

Memorandum

Date: December 23, 2021
To: Thomas S. Lyon, TTL Automotive Enterprises, Inc.
From: Rob Hananouchi & Greg Behrens, Fehr & Peers
Subject: Revised Traffic Study for Davis Express Car Wash

RS21-4053

This memorandum documents the transportation and site access and on-site circulation analysis of the proposed Davis Express Car Wash at 480 Mace Boulevard, located at the northeast corner of the Mace Boulevard/Cowell Boulevard intersection in Davis, California. The proposed project would include an automated car wash with 21 self-service vacuum bays.

This memorandum is organized into the following sections:

- Methodology
- Existing Conditions
- Existing Plus Project Conditions
- Vehicle Miles Traveled (VMT) Evaluation
- Project Access & On-Site Circulation

Methodology

This study analyzes traffic conditions at the study intersections listed below using level of service (LOS) as a primary measure of operational performance. Automobile LOS is a qualitative measure of traffic flow from the perspective of motorists and is an indication of the comfort associated with driving. Typical factors that affect LOS include speed, travel time, and traffic interruptions. Empirical LOS criteria and methods of calculation have been documented in the *Highway Capacity Manual (HCM), 6th Edition* (Transportation Research Board, 2016). The HCM uses a letter classification system to define six levels of



service from LOS A representing the least congested traffic conditions to LOS F representing the most congested traffic conditions where traffic demand exceeds capacity, resulting in long queues and delays.

This study analyzes peak hour operations at the following intersections:

1. Mace Boulevard/Alhambra Drive
2. Mace Boulevard/Second Street/County Road 32A (CR 32A)
3. Mace Boulevard/I-80 Westbound Ramps
4. Mace Boulevard/Chiles Road
5. Chiles Road/I-80 Eastbound Off-Ramp
6. Mace Boulevard/Cowell Boulevard
7. Mace Boulevard/North El Macero Drive

This study analyzes traffic operations at these intersections using the SimTraffic 11 microsimulation software. SimTraffic accounts for interactions between intersections, queue spillback, vehicle platooning, etc. The program also produces more accurate estimates of vehicular queueing (when compared to deterministic methods).

Similar analysis methods were utilized for the traffic operations analysis prepared for the Davis Innovation and Sustainability Campus (DISC) EIR in early 2020. The traffic operations analysis prepared for this study built off the SimTraffic 10 model prepared for the DISC EIR by updating the model to SimTraffic 11 and incorporating model refinements for the roadway network within the immediate vicinity of the project site. The SimTraffic model includes the project driveways, the driveway to the El Macero Commercial Center opposite the project site, and all ramps at the I-80 / Mace Boulevard interchange. Appendix A presents a screenshot of the SimTraffic network for illustration.

Applicable LOS Policies

Per the *City of Davis General Plan Transportation Element*, LOS E is the minimum acceptable LOS for City-operated study intersections (study intersections 1, 2, 4, 6, and 7).

Per the *Caltrans District 3 Interstate 80 Transportation Concept Report (TCR)* (August 2017), the horizon year LOS for I-80 within the study area (including the ramp terminal intersections at study intersections 3 and 5) is LOS F. It is important to note that Caltrans has transitioned away from requesting LOS or other vehicle operations analyses of land use projects in light of Senate Bill (SB) 743 and as described in the *Caltrans VMT-Focused Transportation Impact Study Guide* (May 2020). Instead, Caltrans review of land use projects and plans is focused on VMT, consistent with changes to the CEQA Guidelines resulting from SB 743.



Evaluation Criteria

This section describes the criteria used in this study to determine whether the project would cause an adverse effect to the surrounding transportation system. These criteria are based on policies from the City of Davis General Plan, the City of Davis Street Standards, and criteria utilized in previous transportation studies prepared by the City.

Roadway Operations Criteria

Per the City of Davis General Plan Transportation Element, LOS E is the minimum acceptable LOS for the City-owned study intersections. For the purposes of this analysis, adverse effects to City of Davis roadway operations are defined when the addition of project traffic would cause any of the following:

- For signalized intersections, cause overall intersection operations to deteriorate from an acceptable level (LOS E or better) to an unacceptable level (LOS F);
- For signalized intersections, exacerbate unacceptable (LOS F) operations by increasing an intersection's average delay by five seconds or more;
- For unsignalized intersections, cause the worst-case movement (or average of all movements for all-way stop-controlled intersections) to worsen from an acceptable level (LOS E or better) to an unacceptable level (LOS F) and meet the peak hour signal warrant;
- For unsignalized intersections that operate unacceptably (LOS F) and meet the peak hour signal warrant without the project, worsen operations by increasing the overall intersection's volume served by more than one percent; or
- For unsignalized intersections that operate unacceptably but do not meet the peak hour signal warrant without the project, add sufficient volume to meet the warrant.

Bicycle Facility Criteria

The project is considered to result in an adverse effect to bicycle facilities if:

- The project conflicts with existing, planned, or possible future bicycle facilities; or
- The project otherwise decreases the performance or safety of such facilities.

Pedestrian Facility Criteria

The project is considered to result in an adverse effect to pedestrian facilities if:

- The project conflicts with existing, planned, or possible future pedestrian facilities; or



- The project otherwise decreases the performance or safety of such facilities.

Transit Service and Facilities Criteria

The project is considered to result in an adverse effect to transit facilities and services if:

- The project conflicts with existing, planned, or possible future transit facilities and services; or
- The project otherwise decreases the performance or safety of such facilities and services.

Other Transportation Considerations

The project is additionally considered to result in an adverse effect to the transportation system if any of the following conditions occur:

- The project does not provide for adequate emergency vehicle access;
- The project results in a net increase in VMT; or
- The project does not provide for adequate site access.

Existing Conditions

Project Site Setting

Figure 1 shows the project site location. The project site is bounded by Mace Boulevard on the west, commercial uses to the north, residential apartments to the east, and Cowell Boulevard on the south. The project site is currently vacant. The El Macero Shopping Center anchored by a Nugget Markets grocery store is located on the west side of Mace Boulevard opposite the project site. The primary driveway for the El Macero Shopping Center is located directly west of the project site and provides full access for all entering/exiting vehicular turning movements.

City of Davis Fire Department Station No. 3 is also located on the west side of Mace Boulevard opposite the project site. "Keep Clear" pavement markings are placed on Mace Boulevard across the width of the fire station driveways. Emergency vehicle detection is provided at the fire station, which when actuated by departing fire apparatus, pre-empt the southbound green phases at the Mace Boulevard/Cowell Boulevard intersection and the northbound green phases at the Mace Boulevard/Chiles Road intersection (i.e., to clear vehicles that could interfere with emergency response).



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- 1 Study Intersection
- Parks
- Project Site
- Davis City Limit



Figure 1
Study Area



Near the project site, Mace Boulevard is four lanes north of Cowell Boulevard and two lanes south of Cowell Boulevard. Cowell Boulevard is two lanes east and west of Mace Boulevard. Mace Boulevard has a posted speed limit of 35 miles per hour (MPH) and Cowell Boulevard has a posted speed limit of 25 MPH. The Mace Boulevard/Cowell Boulevard intersection located southwest of the project site is signalized with protected intersection features on all four corners. The Interstate 80 (I-80)/Mace Boulevard interchange is located a short distance north of the project site. The interchange includes on- and off-ramps for both eastbound and westbound travel on I-80.

Bicycle Facilities

Class II bike lanes are provided in both directions on Mace Boulevard north of Cowell Boulevard and on Cowell Boulevard east and west of Mace Boulevard. Field observations indicated that the existing bike lane markings are severely degraded on both Mace Boulevard and Cowell Boulevard along the project site frontage. Class IV protected bikeways are provided in both directions on Mace Boulevard south of Cowell Boulevard.

Pedestrian Facilities

There are no sidewalks present along the project frontage on both Mace Boulevard and Cowell Boulevard. However, there are existing sidewalks to the north of the site along Mace Boulevard and east of the site on Cowell Boulevard, as well as at the northeast corner of the Mace Boulevard/Cowell Boulevard intersection. The Mace Boulevard/Cowell Boulevard intersection provides marked pedestrian crossings on all four intersection legs.

Transit Services and Facilities

Bus stops are located on both sides of Mace Boulevard along the project frontage. The bus stops are served by Unitrans Routes A, P, and Q and Yolobus Routes 42A, 42B, 44, and 232. The bus stop on southbound Mace Boulevard is outfitted with a bus stop sign, bench, shelter, and trash receptacle. The bus stop on northbound Mace Boulevard is outfitted with a bus stop sign only.

Data Collection

This study analyzes the project's impacts during the weekday p.m. peak hour. This hour was chosen over other hours (e.g., morning or weekend peaks) for several reasons. Data shows volumes and delay on Mace Boulevard are greater during this period than others. Trip generating land uses near the project site are generally busier during the evening versus morning peak hour. Finally, trips generated by the proposed project would be greater during the weekday evening peak hour than the morning peak hour. Hence, analysis of the project for weekday p.m. peak hour conditions provides a worst-case assessment of



potential off-site effects of the project. This study also considers project access and on-site circulation needs during the Saturday midday peak period when the project would potentially generate a greater number of trips.

This study uses intersection turning movement counts collected during the weekday a.m. and p.m. peak periods on Thursday, May 30, 2019 and Thursday, October 16, 2019. Intersection counts included volumes for vehicles, bicyclists, and pedestrians. During the traffic counts and field observations, local schools and UC Davis were in regular session and weather conditions were dry and clear. Use of these traffic counts establishes an Existing Conditions analysis scenario that represents operating conditions prior to the COVID-19 pandemic.

Intersection Operations

Table 1 displays the existing weekday a.m. and p.m. peak hour delay and level of service at the study intersections.

Table 1: Peak Hour Intersection Operations – Existing Conditions

Intersection	Jurisdiction	Traffic Control ¹	A.M. Peak Hour		P.M. Peak Hour	
			Delay ²	LOS ³	Delay ²	LOS ³
1. Mace Blvd. / Alhambra Dr.	City of Davis	Signal	17	B	20	B
2. Mace Blvd. / Second St./CR 32A	City of Davis	Signal	34	C	36	D
3. Mace Blvd. / I-80 Westbound Ramps	Caltrans	Signal	20	C	65	E
4. Mace Blvd. / Chiles Rd.	City of Davis	Signal	33	C	80	E
5. Chiles Rd. / I-80 Eastbound Off-Ramp	Caltrans	Signal	11	B	89	F
6. Mace Blvd. / Cowell Blvd.	City of Davis	Signal	11	B	103	F
7. Mace Blvd. / N. El Macero Dr.	City of Davis	AWSC	8	A	113	F

Notes:

Bold text indicates unacceptable operations based on the jurisdiction's applicable LOS policy.

1. "Signal" represents an intersection that operates with a traffic signal. "AWSC" represents an intersection with all-way stop control.
2. Delay is reported as seconds per vehicle. Average control delay for signalized and all-way stop-controlled intersections is the weighted average for all movements.
3. "LOS" represents level of service, determined by the thresholds contained in the *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016).

Source: Fehr & Peers, 2021.

All intersections operate at LOS C or better during the weekday a.m. peak hour, with traffic generally progressing smoothly and most motorists experiencing little delay as they progress through signalized intersections. Considerable delay and queuing occur during the weekday p.m. peak hour, with a few



intersections operating at LOS F. Two of these intersections—Mace Boulevard/Cowell Boulevard and Mace Boulevard/North El Macero Drive—are owned and operated by the City of Davis and do not meet the City of Davis General Plan LOS policy (maintain LOS E or better). These conditions can be attributed to several factors, including the prevalence of diverted regional traffic from eastbound I-80 onto local study area roadways, as well as the existing ramp metering at the eastbound I-80 on-ramps from Mace Boulevard. These conditions are particularly prevalent on Wednesday, Thursday, and Friday afternoons and evenings.

During the p.m. peak period traffic counts, field observations indicated that congested conditions were present on both eastbound I-80 and local roadways surrounding the Mace Boulevard interchange. Stacked vehicles were observed on southbound Mace Boulevard from the eastbound I-80 on-ramp to beyond Alhambra Drive, on northbound Mace Boulevard from the eastbound I-80 on-ramp to beyond San Marino Drive, and on eastbound Chiles Road from Mace Boulevard to the Hanlees Davis Toyota car dealership/service center. This is reflected in the LOS E and LOS F conditions reported during the weekday p.m. peak hour.

Mace Boulevard Corridor Project

The City of Davis and County of Yolo are currently undertaking the Mace Boulevard Corridor Project, which is exploring options to address the mobility challenges on Mace Boulevard that is in part caused by diverted regional traffic onto local area roadways. The goals of the Mace Boulevard Corridor Project include:

- Reduce delay for residents along the Mace Boulevard corridor
- Accommodate people riding bicycles of all ages and abilities
- Reduce induced commute bypass from navigation applications
- Accommodate emergency response and farm vehicles

The City of Davis has committed \$1,600,000 to construct improvements on Mace Boulevard between I-80 and the southern city limits at Montgomery Avenue over the next two fiscal years that achieve these goals. The exact improvements that would be constructed are still to be determined.

Existing Plus Project Conditions

Figure 2 shows the project site plan (A Plus Design Group, November 9, 2021). The proposed project would consist of an automated car wash with 21 self-service vacuum bays. The project site plan also shows a bike wash/fix it station and small dog wash area as ancillary uses. The project proposes two



vehicular access points: one on Mace Boulevard approximately 225 feet south of Chiles Road just south of the driveway to 4810 Chiles Road and one on Cowell Boulevard approximately 130 feet east of Mace Boulevard. The project driveway on Mace Boulevard would be restricted to right-in/right-out access only due to the existing raised median on Mace Boulevard. The project would also construct new sidewalks along the Mace Boulevard and Cowell Boulevard project site frontages and provide a pad for a bus stop shelter at the existing bus stop on northbound Mace Boulevard.

Project Travel Characteristics

Trip Generation

This study estimates the project’s vehicle trip generation based on field observations conducted at two comparable sites in Yolo County containing an automated car wash with vacuum bays. Specifically, the study observed conditions at the Quick Quack Car Wash at 645 Harbor Boulevard in West Sacramento and the Five Star Car Wash at 420 Pioneer Avenue in Woodland.

Trips generated by the automated car wash at each site were counted to estimate the vehicle trip generation. Since traffic volume and delay on Mace Boulevard are greatest on Friday evenings, the field observations were conducted from 4:00 p.m. to 6:00 p.m. on Friday, June 4, 2021, to assess the vehicle trip generation during this peak period.

Table 2 summarizes the peak hour vehicle trip generation data collected at these comparable sites. Appendix B provides the detailed field observation data.

Table 2: Vehicle Trip Generation Observations at Comparable Sites

Location	P.M. Peak Hour		
	In	Out	Total
Quick Quack Car Wash – West Sacramento	71	71	142
Five Star Car Wash – Woodland	38	33	71
Automated Car Wash Average	55	52	107

Notes:

Based on data collected on Friday, June 4, 2021. Counts collected between 4:00 p.m. and 6:00 p.m. based on peak period for adjacent street traffic. Peak hour for vehicle trip generation at the sites occurred from 4:15 p.m. to 5:15 p.m.

Source: Fehr & Peers, 2021.

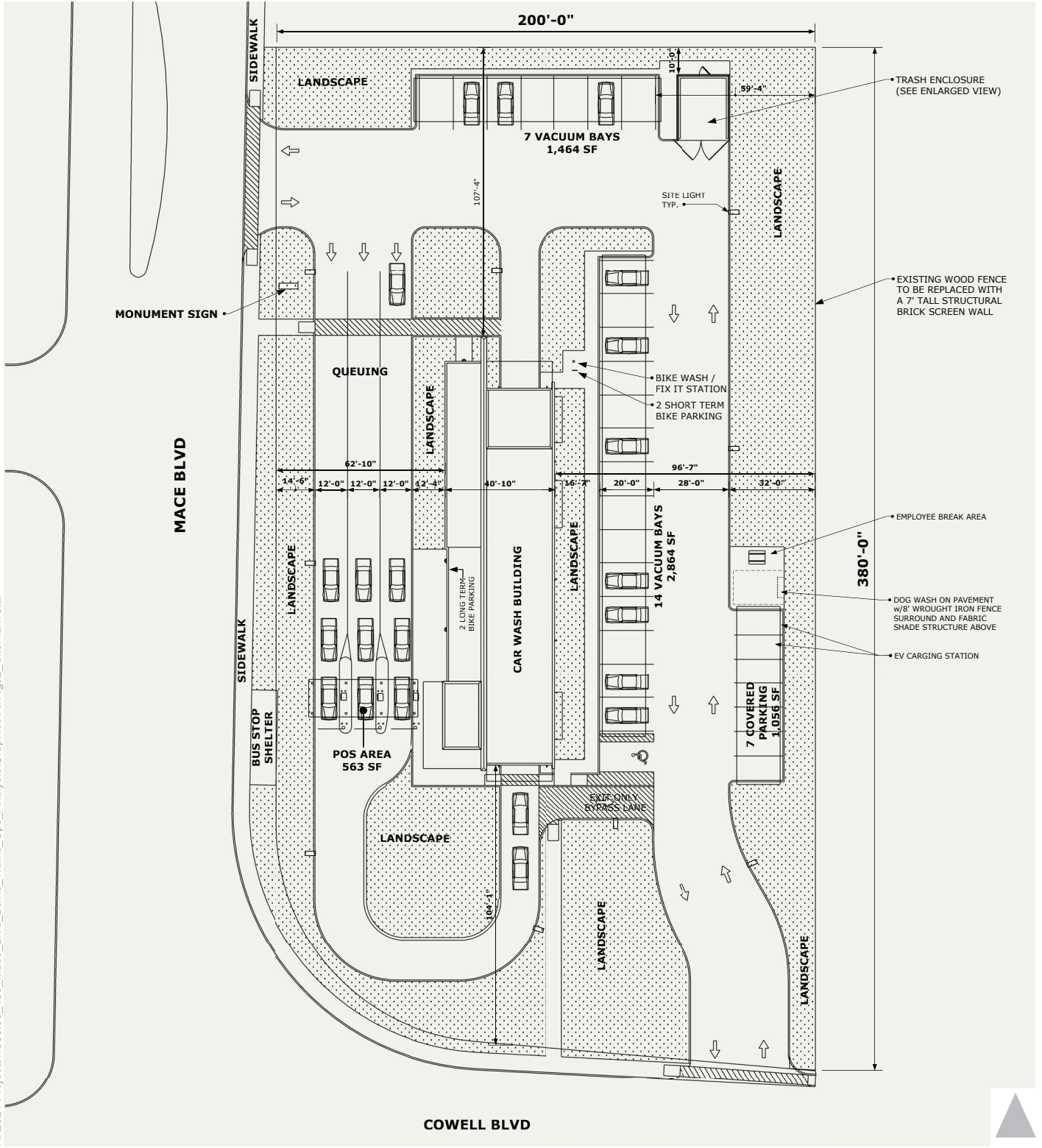


Figure 2
Project Site Plan



The automated car wash service at both the Quick Quack Car Wash in West Sacramento and Five Star Car Wash in Woodland consists of a single aisle automated car wash building with multiple vacuum bays similar to the proposed automated car wash. Therefore, this study averages the vehicle trip generation of these two sites to estimate the project’s vehicle trip generation.

Table 3 presents the project’s estimated vehicle trip generation during the weekday p.m. peak hour. Table 3 includes reductions for pass-by trips. Pass-by trips are trips already on the roadway network that are diverted to and from a commercial land use, and therefore would not be new trips generated by the project. For the proposed project, pass-by trips are existing motorists on Mace Boulevard who would choose to use the automated car wash enroute to their original destination. This study estimates that approximately 10 percent of gross trips generated by the proposed project would be pass-by trips.

Given the nature of the bike wash/fix it station and dog wash area, this study assumes no additional vehicle trips would be generated by these ancillary uses.

Table 3: Project Vehicle Trip Generation Estimate

Land Use	P.M. Peak Hour		
	In	Out	Total
Automated Car Wash ¹	55	52	107
Total Gross Vehicle Trips²	55	52	107
<i>Pass-by Trip Reduction (10%)</i>	-5	-5	-10
Net External Vehicle Trips³	50	47	97

Notes:

1. Trip generation for automated car wash based on average of vehicle trip generation at West Sacramento Quick Quack Car Wash and Woodland Five Star Car Wash.
2. Gross trip generation estimate reflects total trips traveling to/from the project site prior to pass-by trip reduction.
3. Net external vehicle trips represent the new primary trips generated by the project after subtracting existing pass-by trips that travel on the Mace Boulevard corridor prior to the project’s development.

Source: Fehr & Peers, 2021.



Trip Distribution and Trip Assignment

New project trips were assigned to the roadway network based on existing traffic patterns and the general distribution of jobs, schools, and housing in the area, as well as permitted driveway movements. The net new external trips were assigned to the roadway network as follows:

<u>Direction</u>	<u>P.M. Peak Hour Project Trips</u>		
	<u>Percentage</u>	<u>Inbound</u>	<u>Outbound</u>
Mace Boulevard to/from the north (including to/from I-80)	45%	22	21
Mace Boulevard to/from the south	15%	8	7
Cowell Boulevard/Chiles Road to/from the west	29%	14	14
Cowell Boulevard/Chiles Road to/from the east	11%	6	5

Pass-by trips were assigned equally to north-south traffic on Mace Boulevard (i.e., three pass-by trips in each direction).

The raised median on Mace Boulevard would restrict movements at the project driveway to right-in/right-out access only (i.e., no left-turn ingress or egress movements). Inbound project trips traveling from the north on Mace Boulevard were assigned to the southbound left-turn onto Cowell Boulevard and would use the Cowell Boulevard driveway to enter the site. Outbound project trips traveling south on Mace Boulevard are anticipated to exit the Cowell Boulevard driveway and make a westbound left-turn onto Mace Boulevard.

Overall, the project would increase the p.m. peak hour traffic volumes at study intersections by approximately two to four percent compared to existing conditions.

Intersection Operations

Table 4 presents the average delay and LOS at study intersections during the weekday p.m. peak hour under Existing Plus Project conditions. See Appendix C for technical calculations. Under Existing Plus Project conditions, the project would increase delay at several study intersections but would not worsen LOS (i.e., none of the study intersections would drop an LOS letter grade).

At the Mace Boulevard/Cowell Boulevard intersection, the project would increase average intersection delay by three seconds and exacerbate existing LOS F conditions. In instances where a signalized intersection currently operates at LOS F, the City considers a project to have an adverse effect on roadway operations if it would increase delay by five seconds or more. Therefore, this delay increase would not constitute an adverse effect to roadway operations for the purposes of this study.



Table 4: P.M. Peak Hour Intersection Operations – Existing Plus Project

Intersection	Jurisdiction	Traffic Control ¹	Existing Conditions		Existing + Project	
			Delay ²	LOS ³	Delay ²	LOS ³
1. Mace Blvd. / Alhambra Dr.	City of Davis	Signal	20	B	20	B
2. Mace Blvd. / Second St./CR 32A	City of Davis	Signal	36	D	28	C
3. Mace Blvd. / I-80 Westbound Ramps	Caltrans	Signal	65	E	43	D
4. Mace Blvd. / Chiles Rd.	City of Davis	Signal	80	E	78	E
5. Chiles Rd. / I-80 Eastbound Off-Ramp	Caltrans	Signal	89	F	119	F
6. Mace Blvd. / Cowell Blvd.	City of Davis	Signal	103	F	106	F
7. Mace Blvd. / N. El Macero Dr.	City of Davis	AWSC	113	F	100	F

Notes:

Bold text indicates unacceptable operations based on the jurisdiction’s applicable LOS policy.

1. “Signal” represents an intersection that operates with a traffic signal. “AWSC” represents an intersection with all-way stop control.
2. Delay is reported as seconds per vehicle. Values are rounded to the nearest whole number. Average control delay for signalized and all-way stop-controlled intersections is the weighted average for all movements.
3. “LOS” represents level of service, determined by the thresholds contained in the *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016).

Source: Fehr & Peers, 2021.

The Mace Boulevard/North El Macero Drive unsignalized intersection would continue to operate at LOS F under Existing Plus Project conditions. The project would increase traffic volumes at the Mace Boulevard/North El Macero Drive intersection by 15 trips, or two percent, during the p.m. peak hour. In such circumstances, the City considers a project to have an adverse effect on roadway operations if the intersection meets the peak hour signal warrant, or if the volume increase resulting from the project would cause the intersection to meet the peak hour signal warrant. The Mace Boulevard/North El Macero Drive intersection does not meet the peak hour signal warrant under either existing or Existing Plus Project conditions. Therefore, this volume increase would not constitute an adverse effect to roadway operations for the purposes of this study.

Note that the results presented in Table 4 indicate that the project would decrease delay at several intersections. This decrease is the result of variation that occurs when averaging the results of multiple microsimulation model runs. Variation in model runs is particularly common when congested conditions are present, as is the case in the roadway network evaluated in this study. From this, it can be concluded that the effect of project trips is less noticeable than variations in results between model runs.

The traffic delay and LOS at study intersections would also likely be affected by the proposed improvements associated with the Mace Boulevard Corridor Project. As noted earlier, the Mace Boulevard Corridor Project would construct improvements along Mace Boulevard between I-80 and the southern city



limits at Montgomery Avenue that are intended to reduce delay for residents along the Mace Boulevard corridor, while also accommodating bicyclists of all ages and abilities, emergency response, and farm vehicles. Therefore, it is possible that the Mace Boulevard Corridor Project improvements would reduce the delay and improve the LOS at the study intersections compared to the results presented in Table 4.

Bicycle Facilities

Given the proposed land uses, the project would generate a nominal number of new bicycle trips (i.e., fewer than 10 trips per day).

Currently, Class II bike lanes are designated on the Mace Boulevard and Cowell Boulevard project site frontages. As noted in the existing conditions section, at these locations, the existing Class II bike lane markings are severely degraded. The project would include the construction of new driveways on Mace Boulevard and Cowell Boulevard and new vehicle trips generated by the project would increase the number of vehicle turning movements across the existing bike lanes. Altogether, these conditions would increase the potential for bicycle-vehicle conflicts and cause an adverse effect to bicycle facilities.

Recommendation #1: Improve the Class II bike lanes on the Mace Boulevard and Cowell Boulevard project site frontages to reduce the potential for bicycle-vehicle conflicts. Potential improvements include restriping the Class II bike lane markings along the Mace Boulevard and Cowell Boulevard project site frontages and installing high-visibility bike lane conflict markings across the project driveway throats, or measures of equal effectiveness as determined by the City Public Works department. The project should construct these improvements prior to commencing operations.

Pedestrian Facilities

Given the proposed land uses, the project would generate a nominal number of new pedestrian trips, if any.

The project would construct new sidewalks along the Mace Boulevard and Cowell Boulevard project site frontages. These would connect to existing sidewalks north and east of the project site and eliminate existing gaps in the surrounding sidewalk network by creating continuous sidewalks on both sides of Mace Boulevard and Cowell Boulevards within the immediate vicinity of the project site. Altogether, the project would not adversely affect pedestrian facilities.

Transit Services and Facilities

Given the proposed land uses, the project would generate a nominal number of new transit trips, if any.



The project would modify the Mace Boulevard project site frontage by constructing a new driveway and new sidewalk. The project would also provide a pad for a bus shelter at the existing bus stop on northbound Mace Boulevard, which would enhance the existing bus stop. These modifications would not physically disrupt the existing northbound bus stop located on Mace Boulevard immediately north of Cowell Boulevard. Altogether, the project would not adversely affect transit services or facilities.

Emergency Vehicle Access

As described previously, City of Davis Fire Department Station No. 3 is located on the west side of Mace Boulevard opposite the project site. "Keep Clear" pavement markings are placed on Mace Boulevard across the width of the fire station driveways. Emergency vehicle detection is provided at the fire station, which when actuated by departing fire apparatus, pre-empts the southbound green phases at the Mace Boulevard/Cowell Boulevard intersection and the northbound green phases at the Mace Boulevard/Chiles Road intersection (i.e., to clear vehicles that could interfere with emergency response).

The project would increase vehicle travel, queueing, and delay on roadways within the vicinity of the project site, including at the Mace Boulevard/Chiles Road and Mace Boulevard/Cowell Boulevard intersections. However, the existing emergency vehicle detection at Station No. 3 and pre-emption at the Mace Boulevard/Chiles Road and Mace Boulevard/Cowell Boulevard intersections would reduce the potential for project-related increases in vehicle travel, queueing, and delay to adversely affect emergency vehicle access. Altogether, the project would not adversely affect emergency vehicle access.

Vehicle Miles Traveled Evaluation

Background

Senate Bill 743

SB 743 required the California Governor's Office of Planning and Research (OPR) to amend the State CEQA Guidelines to establish new metrics for determining the significance of transportation impacts. In the amended State CEQA Guidelines, OPR selected VMT as the preferred transportation impact metric and applied its discretion to recommend its use statewide. The amended CEQA Guidelines state that "generally, VMT is the most appropriate measure of transportation impacts" and the provisions requiring the use of VMT applied statewide as of July 1, 2020.

SB 743 establishes that aesthetic and parking impacts of a residential, mixed-use residential, or employment center projects on an infill site within a transit priority area (TPA) shall not be considered



significant impacts on the environment. SB 743 also added Section 21099 to the Public Resources Code, which states that automobile delay, as described by level of service (LOS) or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment upon certification of the State CEQA Guidelines by the California Natural Resources Agency. Since the amended State CEQA Guidelines were certified in December 2018, changes in LOS or similar measures of vehicular capacity or traffic congestion are not considered a significant impact on the environment.

Technical Advisory on Evaluating Transportation Impacts in CEQA

To aid in SB 743 implementation, OPR released a *Technical Advisory on Evaluating Transportation Impacts in CEQA* (Technical Advisory) in December 2018. The Technical Advisory provides advice and recommendations to CEQA lead agencies on how to implement SB 743 changes. This includes technical recommendations regarding the assessment of VMT, thresholds of significance, VMT mitigation measures, and screening thresholds for certain land use projects. Lead agencies may consider and use these recommendations at their discretion.

The Technical Advisory identifies screening thresholds to quickly identify when a lead agency may presume a project would cause a less-than-significant impact without conducting a detailed study. The Technical Advisory suggests that projects meeting one or more of the following criteria would be expected to have a less than significant impact on VMT.

- Small projects—projects consistent with a SCS and local general plan that generate or attract fewer than 110 trips per day.
- Projects near major transit stops—certain projects (residential, retail, office, or a mix of these uses) proposed within 0.5 mile of an existing major transit stop or an existing stop along a high-quality transit corridor.
- Affordable residential development—a project consisting of a high percentage of affordable housing may be a basis to find a less-than-significant impact on VMT.
- Local-serving retail—retail development typically redistributes shopping trips rather than creating new trips. Local-serving retail in particular tends to shorten trips and reduce VMT. The Technical Advisory encourages lead agencies to decide when a project will likely be local-serving, but generally acknowledges that retail development including stores larger than 50,000 square feet might be considered regional-serving. The Technical Advisory suggests lead agencies analyze whether regional-serving retail would increase or decrease VMT (i.e., not presume a less-than-significant impact).



- Projects in low-VMT areas—residential and office projects that incorporate similar features (i.e., density, mix of uses, transit accessibility) as existing development in areas with low VMT will tend to exhibit similarly low VMT.
- The Technical Advisory also identifies recommended numeric VMT thresholds for residential, office, and retail projects, as described below.
- Residential development that would generate vehicle travel exceeding 15 percent below existing residential VMT per capita may indicate a significant transportation impact. Existing VMT per capita may be measured as a regional VMT per capita or as city VMT per capita.
- Office projects that would generate vehicle travel exceeding 15 percent below existing regional VMT per employee may indicate a significant transportation impact.
- Retail projects that result in a net increase in total VMT may indicate a significant transportation impact.

VMT Screening Assessment

In accordance with the current CEQA Guidelines, this study evaluates the VMT effects of the proposed project. This study applies the methods outlined in OPR's Technical Advisory since the City of Davis does not have locally adopted VMT thresholds or guidelines.

The OPR Technical Advisory notes that new retail development typically redistributes shopping trips rather than creating new trips. As noted above, local-serving retail is one of the screening criteria identified in the OPR Technical Advisory as uses that can be presumed to have a less than significant VMT impact.

An automated express car wash would likely have a similar effect on travel to retail uses (i.e., demand for car washes is relatively fixed, with customers selecting a car wash business to patronize based on convenience, quality, and/or offered services, similar to commercial retail uses). The OPR Technical Advisory suggests estimating the total change in VMT (i.e., the difference in total VMT in the area affected with and without the project) to analyze a retail project's VMT impact.

The Technical Advisory further states that "adding retail opportunities into the urban fabric and thereby improving retail destination proximity, local-serving retail development tends to shorten trips and reduce VMT. Thus, lead agencies generally may presume such development creates a less-than-significant transportation impact."

A Site Analysis Report and car wash data compiled for the project suggests that most customers at a car wash facility will travel from within a three-mile radius (see Appendix D). This supports the notion that car



wash facilities typically serve a local market. This also aligns with the Lovejoy, et. al study cited in the OPR Technical Advisory, which observed that bringing retail destinations closer to residences could help reduce vehicle travel, particularly where the comparable alternatives are far away. This aligns with general observation that most customers choose to shop at commercial businesses that are closer and/or more convenient to access as opposed to comparable businesses that are further away and/or less convenient to access. In other words, the proposed project is unlikely to draw customers from Woodland or West Sacramento, where comparable express car wash businesses exist. Instead, the project would be expected to cater to clientele within Davis, thus yielding lower trip lengths and, in turn, lower VMT associated with car wash customer trips relative to a comparable facility located elsewhere (e.g., Woodland or West Sacramento).

Since the proposed project can reasonably be described as a “local-serving” business that would improve commercial destination proximity, the project would be expected to generally reduce VMT in the area. In accordance with the OPR Technical Advisory, the project would satisfy the local-serving retail VMT screening criteria by virtue of the nature and size of the project (commercial use with less than 50,000 square feet of building floor area consisting of a local-serving use). Therefore, no quantitative VMT analysis or associated mitigation measures are required, and the project can be presumed to have a less than significant impact on VMT.

Cumulative VMT Impact Assessment

In addition to a project’s direct effects on VMT, the CEQA Guidelines state that environmental review should consider whether a project’s incremental effect is cumulatively considerable when viewed in connection with the effects of past, current, and probable future projects. As a car wash facility, the proposed project would primarily serve local clientele within Davis (e.g., Davis residents and employees), as described above. Reasonably foreseeable projects that are approved or planned in the City of Davis do not include projects with a comparable express automated car wash facility as a primary use (i.e., not associated with a gas station). As the only reasonably foreseeable project of its type, the project’s cumulative effect on VMT would be comparable to its project-specific effect. Since the project-specific effect on VMT is considered less than significant, the project’s cumulative VMT impact is also considered to be less than significant.



Project Access and On-Site Circulation

Project Access & Driveway Analysis

It is important that driveways be designed with adequate width, capacity, and throat depth to accommodate exiting traffic, such that blockages to incoming traffic are minimized. Such blockages could cause inbound traffic to spill back onto public streets, which could increase conflicts with other vehicles and modes of travel. The driveway analysis also includes an assessment of inbound vehicle movements to evaluate the extent to which vehicles waiting to enter the project site could affect traffic operations on the adjacent roadway.

The following conclusions can be drawn from the project access and driveway analysis.

Southbound Access from Mace Boulevard

More than half of inbound project trips are expected to travel to the project on Mace Boulevard from the north (combination of trips from Mace Boulevard north of I-80 and Chiles Road). The raised median on Mace Boulevard would restrict movements to right-in/right-out at the Mace Boulevard driveway, diverting inbound movements to Cowell Boulevard. Since the raised median on Mace Boulevard ends just south of the project driveway, some drivers may attempt a mid-block southbound U-turn movement to access the project. This movement would be undesirable as it could result in a head-on conflict with northbound vehicles turning left into the El Macero Shopping Center in the center two-way left-turn lane. Additionally, if this U-turn movement occurred just south of the raised median, the U-turning vehicle could block travel in the adjacent southbound through lane when waiting for a gap in northbound traffic. This could create an increased potential for collisions and could cause queueing in the southbound through lane as vehicles unexpectedly stop and/or block southbound through traffic on Mace Boulevard.

Mace Boulevard Driveway

This driveway would be located approximately 225 feet south of Chiles Road. The raised median on Mace Boulevard would restrict movements to right-in/right-out access only (i.e., no left-turn ingress and egress movements). The driveway throat depth would be approximately 20 feet (about one car length) measured from the edge of the pedestrian sidewalk to the queue lanes for the car wash. However, there would be approximately 60 feet (about two to three car lengths) of outbound vehicle storage measured from the edge of the sidewalk to the first vacuum bay on the north side of the site.

The outbound vehicle queue at this driveway would be influenced by traffic flow on northbound Mace Boulevard. Vehicle queues on northbound Mace Boulevard currently extend back from the I-80



eastbound on-ramp beyond the proposed location of the project driveway during the weekday p.m. peak hour. This would block egress movements from this driveway and would cause the maximum vehicle outbound queue to reach 125 feet (equivalent to five vehicles) during this period. This maximum queue would extend into the project site, exceeding the available driveway storage. This queue would block a few of the vacuum bays on the north side of the site and extend beyond the exit of the automated car wash building. This could cause a backup into the automated car wash building if vehicles exiting the automated car wash must wait to enter the outbound queue and begin building a queue back into the car wash building. It may also impede on-site circulation if, for example, a vehicle exiting the automated car wash attempts to enter the outbound queue and blocks travel on the main drive aisle.

It should be noted this maximum queue length assumes no “good Samaritan” drivers on northbound Mace Boulevard leave gaps to allow egress trips from the driveway to enter the standing queue on northbound Mace Boulevard. It also presumes that drivers continue to attempt to use the Mace Boulevard driveway although some may choose to use the Cowell Boulevard driveway as an alternate outbound route to avoid a long queue and delay at the Mace Boulevard driveway.

Cowell Boulevard Driveway

This driveway would be approximately 130 feet east of the Mace Boulevard intersection. Westbound queues on Cowell Boulevard from the Mace Boulevard intersection may extend beyond the project driveway, which would block both ingress and egress at the Cowell Boulevard driveway.

Inbound Left-Turn from Cowell Boulevard

Two sets of double yellow lines are striped in the center of Cowell Boulevard to form a striped median and westbound left-turn pocket approaching Mace Boulevard immediately west of the project driveway. Legally, drivers are prohibited from entering this area since the striped median is considered a barrier. However, drivers may still attempt an eastbound left-turn ingress movement from this striped median area given the presence of the project driveway and no physical impediments to block this movement. However, the westbound left-turn pocket approaching Mace Boulevard and corresponding left-turn pocket taper in the center of Cowell Boulevard would limit the space for eastbound left-turn ingress movements. This would leave very little space for eastbound left-turn ingress movements to queue without blocking travel in the eastbound through lane or blocking the westbound left-turn pocket.

Based on the project trip assignment, 36 vehicles would make this eastbound left-turn into the project driveway on Cowell Boulevard during the p.m. peak hour. Most of this demand (28 of the 36 vehicles) would be vehicles traveling from the north on Mace Boulevard (i.e., project trips making a southbound left-turn from Mace Boulevard onto Cowell Boulevard). When multiple vehicles attempt to make the



eastbound left-turn ingress at the project driveway, these vehicles would queue into the adjacent eastbound through lane on Cowell Boulevard. A maximum queue of three vehicles, or approximately 75 feet, is expected based on this forecasted level of project trips (see Appendix C for technical calculations). This left-turn queue would spill back into the eastbound through lane, which would increase the potential for collisions and queuing that could extend back to the Mace Boulevard/Cowell Boulevard intersection.

Outbound Left-Turn onto Cowell Boulevard

The proximity of the project driveway to the Mace Boulevard/Cowell Boulevard intersection would also create a potential sight distance issue for vehicles departing the project's Cowell Boulevard driveway. Specifically, westbound vehicles that are queued back from the Mace Boulevard intersection would inhibit drivers' ability to see oncoming eastbound traffic on Cowell Boulevard. This would make outbound left-turn movements departing the project driveway potentially hazardous. Outbound left-turn movements from the project driveway could attempt to turn left onto Cowell Boulevard without being aware of oncoming eastbound traffic, which would potentially result in increased risk of a sideswipe or broadside collision.

Project Access & Driveway Recommendations

Altogether, these conditions would adversely affect roadway operations and safety on surrounding public roads. Fehr & Peers recommends the following (refer to Figure 3):

Recommendation #2: Add wayfinding signage on site that directs drivers to the Cowell Boulevard driveway to exit the project site. At a minimum, signage should be placed facing the vacuum bays. For example, signage facing the vacuum bays should state: "Exit" with an arrow pointed left towards the Cowell Boulevard driveway. Require on-site staff to monitor the egress queue at the Mace Boulevard driveway and direct outbound vehicles to Cowell Boulevard if a queue of three or more vehicles stack back from Mace Boulevard. This would be necessary to avoid potential blockage of outbound traffic from the automated car wash.

Recommendation #3: Implement measure(s) that deter southbound U-turn movements on Mace Boulevard. The ultimate modification should adequately restrict mid-block U-turn movements to the satisfaction of the City's Public Works department. Potential options include:

- *Install a "no U-turn" sign (CA-MUTCD R3-4) facing southbound traffic in the Mace Boulevard median to indicate to drivers that southbound U-turn movements from the center two-way left-turn lane are prohibited.*



- *Install a “gull-wing” raised median at the El Macero Shopping Center driveway that would allow left-turns into and out of the El Macero Shopping Center (as is allowed today). This would physically prohibit midblock southbound U-turn movements on Mace Boulevard.*
- *Extend the existing Mace Boulevard raised median southerly approximately 70 feet and provide a median break to allow for eastbound left-turn egress from the El Macero Shopping Center. This would prohibit southbound U-turn movements. This would also result in prohibited northbound left-turn ingress into the El Macero Shopping Center. Existing trips entering the El Macero Shopping Center on Mace Boulevard from the south would be rerouted to the Cowell Boulevard driveway.*

Recommendation #4: Add “Keep Clear” pavement marking on westbound Cowell Boulevard adjacent to the Cowell Boulevard driveway to maintain a gap for eastbound left-turn ingress movements at the project driveway. Restripe the center median of Cowell Boulevard to provide space for a 25-foot eastbound left-turn pocket. This left-turn pocket would allow inbound traffic to pull out of the eastbound through lane and minimize impacts to operations at the Mace Boulevard/Cowell Boulevard signal. This would also require shortening the existing westbound left-turn pocket and/or taper on Cowell Boulevard approaching the Mace Boulevard intersection.

Recommendation #5: Modify the Mace Boulevard/Cowell Boulevard intersection to allow southbound U-turn movements. This would facilitate southbound ingress from Mace Boulevard into the project site, reduce the potential for undesirable mid-block U-turn movements, and reduce demand at the eastbound left-turn ingress from Cowell Boulevard. This modification would require reconstruction of the northeast corner of the Mace Boulevard/Cowell Boulevard intersection, including the relocation of the western-most raised median approximately six feet to the east.

Initial analysis of this recommendation suggests that reducing demand for the eastbound left-turn into the project driveway on Cowell Boulevard would correspondingly reduce the maximum queue from 3 vehicles (approximately 75 feet) to 2 vehicles (approximately 50 feet) (see Appendix C for technical calculations). Although minor, this reduction would reduce the likelihood and frequency of queues extending into the adjacent eastbound through lane on Cowell Boulevard.

Recommendation #6: Implement measure(s) that deter southbound left-turn movements out of the Cowell Boulevard driveway. The ultimate modification should adequately deter the outbound left-turn movement to the satisfaction of the City’s Public Works department. Potential options include:

- *Install a “no left-turn” sign (CA-MUTCD R3-2) for outbound traffic at the project driveway on Cowell Boulevard.*



- *Install a raised island at the project's Cowell Boulevard driveway that allow left-turn and right-turn ingress but channelizes outbound movements to make right-turns only. Install a "no left-turn" sign (CA-MUTCD R3-2) to further indicate the prohibition of outbound left-turn movements in a location that does not hinder driver's sight distance.*

On-Site Circulation

In addition to the Friday evening peak period field observations, additional field observations were conducted at automated car wash facilities in the Sacramento region for a Saturday midday peak period to assess on-site queuing and traffic demand at similar facilities.

These field observations noted a maximum queue of 15 total vehicles waiting to pay at automated car wash facilities (i.e., five vehicles per lane for a three-lane pay queue).

Based on our review of the project site plan, the automated car wash would have three lanes approaching the point-of-sale area each with approximately 165 feet of storage space. The maximum queue of 15 total vehicles would occupy approximately 110 to 125 feet (5 vehicles spaced 22 to 25 feet apart), which is within this available storage. Therefore, the project site plan provides sufficient queuing space to accommodate the maximum peak queue for the automated car wash entry.

Summary & Conclusions

In summary, review of the project revealed the need for the following modifications to the project site plan and the surrounding roadway network:

- Improve the Class II bike lanes on the Mace Boulevard and Cowell Boulevard project site frontages;
- Add wayfinding signage on-site that directs vehicles to exit the Cowell Boulevard driveway and require on-site staff to monitor the outbound queue at the Mace Boulevard driveway;
- Implement measure(s) that deter southbound U-turn movements on Mace Boulevard to the satisfaction of the City's Public Works department;
- Stripe an eastbound left-turn pocket on Cowell Boulevard to facilitate inbound movements at project driveway and place "Keep Clear" pavement markings on westbound Cowell Boulevard across the project driveway;
- Modify the Mace Boulevard/Cowell Boulevard intersection to allow southbound U-turn movements; and



- Implement measure(s) that deter outbound left-turn movements out of the project driveway on Cowell Boulevard to the satisfaction of the City's Public Works department.

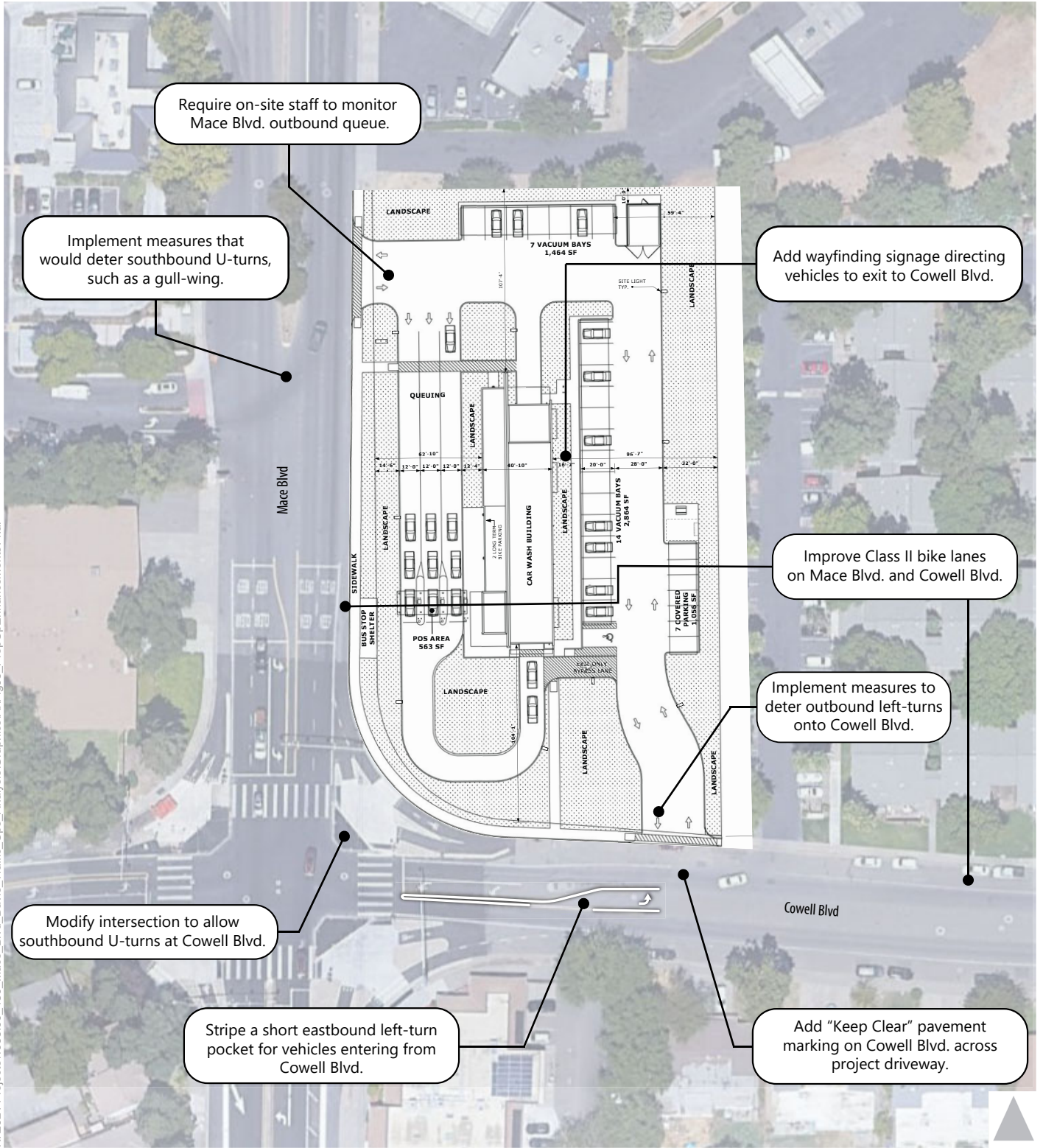


Figure 3
Proposed Operational Enhancements



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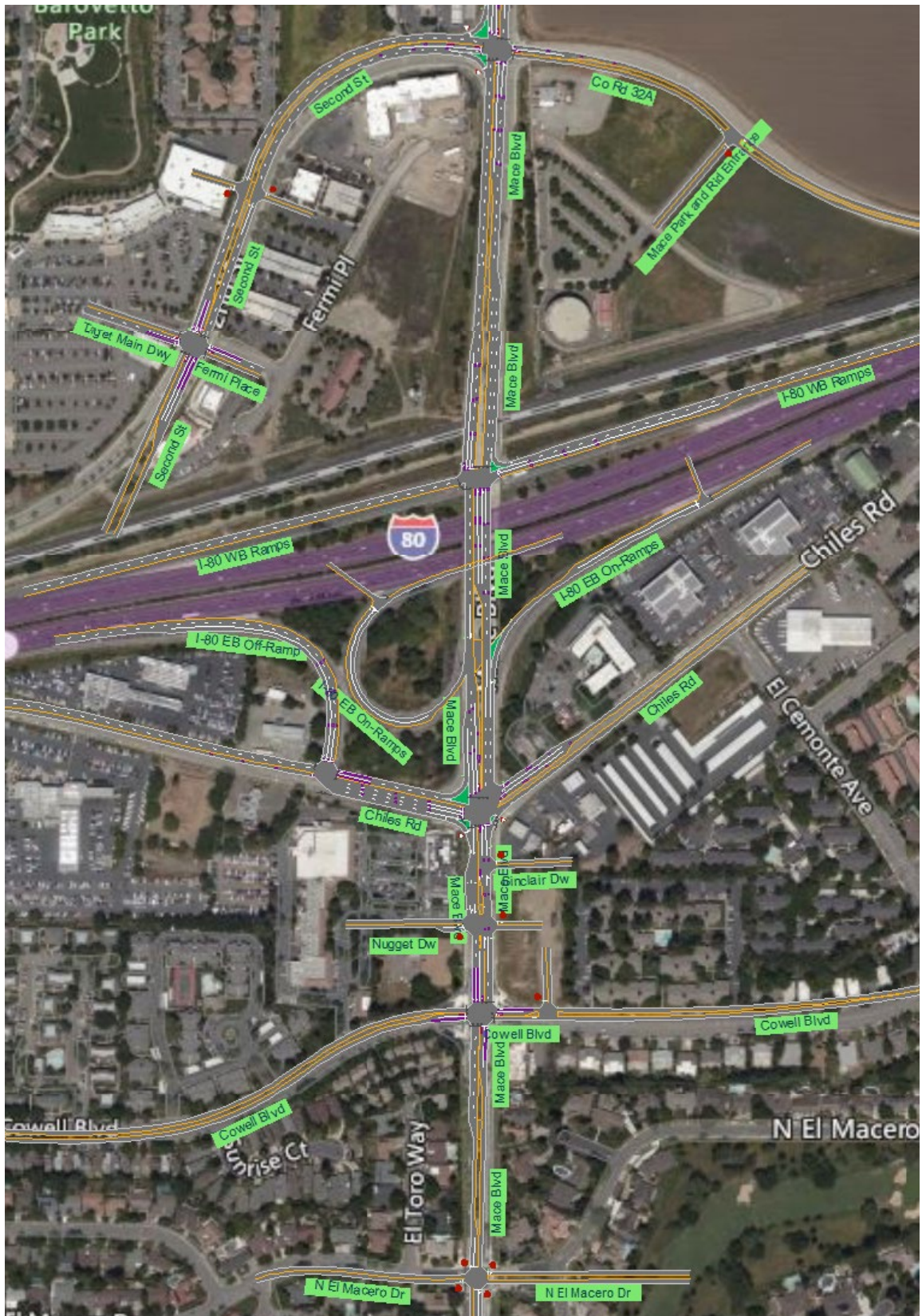
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Appendix A. SimTraffic Microsimulation Model Network





Appendix B. Field Observations at Comparable Sites

Trip Generation Data - Friday PM

	Car Wash (Woodland)			Car Wash (W. Sac)			Car Wash (Average)		
	In	Out	Total	In	Out	Total	In	Out	Total
4:00-4:15	7	8	15	17	11	28	12	9.5	21.5
4:15-4:30	11	7	18	15	12	27	13	9.5	22.5
4:30-4:45	10	9	19	12	26	38	11	17.5	28.5
4:45-5:00	7	10	17	19	14	33	13	12	25
5:00-5:15	10	7	17	25	19	44	17.5	13	30.5
5:15-5:30	4	9	13	14	14	28	9	11.5	20.5
5:30-5:45	7	7	14	10	10	20	8.5	8.5	17
5:45-6:00	2	4	6	5	2	7	3.5	3	6.5
Peak-15	10	9	19	25	19	44	17.5	14	30.5
Peak Hour (4:15-5:15)	38	33	71	71	71	142	54.5	52	106.5

Maximum Queue Observations - Friday PM

	Quick Quack (W. Sac)	Car Wash (Woodland)
4:00-4:15	6	4
4:15-4:30	10	5
4:30-4:45	9	5
4:45-5:00	3	2
5:00-5:15	11	2
5:15-5:30	7	3
5:30-5:45	4	3
5:45-6:00	5	

Maximum Queue Observations - Saturday Midday PM

	Quick Quack (W. Sac)	Quick Quack (Roseville)
12:30-12:45	4	
12:45-1:00	8	
1:00-1:15	4	7
1:15-1:30	3	15
1:30-1:45	4	



Appendix C. Technical Appendix

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing
PM Peak Hour

Intersection 1 **Mace Blvd/Alhambra Dr** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	252	252	100.1%	43.1	9.4	D
	Through	609	593	97.4%	12.9	2.2	B
	Right Turn						
	Subtotal	861	846	98.2%	22.3	3.6	C
SB	Left Turn						
	Through	651	637	97.9%	21.1	2.5	C
	Right Turn	23	23	100.0%	7.0	2.9	A
	Subtotal	674	660	98.0%	20.6	2.4	C
EB	Left Turn	12	12	100.8%	32.9	17.7	C
	Through						
	Right Turn	199	201	100.9%	2.2	0.2	A
	Subtotal	211	213	100.9%	4.2	1.7	A
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,746	1,719	98.4%	19.5	2.3	B

Intersection 2 **Mace Blvd/ 2nd Ave-Co Rd 32A** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	367	350	95.3%	23.8	4.3	C
	Through	716	699	97.6%	14.8	2.7	B
	Right Turn	32	33	101.9%	9.9	6.0	A
	Subtotal	1,115	1,081	96.9%	17.6	2.8	B
SB	Left Turn	98	95	96.9%	53.0	13.7	D
	Through	660	652	98.8%	47.4	30.3	D
	Right Turn	93	91	98.0%	13.4	15.6	B
	Subtotal	851	838	98.5%	44.5	27.2	D
EB	Left Turn	124	125	100.7%	34.8	4.6	C
	Through	113	113	100.3%	34.4	6.3	C
	Right Turn	632	628	99.4%	55.9	62.0	E
	Subtotal	869	867	99.7%	49.6	44.1	D
WB	Left Turn	19	19	97.9%	46.9	14.2	D
	Through	22	23	105.9%	40.1	10.1	D
	Right Turn	41	39	95.9%	12.8	8.9	B
	Subtotal	82	81	99.0%	29.0	8.1	C
Total		2,917	2,867	98.3%	35.7	20.1	D

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing
PM Peak Hour

Intersection 4 Mace Blvd/I-80 WB Ramps Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	253	232	91.7%	38.5	7.3	D
	Through	446	416	93.2%	7.3	3.1	A
	Right Turn						
	Subtotal	699	648	92.6%	18.5	2.6	B
SB	Left Turn						
	Through	1,092	1,042	95.4%	137.1	78.3	F
	Right Turn	219	209	95.3%	77.0	57.4	E
	Subtotal	1,311	1,251	95.4%	126.9	74.6	F
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn	387	379	97.9%	33.0	7.8	C
	Through						
	Right Turn	669	665	99.4%	4.1	0.6	A
	Subtotal	1,056	1,044	98.8%	14.9	3.1	B
Total		3,066	2,942	96.0%	64.6	33.7	E

Intersection 5 Mace Blvd/Chiles Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	24	20	82.9%	123.1	31.9	F
	Through	518	445	85.9%	148.4	38.9	F
	Right Turn	162	142	87.6%	127.8	34.9	F
	Subtotal	704	607	86.2%	142.7	37.3	F
SB	Left Turn	259	246	94.8%	90.4	27.7	F
	Through	430	409	95.2%	44.7	9.2	D
	Right Turn	289	276	95.3%	31.6	9.6	C
	Subtotal	978	930	95.1%	52.8	12.9	D
EB	Left Turn	339	303	89.3%	166.5	17.3	F
	Through	275	252	91.6%	30.4	4.1	C
	Right Turn	85	82	96.9%	2.4	0.3	A
	Subtotal	699	637	91.1%	92.4	8.9	F
WB	Left Turn	46	44	96.1%	43.1	11.2	D
	Through	56	56	99.1%	34.6	15.2	C
	Right Turn	263	259	98.5%	41.2	29.2	D
	Subtotal	365	359	98.3%	41.0	25.1	D
Total		2,746	2,533	92.2%	79.8	10.2	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing
PM Peak Hour

Intersection 15 Chiles Blvd/I-80 EB Ramps Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	175	176	100.5%	27.6	12.4	C
	Through						
	Right Turn	29	31	106.2%	3.4	1.7	A
	Subtotal	204	207	101.3%	24.5	10.5	C
EB	Left Turn						
	Through	524	468	89.2%	192.2	148.9	F
	Right Turn						
	Subtotal	524	468	89.2%	192.2	148.9	F
WB	Left Turn						
	Through	369	350	94.8%	8.9	1.6	A
	Right Turn						
	Subtotal	369	350	94.8%	8.9	1.6	A
Total		1,097	1,024	93.3%	88.6	61.9	F

Intersection 6 Mace Blvd/Cowell Blvd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	15	14	90.7%	266.0	57.8	F
	Through	358	292	81.4%	332.1	123.8	F
	Right Turn	27	22	80.4%	330.3	110.3	F
	Subtotal	400	327	81.7%	329.2	119.0	F
SB	Left Turn	142	137	96.7%	39.0	3.6	D
	Through	225	215	95.3%	17.9	5.5	B
	Right Turn	67	61	91.3%	7.1	2.6	A
	Subtotal	434	413	95.2%	22.7	2.6	C
EB	Left Turn	119	108	91.1%	80.8	43.9	F
	Through	102	102	100.1%	39.9	27.1	D
	Right Turn	24	21	86.3%	29.4	23.6	C
	Subtotal	245	231	94.4%	58.7	32.0	E
WB	Left Turn	21	19	92.4%	61.4	37.7	E
	Through	47	43	91.9%	55.0	39.9	E
	Right Turn	98	95	96.4%	57.5	34.9	E
	Subtotal	166	157	94.6%	57.3	35.5	E
Total		1,245	1,128	90.6%	103.2	16.3	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing
PM Peak Hour

Intersection 7

Mace Blvd/El Marcero

All-way Stop

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	14	12	86.4%	160.7	173.7	F
	Through	329	289	87.8%	275.0	121.0	F
	Right Turn	9	7	78.9%	195.1	162.3	F
	Subtotal	352	308	87.5%	273.4	120.1	F
SB	Left Turn	99	92	92.6%	8.3	1.0	A
	Through	162	154	94.8%	10.5	1.0	B
	Right Turn	9	10	107.8%	8.8	4.7	A
	Subtotal	270	255	94.4%	9.6	0.9	A
EB	Left Turn	4	3	82.5%	31.7	35.9	D
	Through	7	7	95.7%	4.5	1.7	A
	Right Turn	10	13	132.0%	5.1	5.9	A
	Subtotal	21	23	110.5%	11.2	11.4	B
WB	Left Turn	7	4	61.4%	56.7	60.7	F
	Through	14	14	97.1%	58.8	62.4	F
	Right Turn	67	63	93.3%	106.2	67.6	F
	Subtotal	88	80	91.4%	94.6	62.1	F
Total		731	667	91.2%	113.1	32.8	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing + Project
PM Peak Hour

Intersection 1 **Mace Blvd/Alhambra Dr** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	254	243	95.7%	41.0	9.0	D
	Through	613	601	98.1%	13.4	3.3	B
	Right Turn						
	Subtotal	867	844	97.4%	21.6	4.5	C
SB	Left Turn						
	Through	656	652	99.3%	22.4	2.8	C
	Right Turn	23	23	101.7%	8.5	4.5	A
	Subtotal	679	675	99.4%	21.9	2.7	C
EB	Left Turn	12	11	90.0%	35.0	18.7	C
	Through						
	Right Turn	201	206	102.3%	2.0	0.3	A
	Subtotal	213	216	101.6%	3.9	1.4	A
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,759	1,736	98.7%	19.6	2.8	B

Intersection 2 **Mace Blvd/ 2nd Ave-Co Rd 32A** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	370	366	98.9%	23.6	2.3	C
	Through	722	700	96.9%	16.6	3.5	B
	Right Turn	32	28	87.8%	9.8	5.7	A
	Subtotal	1,124	1,094	97.3%	18.8	2.8	B
SB	Left Turn	98	100	101.6%	47.7	14.2	D
	Through	667	668	100.1%	45.1	28.0	D
	Right Turn	93	84	90.0%	12.9	11.0	B
	Subtotal	858	851	99.2%	42.0	23.7	D
EB	Left Turn	124	119	96.0%	34.5	4.2	C
	Through	113	116	102.2%	29.5	7.3	C
	Right Turn	639	630	98.6%	27.9	37.3	C
	Subtotal	876	865	98.7%	28.3	27.0	C
WB	Left Turn	19	18	96.3%	53.7	30.8	D
	Through	22	22	97.7%	39.8	12.1	D
	Right Turn	41	41	100.7%	13.0	7.9	B
	Subtotal	82	81	98.9%	30.2	11.0	C
Total		2,940	2,890	98.3%	28.3	13.1	C

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing + Project
PM Peak Hour

Intersection 4 Mace Blvd/I-80 WB Ramps Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	258	234	90.9%	33.3	8.8	C
	Through	455	416	91.4%	7.0	2.5	A
	Right Turn						
	Subtotal	713	650	91.2%	16.8	4.1	B
SB	Left Turn						
	Through	1,106	1,075	97.2%	85.0	84.3	F
	Right Turn	219	215	98.2%	50.3	58.3	D
	Subtotal	1,325	1,290	97.4%	79.4	80.3	E
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn	395	404	102.2%	31.9	9.8	C
	Through						
	Right Turn	669	676	101.0%	4.4	0.5	A
	Subtotal	1,064	1,080	101.5%	14.4	3.5	B
Total		3,102	3,020	97.3%	42.6	35.4	D

Intersection 5 Mace Blvd/Chiles Rd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		LOS
			Average	Percent	Average	Std. Dev.	
NB	Left Turn	25	22	86.4%	113.1	25.9	F
	Through	541	458	84.7%	135.0	26.9	F
	Right Turn	165	139	84.2%	118.8	31.0	F
	Subtotal	731	619	84.6%	130.7	27.6	F
SB	Left Turn	259	251	97.1%	84.6	24.8	F
	Through	452	450	99.5%	54.1	43.0	D
	Right Turn	289	289	99.9%	23.7	16.0	C
	Subtotal	1,000	990	99.0%	53.6	27.1	D
EB	Left Turn	339	286	84.2%	183.5	52.0	F
	Through	275	248	90.1%	35.4	14.1	D
	Right Turn	91	84	91.8%	2.6	1.0	A
	Subtotal	705	617	87.5%	101.7	27.8	F
WB	Left Turn	49	48	96.9%	58.4	34.5	E
	Through	56	54	96.4%	29.3	6.2	C
	Right Turn	263	259	98.6%	27.6	14.7	C
	Subtotal	368	361	98.1%	31.5	12.0	C
Total		2,804	2,586	92.2%	78.2	13.4	E

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing + Project
PM Peak Hour

Intersection 15 Chiles Blvd/I-80 EB Ramps Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	179	178	99.3%	48.9	26.2	D
	Through						
	Right Turn	29	29	99.3%	3.1	1.3	A
	Subtotal	208	207	99.3%	40.9	21.2	D
EB	Left Turn						
	Through	526	449	85.4%	271.0	145.6	F
	Right Turn						
	Subtotal	526	449	85.4%	271.0	145.6	F
WB	Left Turn						
	Through	370	364	98.5%	11.4	2.0	B
	Right Turn						
	Subtotal	370	364	98.5%	11.4	2.0	B
Total		1,104	1,020	92.4%	119.2	56.0	F

Intersection 6 Mace Blvd/Cowell Blvd Signal

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	15	13	86.7%	213.4	50.3	F
	Through	363	293	80.6%	253.8	78.2	F
	Right Turn	30	23	77.7%	236.4	69.7	F
	Subtotal	408	329	80.6%	251.0	75.3	F
SB	Left Turn	141	140	99.1%	63.1	32.2	E
	Through	224	217	96.9%	39.5	27.0	D
	Right Turn	68	67	98.4%	27.7	27.0	C
	Subtotal	433	424	97.9%	44.9	28.1	D
EB	Left Turn	127	117	92.0%	106.2	70.3	F
	Through	107	106	99.1%	49.4	57.1	D
	Right Turn	24	23	97.1%	46.2	72.1	D
	Subtotal	258	246	95.4%	73.1	63.1	E
WB	Left Turn	30	26	86.7%	64.9	29.1	E
	Through	60	58	97.2%	60.5	28.4	E
	Right Turn	101	102	100.9%	67.8	32.4	E
	Subtotal	191	186	97.5%	64.9	28.3	E
Total		1,290	1,185	91.9%	106.4	30.2	F

SimTraffic Post-Processor
Average Results from 10 Runs
Volume and Delay by Movement

Mace Car Wash
Existing + Project
PM Peak Hour

Intersection 7

Mace Blvd/El Marcero

All-way Stop

Direction	Movement	Demand Volume (vph)	Served Volume (vph)		Total Delay (sec/veh)		
			Average	Percent	Average	Std. Dev.	LOS
NB	Left Turn	14	14	97.1%	180.5	139.9	F
	Through	336	287	85.5%	222.1	124.8	F
	Right Turn	9	8	91.1%	233.9	123.0	F
	Subtotal	359	309	86.1%	218.9	123.0	F
SB	Left Turn	102	97	95.4%	10.0	1.6	A
	Through	167	162	96.7%	11.5	1.6	B
	Right Turn	9	10	108.9%	6.5	4.4	A
	Subtotal	278	269	96.6%	10.8	1.6	B
EB	Left Turn	4	3	77.5%	15.8	18.0	C
	Through	7	7	101.4%	5.6	2.5	A
	Right Turn	10	9	92.0%	5.6	5.4	A
	Subtotal	21	19	92.4%	8.8	4.9	A
WB	Left Turn	7	6	91.4%	26.5	53.3	D
	Through	14	14	97.1%	29.7	26.6	D
	Right Turn	68	63	92.8%	54.3	36.3	F
	Subtotal	89	83	93.4%	49.1	33.2	E
Total		747	680	91.1%	100.0	45.4	F

Maximum Queue Estimation for: Major Street Left-Turn

Movement: EB Left-Turn Ingress from Cowell Blvd. into Project Driveway
Existing Plus Project Conditions

Input Data

Subject Approach	
Traffic Volume (vph) =	36
PHF=	0.95

Major Street	
Conflicting Traffic Volume (vph) =	169
PHF=	0.95
Conflicting Number of Through Lanes	1
Posted Speed Limit (mph)=	25

Is a Traffic Signal Located on Major Street Within 1/4 mi of intersection? (Enter 1 if yes; 0 if no)	1
---	---

Output

Estimated Maximum Queue	3	vehicles
-------------------------	---	----------

Maximum Queue Estimation for: Major Street Left-Turn

Movement: EB Left-Turn Ingress from Cowell Blvd. into Project Driveway
Existing Plus Project Conditions w/ SB U-Turns Permitted at Mace Blvd./Cowell Blvd.

Input Data

Subject Approach	
Traffic Volume (vph) =	16
PHF=	0.95

Major Street	
Conflicting Traffic Volume (vph) =	169
PHF=	0.95
Conflicting Number of Through Lanes	1
Posted Speed Limit (mph)=	25

Is a Traffic Signal Located on Major Street Within 1/4 mi of intersection? (Enter 1 if yes; 0 if no)	1
---	---

Output

Estimated Maximum Queue	2	vehicles
-------------------------	---	----------



Appendix D. Site Analysis Report & Car Wash Market Data

SITE ANALYSIS REPORT



YOUR CARWASH EXPERT



Prepared for

Evan Lyon
Davis Car Wash
480 Mace Blvd, Davis,
CA 95618, USA

2021-05-26

1111111X

Site Analysis Processing Data	5-8
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THE

PERFECT CAR WASH

FOR YOUR SITE

The EDGE ALL-IN-ONE TUNNEL SOLUTION



**Business &
Financial
Modeling**



**Site Selection
& Validation
Services**



**Architectural
& Construction
Services**



**Leading
Brands**



**Installation
& Start Up**



**Cleaning Fluids
& Parts**



**Preventative
Maintenance
& Audits**



**Help Desk &
On-Site
Service**



**Interactive
Education**

Much more than just equipment, the Macneil Edge-AOS provides best-in-class solutions for each link of the value chain and ensures they work efficiently together to optimize your car wash investment returns.

EDUCATION

Business & Finance

The business of washing cars is our specialty. We help our customers boost revenue and profit by providing business consultation, financial support, and best practices for operational excellence.

Operator Level Maintenance

Hands-on training teaches you everything you need to know to maximize your up-time and discern when it's time to call in the professionals.

Site Management

The "how-to" of effective operations taught by general managers and owners of successful, multi-site car wash companies.

Cleaning Fluids 101

Get your hands dirty training on live systems while learning the how and why of achieving clean, shiny and dry vehicles every time.

QUALITY

Leading Brands, Seamlessly Integrated, Deliver.

Running faster, longer, and safer is vital in the car wash industry, and is the hallmark of MacNeil equipment. When integrated with best-in-class point-of-sale (POS) and support solutions, our total wash systems deliver consistent quality and up-time.

Clean Touch Formulas

Our eco-friendly wash solutions are tough on dirt and gentle on the environment with formulations that go head-to-head with leading national brands at a lower cost to you. We deliver with 3 days across North America.

Locally Available Parts

Our replacement parts are stocked in strategically placed warehouses and distribution centers across North America, and are shipped on a moment's notice.

SITE ANALYSIS PROCESSING DATA



SUMMARY



OVERALL
SITE
SCORE
AVERAGE

What does my site score average mean?

Site scoring is a method to visualize data that determines the top-line or revenue-producing aspects of the location. It is comprised of the categorical scores with weighting to achieve the average.

It is important to understand that site scoring does not directly translate to profitability because capital expenditures, loan considerations, and other factors effect the bottom line.

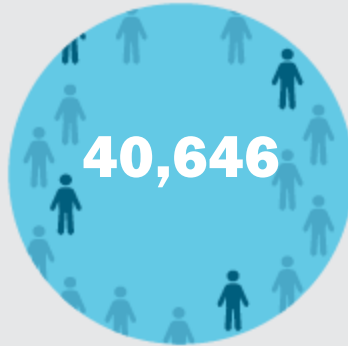
A simplified example would be a location with a site score of 9 with a project cost of \$7 million compared with a second location scoring 7 with a project cost of \$3 million. Site scoring is an important aspect of return on investment, but is only one landmark within a landscape of considerations.

Location Type Retail Draw, Complimentary Businesses, Customer Base Aggregation		6.5
Demographics Population Within 3 mile Radius		7.0
Demographics Population Within 5 mile Radius		7.0
Local Economy Growing, Stagnant, or in Decline		10.0
Site Visibility Impulse Purchases & Passive Marketing		7.0
Traffic Quantity Daily Average Volume in Both Directions on Primary Drive		0.0
Traffic Quality & Speed Commuter/Local Travelers, Immediate Practical Speed (mph)		10.0
Site Accessibility & Queuing Commuter/Local Travelers, Immediate Practical Speed (mph)		9.7
Vacuum Space Quantity Allowing for Adequate Peak Volume Processing		7.5
Competition Levels Relative Levels of Express and Full-Serve Washes, 3 mile radius		10.0

DEMOGRAPHIC BREAKDOWN

Population

3 Mile Radius

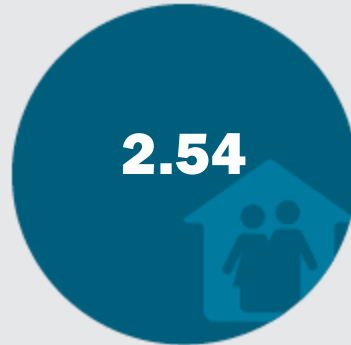
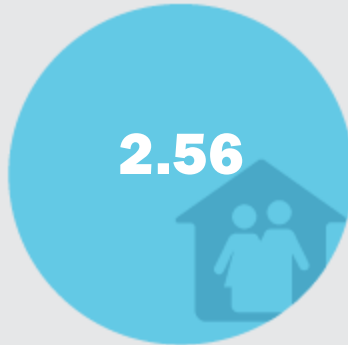


5 Mile Radius



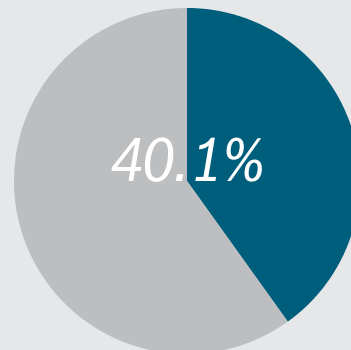
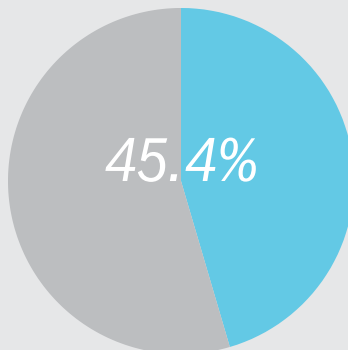
Average Household Size

* Target size > 2.1



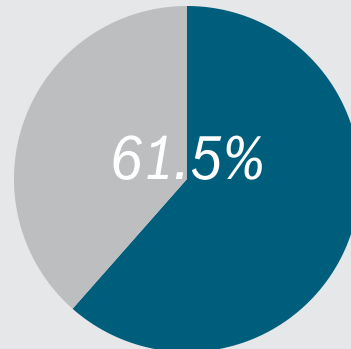
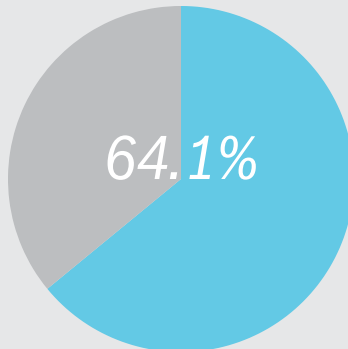
Population % Age 25-65

* Target % > 54%



Income Average % Above \$50,000 Annually

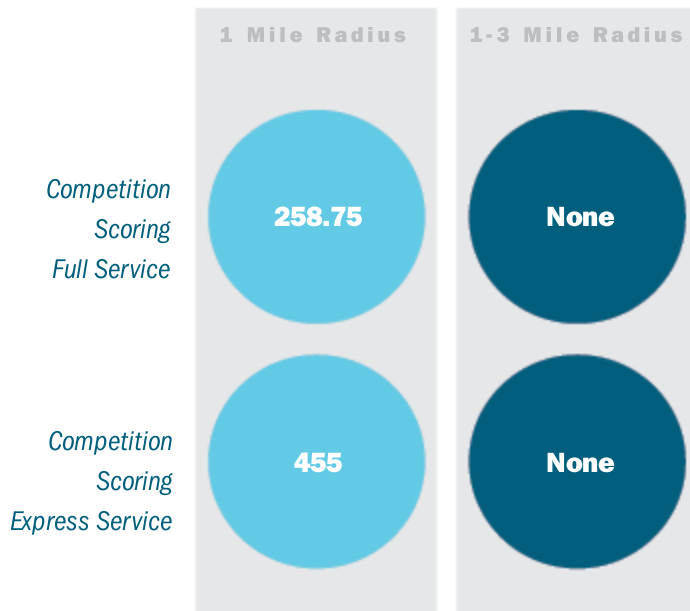
* Target % > 50%



SITE-SPECIFIC INFORMATION



COMPETITION



PACKAGE PRICING

	RETAIL
Package 1	\$18
Package 2	\$15
Package 3	\$12
Package 4	\$8
	MEMBERSHIP
Package 1	\$36
Package 2	\$30
Package 3	\$24
Package 4	\$18

VOLUME CAPACITY CONSIDERATIONS



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Updated Guide to Finding Success

Posted by **Anthony Analetto** on 6/29/2018

“Intelligence is the ability to adapt to change.” Stephen Hawking

Nostalgia is an interesting word.

Chances are good that simply reading it evoked a fond memory. Was it a car you owned? Maybe a movie you saw or some family event from when you were a kid?

Nostalgia can be fun and occasionally it leads to action. I bought a 1956 Oldsmobile last year—the same car I drove in high school—as a testament to that truth. There’s nothing wrong with longing for the past, unless of course it clouds your decision-making process in the present. I’ll admit certain nostalgia for my family’s old full-serve wash creeps into my mind each time I evaluate purchasing or building a new express-exterior wash—despite only building express sites for decades.

As I find myself pulled into site-selection discussions for various projects, I find myself facing a dilemma.

My belief is that a new location shouldn't have direct competition within three miles. Is it nostalgia for past market conditions, or is my conviction even relevant today? Either way, things change.

Express-exterior car washes with free vacuums have shifted the value proposition for consumers both in time and money and have brought waves of new traffic to professional car washing. Monthly wash clubs and premium online services have changed customer expectations. Population densities in many markets have changed. So if intelligence is the ability to adapt to change, then I suppose it’s time for me to update my rules of car wash site selection to reflect today’s reality.

Let’s start with the three mile rule.

I won’t pretend that I don’t still prize locations that have no direct competition within three miles, however, those locations are very difficult to find today. I’ve also seen far too many markets with two, three or more locations successfully coexisting within a three-mile radius, which doesn’t give this rule much weight any longer. That said, my challenge has been defining the new rule. After many hours debating this with friends and colleagues, the consensus is there aren’t any one-size-fits-all rules about competition.

As one friend said to me, “I’ll build if it makes sense and there’s at least 30,000 heads or more available per tunnel operating within a three mile radius.”

The reality is that a market with 500,000 heads is very different than one with 35,000 in the same radius. That brings us to the ‘what makes sense’ part of his comment. Fortunately, there’s a little more consensus in gathering the numbers for a pro forma analysis to see if the potential ROI makes sense.

The first thing to do is to accurately define the boundaries of the market you’re planning to compete in. The days of drawing a three, five or seven-mile circle around a physical address is no longer sufficient. Instead, savvy investors are incorporating large delineators such as rivers, traffic patterns, demographic shifts and major highways into their

The first thing to do is to accurately define the boundaries of the market you're planning to compete in. The days of drawing a three, five or seven-mile circle around a physical address is no longer sufficient. Instead, savvy investors are incorporating large delineators such as rivers, traffic patterns, demographic shifts and major highways into their calculations.

It makes sense. I know two washes separated by a major highway that don't view each other as competition despite being less than a mile apart. Instead, each of them is on the outside ring of a different market that extends from a center three miles away. Most industry experts agree that site selection is the single biggest decision regarding the success of your car wash.

I have seen less diligent operators make money 'in spite of themselves' when they have chosen a great location. Conversely, I have seen great operators who believe that their marketing and management skill can overcome a poor location struggle to stay alive.

The fact is that part of selecting a winning site relies on understanding that particular market. Once you've got it clearly defined, many of the other guidelines to predicting a successful site become more predictable. So, what are they?

Let's take a look.

- Traffic should exceed 25,000 cars per day in a 24-hour period. Bear in mind that commuter traffic—people on their way to and from work—will stop less often for a car wash than local residents. Also, when looking at a property on a divided highway, or without a nearby turning lane, only consider the traffic on your side of the street.
- The property must be visible from a distance and easily accessible with enough time to slow and make a safe turn into the property. Ideally there is a deceleration lane. In a perfect world, your proposed property is on the right hand side after a stop light. Car washes are often an impulse buy so visibility is critical.
- Zoning rules must allow you to prominently promote your brand and service. Never make assumptions. Confirm with reasonable certainty that you will be able to effectively promote your business to customers driving by with sufficient time to slow down and pull in. If that isn't available, I'd recommend moving on to another piece of land.
- Speed matters. Too fast and potential customers will zip past never realizing your wash is there. Too congested and frustrated drivers, eager to get through the traffic seldom pull in for a car wash. The rule of thumb is 45 mph. Are there exceptions? Of course. Stop lights and signs can create intermittent traffic conditions that work well even at 60 mph, but these are outliers.
- The population density per conveyor mentioned earlier isn't the complete picture. Look for markets with high occupancy rates, meaning, the market isn't saturated with unoccupied units available for rent or sale. Mixed residential with some apartment inventory is preferable. Apartment complexes rarely allow driveway washing and can positively impact overall volume.
- Look for markets with a working population with at least 55 percent of the total population being between 25 to 55 years old. The logic here is quite simple—employed people have more disposable income than retirees and students.
- Ideally, 50 percent of your proposed market should make over \$50,000 household income per year. This is critical for a full or flex serve, though the income requirement is somewhat relaxed for an express-exterior wash.
- Total population and income in your selected market should be projected to grow over the next five years. Enter a market too early, and you may fail before it takes off. Buy too late and the cost of the land may not fit your investment objective. Review census data to see if the population is growing. Visit the city planner's office to see which—if any—areas have been plotted for retail development. You're looking for opportunities to get in before land prices surge that have sufficient traffic to support your businesses during that growth.
- Car washing should be a permissible use for the property before you invest money. If it's not, be prepared to spend tens—or even hundreds—of thousands of dollars to get an exception made with no guarantee that you'll have anything to show for it. That said, the right site may be worth the battle so be prepared to fight if it makes sense.
- The utilities required to operate a car wash should be available before you make an offer. This includes the presence of a two-inch water main and sewer connection without an exorbitant impact fee. Three-phase electricity must also be available. Don't assume unless you enjoy wasting time, and money.

If you find sites with all these characteristics you should fare well provided you deliver a consistent quality product, good value and a positive customer experience.

Markets and industries change. Just make sure that while you adapt to these changes you continue to rely on sound business practices before moving forward on your next property. Do that, and chances are that someday, someone, will be nostalgic for the business you build.

About the author

Anthony Analetto - President

Joining the company in 2000, Anthony Analetto serves as the President of SONNY'S CarWash Equipment Division. In this

- l. Ideally, 50 percent of your proposed market should make over \$50,000 household income per year. This is critical for a full or flex serve, though the income requirement is somewhat relaxed for an express-exterior wash.
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Joining the company in 2000, Anthony Analetto serves as the President of SONNY'S CarWash Equipment Division. In this role, Anthony leads the innovation of new products to drive client success, and oversees all operations, engineering, and supply chain management. Washing cars for over 30 years, Anthony was the director of operations for a 74 location national car wash chain prior to joining the company.

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