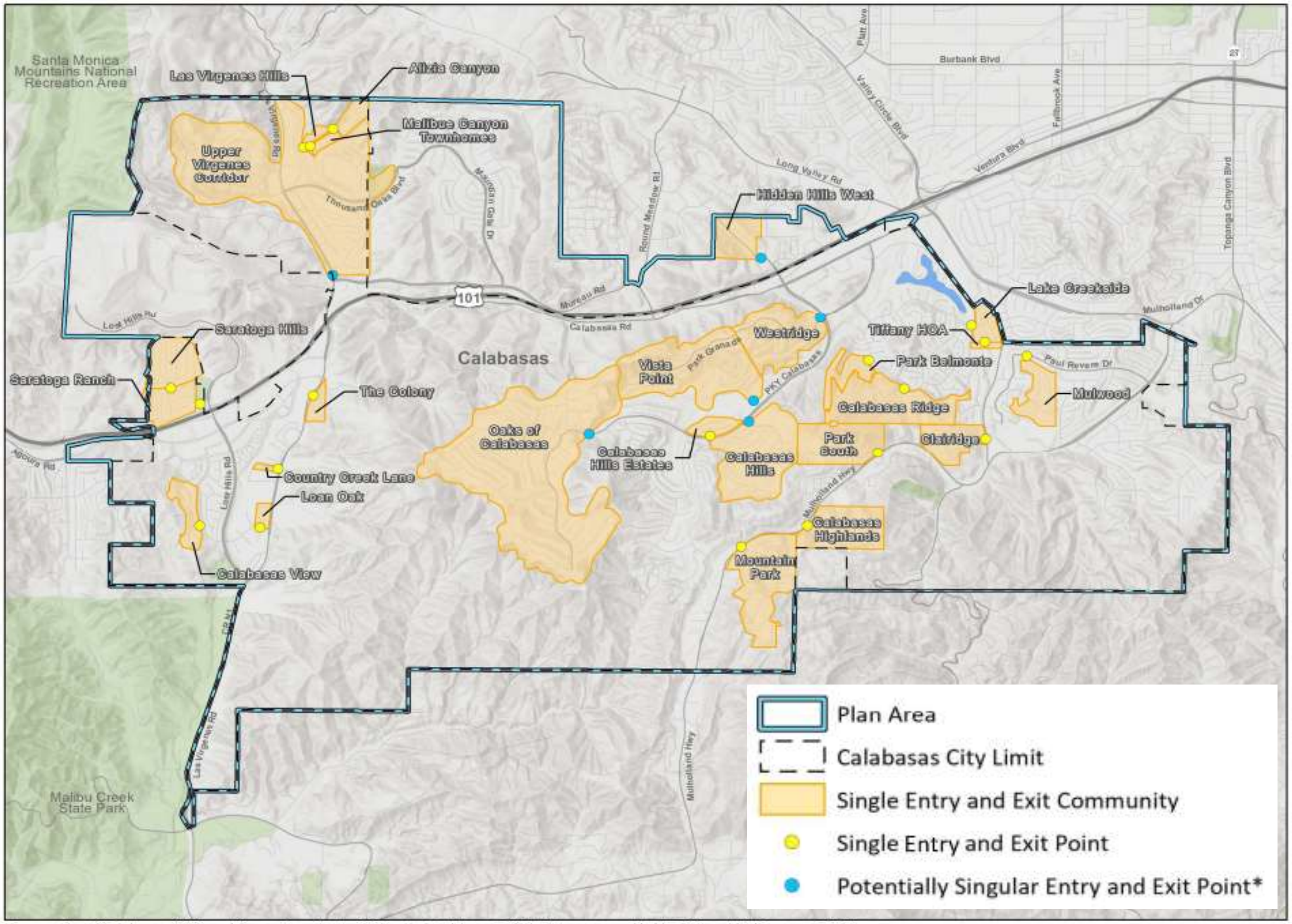
Table 4 – Emergency Access Considerations for Circulation Element Transportation Projects

Potential Enhancement	Emergency Access Consideration
No widening of Mulholland Highway to create additional through travel lanes shall be permitted west of Old Topanga Canyon Road to the City boundary except to provide for active transportation facilities.	Explore bicycle facility or shoulder design that can accommodate an additional (temporary) vehicle travel lane during an evacuation.
Consider a reduction in vehicle lanes on Lost Hills Road, south of Malibu Hills Road, to improve active transportation opportunities, improve crossing safety, and reduce through vehicle traffic and speeds.	Explore bicycle facility or shoulder design that can accommodate an additional (temporary) vehicle travel lane during an evacuation.
Provide active transportation only connectivity to Las Virgenes Road from the end of Calabasas Road (i.e. near the Juan Bautista de Anza East Trailhead).	Explore bicycle/pedestrian corridor design that can facilitate emergency vehicle access during an evacuation.

The City can also develop a catalog of sample roadway cross sections of best practice treatments with emergency access considerations. Although the sample cross sections will not be applicable in every scenario, they can serve as a framework and resource for the City to balance their Complete Streets goals with their emergency evacuation needs.

Attachment A: Senate Bill 99 Analysis – Map of Single Point of Entry Communities

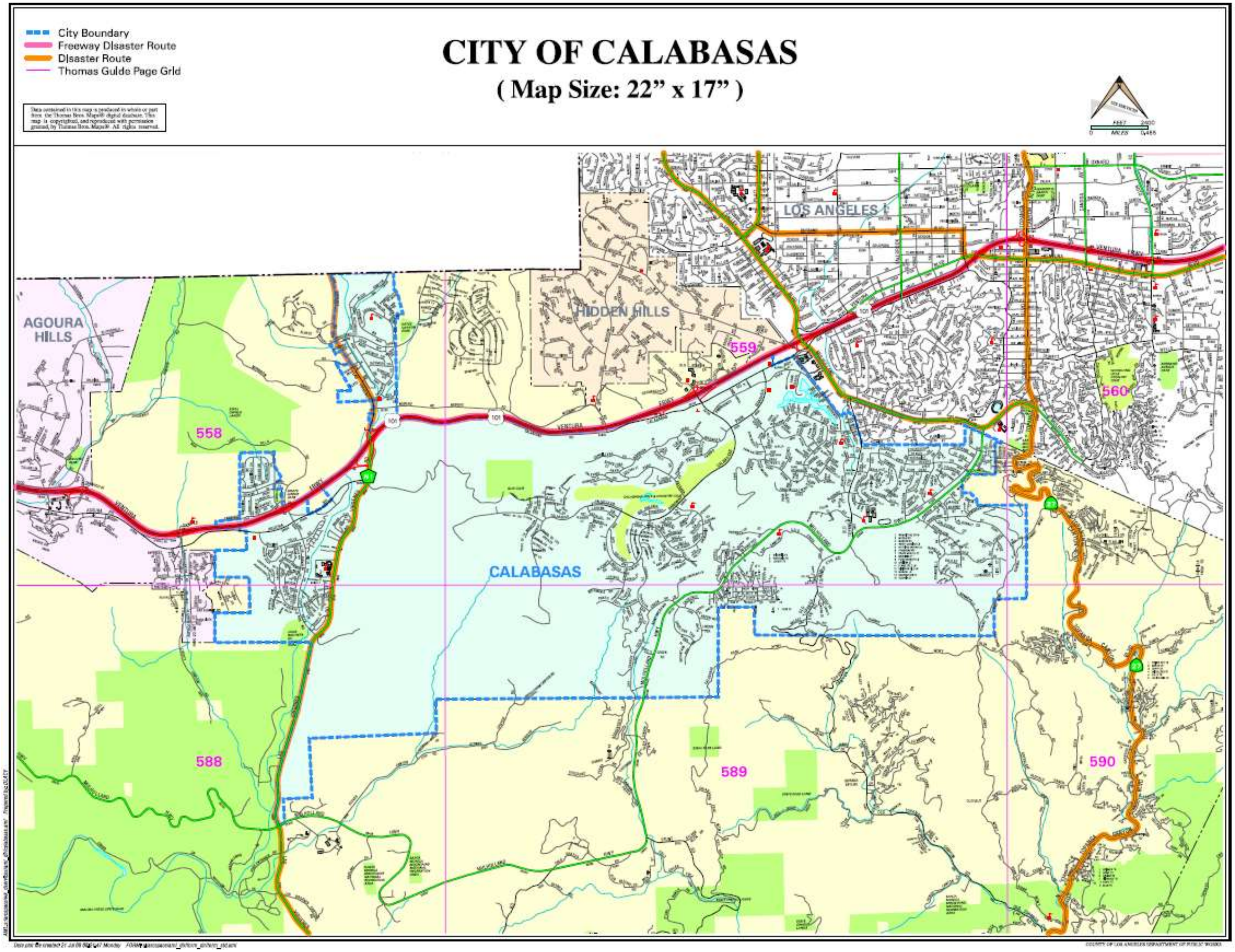
Single Entry and Exit Communities in Calabasas



Source: City of Calabasas, 2018, and Rincon Consultants, 2021. Updated August 2021. Basemap provided by ESRI and its licensors © 2021.

FEHR PEERS

Attachment B: City of Calabasas Public Safety & Emergency Preparedness Evacuation Route Map



Source: https://www.cityofcalabasas.com/government/public-safety-emergency-preparedness/evacuation-route-maps