

Memorandum

Date: October 31, 2023
To: Hannah Mize, Rincon Consultants
From: Nico Boyd and John Muggridge
Subject: City of Camarillo Evacuation Capacity Analysis

LA22-3379

Fehr & Peers has completed an assessment of the effect that a wildfire necessitating evacuation for the east part of the City of Camarillo (City) may have on emergency evacuation travel demand in the City. This assessment is being conducted in consideration of the new Assembly Bill 747 (AB 747) which is a requirement for Safety Element Updates that occur after January 2022 and requires that Safety Elements be reviewed and updated to identify evacuation routes and their capacity, safety, and viability.

This document is intended to provide an assessment of roadway capacity under an evacuation event affecting the east side communities of Camarillo Springs, Leisure Village, and Upland in the City of Camarillo. Please note that emergency evacuation can occur due to any number of events. Additionally, fire and other hazard movement is unpredictable as is individual behavior related to evacuation events. As such, this assessment is intended to provide the City with a broad "planning level" assessment of the capacity of the transportation system during an evacuation scenario; it does not provide guarantees as to the adequacy of the system nor can 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. We have adopted existing methodologies in transportation planning that, in our knowledge and experience, we believe are the most appropriate.

Background

AB 747 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 is now a requirement for all safety elements or updates to a hazard mitigation plan completed after January 2022. This study is intended to provide the City with a broad planning level assessment of the capacity of the transportation



system during an evacuation event affecting the east side of the City, specifically the communities of Camarillo Springs, Leisure Village, and Upland.

Approach

Because the east side of the City of Camarillo is located adjacent to undeveloped land in the foothills of the Santa Monica Mountains where fire risk is relatively high, evacuation of the communities there requires access to the US-101 freeway to proceed west toward the City of Oxnard. In consultation with City staff, Fehr & Peers identified the transportation analysis zones (TAZs) in the Ventura County Transportation Model (VCTM) that correspond with the Camarillo Springs, Leisure Village, and Upland Communities, as these communities are most likely to require evacuation if a fire were to erupt to the east of the City. Following the identification of the corresponding TAZs in the VCTM, Fehr & Peers identified evacuation routes and access points to those routes connecting the three communities to the US-101 freeway. These routes are described below (see **Appendix A** for the City's Evacuation Route Map):

- Primary Evacuation Routes:
 - Camarillo Springs Road – Camarillo Springs Road is a north-south road that provides access from the Camarillo Springs community, located south of the US-101 freeway in the southeast corner of the City, to the US-101 freeway to the north.
 - Santa Rosa Road – Santa Rosa Road is a north-south road that connects the Upland community in the northeast corner of the City and the Leisure Village community at the eastern edge of the City to the US-101 freeway to the south.
- Secondary Evacuation Routes:
 - Pleasant Valley Road – Pleasant Valley Road is a east-west road along the southern boundary of the City that provides access from the Camarillo Springs community west toward Lewis Road, which in turn provides access to the US-101 freeway.
 - Lewis Road – Lewis Road is a north-south road located in the center of the City that provides access to the US-101 freeway.
- Other Potential Evacuation Routes:
 - Las Posas Road – On the west side of the City, Las Posas Road is a north-south road that provides access from Pleasant Valley Road to the south to the US-101 freeway to the north.
 - Flynn Road – Flynn Road is a north-south road located east of Lewis Road that provides access from the Upland community to the north to the US-101 freeway to the south.
- The US-101 is a freeway that runs through the city limits and serves as the primary evacuation route for vehicles traveling west toward the City of Oxnard and the Pacific coast.

Twenty roadway segments were analyzed as key roadways to access the US-101 freeway from the three identified communities on the east side of the City:



- 1) Lewis Road from Adolfo Road to US-101 freeway
- 2) Lewis Road from Las Posas Road/Upland Road to Adolfo Road
- 3) Upland Road from Lewis Road to Flynn Road
- 4) Upland Road from Flynn Road to Woodcreek Road
- 5) Upland Road from Woodcreek Road to Mission Oaks Boulevard
- 6) Upland Road from Mission Oaks Boulevard to Santa Rosa Road
- 7) Santa Rosa Road from Upland Road to Oak Canyon Road
- 8) Santa Rosa Road from Oak Canyon Road to Woodcreek Road
- 9) Santa Rosa Road from Woodcreek Road to Los Pueblos Drive
- 10) Santa Rosa Road from Los Pueblos Drive to Adolfo Road
- 11) Santa Rosa Road from Adolfo Road to US-101 Freeway
- 12) Pleasant Valley Road/Santa Rosa Road from US-101 Freeway to Pancho Road
- 13) Pleasant Valley Road from Pancho Road to Lewis Road
- 14) Pleasant Valley Road from Lewis Road to Las Posas Road
- 15) Las Posas Road from Pleasant Valley Road to Ventura Boulevard
- 16) Las Posas Road from Ventura Boulevard to Daily Drive
- 17) Flynn Road from Upland Road to Adolfo Road
- 18) Flynn Road from Adolfo Road to Mission Oaks Boulevard/US-101 Freeway
- 19) Camarillo Springs Road from Ridge View Street/Adohr Lane to the US-101 Freeway
- 20) Adohr Lane from Pancho Road to Ridge View Street

This assessment was completed under existing (2022) PM peak hour conditions with and without evacuation traffic. To compare evacuation travel demand to typical PM peak hour traffic volumes on the twenty study roadway segments, Fehr & Peers obtained weekday PM peak hour traffic counts from the City for key intersections located along the roadway segments and used these volumes to impute the volumes traveling on each segment.

Evacuation access from the aforementioned east side communities was assessed by reviewing the vehicle travel demand on each roadway during an evacuation event. To estimate evacuation travel demand for each study segment, land use and socioeconomic data were aggregated by transportation analysis zones (TAZs) from the Ventura County Transportation Model (VCTM). The VCTM is a useful starting point for estimating travel demand as it provides socioeconomic information, such as population, employment, and number of households, and the TAZs represent distinct areas of the city that can be used to estimate vehicle travel demand along each study roadway segment during an evacuation event. The process for developing the evacuation travel demand estimates is explained in further detail below.



Evacuation Assessment

A capacity assessment was performed for an emergency evacuation scenario in which the Santa Ana Winds cause a wildfire necessitating evacuation for the east side communities of Camarillo Springs, Leisure Village, and Upland. For this assessment, it was assumed that all residents and employees in the affected communities would need to evacuate towards the US-101 freeway and travel west toward the City of Oxnard and the Pacific coast. In addition, it was assumed that only land uses in the City of Camarillo would be under an evacuation order.

The first step in the evacuation assessment was to identify the number of residents, households, and employees in the VCTM TAZs that correspond with the Camarillo Springs, Leisure Village, and Upland communities to inform estimates of evacuation demand. The VCTM was also used to identify vehicle availability by household size, which informed the conversion of residential person trips into evacuation vehicle trips. For employment trips, all workers employed in the VCTM TAZs that correspond with the evacuation communities were assumed to travel alone in their own vehicle during the evacuation event.

Table 1 summarizes the socioeconomic information from the VCTM that was used to develop estimates of vehicle trips during an evacuation scenario. **Table 2** summarizes the total number of residential PM peak hour vehicle evacuation trips that were assumed in the evacuation assessment by TAZ.

Table 1: Camarillo Evacuation Socioeconomic Data Summary

TAZ/Community	Population	Households	Employees
60119201 / Upland	1,684	621	-
60117101 / Leisure Village	4,113	1,507	216
60117201 / Leisure Village	3,854	1,421	199
60116401 / Camarillo Springs	2,543	940	312

Source: Ventura County Transportation Model data compiled by Fehr & Peers, 2023.

Table 2: Residential Vehicle Evacuation PM Peak Hour Trips by TAZ

TAZ/Community	Total Residential Vehicle Evacuation Trips
60119201 / Upland	1,081
60117101 / Leisure Village	2,675
60117201 / Leisure Village	2,416
60116401 / Camarillo Springs	1,582

Source: Ventura County Transportation Model data compiled by Fehr & Peers, 2023.

The second step in the evacuation assessment was to assign evacuation trips to evacuation routes based on location and proximity to the various routes available during an evacuation scenario. **Table 3** summarizes the proportion of evacuation trips that were assigned to each route by community/TAZ. For each community, the proportion of evacuation trips assigned to each route sums to 100%.



Table 3: Camarillo Evacuation Socioeconomic Data Summary

Community	TAZ	Route	% of Trips
Upland	60119201	Upland – Lewis – US-101	50%
Upland	60119201	Upland – Flynn – US-101	25%
Upland	60119201	Upland – Santa Rosa – US-101	25%
Leisure Village (north)	60117101	Santa Rosa – US-101	50%
Leisure Village (north)	60117101	Santa Rosa – Pleasant Valley – Las Posas – US-101	50%
Leisure Village (south)	60117201	Santa Rosa – US-101	50%
Leisure Village (south)	60117201	Santa Rosa – Pleasant Valley – Las Posas – US-101	50%
Camarillo Springs	60116401	Camarillo Springs – US-101	50%
Camarillo Springs	60116401	Ridge View – Adohr – Pleasant Valley – Las Posas – US-101	50%

The *Highway Capacity Manual (6th Ed)* was utilized to estimate roadway capacity during an evacuation event. Ideal saturation flow on a roadway is 1,900 vehicles per lane per hour. The per lane capacity applied in this assessment is based on a capacity of 950 vehicles per hour per lane to account for constraints at intersections due to typical weekday traffic signal timings and vehicle turning movements. The roadway capacities are shown in **Table 4**.



Table 4: Evacuation Capacity

Roadway	Outbound Lanes	Outbound Capacity (vehicles per hour)
Lewis Road from Adolfo Road to US-101 Freeway	1	950
Lewis Road from Las Posas Road/Upland Road to Adolfo Road	1	950
Upland Road from Lewis Road to Flynn Road	2	1,900
Upland Road from Flynn Road to Woodcreek Road	2	1,900
Upland Road from Woodcreek Road to Mission Oaks Blvd	2	1,900
Upland Road from Mission Oaks Blvd to Santa Rosa Road	2	1,900
Santa Rosa Road from Upland Road to Oak Canyon Road	2	1,900
Santa Rosa Road from Oak Canyon Road to Woodcreek Road	2	1,900
Santa Rosa Road from Woodcreek Road to Los Pueblos Drive	2	1,900
Santa Rosa Road from Los Pueblos Drive to Adolfo Road	2	1,900
Santa Rosa Road from Adolfo Road to US-101 Freeway	3	2,850
Pleasant Valley Road/Santa Rosa Road from US-101 Freeway to Pancho Road	2	1,900
Pleasant Valley Road from Pancho Road to Lewis Road	2	1,900
Pleasant Valley Road from Lewis Road to Las Posas Road	2	1,900
Las Posas Road from Pleasant Valley Road to Ventura Boulevard	2	1,900
Las Posas Road from Ventura Boulevard to Daily Drive	3	2,850
Flynn Road from Upland Road to Adolfo Road	2	1,900
Flynn Road from Adolfo Road to Mission Oaks Blvd/US-101 Freeway	2	1,900
Camarillo Springs Road from Ridge View Street/Adohr Lane to US-101 Freeway	2	1,900
Adohr Lane from Pancho Road to Ridge View Street	1	950

Source: Highway Capacity Manual 6th Edition, Transportation Research Board, 2016.

The final step in the evacuation assessment was to compare the travel demand during an evacuation event to the roadway capacity for the study roadway segments that would provide access to the US-101 for vehicles exiting the City. The roadway capacity, typical peak hour traffic volumes, and estimated evacuation demand were combined to compare the evacuation demand and volume-to-capacity ratio (V/C) for each study roadway segment. The total evacuation travel demand assumes that two-thirds (67%) will occur during a one-hour period based on consultation with public safety experts. The results of the evacuation analysis are shown in **Table 5**.

Table 5: Evacuation Analysis

Roadway	Background Traffic	Residential Evacuation Traffic	Employee Evacuation Traffic	Total Traffic	Lanes	Capacity (vehicles per hour)	Existing V/C Ratio	Evacuation V/C Ratio
Lewis Road from Adolfo Road to US-101 Freeway	664	362	-	1,026	1	950	0.7	1.1
Lewis Road from Las Posas Road/Upland Road to Adolfo Road	490	362	-	852	1	950	0.5	0.9
Upland Road from Lewis Road to Flynn Road	765	362	-	1,127	2	1,900	0.4	0.6
Upland Road from Flynn Road to Woodcreek Road	962	543	-	1,505	2	1,900	0.5	0.8
Upland Road from Woodcreek Road to Mission Oaks Blvd	590	543	-	1,133	2	1,900	0.3	0.6
Upland Road from Mission Oaks Blvd to Santa Rosa Road	349	543	-	892	2	1,900	0.2	0.5
Santa Rosa Road from Upland Road to Oak Canyon Road	768	181	-	949	2	1,900	0.4	0.5
Santa Rosa Road from Oak Canyon Road to Woodcreek Road	914	1,077	72	2,063	2	1,900	0.5	1.1
Santa Rosa Road from Woodcreek Road to Los Pueblos Drive	914	1,077	72	2,063	2	1,900	0.5	1.1
Santa Rosa Road from Los Pueblos Drive to Adolfo Road	1,365	1,886	139	3,390	2	1,900	0.7	1.8
Santa Rosa Road from Adolfo Road to US-101 Freeway	1,854	1,886	139	3,879	3	2,850	0.7	1.4
Pleasant Valley Road/Santa Rosa Road from US-101 Freeway to Pancho Road	1,092	1,705	139	2,937	2	1,900	0.6	1.5
Pleasant Valley Road from Pancho Road to Lewis Road	1,369	2,515	206	4,090	2	1,900	0.7	2.2
Pleasant Valley Road from Lewis Road to Las Posas Road	402	2,515	206	3,123	2	1,900	0.2	1.6
Las Posas Road from Pleasant Valley Road to Ventura Boulevard	968	2,515	206	3,689	2	1,900	0.5	1.9
Las Posas Road from Ventura Boulevard to Daily Drive	968	2,515	206	3,689	3	2,850	0.3	1.3
Flynn Road from Upland Road to Adolfo Road	295	181	-	476	2	1,900	0.2	0.3
Flynn Road from Adolfo Road to Mission Oaks Blvd/US-101 Freeway	527	181	-	708	2	1,900	0.3	0.4
Camarillo Springs Road from Ridge View Street/Adohr Lane to US-101 Freeway	164	809	67	1,040	2	1,900	0.1	0.5
Adohr Lane from Pancho Road to Ridge View Street	607	809	67	1,483	1	950	0.6	1.6

As shown in **Table 5**, evacuation demand in the east side of the City would strain the capacity of many roadway segments along the identified evacuation routes. With the addition of evacuation traffic on top of the existing background traffic, slightly more than half of the roadway segments analyzed would exceed a V/C of 1.0, indicating that the evacuation demand would exceed the roadway capacity of these segments, and therefore, some vehicles would require longer than the peak hour following an evacuation order to evacuate the City.

The assessment assumes evacuation traffic would be evenly distributed across each evacuation roadway according to the route assignment percentages shown in **Table 3**. However, emergency scenarios are often unpredictable and driver behavior can be disorderly. Additionally, evacuation events are not linear in nature (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. These are conditions which would affect the total evacuation operations estimated in our assessment that are beyond the scope of this study. There is also general unpredictability in operational issues such as traffic signal synchronization issues between City intersections and/or Caltrans ramps, power issues that would trigger traffic signals to operate in “red flash”, or congestion along the US-101 that could further impede traffic flows.

Recommendations

Given the topographic constraints that would preclude evacuation to the north, south, or east, the City has limited options to manage evacuation demand from the east side of the City during an emergency scenario. However, as the City continues to prepare for emergency events, special considerations can be taken to facilitate emergency evacuation. Some considerations are provided below:

- 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.
 - In evacuation events, painted medians could operate as additional egress lanes. For example, a four-lane roadway could operate with three egress lanes and one ingress lane (for emergency vehicles). The capacity of many roadway segments along the identified evacuation could effectively be doubled using this approach.
- Evacuation event signal timing should be periodically reviewed and updated to provide additional evacuation capacity.
 - In the assessment above, the roadway capacities are based on typical traffic signal operations and green time allocation in the City. Implementing a traffic signal timing



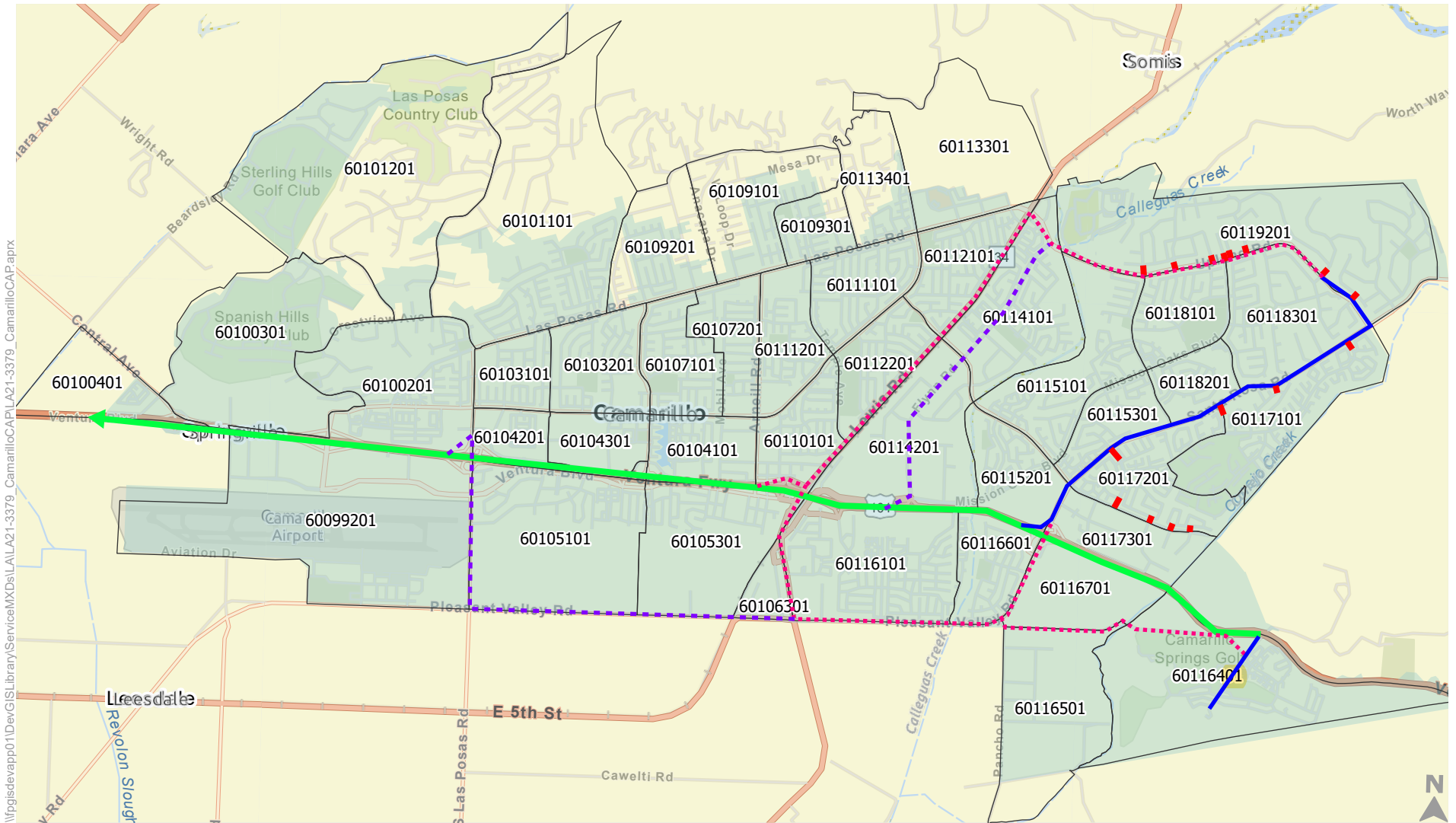
and coordination plan that prioritizes green time for the evacuation of vehicles to the US-101 freeway would provide additional roadway capacity and improve the V/C results reported in **Table 5**.

- 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.

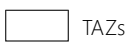


Attachment A

City of Camarillo Evacuation Route Map



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TAZs



Camarillo City Boundary



Evacuation on 101 WB



Primary Evacuation Routes via Camarillo Springs Rd and Santa Rosa Rd



Secondary Evacuation Routes via Pleasant Valley Rd and Lewis Rd



Other Potential Evacuation Routes via Las Posas Rd and Flynn Rd



Access Points



City of Camarillo Evacuation Route Map