

MEMORANDUM

Date: January 2, 2018
To: Maggie Tougas, California State University Channel Islands
From: Cary Bearn & Miguel Nunez, AICP
Subject: California State University Channel Islands Evacuation Planning Analysis

LA17-2966

This memorandum was prepared to assist California State University Channel Islands (CSUCI) with evacuation planning at the campus. University staff have prepared an evacuation plan with information pertaining to evacuation routes and conditions. In consultation with CSUCI staff and using available data for determining the campus population of students, faculty, staff, employees, and residents, a campus evacuation scenario was studied to try and understand anticipated travel routes and travel times for people that would need to evacuate from the campus setting. It should be noted that it is difficult to predict or analyze evacuation events as they may arise suddenly, for a variety of reasons, and conditions may be such that planned evacuation routes are not available. The following effort establishes baseline travel times for traveling off the campus, estimates evacuation trip generation estimates, identifies potential evacuation routes, and estimates potential changes to travel time from several locations on-campus to reaching Lewis Road.

Baseline Travel Times

Travel times were collected by Fehr & Peers on Wednesday September 6th 2017, during the AM peak period, and Wednesday September 13th 2017, during the PM peak period. Table 1 shows average travel times for representative exit routes from both the Campus Area as well as the University Glen Apartments Area. The travel time runs were conducted during the first weeks of the fall semester to capture the busiest times on campus for arrival/departure activity, based on consultation with CSUCI staff.



Travel time runs were conducted for eight different campus locations and establish baseline travel time for trips leaving the campus and travel routes to exit the campus. The shortest route was 3.4 minutes (1.1 miles), from Central Mall East to University Drive & Lewis Road. The longest route was 7.3 minutes (2.2 miles) from Elephant Seal Cove & Channel Islands Dive to Lewis Road, via Camarillo Street and Potrero Road.

**TABLE 1
 CSUCI CAMPUS EVACUATION
 TRAVEL TIME RUNS AM AND PM PEAK PERIODS**

| Start Point | End Point | Travel Distance | Average Travel Time [1] |
|---|--------------------------|-----------------|-------------------------|
| Campus Area | | | |
| 1 Central Mall - West | University Dr & Lewis Rd | 1.1 mi | 4.1 |
| 2 Central Mall - East | University Dr & Lewis Rd | 1.1 mi | 3.4 |
| 3 Central Mall - East | Camarillo St & Lewis Rd | 1.8 mi | 4.53 |
| 4 Chapel Dr & Camarillo St | Potrero Rd & Lewis Rd | 1.9 mi | 5.13 |
| University Glen Apartments | | | |
| 5 Anacapa Island Dr Traffic Circle | Camarillo St & Lewis Rd | 2.2 mi | 6.23 |
| 6 Elephant Seal Cove & Channel Islands Dr | Camarillo St & Lewis Rd | 2.1 mi | 6.23 |
| 7 Elephant Seal Cove & Channel Islands Dr | Potrero Rd & Lewis Rd | 2.2 mi | 7.25 |
| 8 Anacapa Island Dr & Channel Islands Dr | Potrero Rd & Lewis Rd | 2.3 mi | 6.57 |

Note:

[1] Travel times were collected by Fehr & Peers on Wednesday September 6th 2017, during the AM peak period, and Wednesday September 13th 2017, during the PM peak period. Average travel times are presented for each route

Evacuation Trip Generation

The number of people on-site, including students, faculty, staff, and residents varies throughout the day. This analysis assumes a worst case condition in which both the Campus and the University Glen area is fully occupied. Table 2 presents the assumptions made in terms of estimated number of people on-site as well as the estimated number of evacuation vehicles. The trip generation estimate shown in Table 2 assumes 2.5 students per vehicle, 1.5 faculty/staff per vehicle, and one vehicle per household. Based on these assumptions, the analysis assumes 4,413 evacuation trips.



| TABLE 2 CSUCI CAMPUS EVACUATION EVACUATION TRIP ASSUMPTIONS | | |
|--|--|--|
| Campus User | Maximum Number of Evacuation Vehicles | Assumptions |
| Students living on-campus | 643 | Assume 1608 students living on campus with 2.5 students per evacuation vehicle |
| Students living off-campus | 1,757 | Assume 6,000 enrolled minus 1,608 students living on campus equals 4,392 students living off-campus. Assume all 4,392 students are on-campus and evacuate with 2.5 students per evacuation vehicle |
| Faculty and Staff | 685 | Assume all faculty/staff are on-campus with 1.5 average faculty/staff per evacuation vehicle |
| Retail | 70 | Assume full evacuation of 70 retail permits. |
| U Glen - Existing | 658 | Assume one evacuation vehicle per dwelling unit (658 dwelling units) |
| U Glen - Proposed | 600 | Assume one evacuation vehicle per dwelling unit (600 dwelling units) |
| Total | 4,413 | |

Evacuation Routes

Figure 1 shows potential evacuation routes from various points on campus. Evacuation routes were informed by trip generation estimates, travel time, distance, and roadway capacity. Since this analysis is intended to replicate an evacuation scenario, several assumptions were made regarding local travel patterns and traffic operations:

- Vehicle traffic would be outbound only, minimizing conflicts with pedestrians and inbound vehicles, and allowing the flexibility to convert inbound lanes to outbound lanes on key roadways such as University Drive



- Stop-controlled intersections would operate as yield-controlled intersections
- Existing peak hour vehicle volumes on Lewis Road were assumed during an evacuation scenario for the purposes of forecasting operations at intersections along Lewis Road
- Based on the evacuation assumptions described above, not all cars on campus would be evacuated from the campus
- The assumptions above reflect a scenario when campus and residences are both fully occupied, which may not be the case if or when an evacuation is ordered

Evacuation Travel Times

To estimate the evacuation travel times, an evacuation scenario was analyzed based on the trip generation and evacuation routes presented above. Estimated delay was calculated for each intersection using the Highway Capacity Manual (HCM) methodology. Table 3 shows the estimated evacuation travel times. Estimated evacuation travel time was calculated by aggregating the intersection delay along each of the evacuation routes and combining it with the baseline travel time runs. One best practice is to estimate future evacuation travel times through the development of a simulation model for the campus that is calibrated to current conditions and reflects the existing roadway network and characteristics. While CSUCI continues evacuation and emergency planning this analysis was conducted without a simulation model and one may be considered in the future. Based on the methodology described above, estimated evacuation travel times range from 8.5 minutes from the Central Mall-East to Camarillo Street & Lewis Road to approximately 21 minutes from Elephant Seal Cove & Channel Islands Drive to Potrero Road & Lewis Drive.



**TABLE 3
 CSUCI CAMPUS EVACUATION
 ESTIMATED EVACUATION TRAVEL TIMES**

| | Start Point | End Point | Travel Distance | Baseline Travel Time | Estimated Evacuation Travel Time |
|-----------------------------------|---|--------------------------|-----------------|----------------------|----------------------------------|
| Campus Area | | | | | |
| 1 | Central Mall - West | University Dr & Lewis Rd | 1.1 mi | 4.1 | 15.93 |
| 2 | Central Mall - East | University Dr & Lewis Rd | 1.1 mi | 3.4 | 15.37 |
| 3 | Central Mall - East | Camarillo St & Lewis Rd | 1.8 mi | 4.53 | 8.5 |
| 4 | Chapel Dr & Camarillo St | Potrero Rd & Lewis Rd | 1.9 mi | 5.13 | 18.34 |
| University Glen Apartments | | | | | |
| 5 | Anacapa Island Dr Traffic Circle | Camarillo St & Lewis Rd | 2.2 mi | 6.23 | 10.99 |
| 6 | Elephant Seal Cove & Channel Islands Dr | Camarillo St & Lewis Rd | 2.1 mi | 6.23 | 10.95 |
| 7 | Elephant Seal Cove & Channel Islands Dr | Potrero Rd & Lewis Rd | 2.2 mi | 7.25 | 20.76 |
| 8 | Anacapa Island Dr & Channel Islands Dr | Potrero Rd & Lewis Rd | 2.3 mi | 6.57 | 20.17 |

Conclusions

Based on the evacuation travel times presented above, the longest estimated evacuation travel times were identified for the existing University Glen Residential Area and the southern portion of campus. Some recommendations that may improve travel times throughout campus are listed below:

- Additional staffing intersection with a traffic control operators can improve operations and allow more efficient use of existing travel lanes. For example, the traffic control operator can help facilitate merges, prevent roundabouts from blocking up, or identify gaps for turning vehicles. The following intersections could benefit from staffing to improve operational efficiency:
 - All three major intersections along Lewis Road
 - The three roundabouts along Channel Islands Drive
 - Camarillo Street & Channel Islands Drive



- University Drive & Santa Barbara Avenue
- University Drive & Lot A3 entrance/exit
- Ventura Street & Oxnard Street
- Oxnard Street & Potrero Road
- Contraflow lanes can provide additional capacity for vehicles exiting campus. Implementing contraflow lanes requires traffic control devices (e.g., staffing, cones, signage) to inform drivers of where and when the lanes are active. Locations to consider for implementing contraflow lanes would be along the following roadway segments:
 - University Drive (between Santa Barbara Ave and Lewis Road)
 - Channel Island Drive (between Anacapa Island Drive and Lewis Road)
 - Camarillo Street (between Santa Barbara Avenue and Lewis Road)
- Policy to enforce early evacuation of non-essential staff will further reduce the number of people attempting to evacuate at the same time.

The estimated evacuation travel times presented in this memorandum are based on high-level assumptions and utilize an intersection based methodology. To more accurately estimate evacuation travel times a microsimulation model should be considered. Finally, conducting evacuation preparedness activities like a practice evacuation would allow for campus staff to observe evacuation behavior and travel times, and to identify and evaluate the effectiveness of changes to staffing and policy, like those described above, that help serve the campus condition and needs.

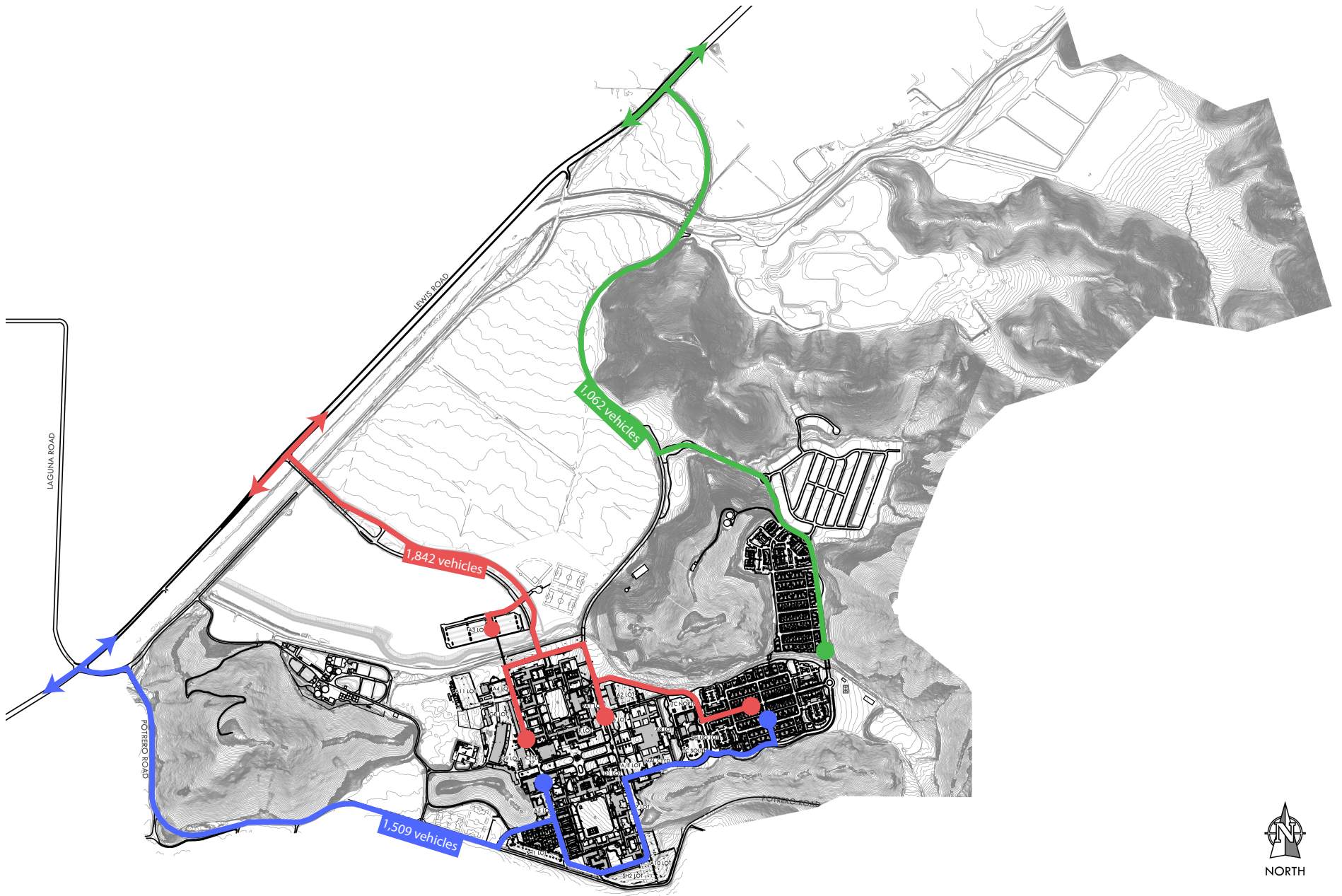


Figure 1
Evacuation Routes