# Appendix M

Addendum to Traffic Impact Analysis, David Evans and Associates Inc., October 10, 2019

DAVID EVANS AND ASSOCIATES INC.

October 10, 2019 Job No. LSTP0000-0001

**To:** **Rosa Clark**
Office Chief
Intergovernmental Review, Community and Regional Planning
Caltrans District 8

**From:** **Robert Kilpatrick, PE/TE**
Senior Project Manager / Senior Associate

**RE:** **Response to Comments – PA 2018-78 (CUP 2018-22/CDR 2018-16/TPM 37550) (Lake Street Storage) (CRS 2134)**

The following are our responses to the comments outlined in your January 8, 2019 letter.

**TRAFFIC FORECASTING**

**Comment 1:** Analysis Scenarios. Please update the Opening Year to 2019

*Response 1:*

- *A Traffic Impact Analysis Addendum has been prepared to address this comment. The Addendum has provided that the updating of the Opening Year analysis to 2019 has resulted in the mitigation presented in the Original report to be still valid.*

**Comment 2:** Summary of Level of Service (LOS) Deficiencies. Section 1.4.3 Horizon Year (2035) without and With Project Conditions states the following:

a. "Based on the assessment of Horizon Year Without and With Project traffic conditions, which includes planned improvements, there were no intersections found to operate at a deficient LOS."
b. The subsequent paragraph states:
"All of the I-15 Freeway mainline segments and the merge/diverge ramp junctions at Lake Street are anticipated to operate at unacceptable LOS under Horizon Year Without and With Project traffic conditions."
c. The statements within this section conflict.
    i. Please revise the TIA to correct the discrepancy between "no intersections found to operate at a deficient LOS" and "ramp junctions are anticipated to continue to operate at unacceptable LOS F."

*Response 2:*

- *The summary of Level of Service (LOS) Deficiencies Section 1.4.3 Horizon Year (2035) without and With Project Conditions outlines that the Study intersections are found to continue to operate at an acceptable LOS under these capacity analysis scenarios.*

- *The next statement is in regards to the operation of the I-15 Freeway mainline segments and the merge/diverge ramp junctions. In the Horizon Year (2035) without and With Project Conditions all of the identified I-15 Freeway mainline segments and the merge/diverge ramp junctions are anticipated to operate at unacceptable LOS.*

- *The two paragraphs are referring to different analysis completed within the study area. The language in the original report will remain the same.*

**TRAFFIC OPERATIONS**

**Comment 1:** Driveway Access.

a. The proposed driveway is approximately 165 feet away from the southbound onramp. Per the Caltrans' Highway Design Manual (Sixth Edition), The minimum distance (curb return to curb return) between ramp intersections and local road intersections shall be 400 feet. The preferred minimum distance should be 500 feet. With the use of a raised median islands along the local facility, right-in/right-out access may be permitted beyond 200 feet from the ramp intersection.
   i. Due to physical barriers (i.e. I-15 and Temescal Wash), access to the site is restricted to Lake Street requiring the need for a Design Exception.
   ii. Prior to permit submittal, the project proponent will need to prepare a Design Standard Decision Document (previously known as a design exception fact sheet or fact sheet).
   iii. Details can be found in Chapter 21 of the Project Development Procedures Manual (PDPM) http://www.dot.ca.gov/design/manuals/pdpm/chapter/cpapt21.pdf
b. Exhibit 3-2 Existing Plus Project Conditions with Adjusted Driveway found on Page 25 of the TIA proposes a "Full Access Signal at Project Entry."
   i. Please submit a signal warrant analysis demonstrating the need for the signal.

*Response 3:*

- *A Conceptual Geometric Plan is included in this resubmittal package, which illustrates the proposed site access geometrics on Lake Street.*

- *The location of the proposed signalized intersection (Project Access), which is approximately 175- feet from the I-15 Freeway Southbound Ramps does not meet the standard presented in the Highway Design Manual (HDM) Section 504.3. The existing site is land locked with the I-15 Freeway to the north and the Temescal Wash to the south. The Project Access is the only access available for the Site. A Design Standard Decision Document will be prepared and submitted with the Encroachment Permit Submittal.*

DAVID EVANS AND ASSOCIATES INC.

- *Traffic signal warrant worksheets are provided in the appendices to the original report. An update to the Opening Year analysis traffic signal warrant worksheets are provided in the Traffic Impact Analysis Addendum provided with in this resubmittal package.*

**HYDRAULICS/STORM WATER QUALITY**

**Comment 1:** Federal Emergency Management Agency (FEMA). The project encroaches onto a FEMA Flood Plain as shown on the attached picture. (Please see Exhibit 1)

a. Consequently, the project will need the following documents to address any potential FEMA and/or Floodplain issues:
   i. Location Hydraulic Study (LHS)
   ii. Summary Floodplain Evaluation Report (SFER)

b. Guidance regarding the required content of the Location Hydraulic Study can be found in Volume 1 Chapter 17 of Caltrans' Standard Environmental Reference. It can be accessed using the following link: http://www.dot.ca.gov/ser/voll/sec3/special/ch17flood/chap17.htm

*Response 1:*

- *As illustrated in Attachment 2 the project site is within a non-regulated flood plain.*

**Comment 2:** National Pollutant Discharge Elimination System (MPDES): The documents were reviewed for consistency with the National Pollutant Discharge Elimination System (NPDES) requirements (Section 402 of the Clean Water Act).

a. All NPDES issues outside of State right of way shall comply with the following:
   i. NPDES Permit and Waste Discharge Requirements for the Riverside County Flood Control and Water Conservation District, the County of Riverside, and the incorporated cities of Riverside County within the Santa Ana Region, Order No. R9-2013-0001, and Order No. R8-2010-0033, NPDES No. CAS 618033 issued by the Santa Ana RWQCB.
   ii. At no time (during construction or after construction) shall untreated storm water discharge into State right of way.
b. All NPDES issues outside of State right of way shall comply with the following NPDES permit:
   i. NPDES Statewide Storm Water Permit Waste Discharge Requirements (WDRS) for State of California Department of Transportation, Order No. 2012-0011-DWQ (and as amended by Order Nos. WQ 2014-0006-Exec, WQ 2014-0077-DWQ & WQ 2015-0036-Exec) NPDES No. CAS000003.

To comply with the County of Riverside NPDES Permit No. 618033, the identification of the type and location of treatment BMP's should be included within the Site Plan.

*Response 2:*

- *A Preliminary Project Specific Water Quality Management Plan (WQMP) is currently under review with the City of Lake Elsinore. A copy of the Preliminary Project Specific Water Quality Management Plan (WQMP) is provided with this submittal. The Preliminary Project Specific Water Quality Management Plan (WQMP) will be provided during the Encroachment Permit Submittal.*

# ATTACHMENT 1



restrictive metering all provide an opportunity to reevaluate the need for a HOV preferential lane. HOV preferential lanes should remain in place or be added to the scope of projects generated in response to any of the above scenarios. Alternate solutions should be investigated before removal is considered. For example: better control over ramp traffic can be attained by retrofitting ramps to meter HOV traffic which bypasses the ramp meter. Underutilization of an existing lane plus the need for additional right of way for storage, the availability of an alternate HOV entrance ramp within 1½ mile, or the availability of a direct HOV access (drop) ramp will typically provide adequate justification for the removal of a HOV preferential lane at specific locations.

The Deputy District Director of Operations, in consultation with the HQ Traffic Liaison, is responsible for approving decisions to remove HOV preferential lanes. Written documentation should be provided in the appropriate project document(s).

(j) Enforcement Areas and Maintenance Pullouts

Division of Traffic Operations policy requires an enforcement area be provided on all two-lane and three-lane on-ramps with HOV preferential lanes. Deviation from this policy requires concurrence from the HQ Traffic Liaison, which must be reflected in the Project Initiation Document.

On single-lane ramps, a paved enforcement area is not necessary, but the area should be graded to facilitate future ramp widening (see Figure 504.3A). Enforcement areas are used by the California Highway Patrol (CHP) to enforce minimum vehicle occupancy requirements. At locations where the HOV preferential lane is metered, the CHP enforcement area should begin as close to the limit line as practical. Where unmetered, it should begin approximately 170 feet downstream of the limit line. On three-lane ramps, the CHP enforcement area should be downstream of the mast arm standard, approximately 70 feet from the limit line. The length of the CHP enforcement area and its distance downstream of the limit line may be adjusted to fit conditions at the ramp with CHP approval.

The District Traffic Operations Branch responsible for ramp metering must coordinate enforcement issues with the CHP. The CHP Area Commander must be contacted during the Project Report stage, prior to design, to discuss any variations needed to the CHP enforcement area designs shown in this manual. Variations must be discussed with the HQ Traffic Liaison and the Design Coordinator and/or Design Reviewer.

A paved pullout area near the controller cabinet should be provided for safe and convenient access for Maintenance and Operations personnel. If a pullout cannot be provided, a paved or "all weather" walkway should be provided to the controller cabinet, see Index 107.2. See Topic 309, Clearances, for placement guidance of fixed objects such as controller cabinets. HDM 504.3

*(3) Location and Design of Ramp Intersections on the Crossroads.*

Factors which influence the location of ramp intersections on the crossroads include sight distance, construction and right of way costs, bicycle and pedestrian mobility, circuitous travel for left-turn movements, crossroads gradient at ramp intersections, storage requirements for left-turn movements off the crossroads, and the proximity of other local road or bicycle path intersections.

Ramp terminals should connect where the grade of the overcrossing is 4 percent or less to avoid potential overturning of trucks.

For left-turn maneuvers from an off-ramp at an unsignalized intersection, the length of

ATTACHMENT 1



crossroads open to view should be greater than the product of the prevailing speed of vehicles on the crossroads, and the time required for a stopped vehicle on the ramp to execute a left-turn maneuver. This time is estimated to be 7½ seconds.

Where a separate right-turn lane is provided at ramp terminals, the turn lane should not continue as a "free" right. It is preferred that the turn lane be controlled by a signal, "STOP", or "YIELD" sign. Free rights are problematic for pedestrians, bicycle traffic, and vehicular merges.

Horizontal sight restrictions may be caused by bridge railings, bridge piers, or slopes. Sight distance is measured between the center of the outside lane approaching the ramp and the eye of the driver of the ramp vehicle assumed 8 feet back from the edge of shoulder at the crossroads. Figure 504.3J illustrates the determination of ramp setback from an overcrossing structure on the basis of sight distance controlled by the bridge rail. The same relationship exists for sight distance controlled by bridge piers or slopes.

Where ramp set back for the 7½ second criterion is unobtainable, sight distance should be provided by flaring the end of the overcrossing structures or setting back the piers or end slopes of an undercrossing structure.

If signals are warranted within 5 years of construction, consideration may be given to installing signals initially in lieu of providing horizontal sight distance which meets the 7½ second criterion. See Part 4 of the California MUTCD, 4B.107(CA). However, this is not desirable and corner sight distance commensurate with design speed should be provided where obtainable (see AASHTO, A Policy on Geometric Design of Highways and Streets).

For additional information on sight distance requirements at signalized intersections, see Index 405.1.

**The minimum distance (curb return to curb return) between ramp intersections and local road intersections shall be 400 feet.** The preferred minimum distance should be 500 feet. This does not apply to Resurfacing, Restoration and Rehabilitation (3R), ramp widening, restriping or other projects which do not reconfigure the interchange. This standard does apply to projects proposing to realign a local street.

Where intersections are closely spaced, traffic operations are often inhibited by short weave distance, storage lengths, and signal phasing. In addition it is difficult to provide proper signing and delineation. The District Traffic Branch should be consulted regarding traffic engineering studies needed to determine the appropriate signage, delineation, and form of intersection control.

*(4) Superelevation for Ramps.* The factors controlling superelevation rates discussed in Topic 202 apply also to ramps. As indicated in Table 202.2 use the 12 percent $e_{max}$ rate except where snow and ice conditions prevail. In restrictive cases where the length of curve is too short to develop standard superelevation, the highest obtainable rate should be used (see Index 202.5). If feasible, the curve radius can be increased to reduce the standard superelevation rate. Both edge of traveled way and edge of shoulder should be examined at ramp junctions to assure a smooth transition.

Under certain restrictive conditions the standard superelevation rate discussed above may not be required on the curve nearest the ramp intersection of a ramp. The specific conditions under which lower superelevation rates would be considered must be evaluated on a case-by-case basis and must be discussed with the Design Coordinator and documentation as required by the Design Coordinator.

*(5) Single-lane Ramps.* Single lane ramps are those ramps that either enter into or exit from the freeway as a single lane. These ramps are often widened near the ramp intersection with the crossroads to accommodate turning movements onto or from the ramp. When additional lanes are provided near an entrance ramp intersection, the lane drop should be accomplished over a distance equal to WV.

ATTACHMENT 1



movements operate at least one level of service better than the mainline level of service. In determining acceptable hourly operating volumes, peak hour factors should be used.

**The minimum weaving length, measured as shown on Figures 504.2A and 504.2B shall be 2,000 feet in urban areas, 5,000 feet in rural areas, and 5,000 feet between freeway-to-freeway interchanges and other interchanges.** The volumes used must be volumes unconstrained by metering regardless of whether metering will be used. It should be noted that a weaving analysis must be considered over an entire freeway segment as weaving can be affected by other nearby ramps.

The District Traffic Operations Branch should be consulted for difficult weaving analysis problems.

## 504.8 Access Control

**Access rights shall be acquired along interchange ramps to their junction with the nearest public road.** At such junctions, for new construction, access control should extend 100 feet beyond the end of the curb return or ramp radius in urban areas and 300 feet in rural areas, or as far as necessary to ensure that entry onto the facility does not impair operational characteristics. **Access control shall extend at least 50 feet beyond the end of the curb return, ramp radius, or taper.**

Typical examples of access control at interchanges are shown in Figure 504.8. These illustrations do not presume to cover all situations or to indicate the most desirable designs for all cases. When there is state-owned access control on both sides of a local road, a maintenance agreement may be needed.

**For new construction or major reconstruction, access rights shall be acquired on the opposite side of the local road from ramp terminals to preclude the construction of future driveways or local roads within the ramp intersection.** This access control would limit the volume of traffic and the number of phases at the intersection of the ramp and local facility, thereby optimizing capacity and operation of the ramp. Through a combination of access control and the use of raised median islands along the local facility, right–in/ right-out access may be permitted beyond 200 feet from the ramp intersection. The length of access control on both sides of the local facility should match. See 504.3(3) for local road intersection.

In Case 2 consider private ownership within the loop only if access to the property is an adequate distance from the ramp junction to preserve operational integrity.

In Case 3 if the crossroads is near the ramp junction at the local road, full access control should be acquired on the local road from the junction to the intersection with the crossroad.

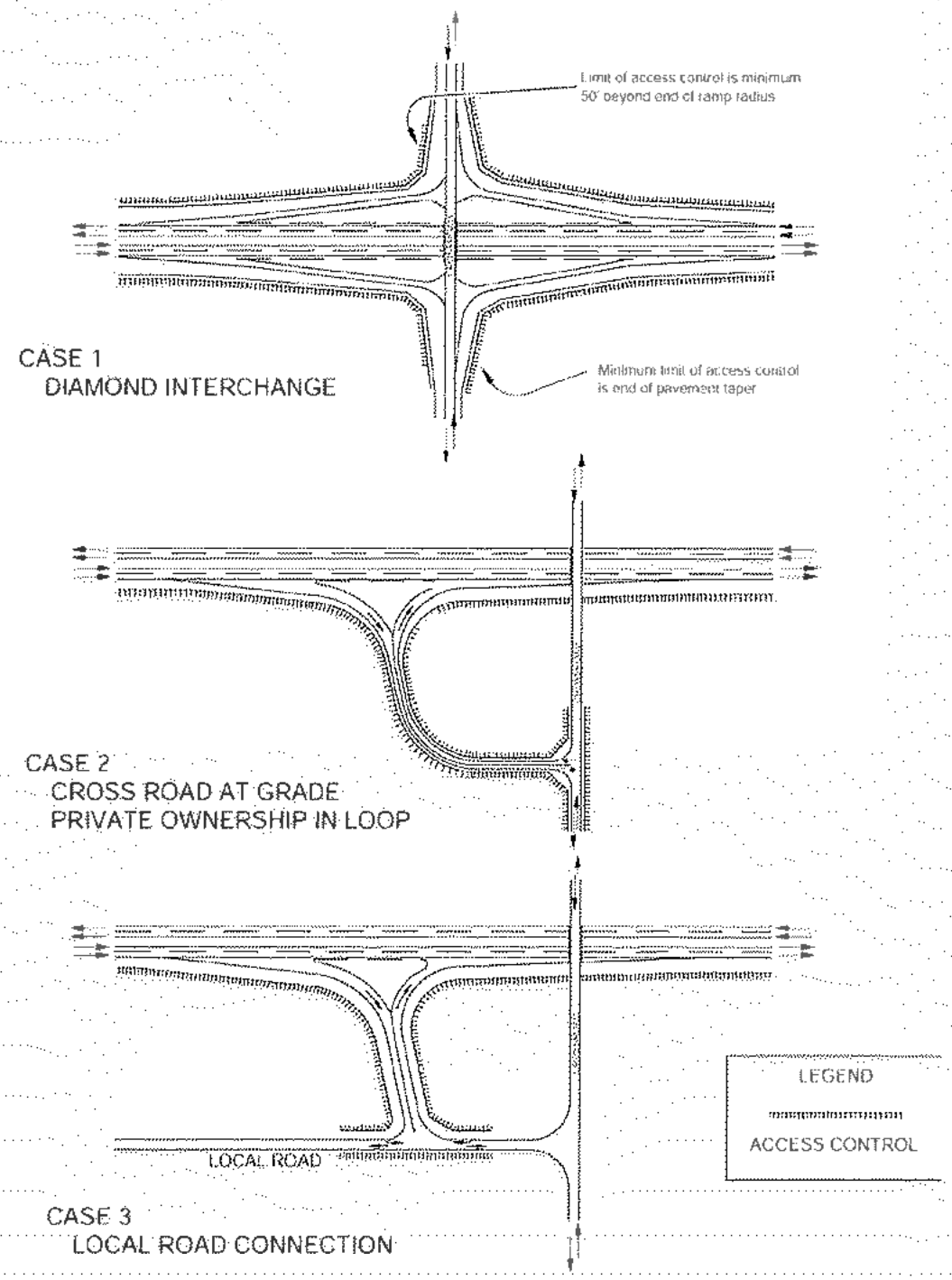
Case 6 represents a slip ramp design. If the ramp is perpendicular to the local/frontage road refer to Case 3. In Case 6 if the crossroad is near the ramp junction to the local/frontage road, access control should be acquired on the opposite side of the local road from the junction.

ATTACHMENT 1



## Figure 504.8

## Typical Examples of Access Control at Interchanges

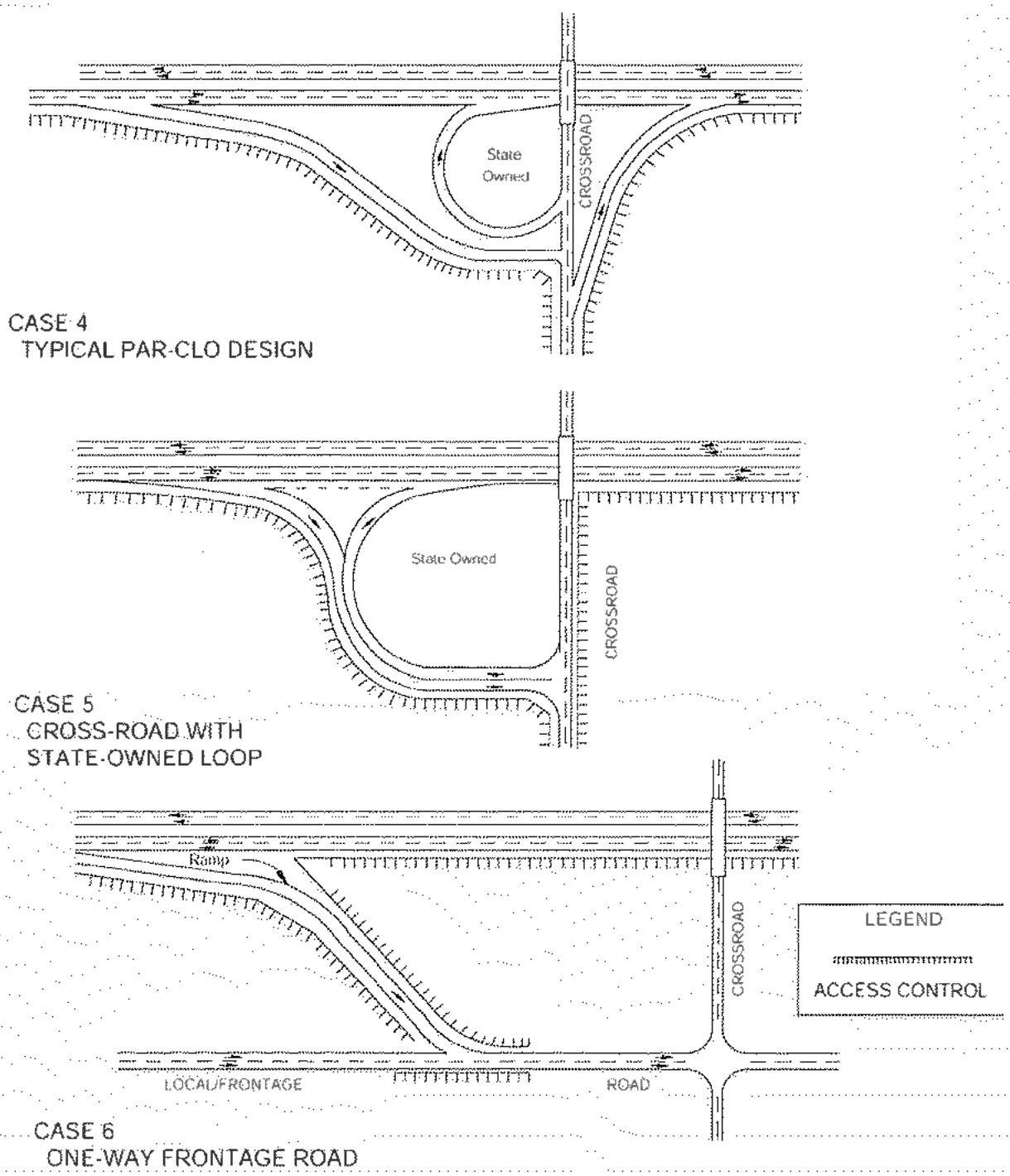


# ATTACHMENT 1



## Figure 504.8 (cont.)

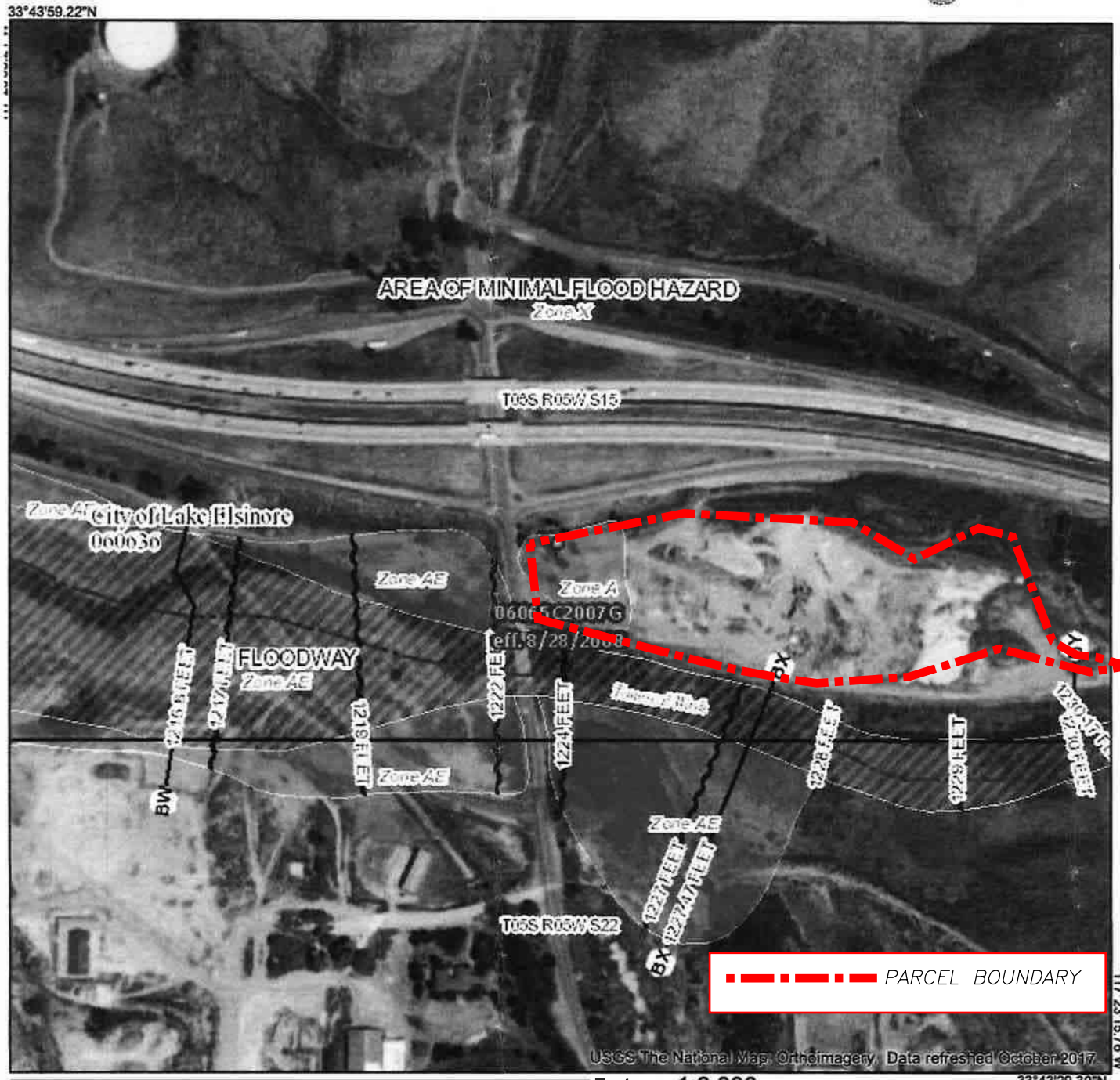
## Typical Examples of Access Control at Interchanges



ATTACHMENT 2 Exhibit 1

# National Flood Hazard Layer FIRMette

FEMA




## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

**SPECIAL FLOOD HAZARD AREAS**
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile Zone
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

**OTHER AREAS**
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**MAP PANELS**
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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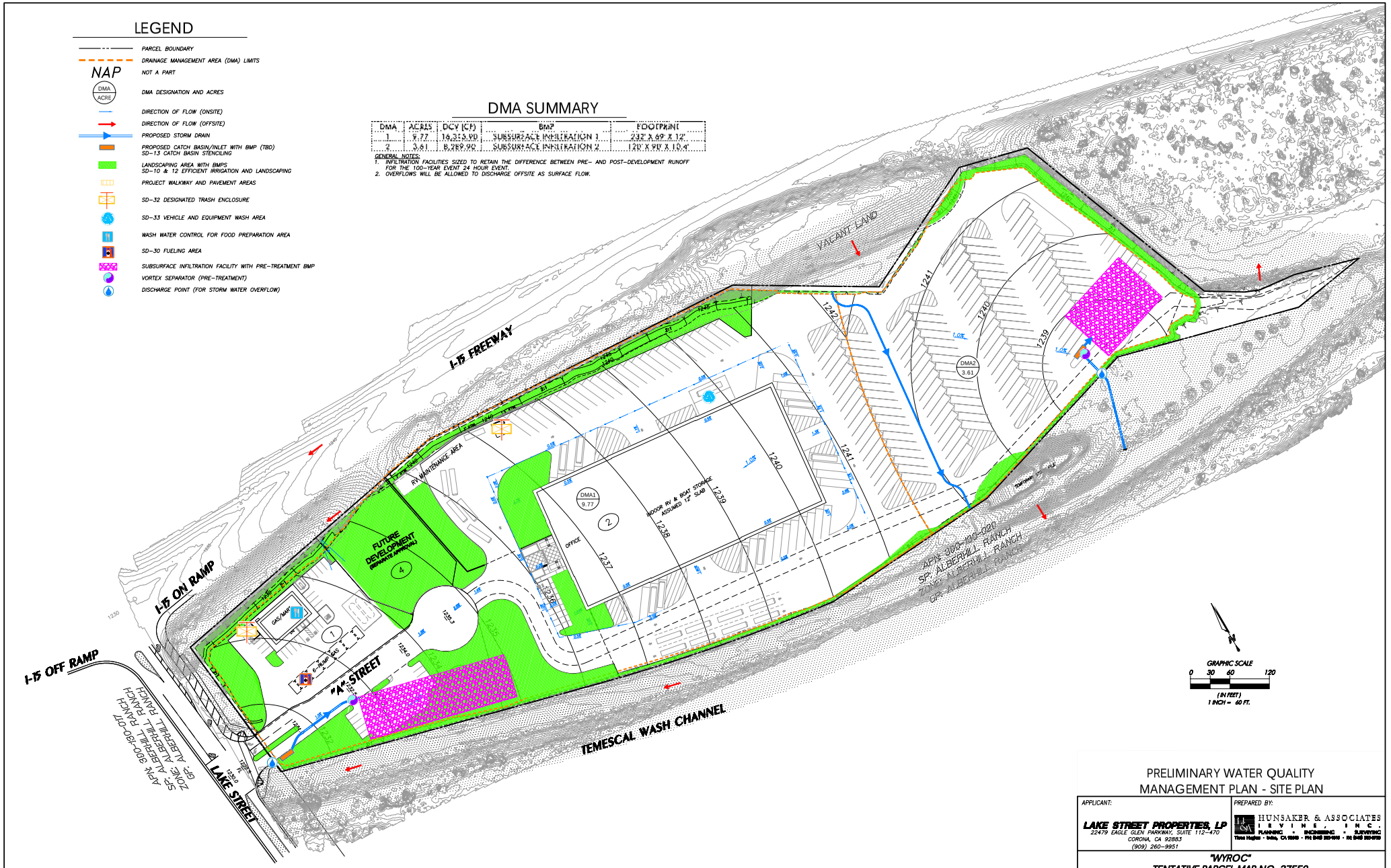
# ATTACHMENT 3



**DEPARTMENT OF TRANSPORTATION**
DISTRICT 8
PLANNING
464 WEST FOURTH STREET, 6th FLOOR, MS 725
SAN BERNARDINO, CA 92401-1400
PHONE (909) 383-4147
FAX (909) 383-5936
TTY 711
www.dot.ca.gov/dist8

*Making Conservation a California way of Life.*

January 8, 2019 **RIV 15 PM 26.66**

Ms. Damaris Abraham
City of Lake Elsinore
Community Development Department
130 South Main Street
Lake Elsinore, CA 92530

**Subject: PA 2018-78 (CUP 2018-22/CDR 2018-16/TPM 37550) (Lake Street Storage) (CRS 2134)**

Dear Ms. Abraham

The California Department of Transportation (Caltrans) has completed the review of a proposal to establish a 90,000 sq. ft. boat/RV storage facility with 203 outdoor covered storage spaces, and a 3,062 sq. ft. mini-mart and gas station on an approximately 14-acre site. The project is located at the southeasterly corner of the Interstate 15 (I-15) /Lake Street Interchange.

As the owner and operator of the State Highway System (SHS), it is our responsibility to coordinate and consult with local jurisdictions when proposed development may impact our facilities. Under the California Environmental Quality Act (CEQA), we are required to make recommendations to offset associated impacts with the proposed project. Although the project is under the jurisdiction of the City of Lake Elsinore, it is also subject to the policies and regulations that govern the SHS due to the project's potential impact to State facilities. After reviewing the documents submitted, we have the following comments:

**Traffic Forecasting**

The primary function of the Office of Forecasting is to provide critical project travel analysis of past, present and future traffic volumes, as well as other operational characteristics. After reviewing the TIA, we have the following comments:

*Analysis Scenarios*

- Please update the Opening Year to 2019.

*Summary of Level of Service (LOS) Deficiencies*

- Section 1.4.3: Horizon Year (2035) without and With Project Conditions states the following:

  *"Based on the assessment of Horizon Year Without and With Project traffic conditions, which includes planned improvements, there were no intersections found to operate at a deficient LOS."*

  The subsequent paragraph states:

  *"All of the I-15 Freeway mainline segments and the merge/diverge ramp junctions at Lake Street are anticipated to operate at unacceptable LOS under Horizon Year Without and With Project traffic conditions."*

  The statements within this section conflict.

  - Please revise the TIA to correct the discrepancy between "*no intersections found to operate at a deficient LOS*" and "*ramp junctions are anticipated to continue to operate at unacceptable LOS F.*"

**Traffic Operations**

Caltrans aims to enhance the operation of the SHS to facilitate and optimize the movement of people, goods, and services in a safe and efficient manner. In regards to traffic operations, we have the following comments:

*Driveway Access*

- The proposed driveway is approximately 165 feet away from the southbound onramp. Per the Caltrans' Highway Design Manual (Sixth Edition), The minimum distance (curb return to curb return) between ramp intersections and local road intersections shall be 400 feet. The preferred minimum distance should be 500 feet. With the use of a raised median islands along the local facility, right-in/right-out access may be permitted beyond 200 feet from the ramp intersection.

  - Due to physical barriers (i.e. I-15 and Temescal Wash), access to the site is restricted to Lake Street requiring the need for a Design Exception.
  - Prior to permit submittal, the project proponent will need to prepare a Design Standard Decision Document (previously known as a design exception fact sheet or fact sheet.)

    Details can be found in Chapter 21 of the Project Development Procedures Manual (PDPM).

    http://www.dot.ca.gov/design/manuals/pdpm/chapter/chapt21.pdf

- Exhibit 3-2: Existing Plus Project Conditions with Adjusted Driveway found on Page 25 of the TIA proposes a "Full Access Signal at Project Entry."

- Please submit a signal warrant analysis demonstrating the need for this signal.

**Hydraulics / Storm Water Quality**

Regarding hydraulics and storm water management, Caltrans aims to mitigate, abate, or reverse the adverse results, both in water quantity and water quality, associated with the altered runoff phenomena that typically accompanies urbanization. The following are our comments concerning hydraulics and storm water management:

*Federal Emergency Management Agency (FEMA)*

- The project encroaches onto a FEMA Flood Plain as shown on the attached picture. (Please see Exhibit 1)
    - Consequently, the project will need the following documents to address any potential FEMA and/or Floodplain issues:
        - Location Hydraulic Study (LHS)
        - Summary Floodplain Evaluation Report (SFER)

      Guidance regarding the required content of the Location Hydraulic Study can be found in Volume 1 Chapter 17 of Caltrans' Standard Environmental Reference. It can be accessed using the following link:

      http://www.dot.ca.gov/ser/vol1/sec3/special/ch17flood/chap17.htm

*National Pollutant Discharge Elimination System (MPDES)*

- The documents were reviewed for consistency with the National Pollutant Discharge Elimination System (NPDES) requirements (Section 402 of the Clean Water Act).
    - All NPDES issues outside of State right of way shall comply with the following:
        - NPDES Permit and Waste Discharge Requirements for the Riverside County Flood Control and Water Conservation District, the County of Riverside, and the incorporated cities of Riverside County within the Santa Ana Region, Order No. R9-2013-0001, and Order No. R8-2010-0033, NPDES No. CAS 618033 issued by the Santa Ana RWQCB.

          At no time (during construction or after construction) shall untreated storm water discharge into State right of way.
    - All NPDES issues inside State right of way shall comply with the following NPDES permit:
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- To comply with the County of Riverside NPDES Permit No. 618033, the identification of the type and location of treatment BMP's should be included within the Site Plan.

We appreciate the opportunity to offer comments concerning this project. If this proposal is revised in any way, please forward the appropriate information to this Office so that updated recommendations for impact mitigation may be provided. If you have any questions regarding this letter, please contact Kwasi Agyakwa at (909) 806-3955 or myself at (909) 383-4557 for assistance.

Sincerely,

MARK ROBERTS, AICP
Office Chief
Intergovernmental Review, Community and Regional Planning

# National Flood Hazard Layer FIRMette

FEMA

Exhibit 1


Feet 1:6,000

0 250 500 1,000 1,500 2,000

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

**OTHER AREAS**
- NO SCREEN Area of Minimal Flood Hazard Zone X
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- Area of Undetermined Flood Hazard Zone

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- Base Flood Elevation Line (BFE)
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- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

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The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/7/2018 at 11:08:15 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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DAVID EVANS AND ASSOCIATES INC.

October 10, 2019 Job No. LSTP0000-0001

**MEMORANDUM**


To: Ron Clark
**Lake Street Properties, LP**
2279 Eagle Glen Parkway, Suite 112-740
Corona, Ca 91754

From: Robert Kilpatrick, PE/TE
Senior Project Manager / Senior Associate

**RE: Traffic Impact Analysis Addendum –**
**Lake Street / I-15 Property -**
**Lake Elsinore, CA**

**David Evans and Associates, Inc.** is pleased to submit this addendum to the Lake Street / I-15 Property, Traffic Impact Analysis, by Urban Crossroads, dated September 10, 2018. The Lake Street / I-15 Property TIA has been approved by the City of Lake Elsinore. The intent of this addendum is to address the California Department of Transportation's (Caltrans) comments outlined in a January 8, 2019 Intergovernmental Review Letter. The Caltrans Traffic Forecasting comments include updating the Opening Year analysis to 2019.

## 1. Project Description

The Lake Street / I-15 Property is located at the southeast corner of I-15 Southbound Ramps and Lake Street in the City of Lake Elsinore, California. The City of Lake Elsinore approved TIA, provided a site plan consisting of a gas station, indoor and outdoor RV storage, and self-storage buildings. The gas station includes 12 vehicle fueling positions and the RV storage and self storage consists of approximately 13.34 acres. *Exhibit A* illustrates the vicinity map and project location. *Exhibit B* illustrates the City approved Site Plan. The project is bounded to the north by the I-15 Freeway, to the south by the Temescal Wash, to the west by Lake Street, and to the east by undeveloped/vacant land.

DAVID EVANS AND ASSOCIATES INC.

1.1 Capacity Analysis Scenarios

The City approved TIA capacity analysis scenarios included six conditions:

- Existing (2017) Conditions (Baseline)
- Existing plus Project Conditions
- **Existing plus Ambient plus Project (EAP) (2018) Conditions**
- **Existing plus Ambient plus Project plus Cumulative (EAPC) (2018) Conditions**
- Horizon Year (2035), Without Project Conditions
- Horizon Year (2035), With Project Conditions

The Caltrans Traffic Forecasting comments include updating the Existing plus Ambient plus Project (EAP) (2018) Conditions and Existing plus Ambient plus Project plus Cumulative (EAPC) (2018) Conditions analysis to 2019.

1.2 Study Intersections

The City approved TIA included eight intersections within the study area, five existing intersections and three future intersections, denoted with an "*", within the City of Lake Elsinore and Caltrans Jurisdiction.

1. **Lake St. / I-15 NB Ramps (Jurisdiction: Caltrans, Lake Elsinore)**
2. **Lake St. / I-15 SB Ramps (Jurisdiction: Caltrans, Lake Elsinore)**
3. **Lake St. / Project Access (Jurisdiction: Lake Elsinore)**
4. **Lake St. / Temescal Cyn. Rd. (Jurisdiction: Lake Elsinore)**
5. **Lake St. / Nichols Rd. (Jurisdiction: Lake Elsinore)**
6. Lake St. / A St. (Jurisdiction: Lake Elsinore)*
7. Lake St. / B St. (Jurisdiction: Lake Elsinore)*
8. Lake St. / D St. (Jurisdiction: Lake Elsinore)*

The Existing plus Ambient plus Project (EAP) (2019) Conditions and Existing plus Ambient plus Project plus Cumulative (EAPC) (2019) Conditions analysis includes the study intersections numbered 1-5. The study intersections 6-7 were included in the Horizon Year (2035), Without Project Conditions and Horizon Year (2035), With Project Conditions.

The intersection analysis included queuing analysis at the Project entry and nearby interchange area (including Lake Street at the I-15 Ramps and Lake Street at Project Access).

The signal warrant criteria presented in the latest edition of the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), as amended by the MUTCD 2014 California Supplement, was reviewed for the Project entry intersection.

### 1.3 Freeway Mainline Segments

The City approved TIA included six mainline segments within the study area.

1. I-15 Freeway – Northbound, South of Lake Street
2. I-15 Freeway – Northbound, Between Ramps
3. I-15 Freeway – Northbound, North of Lake Street
4. I-15 Freeway – Southbound, North of Lake Street
5. I-15 Freeway – Southbound, Between Ramps
6. I-15 Freeway – Southbound, South of Lake Street

### 1.4 Freeway Ramp Junctions

The City approved TIA included four freeway ramp junctions within the study area.

1. I-15 Freeway – Northbound, Off-Ramp at Lake Street (Diverge)
2. I-15 Freeway – Northbound, On-Ramp at Lake Street (Merge)
3. I-15 Freeway – Southbound, Off-Ramp at Lake Street (Diverge)
4. I-15 Freeway – Southbound, On-Ramp at Lake Street (Merge)

## 2. Traffic Forecasting

The Lake Street / I-15 Property TIA, approved by the City of Lake Elsinore, identified the Existing plus Ambient plus Project Conditions for Year 2018. Caltrans has requested that the condition updated to be Year 2019. The Existing plus Ambient plus Project (EAP) Conditions Analysis included in this addendum will assess opening year as Year 2019. The existing intersection geometrics have also been updated to reflect the recently installed Programmed TUMF1 / TIF2 improvements to the intersections of Lake St. at I-15 NB Ramps and Lake St. at I-15 SB Ramps. The Synchro intersection capacity analysis model was also updated to reflect the improvements in the intersection capacity analysis outputs.

### 2.1 Existing plus Ambient plus Project (EAP)

The analysis determines the traffic impacts based on a comparison of the EAP traffic conditions to Existing Conditions (i.e., baseline conditions). To account for background traffic growth, an Ambient from Existing Conditions (Year 2017) of 2% annually, 4% growth to Year 2019, is included for EAP traffic conditions. Cumulative development projects are not included as part of the EAP analysis. For the purposes of this traffic analysis, the EAP scenario has been utilized to discern Project impacts consistent with the County of Riverside Traffic Study Guidelines.

#### *2.1.1 Intersection Capacity Analysis*

The Existing plus Ambient plus Project Conditions Traffic Volumes are illustrated in *Exhibit C.* The intersection geometrics are illustrated in *Exhibit D.* The recently installed improvements to the intersections of Lake St. at I-15 NB Ramps and Lake St. at I-15 SB Ramps include the signalization of each intersection. Recently installed improvements at the intersection of Lake St at I-15 NB Ramps include an exclusive northbound left turn lane and exclusive westbound left turn lane. Recently installed improvements at the intersection of Lake St at I-15 SB Ramps include an exclusive northbound right turn lane and a exclusive southbound left turn.

An intersection capacity analysis for the Existing plus Ambient plus Project Conditions was performed using the methodology presented in the Lake Street / I-15 Property, Traffic Impact Analysis, by Urban Crossroads, dated September 10, 2018. Intersection capacity analyses were conducted using Synchro Trafficware Ltd, version 10, which implements the methods of the Highway Capacity Manual, 2010 Edition (HCM2010). Synchro10 is a macroscopic traffic software program that is based on the intersection capacity analysis as specified in the HCM.

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1 Western Riverside Council of Governments (WRCOG)Transportation Uniform Mitigation Fee (TUMF)
2 City of Lake Elsinore Traffic Infrastructure Fee (TIF)

The resulting LOS for the Existing plus Ambient plus Project Conditions of each of the intersections are shown in *Table A* and provided in *Appendix B.*

**Table A: Intersection Capacity Analysis - Existing + Ambient + Project Conditions**

| | Intersection | AM | | PM | |
|---|---|---|---|---|---|
| | | Delay(1) | LOS(2) | Delay(1) | LOS(2) |
| 1 | Lake St. at I-15 NB Ramps | 31.8 | C | 21.1 | C |
| 2 | Lake St. at I-15 SB Ramps | 8.2 | A | 29.5 | C |
| 3 | Lake St. at Project Access | 3.6 | A | 5.4 | A |
| | Mitigation: Exclusive SB Left | 5.5 | A | 6.0 | A |
| 4 | Lake St. at Temescal Cyn. Rd. | 39.7 | D | 15.6 | B |
| 5 | Lake St. at Nichols Rd. | 25.7 | C | 34.9 | C |

(1) Delay –In Seconds
(2) LOS – Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As presented in *Table A,* under Existing plus Ambient plus Project Conditions the study intersections are anticipated to operate at an acceptable LOS with the existing geometrics during the AM and PM peak hours.

The mitigation evaluated at the intersection of Lake St at Project Access is to provide an exclusive southbound left turn lane.

### *2.1.2 Queuing Analysis*

A queuing analysis for the Existing plus Ambient plus Project Conditions was performed at the Project entry and nearby interchange area (including Lake Street at the I-15 Ramps and Lake Street at Project Access). The queuing analysis was performed utilizing the Trafficware SimTraffic10 software package.

The 95$^{th}$ percentile maximum queue length results for the Existing plus Ambient plus Project Conditions for the turn lanes are shown in *Table B* and provided in *Attachment C.*

**Table B: Queuing Analysis - Existing + Ambient + Project Conditions**

| Intersection / Turn Storage Lane | Storage Length | AM (1) | PM (1) | AM (2) | PM (2) |
|---|---|---|---|---|---|
| | | | | | |
| 1. Lake St. at I-15 NB Ramps | | | | | |
| NBL | 280 | 200 | 108 | - | - |
| | | | | | |
| 2. Lake St. at I-15 SB Ramps | | | | | |
| EBR | 280 | 192 | 422 | - | - |
| | | | | | |
| NBR | **(200)** | **73** | 161 | - | - |
| | | | | | |
| SBL | 150 | 51 | 64 | - | - |
| | | | | | |
| 3. Lake St. at Project Access | | | | | |
| SBL | **(125)** | - | - | 105 | 139 |
| | | | | | |

Queue – In Feet
**(XXX)** – Proposed Storage Length
(1) – Queuing Analysis completed with Existing Intersection Geometrics
(2) – Queuing Analysis completed with Proposed Mitigated Intersection Geometrics
Critical Queue Length is denoted in **Bold** font
95% - 95 Percentile Queue Length
Source: **David Evans and Associates, Inc.**

As presented in *Table B,* under Existing plus Ambient plus Project Conditions the existing and recommended turn bay lengths can accommodate the weekday AM or weekday PM peak 95th percentile traffic flows.

### *2.1.3 Traffic Signal Warrant Analysis*

The signal warrant criteria presented in the latest edition of the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), as amended by the MUTCD 2014 California Supplement, was reviewed for the project access intersection. The Peak Hour Volume-based Warrant 3 is utilized as the appropriate representative of traffic signal warrant analysis for Existing plus Ambient plus Project Traffic Conditions.

The intersection of Lake St. at Project Access meets the Peak Hour Volume-based Warrant 3 as a result of the am and pm peak period volumes plotting a point above the rural areas curve in Figure 4C-4 for the Existing plus Ambient plus Project Conditions. The traffic signal warrant worksheets are provided in *Attachment D.*

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### *2.1.4 Freeway Mainline Segments*

The Existing plus Ambient plus Project Conditions Freeway Segment Volumes are illustrated in *Exhibit E.*

A freeway segment analysis for the Existing plus Ambient plus Project Conditions was performed using the methodology presented in the Lake Street / I-15 Property TIA. Freeway Mainline capacity analyses were conducted using HCS2010 software which implements the methods of the Highway Capacity Manual, 2010 Edition (HCM2010). The performance measure preferred by Caltrans to calculate LOS is density. Density is expressed in terms of passenger cars per mile per lane.

Freeway mainline capacity analyses were conducted for the six freeway segments. The resulting LOS for the Existing plus Ambient plus Project Conditions of each of the freeway segments analyzed are shown in *Table C* and *Attachment E.*

**Table C: Freeway Mainline Capacity Analysis – Existing + Ambient + Project Conditions**

| | Segment/Freeway Name | AM | | PM | |
|---|---|---|---|---|---|
| | | Density(1) | LOS(2) | Density(1) | LOS(2) |
| 1 | I-15 Freeway – Northbound, South of Lake Street | 11.1 | B | 10.6 | A |
| 2 | I-15 Freeway – Northbound, Between Ramps | 8.2 | A | 9.5 | A |
| 3 | I-15 Freeway – Northbound, North of Lake Street | 11.4 | B | 11.8 | B |
| 4 | I-15 Freeway – Southbound, North of Lake Street | 16.2 | B | 23.9 | C |
| 5 | I-15 Freeway – Southbound, Between Ramps | 14.9 | B | 19.3 | C |
| 6 | I-15 Freeway – Southbound, South of Lake Street | 16.3 | B | 20.5 | C |

(1) Density – Highway Capacity Manual (pc/mi/ln)
(2) LOS - Highway Capacity Manual Level of Service
Source: **David Evans and Associates, Inc.**

As presented in *Table C,* under the Existing plus Ambient plus Project Conditions, the identified freeway segments are operating at an acceptable LOS during the AM and PM peak hours.

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### *2.1.5 Freeway Merge and Diverge Ramps*

The Existing plus Ambient plus Project Conditions Merge and Diverge Ramp Volumes are illustrated in *Exhibit F.* A Merge and Diverge Ramp analysis for the Existing plus Ambient plus Project Conditions was performed using the methodology presented in the Lake Street / I-15 Property TIA. Merge and Diverge Ramp analyses were conducted using HCS2010 software, which implements the methods of the Highway Capacity Manual, 2010 Edition (HCM2010).

The measure of effectiveness (reported in passenger cars per mile per lane) are calculated based on the existing number of travel lanes, number of lanes at the on and off ramps both at the analysis junction and at upstream and downstream locations (if applicable) and acceleration/deceleration lengths at each merge/diverge point.

A Merge and Diverge Ramp analysis was conducted for the four Merge and Diverge Ramp locations identified. The resulting LOS for the Existing plus Ambient plus Project Conditions of each Merge and Diverge Ramp location analyzed is presented in *Table D* and *Attachment F.*

**Table D: Freeway Ramp Junction Analysis – Existing + Ambient + Project Conditions**

| | Freeway Name/Ramp Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | Density(1) | LOS(2) | Density(1) | LOS(2) |
| 1 | I-15 Freeway – Northbound, Off-Ramp at Lake Street (Diverge) | 16.7 | B | 15.2 | B |
| 2 | I-15 Freeway – Northbound, On-Ramp at Lake Street (Merge) | 14.6 | B | 14.4 | B |
| 3 | I-15 Freeway – Southbound, Off-Ramp at Lake Street (Diverge) | 21.1 | C | 29.0 | D |
| 4 | I-15 Freeway – Southbound, On-Ramp at Lake Street (Merge) | 17.9 | B | 21.4 | C |

(1) Density – Highway Capacity Manual (pc/mi/ln)
(2) LOS - Highway Capacity Manual Level of Service
Source: **David Evans and Associates, Inc.**

As presented in *Table D* under the Existing plus Ambient plus Project Conditions, the freeway ramps are operating at an acceptable LOS during the AM and PM peak hours.

## 2.2 Existing plus Ambient plus Project plus Cumulative Conditions (EAPC)

To account for cumulative development projects and regional impacts, the cumulative development projects are added to the Existing Plus Ambient Plus Project Conditions. For the purposes of this traffic analysis, the EAPC scenario has been utilized to discern Cumulative impacts consistent with the County of Riverside Traffic Study Guidelines.

### *2.2.1 Intersection Capacity Analysis*

The Existing plus Ambient plus Project plus Cumulative Conditions Traffic Volumes are illustrated in *Exhibit G.*

An intersection capacity analysis for the Existing plus Ambient plus Project plus Cumulative Conditions was performed using the methodology presented in the Lake Street / I-15 Property TIA. Intersection capacity analyses were conducted using Synchro Trafficware Ltd, version 10, which implements the methods of the Highway Capacity Manual, 2010 Edition (HCM2010). Synchro10 is a macroscopic traffic software program that is based on the intersection capacity analysis as specified in the HCM.

The resulting LOS for the Existing plus Ambient plus Project plus Cumulative Conditions of each of the intersections are shown in *Table E* and provided in *Appendix B.*

**Table E: Intersection Capacity Analysis - Existing+Ambient+Project+Cumulative Conditions**

| Intersection | | AM | | PM | |
|---|---|---|---|---|---|
| | | Delay(1) | LOS(2) | Delay(1) | LOS(2) |
| 1 | Lake St. at I-15 NB Ramps | 34.1 | C | 21.3 | C |
| 2 | Lake St. at I-15 SB Ramps | 10.0 | A | 52.5 | D |
| 3 | Lake St. at Project Access | 3.7 | A | 5.4 | A |
| | Mitigation: Exclusive SB Left | 5.7 | A | 6.8 | A |
| 4 | Lake St. at Temescal Cyn. Rd. | 48.4 | D | 17.7 | B |
| 5 | Lake St. at Nichols Rd. | 30.2 | C | 46.6 | D |

(1) Delay –In Seconds
(2) LOS – Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As presented in *Table E,* under Existing plus Ambient plus Project plus Cumulative Conditions the study intersections are anticipated to operate at an acceptable LOS with the existing geometrics during the AM and PM peak hours.

The mitigation evaluated at the intersection of Lake St at Project Access is to provide an exclusive southbound left turn lane.

### *2.2.2 Queuing Analysis*

A queuing analysis for the Existing plus Ambient plus Project plus Cumulative Conditions, was performed at the Project entry and nearby interchange area (including Lake Street at the I-15 Ramps and Lake Street at Project Access). The queuing analysis was performed utilizing the Trafficware SimTraffic10 software package.

The 95th percentile maximum queue length results for the Existing plus Ambient plus Project plus Cumulative Conditions for the turn lanes are shown in *Table F* and provided in *Attachment C.*

**Table F: Queuing Analysis - Existing + Ambient + Project + Cumulative Conditions**

| Intersection / Turn Storage Lane | Storage Length | AM (1) | PM (1) | AM (2) | PM (2) |
|---|---|---|---|---|---|
| | | | | | |
| 1. Lake St. at I-15 NB Ramps | | | | | |
| NBL | 280 | 222 | 71 | - | - |
| | | | | | |
| 2. Lake St. at I-15 SB Ramps | | | | | |
| EBR | 280 | 399 | 421 | - | - |
| | | | | | |
| NBR | **(200)** | **97** | 198 | - | - |
| | | | | | |
| SBL | 150 | 132 | 102 | - | - |
| | | | | | |
| 3. Lake St. at Project Access | | | | | |
| SBL | **(125)** | - | - | 112 | 151 |
| | | | | | |

Queue – In Feet
**(XXX)** – Proposed Storage Length
(1) – Queuing Analysis completed with Existing Intersection Geometrics
(2) – Queuing Analysis completed with Proposed Mitigated Intersection Geometrics
Critical Queue Length is denoted in **Bold** font
95% - 95 Percentile Queue Length
Source: **David Evans and Associates, Inc.**

As presented in Table F, under Existing plus Ambient plus Project plus Cumulative Conditions the existing and recommended turn bay lengths can accommodate the weekday AM or weekday PM peak 95th percentile traffic flows.

### *2.2.3 Traffic Signal Warrant Analysis*

The traffic signal warrant criteria presented in the latest edition of the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), as amended by the MUTCD 2014 California Supplement, was reviewed for the project access intersection. The Peak Hour Volume-based Warrant 3 is utilized as the appropriate representative of traffic signal warrant analysis for Existing plus Ambient plus Project plus Cumulative Traffic Conditions.

The intersection of Lake St. at Project Access meets the Peak Hour Volume-based Warrant 3 as a result of the am and pm peak period volumes plotting a point above the rural areas curve in Figure 4C-4 for the Existing plus Ambient plus Project plus Cumulative Conditions. The traffic signal warrant worksheets are provided in *Attachment D.*

### *2.2.4 Freeway Mainline Segments*

The Existing plus Ambient plus Project plus Cumulative Conditions Freeway Segment Volumes are illustrated in *Exhibit H.*

A freeway segment analysis for the Existing plus Ambient plus Project plus Cumulative Conditions was performed using the methodology presented in the Lake Street / I-15 Property TIA. Freeway Mainline capacity analyses were conducted using HCS2010 software which, implements the methods of the Highway Capacity Manual, 2010 Edition (HCM2010). The performance measure preferred by Caltrans to calculate LOS is density. Density is expressed in terms of passenger cars per mile per lane.

The resulting LOS for the Existing plus Ambient plus Project plus Cumulative Conditions of each of the freeway segments analyzed are shown in *Table G* and *Attachment E.*

**Table G: Freeway Mainline Capacity Analysis – Existing+Ambient+Project+Cumulative Conditions**

| | Segment/Freeway Name | AM | | PM | |
|---|---|---|---|---|---|
| | | Density(1) | LOS(2) | Density(1) | LOS(2) |
| 1 | I-15 Freeway – Northbound, South of Lake Street | 11.1 | B | 10.6 | A |
| 2 | I-15 Freeway – Northbound, Between Ramps | 8.2 | A | 9.5 | A |
| 3 | I-15 Freeway – Northbound, North of Lake Street | 12.0 | B | 12.2 | B |
| 4 | I-15 Freeway – Southbound, North of Lake Street | 16.4 | B | 24.8 | C |
| 5 | I-15 Freeway – Southbound, Between Ramps | 14.9 | B | 19.3 | C |
| 6 | I-15 Freeway – Southbound, South of Lake Street | 16.3 | B | 20.5 | C |

(1) Density – Highway Capacity Manual (pc/mi/ln)
(2) LOS - Highway Capacity Manual Level of Service
Source: **David Evans and Associates, Inc.**

As presented in *Table G,* under the Existing plus Ambient plus Project plus Cumulative Conditions, , the identified freeway segments are operating at an acceptable LOS during the AM and PM peak hours.

### *2.2.5 Freeway Merge and Diverge Ramps*

The Existing plus Ambient plus Project plus Cumulative Conditions Merge and Diverge Ramp Volumes are illustrated in *Exhibit I.*

A Merge and Diverge Ramp analysis for the Existing plus Ambient plus Project plus Cumulative Conditions was performed using the methodology presented in the Lake Street / I-15 Property TIA. Merge and Diverge Ramp analyses were conducted using HCS2010 software which implements the methods of the Highway Capacity Manual, 2010 Edition (HCM2010). The measure of effectiveness (reported in passenger cars per mile per lane) are calculated based on the existing number of travel lanes, number of lanes at the on and off ramps both at the analysis junction and at upstream and downstream locations (if applicable) and acceleration/deceleration lengths at each merge/diverge point.

A Merge and Diverge Ramp analysis was conducted for the four Merge and Diverge Ramp locations identified. The resulting LOS for the Existing plus Ambient plus Project Conditions of each Merge and Diverge Ramp location analyzed is presented in *Table H* and *Attachment F.*

**Table H: Freeway Ramp Junction Analysis – Existing+Ambient+Project+Cumulative Conditions**

| | Freeway Name/Ramp Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | Density(1) | LOS(2) | Density(1) | LOS(2) |
| 1 | I-15 Freeway – Northbound, Off-Ramp at Lake Street (Diverge) | 16.7 | B | 15.2 | B |
| 2 | I-15 Freeway – Northbound, On-Ramp at Lake Street (Merge) | 15.5 | B | 15.1 | B |
| 3 | I-15 Freeway – Southbound, Off-Ramp at Lake Street (Diverge) | 21.5 | C | 29.9 | D |
| 4 | I-15 Freeway – Southbound, On-Ramp at Lake Street (Merge) | 17.9 | B | 21.4 | C |

(1) Density – Highway Capacity Manual (pc/mi/ln)
(2) LOS - Highway Capacity Manual Level of Service
Source: **David Evans and Associates, Inc.**

As presented in *Table H* under the Existing plus Ambient plus Project plus Cumulative Conditions, most of the freeway ramps are operating at an acceptable LOS of D or better throughout the day.

## 3. Summary

The updating the Opening Year analysis to 2019 has resulted the level of service and operation of the study intersections, freeway mainline, and freeway ramp junctions to be consistent with the analysis presented in the Lake Street / I-15 Property, Traffic Impact Analysis, by Urban Crossroads, dated September 10, 2018. The queuing analysis and traffic signal warrant analysis are also consistent with the analysis presented in the Original Report.

This memorandum addressing Caltrans comment to update the Opening Year analysis to 2019 has shown the mitigation presented in the Original report to be still valid.

If you have any questions or comments, please feel free to contact us.

DAVID EVANS AND ASSOCIATES INC.

Attachments

1. Exhibit A – Vicinity Map
2. Exhibit B – City approved Site Plan
3. Exhibit C – Existing plus Ambient plus Project Traffic Volumes
4. Exhibit D – Existing plus Ambient plus Project Intersection Geometrics
5. Exhibit E – Existing plus Ambient plus Project Freeway Segment Volumes
6. Exhibit F – Existing plus Ambient plus Project Ramp Volumes
7. Exhibit G – Existing plus Ambient plus Project plus Ambient Traffic Volumes
8. Exhibit H – Existing plus Ambient plus Project plus Ambient Intersection Geometrics
9. Exhibit I – Existing plus Ambient plus Project plus Ambient Freeway Segment Volumes
10. Exhibit J – Existing plus Ambient plus Project plus Ambient Merge/Diverge - Ramp Volumes
11. Attachment A – Volume Development Worksheets from Lake Street / I-15 Property, Traffic Impact Analysis, by Urban Crossroads, dated September 10, 2018
12. Attachment B – Intersection Capacity Analysis
13. Attachment C – Queuing Analysis
14. Attachment D – Traffic Signal Warrant Worksheets
15. Attachment E – Freeway Segment Capacity Analysis
16. Attachment F – Merge/Diverge - Ramp Junction Capacity Analysis


N

NOT TO SCALE

DAVID EVANS AND ASSOCIATES INC.

# EXHIBIT A: VICINITY MAP
# LAKE STREET / I-15 PROPERTY PROJECT
# LAKE ELSINORE, CALIFORNIA

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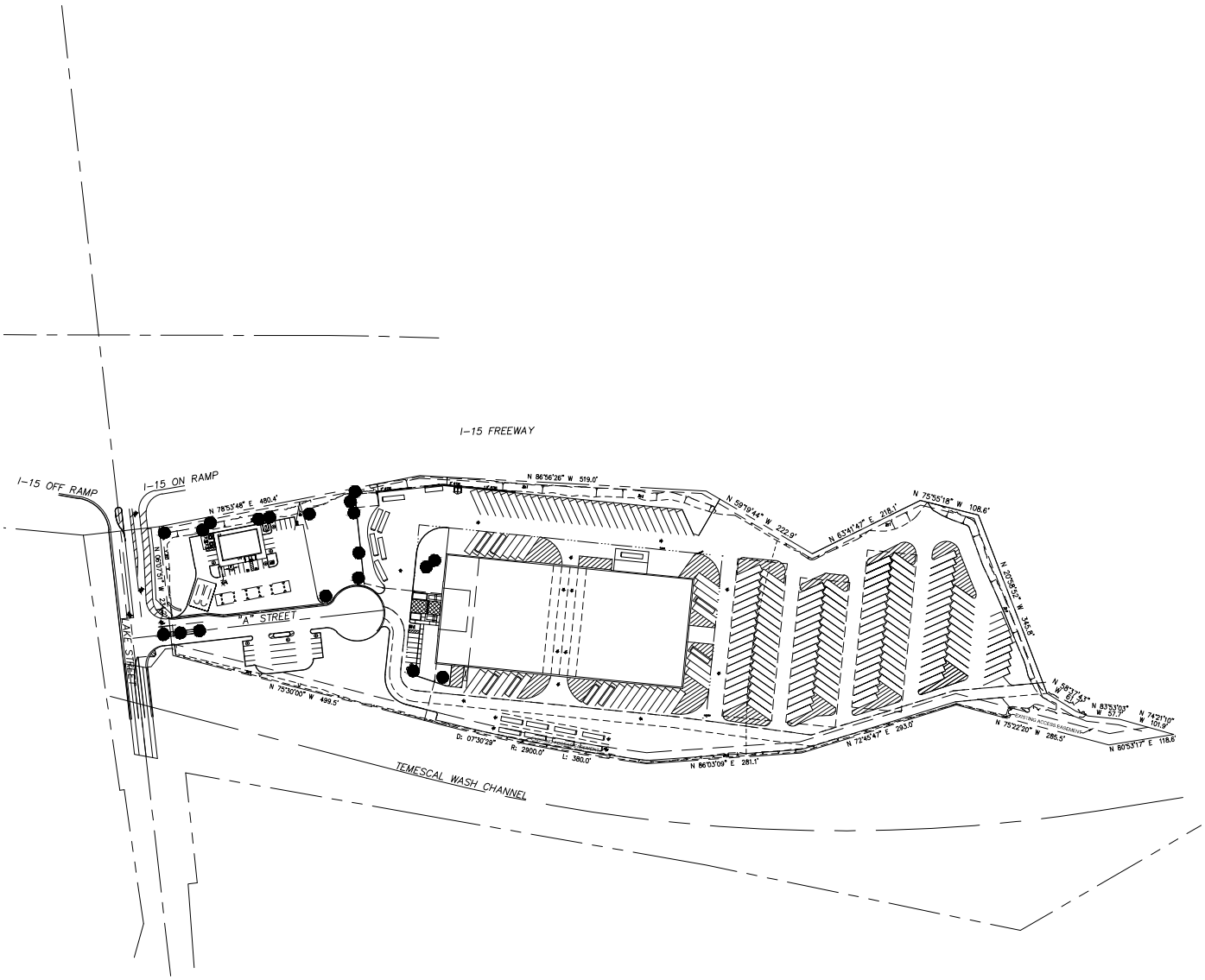


NOT TO SCALE

DAVID EVANS AND ASSOCIATES INC.

# EXHIBIT B: CITY APPROVED SITE MAP
# LAKE STREET / I-15 PROPERTY PROJECT
# LAKE ELSINORE, CALIFORNIA

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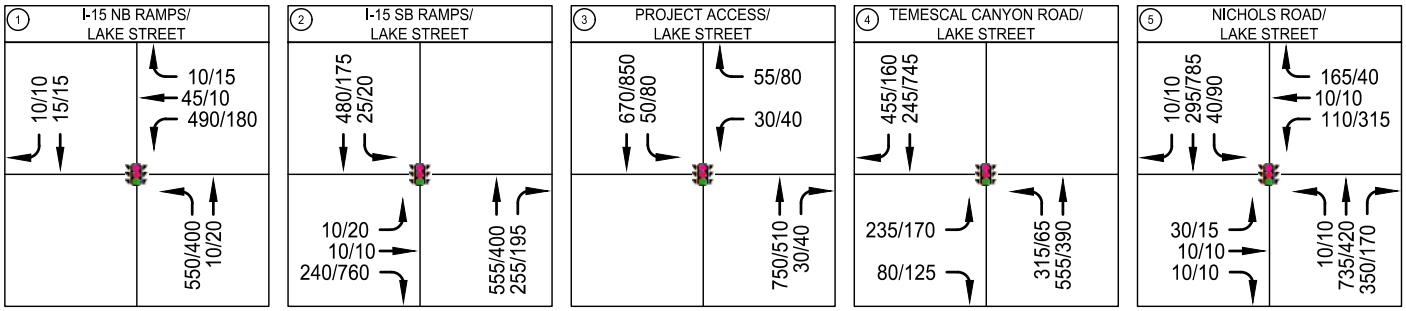



## LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

SIGNALIZED INTERSECTION

STOP CONTROLLED APPROACH

DAVID EVANS AND ASSOCIATES INC.

# EXHIBIT C: EXISTING PLUS AMBIENT PLUS PROJECT TRAFFIC VOLUMES
# LAKE STREET / I-15 PROPERTY PROJECT
# LAKE ELSINORE, CALIFORNIA

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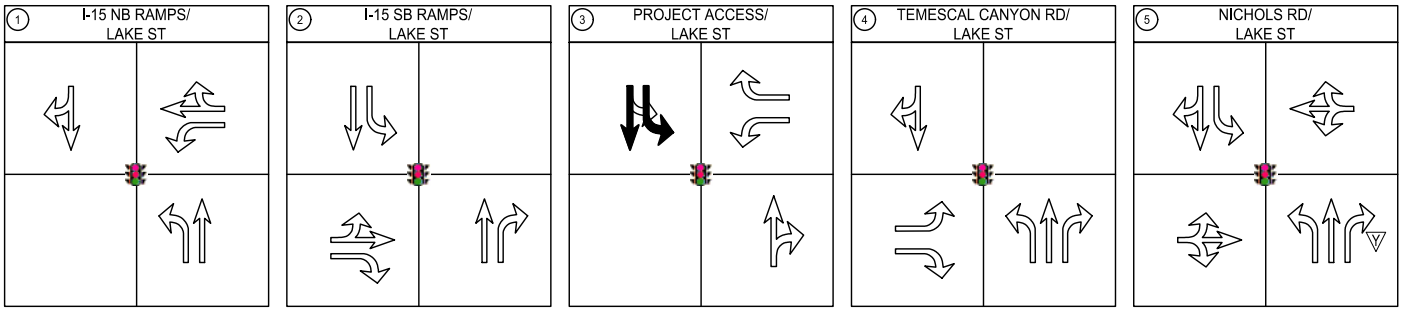



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NOT TO SCALE

LEGEND

- TO BE REMOVED GEOMETRICS
- EXISTING GEOMETRICS
- PROPOSED GEOMETRICS
- # - STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- STOP CONTROLLED APPROACH
- YIELD CONTROLLED APPROACH

DAVID EVANS AND ASSOCIATES INC.

# EXHIBIT D: EXISTING PLUS AMBIENT PLUS PROJECT INTERSECTION GEOMETRICS
# LAKE STREET / I-15 PROPERTY PROJECT
# LAKE ELSINORE, CALIFORNIA

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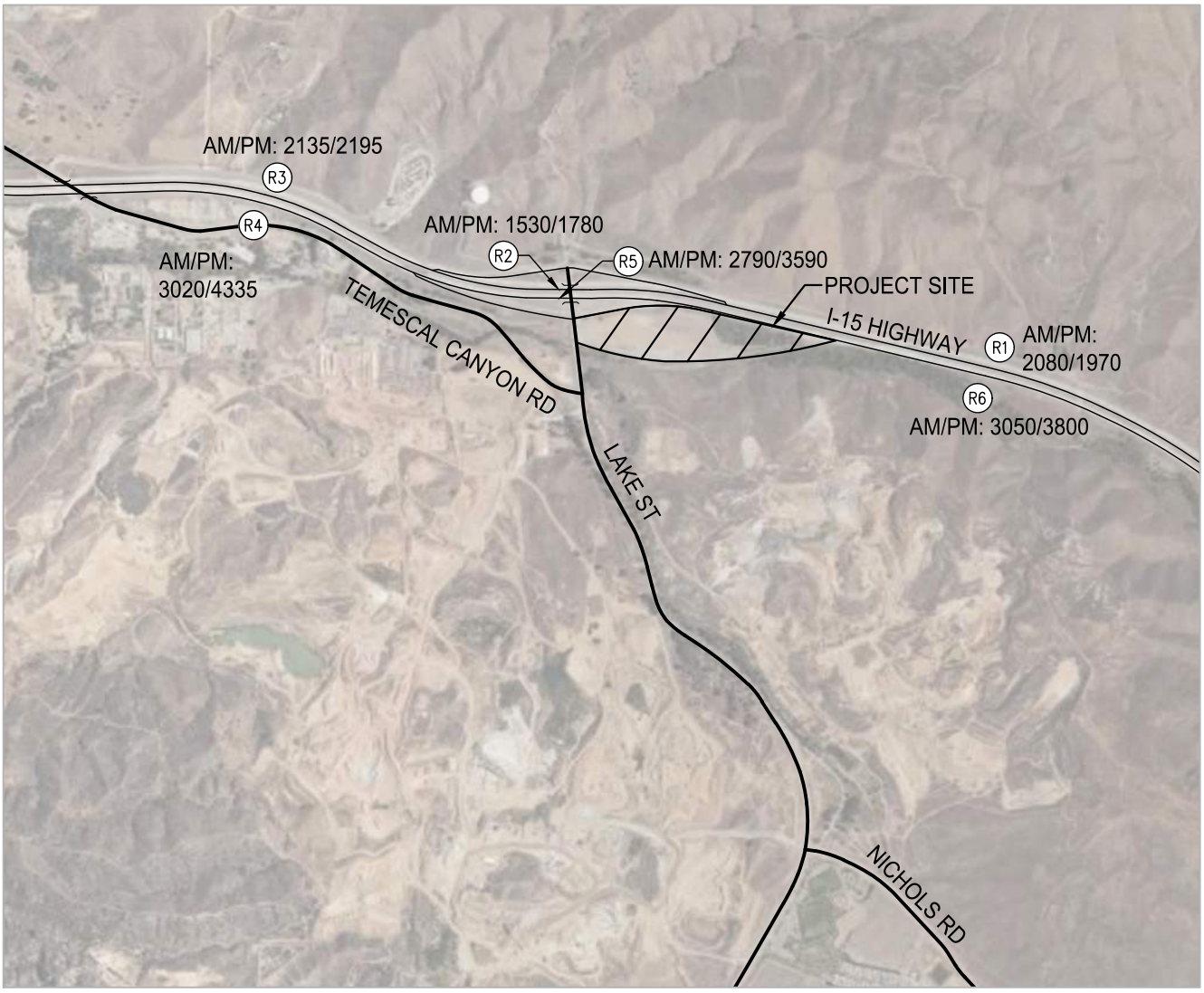


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NOT TO SCALE

DAVID EVANS AND ASSOCIATES INC.

# EXHIBIT E: EXISTING PLUS AMBIENT PLUS PROJECT FREEWAY SEGMENT VOLUMES
# LAKE STREET / I-15 PROPERTY PROJECT
# LAKE ELSINORE, CALIFORNIA

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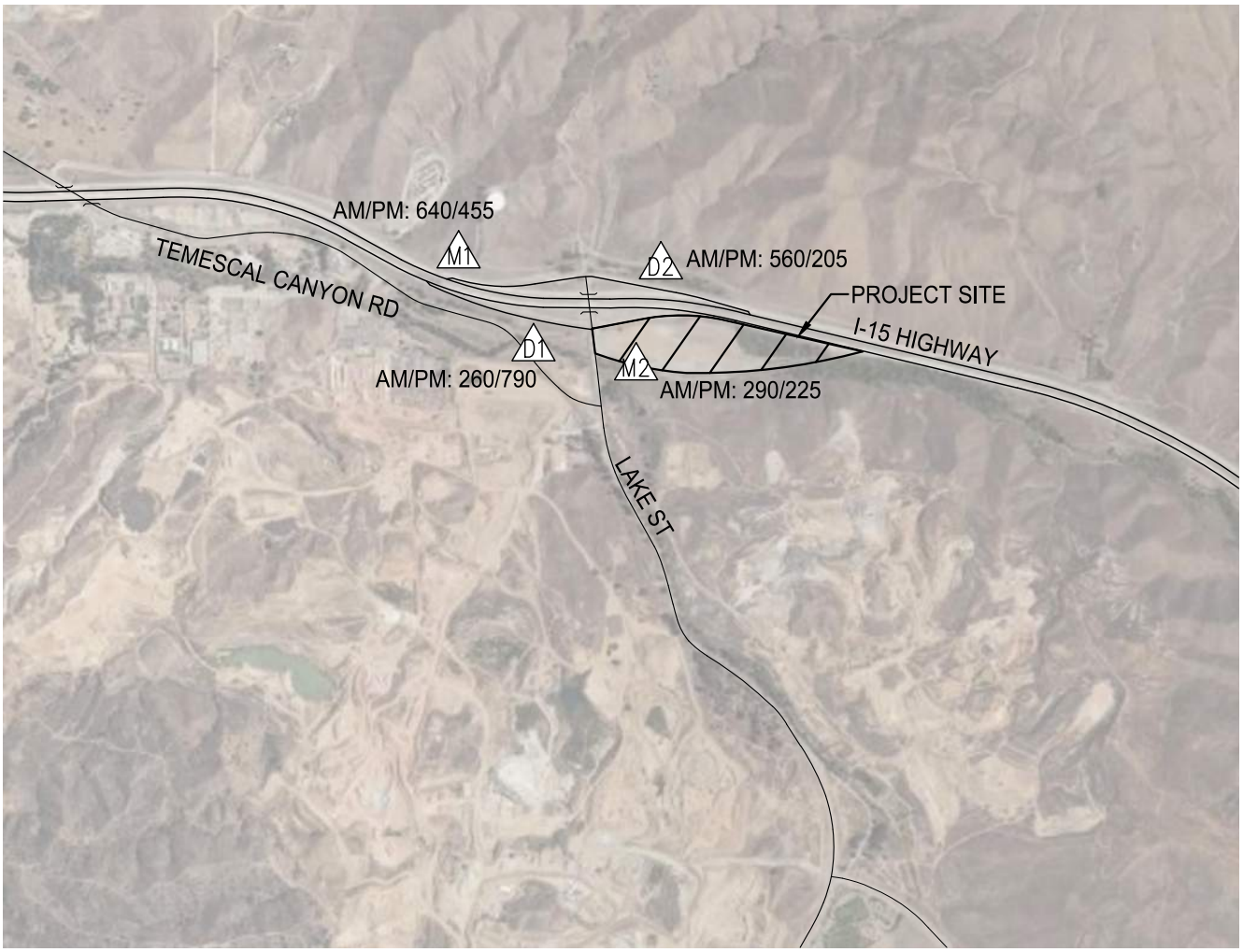


DAVID EVANS AND ASSOCIATES INC.

# EXHIBIT F: EXISTING PLUS AMBIENT PLUS PROJECT RAMP VOLUMES
# LAKE STREET / I-15 PROPERTY PROJECT
# LAKE ELSINORE, CALIFORNIA

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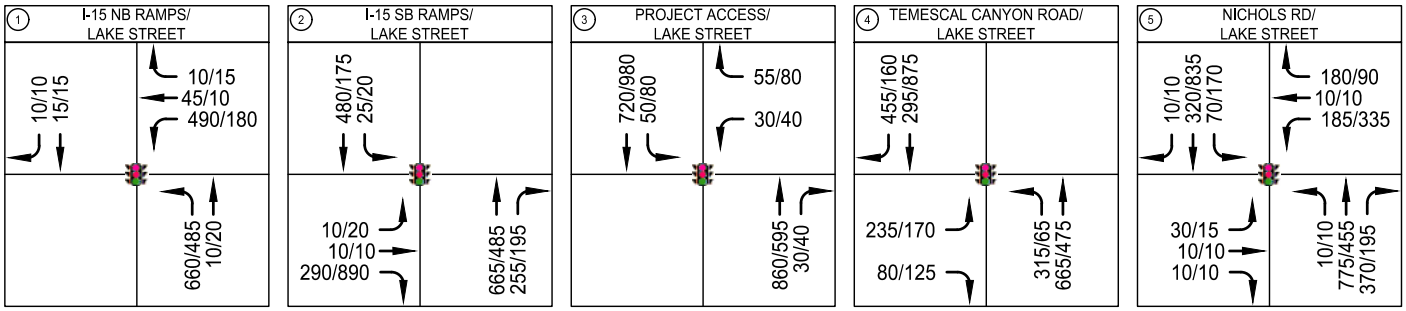




## LEGEND

XX/XX - AM/PM PROJECT TRIP

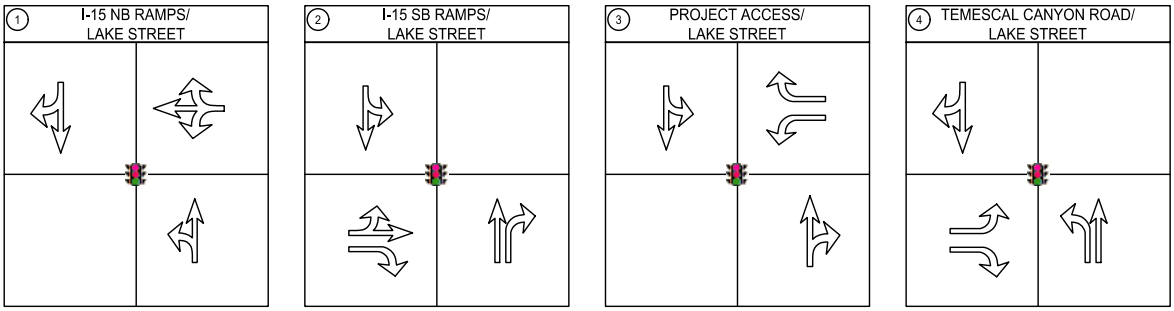
(#) - STUDY INTERSECTIONS

SIGNALIZED INTERSECTION

STOP CONTROLLED APPROACH

# EXHIBIT G: EXISTING PLUS AMBIENT PLUS PROJECT PLUS CUMULATIVE TRAFFIC VOLUMES LAKE STREET / I-15 PROPERTY PROJECT LAKE ELSINORE, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

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## LEGEND

- EXISTING GEOMETRICS
- (#) - STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- STOP CONTROLLED APPROACH

DAVID EVANS AND ASSOCIATES INC.

# EXHIBIT H: EXISTING PLUS AMBIENT PLUS PROJECT PLUS CUMULATIVE INTERSECTION GEOMETRICS
# LAKE STREET / I-15 PROPERTY PROJECT
# LAKE ELSINORE, CALIFORNIA

Drawing Name: P:\LLS\TF00000001040\CAD\TTE\EXHIBIT S\StudyExhibit H.dwg
Last Opened: Oct 01, 2019 - 12:34pm by: kjch

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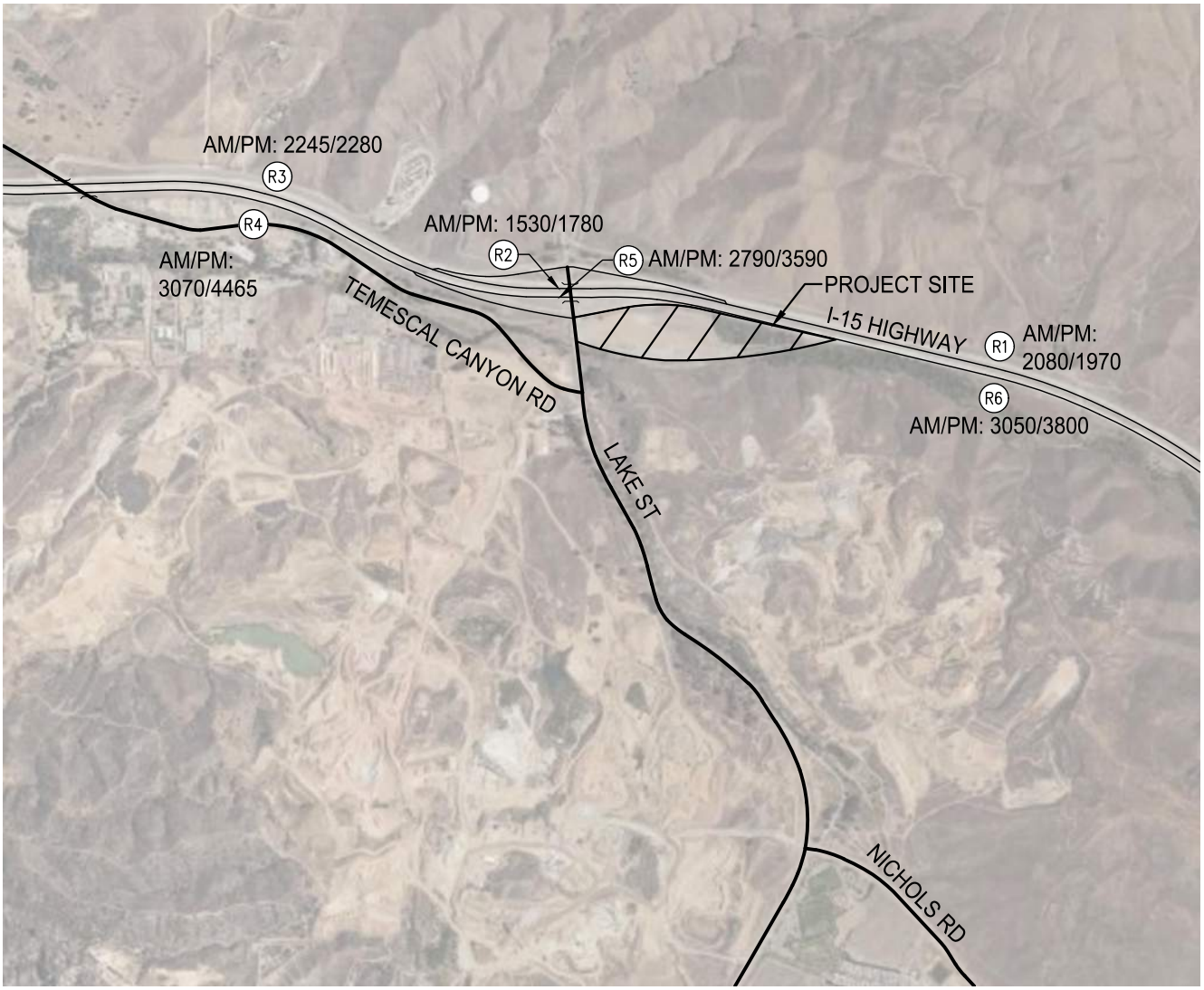
NOT TO SCALE




DAVID EVANS AND ASSOCIATES INC.

EXHIBIT I: EXISTING PLUS AMBIENT PLUS PROJECT
PLUS CUMULATIVE FREEWAY SEGMENT VOLUMES
LAKE STREET / I-15 PROPERTY PROJECT
LAKE ELSINORE, CALIFORNIA

Drawing Name: P:\LLS\TP00000001\040\CAD\TTE\EXHIBIT I\StudyExhibit I.dwg
Last Opened: Oct 01, 2019 - 12:34pm by: kjch

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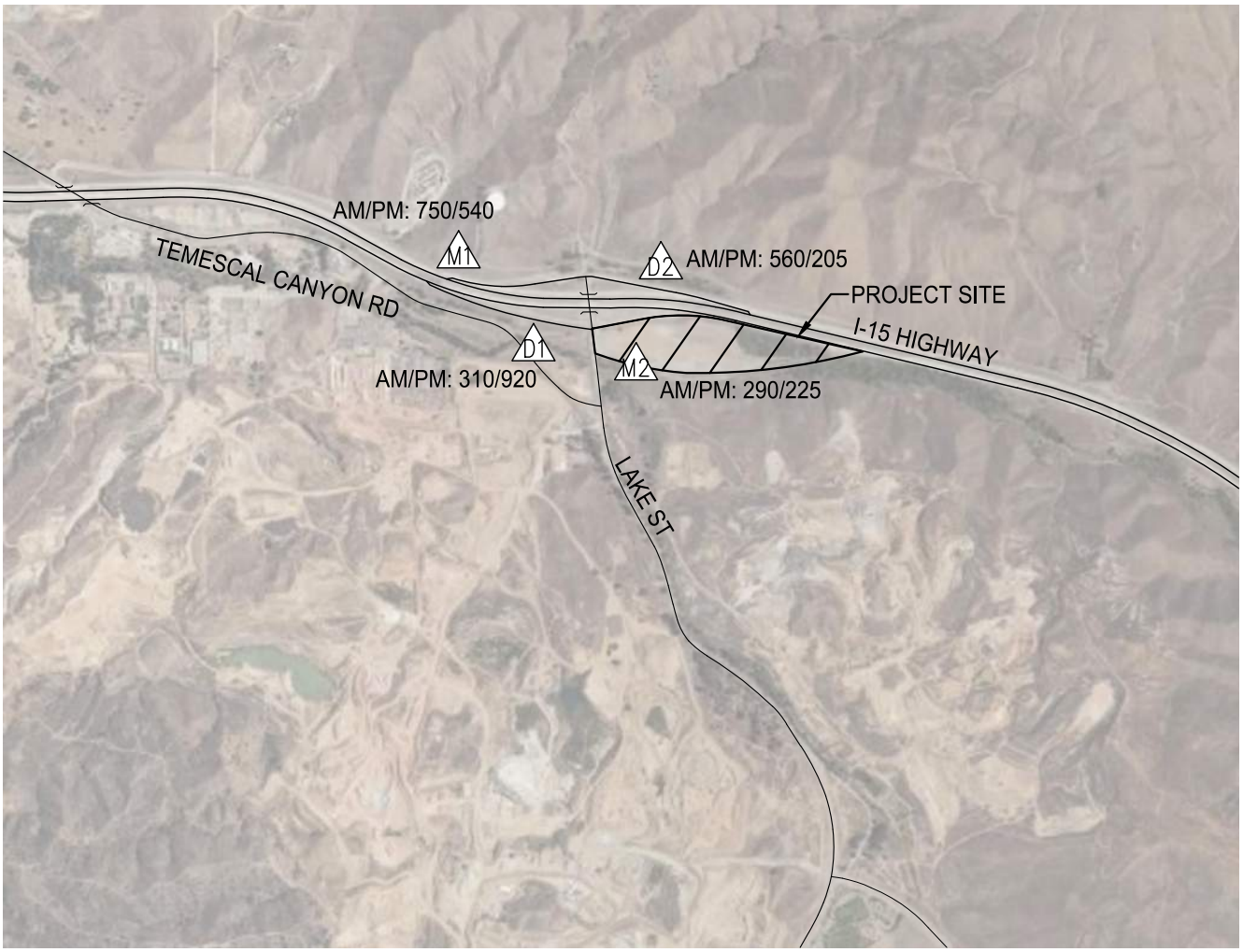



DAVID EVANS AND ASSOCIATES INC.

EXHIBIT J: EXISTING PLUS AMBIENT PLUS PROJECT PLUS CUMULATIVE RAMP VOLUMES
LAKE STREET / I-15 PROPERTY PROJECT
LAKE ELSINORE, CALIFORNIA

Drawing Name: P:\ILLS\TF00000001\040\CAD\TTE\EXHIBIT S\StudyExhibit J.dwg
Last Opened: Oct 01, 2019 - 12:34pm by: kjch

DAVID EVANS AND ASSOCIATES INC.

# ATTACHMENT A - VOLUME DEVELOPMENT WORKSHEETS FROM LAKE STREET / I-15 PROPERTY, TRAFFIC IMPACT ANALYSIS, BY URBAN CROSSROADS, DATED SEPTEMBER 10, 2018

## LAKE STREET / I-15 PROPERTY PROJECT
## LAKE ELSINORE, CALIFORNIA

**JN:10898 - Lake Street / I-15**

| ID | (NS) | (EW) | INTERSECTION | AM PHF | PM PHF | DATE | NOTE |
|---|---|---|---|---|---|---|---|
| 1 | Lake St. | I-15 NB Ramps | Lake St. / I-15 NB Ramps | 0.93 | 0.91 | 5/3/2017 | |
| 2 | Lake St. | I-15 SB Ramps | Lake St. / I-15 SB Ramps | 0.93 | 0.91 | 5/3/2017 | |
| 3 | Lake St. | Project Access | Lake St. / Project Access | 0.94 | 0.92 | 5/3/2017 | |
| 4 | Lake St. | Temescal Cyn. Rd. | Lake St. / Temescal Cyn. Rd. | 0.97 | 0.92 | 5/3/2017 | |
| 5 | Lake St. | Nichols Rd. | Lake St. / Nichols Rd. | 0.95 | 0.88 | 5/3/2017 | |
| 6 | Lake St. | A St. | Lake St. / A St. | 0.950 | 0.950 | - | Consistent with Alberhill TIA |
| 7 | Lake St. | B St. | Lake St. / B St. | 0.950 | 0.950 | - | Consistent with Alberhill TIA |
| 8 | Lake St. | D St. | Lake St. / D St. | 0.950 | 0.950 | - | Consistent with Alberhill TIA |
| 9 | | | / | | | | |
| 10 | | | / | | | | |
| 11 | | | / | | | | |
| 41 | Dummy Node | | Dummy Node | 0.920 | 0.920 | - | Future - Default to 0.92 |

| EXISTING (2017) AM Peak Hour (Final) | | | | | | | | | | | | | | | EXISTING (2017) PM Peak Hour (Final) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NORTHBOUND | | | SOUTHBOUND | | | EASTBOUND | | | WESTBOUND | | | | | NORTHBOUND | | | SOUTHBOUND | | | EASTBOUND | | | WESTBOUND | | | |
| ID | INTERSECTION | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | TOTAL | ID | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | TOTAL |
| 1 | Lake St. / I-15 NB Ramps | 493 | 4 | 0 | 0 | 6 | 1 | 0 | 0 | 0 | 450 | 37 | 4 | 995 | 1 | 340 | 11 | 0 | 0 | 9 | 5 | 0 | 0 | 0 | 139 | 5 | 8 | 517 |
| 2 | Lake St. / I-15 SB Ramps | 0 | 496 | 221 | 16 | 440 | 0 | 1 | 1 | 197 | 0 | 0 | 0 | 1,372 | 2 | 0 | 339 | 151 | 14 | 134 | 0 | 12 | 3 | 682 | 0 | 0 | 0 | 1,335 |
| 3 | Lake St. / Project Access | 0 | 717 | 0 | 0 | 637 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,354 | 3 | 0 | 488 | 0 | 1 | 815 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1,306 |
| 4 | Lake St. / Temescal Cyn. Rd. | 296 | 506 | 0 | 0 | 214 | 423 | 211 | 0 | 74 | 0 | 0 | 0 | 1,724 | 4 | 56 | 345 | 0 | 0 | 683 | 132 | 143 | 0 | 120 | 0 | 0 | 0 | 1,479 |
| 5 | Lake St. / Nichols Rd. | 2 | 689 | 335 | 23 | 263 | 2 | 21 | 5 | 1 | 153 | 3 | 92 | 1,589 | 5 | 3 | 379 | 158 | 68 | 734 | 1 | 6 | 5 | 1 | 298 | 1 | 16 | 1,670 |
| 6 | Lake St. / A St. | 0 | 802 | 0 | 0 | 288 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,090 | 6 | 0 | 401 | 0 | 0 | 803 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,204 |
| 7 | Lake St. / B St. | 0 | 802 | 0 | 0 | 288 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,090 | 7 | 0 | 401 | 0 | 0 | 803 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,204 |
| 8 | Lake St. / D St. | 0 | 802 | 0 | 0 | 288 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,090 | 8 | 0 | 401 | 0 | 0 | 803 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,204 |
| 9 | / | | | | | | | | | | | | | 0 | 9 | | | | | | | | | | | | | 0 |
| 10 | / | | | | | | | | | | | | | 0 | 10 | | | | | | | | | | | | | 0 |
| 41 | Dummy Node | | | | | | | | | | | | | 0 | 41 | | | | | | | | | | | | | 0 |
| | | | | | | | | | | | | AM TOTAL | | 10,304 | | | | | | | | | | | | PM TOTAL | | 9,919 |

| Project (from Traffix) Opening Year (2018) AM Peak Hour | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NORTHBOUND | | | SOUTHBOUND | | | EASTBOUND | | | WESTBOUND | | | |
| ID | INTERSECTION | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | TOTAL |
| 1 | Lake St. / I-15 NB Ramps | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 51 |
| 2 | Lake St. / I-15 SB Ramps | 0 | 32 | 20 | 0 | 19 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 101 |
| 3 | Lake St. / Project Access | 0 | 0 | 27 | 49 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 52 | 156 |
| 4 | Lake St. / Temescal Cyn. Rd. | 0 | 19 | 0 | 0 | 20 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 55 |
| 5 | Lake St. / Nichols Rd. | 0 | 11 | 0 | 8 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 39 |
| 6 | Lake St. / A St. | 0 | 19 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 |
| 7 | Lake St. / B St. | 0 | 19 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 |
| 8 | Lake St. / D St. | 0 | 19 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 |
| 9 | / | | | | | | | | | | | | | 0 |
| 10 | / | | | | | | | | | | | | | 0 |
| 41 | Dummy Node | | | | | | | | | | | | | 0 |
| | | | | | | | | | | | | AM TOTAL | | 519 |

| Project (from Traffix) Opening Year (2018) PM Peak Hour (Final) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NORTHBOUND | | | SOUTHBOUND | | | EASTBOUND | | | WESTBOUND | | | |
| ID | | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | TOTAL |
| 1 | | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 0 | 0 | 68 |
| 2 | | 0 | 42 | 26 | 0 | 26 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 136 |
| 3 | | 0 | 0 | 37 | 68 | 0 | 0 | 0 | 0 | 0 | 37 | 0 | 68 | 210 |
| 4 | | 0 | 26 | 0 | 0 | 26 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 74 |
| 5 | | 0 | 16 | 0 | 11 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 54 |
| 6 | | 0 | 26 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 |
| 7 | | 0 | 26 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 |
| 8 | | 0 | 26 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 |
| 9 | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | 0 |
| 41 | | | | | | | | | | | | | | 0 |
| | | | | | | | | | | | | PM TOTAL | | 698 |

| Cumulative AM Peak Hour | | | | | | | | | | | | | | | Cumulative PM Peak Hour (Final) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NORTHBOUND | | | SOUTHBOUND | | | EASTBOUND | | | WESTBOUND | | | | | NORTHBOUND | | | SOUTHBOUND | | | EASTBOUND | | | WESTBOUND | | | |
| ID | INTERSECTION | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | TOTAL | ID | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | TOTAL |
| 1 | Lake St. / I-15 NB Ramps | 110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 110 | 1 | 83 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 83 |
| 2 | Lake St. / I-15 SB Ramps | 0 | 110 | 0 | 0 | 0 | 0 | 0 | 0 | 49 | 0 | 0 | 0 | 159 | 2 | 0 | 83 | 0 | 0 | 0 | 0 | 0 | 0 | 126 | 0 | 0 | 0 | 209 |
| 3 | Lake St. / Project Access | 0 | 110 | 0 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 159 | 3 | 0 | 83 | 0 | 0 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 209 |
| 4 | Lake St. / Temescal Cyn. Rd. | 0 | 110 | 0 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 159 | 4 | 0 | 83 | 0 | 0 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 209 |
| 5 | Lake St. / Nichols Rd. | 0 | 39 | 17 | 26 | 23 | 0 | 0 | 0 | 0 | 18 | 0 | 70 | 193 | 5 | 0 | 33 | 21 | 79 | 47 | 0 | 0 | 0 | 0 | 20 | 0 | 50 | 250 |
| 6 | Lake St. / A St. | 0 | 110 | 0 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 159 | 6 | 0 | 83 | 0 | 0 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 209 |
| 7 | Lake St. / B St. | 0 | 110 | 0 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 159 | 7 | 0 | 83 | 0 | 0 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 209 |
| 8 | Lake St. / D St. | 0 | 110 | 0 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 159 | 8 | 0 | 83 | 0 | 0 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 209 |
| 9 | / | | | | | | | | | | | | | 0 | 9 | | | | | | | | | | | | | 0 |
| 10 | / | | | | | | | | | | | | | 0 | 10 | | | | | | | | | | | | | 0 |
| 41 | Dummy Node | | | | | | | | | | | | | 0 | 41 | | | | | | | | | | | | | 0 |
| | | | | | | | | | | | | AM TOTAL | | 1,257 | | | | | | | | | | | | PM TOTAL | | 1,587 |

## Freeway Volumes - AM Peak Hour

| | | | | | | Interpolate | | | 1.02 | Interpolate + P + C |
|---|---|---|---|---|---|---|---|---|---|---|
| | Existing (2017) | Project (2018) | Project (2035) | Cumulative | E+P | 2018 Growth Factor | EAC (2018) | EAPC (2019) JN10878 (June 2017 TIA) | EAP (2018) | EAPC (2018) |
| **I-15 Northbound** | | | | | | | | | | |
| S of Lake St. | 1,922 | 19 | 19 | 0 | 1,941 | 1.253507047 | 2,400 | 3,020 | 1,960 | 2,419 |
| NB Off Ramp at Lake St. | 491 | 19 | 19 | 0 | 510 | | | | 520 | 520 |
| Between | 1,431 | 0 | 0 | 0 | 1,431 | | | | 1,440 | 1,899 |
| NB On Ramp at Lake St. | 531 | 32 | 28 | 110 | 563 | | | | 574 | 684 |
| N of Lake St. | 1,962 | 32 | 28 | 110 | 1,994 | | | | 2,014 | 2,583 |
| **I-15 Southbound** | | | | | | | | | | |
| N of Lake St. | 2,967 | 30 | 27 | 49 | 2,997 | | | | 3,037 | 3,240 |
| SB Off Ramp at Lake St. | 199 | 30 | 27 | 49 | 229 | | | | 233 | 282 |
| Between | 2,768 | 0 | 0 | 0 | 2,768 | | | | 2,804 | 2,958 |
| SB On Ramp at Lake St. | 238 | 20 | 20 | 0 | 258 | | | | 262 | 262 |
| S of Lake St. | 3,006 | 20 | 20 | 0 | 3,026 | 1.077811044 | 3,200 | 3,492 | 3,066 | 3,220 |

**PeMS Data for Week of May 2-4, 2017 (consistent with Interchange count data).**

Flow Conserved Volumes

**Freeway Mainline Truck %: Based on 2015 Annual Average Daily Truck Traffic (Source: Caltrans)**

**I-15 = 7.4 % >>> HCS Input = 7% (rounded value)**

**EA2018 Freeway Mainline Growth Factor**

**Growth Factor = (EAPC2019/Existing)^(1/(2019-Existing))**

**Interpolate Calc = Round(ROUND(Existing*Growth Factor^ Opening year-Existing Year,0)/100,0)*100**

## Freeway Volumes - PM Peak Hour

| | | | | | | Interpolate | | | 1.02 | Interpolate + P + C |
|---|---|---|---|---|---|---|---|---|---|---|
| | Existing (2017) | Project (2018) | Project (2035) | Cumulative | E+P | 2018 Growth Factor | EAC (2018) | EAPC (2019) JN10878 (June 2017 TIA) | EAP (2018) | EAPC (2018) |
| **I-15 Northbound** | | | | | | | | | | |
| S of Lake St. | 1,844 | 26 | 26 | 0 | 1,870 | 1.211612289 | 2,200 | 2,707 | 1,881 | 2,226 |
| NB Off Ramp at Lake St. | 152 | 26 | 26 | 0 | 178 | | | | 181 | 181 |
| Between | 1,692 | 0 | 0 | 0 | 1,692 | | | | 1,700 | 2,045 |
| NB On Ramp at Lake St. | 350 | 42 | 37 | 83 | 392 | | | | 399 | 482 |
| N of Lake St. | 2,042 | 42 | 37 | 83 | 2,084 | | | | 2,099 | 2,527 |
| **I-15 Southbound** | | | | | | | | | | |
| N of Lake St. | 4,250 | 42 | 37 | 126 | 4,292 | | | | 4,351 | 4,708 |
| SB Off Ramp at Lake St. | 697 | 42 | 37 | 126 | 739 | | | | 753 | 879 |
| Between | 3,553 | 0 | 0 | 0 | 3,553 | | | | 3,598 | 3,829 |
| SB On Ramp at Lake St. | 168 | 26 | 26 | 0 | 194 | | | | 197 | 197 |
| S of Lake St. | 3,721 | 26 | 26 | 0 | 3,747 | 1.087417964 | 4,000 | 4,400 | 3,795 | 4,026 |

**PeMS Data for Week of May 2-4, 2017 (consistent with Interchange count data).**

Flow Conserved Volumes

**Freeway Mainline Truck %: Based on 2015 Annual Average Daily Truck Traffic (Source: Caltrans)**

**I-15 = 7.4 % >>> HCS Input = 7% (rounded value)**

**EA2018 Freeway Mainline Growth Factor**

**Growth Factor = (EAPC2019/Existing)^(1/(2019-Existing))**

**Interpolate Calc = Round(ROUND(Existing*Growth Factor^ Opening year-Existing Year,0)/100,0)*100**

DAVID EVANS AND ASSOCIATES INC.

# ATTACHMENT B - INTERSECTION CAPACITY ANALYSIS

## LAKE STREET / I-15 PROPERTY PROJECT
## LAKE ELSINORE, CALIFORNIA

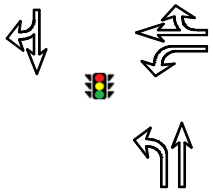
DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : I-15 NB RAMPS
N/S STREET : LAKE STREET
CONDITION : AM PEAK HOUR

INTERSECTION : 1
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS



## EXISTING GEOMETRICS

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **I-15 NB RAMPS** | | | | | | | |
| EB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Left | 450 | 20 | 470 | 20 | 490 | 0 | 490 |
| WB Thru | 40 | 0 | 40 | 5 | 45 | 0 | 45 |
| WB Right | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| **LAKE STREET** | | | | | | | |
| NB Left | 495 | 35 | 530 | 20 | 550 | 110 | 660 |
| NB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| NB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Thru | 10 | 0 | 10 | 5 | 15 | 0 | 15 |
| SB Right | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| **TOTALS** | **1010** | **55** | **1065** | **65** | **1130** | **110** | **1240** |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 490 | 45 | 10 | 550 | 10 | 0 | 0 | 15 | 10 |
| Future Volume (veh/h) | 0 | 0 | 0 | 490 | 45 | 10 | 550 | 10 | 0 | 0 | 15 | 10 |
| Number | | | | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | | | 1810 | 1530 | 1900 | 1845 | 1863 | 0 | 0 | 1863 | 1900 |
| Adj Flow Rate, veh/h | | | | 527 | 48 | 11 | 591 | 11 | 0 | 0 | 16 | 11 |
| Adj No. of Lanes | | | | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| Peak Hour Factor | | | | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | | | | 5 | 24 | 5 | 3 | 2 | 0 | 0 | 2 | 2 |
| Cap, veh/h | | | | 560 | 391 | 90 | 848 | 1048 | 0 | 0 | 579 | 398 |
| Arrive On Green | | | | 0.32 | 0.32 | 0.32 | 0.56 | 0.56 | 0.00 | 0.00 | 0.56 | 0.56 |
| Sat Flow, veh/h | | | | 1723 | 1205 | 276 | 1364 | 1863 | 0 | 0 | 1030 | 708 |
| Grp Volume(v), veh/h | | | | 527 | 0 | 59 | 591 | 11 | 0 | 0 | 0 | 27 |
| Grp Sat Flow(s),veh/h/ln | | | | 1723 | 0 | 1481 | 1364 | 1863 | 0 | 0 | 0 | 1738 |
| Q Serve(g_s), s | | | | 23.8 | 0.0 | 2.2 | 27.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.6 |
| Cycle Q Clear(g_c), s | | | | 23.8 | 0.0 | 2.2 | 27.7 | 0.2 | 0.0 | 0.0 | 0.0 | 0.6 |
| Prop In Lane | | | | 1.00 | | 0.19 | 1.00 | | 0.00 | 0.00 | | 0.41 |
| Lane Grp Cap(c), veh/h | | | | 560 | 0 | 481 | 848 | 1048 | 0 | 0 | 0 | 978 |
| V/C Ratio(X) | | | | 0.94 | 0.00 | 0.12 | 0.70 | 0.01 | 0.00 | 0.00 | 0.00 | 0.03 |
| Avail Cap(c_a), veh/h | | | | 571 | 0 | 491 | 848 | 1048 | 0 | 0 | 0 | 978 |
| HCM Platoon Ratio | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | | | 1.00 | 0.00 | 1.00 | 0.92 | 0.92 | 0.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | | | 26.3 | 0.0 | 19.0 | 13.9 | 7.7 | 0.0 | 0.0 | 0.0 | 7.8 |
| Incr Delay (d2), s/veh | | | | 23.8 | 0.0 | 0.1 | 4.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Initial Q Delay(d3),s/veh | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | | | | 15.0 | 0.0 | 0.9 | 11.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.3 |
| LnGrp Delay(d),s/veh | | | | 50.1 | 0.0 | 19.1 | 18.3 | 7.7 | 0.0 | 0.0 | 0.0 | 7.8 |
| LnGrp LOS | | | | D | | B | B | A | | | | A |
| Approach Vol, veh/h | | | | | 586 | | | 602 | | | 27 | |
| Approach Delay, s/veh | | | | | 47.0 | | | 18.1 | | | 7.8 | |
| Approach LOS | | | | | D | | | B | | | A | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 49.5 | | | | 49.5 | | 30.5 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 44.5 | | | | 44.5 | | 26.5 |
| Max Q Clear Time (g_c+I1), s | | 29.7 | | | | 2.6 | | 25.8 |
| Green Ext Time (p_c), s | | 1.8 | | | | 0.1 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 31.8 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 490 | 45 | 10 | 660 | 10 | 0 | 0 | 15 | 10 |
| Future Volume (veh/h) | 0 | 0 | 0 | 490 | 45 | 10 | 660 | 10 | 0 | 0 | 15 | 10 |
| Number | | | | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | | | 1810 | 1530 | 1900 | 1845 | 1863 | 0 | 0 | 1863 | 1900 |
| Adj Flow Rate, veh/h | | | | 527 | 48 | 11 | 710 | 11 | 0 | 0 | 16 | 11 |
| Adj No. of Lanes | | | | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| Peak Hour Factor | | | | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | | | | 5 | 24 | 5 | 3 | 2 | 0 | 0 | 2 | 2 |
| Cap, veh/h | | | | 560 | 391 | 90 | 848 | 1048 | 0 | 0 | 579 | 398 |
| Arrive On Green | | | | 0.32 | 0.32 | 0.32 | 0.56 | 0.56 | 0.00 | 0.00 | 0.56 | 0.56 |
| Sat Flow, veh/h | | | | 1723 | 1205 | 276 | 1364 | 1863 | 0 | 0 | 1030 | 708 |
| Grp Volume(v), veh/h | | | | 527 | 0 | 59 | 710 | 11 | 0 | 0 | 0 | 27 |
| Grp Sat Flow(s),veh/h/ln | | | | 1723 | 0 | 1481 | 1364 | 1863 | 0 | 0 | 0 | 1738 |
| Q Serve(g_s), s | | | | 23.8 | 0.0 | 2.2 | 38.6 | 0.2 | 0.0 | 0.0 | 0.0 | 0.6 |
| Cycle Q Clear(g_c), s | | | | 23.8 | 0.0 | 2.2 | 39.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.6 |
| Prop In Lane | | | | 1.00 | | 0.19 | 1.00 | | 0.00 | 0.00 | | 0.41 |
| Lane Grp Cap(c), veh/h | | | | 560 | 0 | 481 | 848 | 1048 | 0 | 0 | 0 | 978 |
| V/C Ratio(X) | | | | 0.94 | 0.00 | 0.12 | 0.84 | 0.01 | 0.00 | 0.00 | 0.00 | 0.03 |
| Avail Cap(c_a), veh/h | | | | 571 | 0 | 491 | 848 | 1048 | 0 | 0 | 0 | 978 |
| HCM Platoon Ratio | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | | | 1.00 | 0.00 | 1.00 | 0.86 | 0.86 | 0.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | | | 26.3 | 0.0 | 19.0 | 16.5 | 7.7 | 0.0 | 0.0 | 0.0 | 7.8 |
| Incr Delay (d2), s/veh | | | | 23.8 | 0.0 | 0.1 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Initial Q Delay(d3),s/veh | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | | | | 15.0 | 0.0 | 0.9 | 16.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.3 |
| LnGrp Delay(d),s/veh | | | | 50.1 | 0.0 | 19.1 | 24.9 | 7.7 | 0.0 | 0.0 | 0.0 | 7.8 |
| LnGrp LOS | | | | D | | B | C | A | | | | A |
| Approach Vol, veh/h | | | | | 586 | | | 721 | | | 27 | |
| Approach Delay, s/veh | | | | | 47.0 | | | 24.6 | | | 7.8 | |
| Approach LOS | | | | | D | | | C | | | A | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 49.5 | | | | 49.5 | | 30.5 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 44.5 | | | | 44.5 | | 26.5 |
| Max Q Clear Time (g_c+I1), s | | 41.1 | | | | 2.6 | | 25.8 |
| Green Ext Time (p_c), s | | 1.0 | | | | 0.1 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 34.1 |
| HCM 2010 LOS | C |

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : I-15 NB RAMPS
N/S STREET : LAKE STREET
CONDITION : PM PEAK HOUR

INTERSECTION : 1
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 2 | | 4 | | 6 | | 8 |
| **I-15 NB RAMPS** | | | | | | | |
| EB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Left | 140 | 30 | 170 | 10 | 180 | 0 | 180 |
| WB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| WB Right | 10 | 0 | 10 | 5 | 15 | 0 | 15 |
| **LAKE STREET** | | | | | | | |
| NB Left | 340 | 45 | 385 | 15 | 400 | 85 | 485 |
| NB Thru | 15 | 0 | 15 | 5 | 20 | 0 | 20 |
| NB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Thru | 10 | 0 | 10 | 5 | 15 | 0 | 15 |
| SB Right | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| **TOTALS** | **525** | **75** | **600** | **50** | **650** | **85** | **735** |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 180 | 10 | 15 | 400 | 20 | 0 | 0 | 15 | 10 |
| Future Volume (veh/h) | 0 | 0 | 0 | 180 | 10 | 15 | 400 | 20 | 0 | 0 | 15 | 10 |
| Number | | | | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | | | 1810 | 1863 | 1900 | 1810 | 1863 | 0 | 0 | 1863 | 1900 |
| Adj Flow Rate, veh/h | | | | 198 | 11 | 16 | 440 | 22 | 0 | 0 | 16 | 11 |
| Adj No. of Lanes | | | | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| Peak Hour Factor | | | | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | | | | 5 | 2 | 5 | 5 | 2 | 0 | 0 | 2 | 2 |
| Cap, veh/h | | | | 232 | 92 | 134 | 1110 | 1460 | 0 | 0 | 807 | 555 |
| Arrive On Green | | | | 0.13 | 0.13 | 0.13 | 0.78 | 0.78 | 0.00 | 0.00 | 0.78 | 0.78 |
| Sat Flow, veh/h | | | | 1723 | 687 | 999 | 1338 | 1863 | 0 | 0 | 1030 | 708 |
| Grp Volume(v), veh/h | | | | 198 | 0 | 27 | 440 | 22 | 0 | 0 | 0 | 27 |
| Grp Sat Flow(s),veh/h/ln | | | | 1723 | 0 | 1686 | 1338 | 1863 | 0 | 0 | 0 | 1738 |
| Q Serve(g_s), s | | | | 12.4 | 0.0 | 1.5 | 11.8 | 0.3 | 0.0 | 0.0 | 0.0 | 0.4 |
| Cycle Q Clear(g_c), s | | | | 12.4 | 0.0 | 1.5 | 12.2 | 0.3 | 0.0 | 0.0 | 0.0 | 0.4 |
| Prop In Lane | | | | 1.00 | | 0.59 | 1.00 | | 0.00 | 0.00 | | 0.41 |
| Lane Grp Cap(c), veh/h | | | | 232 | 0 | 227 | 1110 | 1460 | 0 | 0 | 0 | 1362 |
| V/C Ratio(X) | | | | 0.86 | 0.00 | 0.12 | 0.40 | 0.02 | 0.00 | 0.00 | 0.00 | 0.02 |
| Avail Cap(c_a), veh/h | | | | 353 | 0 | 345 | 1110 | 1460 | 0 | 0 | 0 | 1362 |
| HCM Platoon Ratio | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | | | 1.00 | 0.00 | 1.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | | | 46.6 | 0.0 | 41.9 | 3.9 | 2.6 | 0.0 | 0.0 | 0.0 | 2.6 |
| Incr Delay (d2), s/veh | | | | 12.1 | 0.0 | 0.2 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | | | | 6.7 | 0.0 | 0.7 | 4.6 | 0.2 | 0.0 | 0.0 | 0.0 | 0.2 |
| LnGrp Delay(d),s/veh | | | | 58.7 | 0.0 | 42.1 | 4.9 | 2.6 | 0.0 | 0.0 | 0.0 | 2.6 |
| LnGrp LOS | | | | E | | D | A | A | | | | A |
| Approach Vol, veh/h | | | | | 225 | | | 462 | | | 27 | |
| Approach Delay, s/veh | | | | | 56.7 | | | 4.8 | | | 2.6 | |
| Approach LOS | | | | | E | | | A | | | A | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 90.7 | | | | 90.7 | | 19.3 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 78.5 | | | | 78.5 | | 22.5 |
| Max Q Clear Time (g_c+I1), s | | 14.2 | | | | 2.4 | | 14.4 |
| Green Ext Time (p_c), s | | 1.5 | | | | 0.1 | | 0.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 21.1 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 180 | 10 | 15 | 485 | 20 | 0 | 0 | 15 | 10 |
| Future Volume (veh/h) | 0 | 0 | 0 | 180 | 10 | 15 | 485 | 20 | 0 | 0 | 15 | 10 |
| Number | | | | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | | | 1810 | 1863 | 1900 | 1810 | 1863 | 0 | 0 | 1863 | 1900 |
| Adj Flow Rate, veh/h | | | | 198 | 11 | 16 | 533 | 22 | 0 | 0 | 16 | 11 |
| Adj No. of Lanes | | | | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| Peak Hour Factor | | | | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | | | | 5 | 2 | 5 | 5 | 2 | 0 | 0 | 2 | 2 |
| Cap, veh/h | | | | 229 | 91 | 133 | 1112 | 1463 | 0 | 0 | 809 | 556 |
| Arrive On Green | | | | 0.13 | 0.13 | 0.13 | 0.79 | 0.79 | 0.00 | 0.00 | 0.79 | 0.79 |
| Sat Flow, veh/h | | | | 1723 | 687 | 999 | 1338 | 1863 | 0 | 0 | 1030 | 708 |
| Grp Volume(v), veh/h | | | | 198 | 0 | 27 | 533 | 22 | 0 | 0 | 0 | 27 |
| Grp Sat Flow(s),veh/h/ln | | | | 1723 | 0 | 1686 | 1338 | 1863 | 0 | 0 | 0 | 1738 |
| Q Serve(g_s), s | | | | 12.4 | 0.0 | 1.6 | 15.9 | 0.3 | 0.0 | 0.0 | 0.0 | 0.4 |
| Cycle Q Clear(g_c), s | | | | 12.4 | 0.0 | 1.6 | 16.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.4 |
| Prop In Lane | | | | 1.00 | | 0.59 | 1.00 | | 0.00 | 0.00 | | 0.41 |
| Lane Grp Cap(c), veh/h | | | | 229 | 0 | 224 | 1112 | 1463 | 0 | 0 | 0 | 1365 |
| V/C Ratio(X) | | | | 0.86 | 0.00 | 0.12 | 0.48 | 0.02 | 0.00 | 0.00 | 0.00 | 0.02 |
| Avail Cap(c_a), veh/h | | | | 290 | 0 | 284 | 1112 | 1463 | 0 | 0 | 0 | 1365 |
| HCM Platoon Ratio | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | | | 1.00 | 0.00 | 1.00 | 0.69 | 0.69 | 0.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | | | 46.7 | 0.0 | 42.0 | 4.4 | 2.6 | 0.0 | 0.0 | 0.0 | 2.6 |
| Incr Delay (d2), s/veh | | | | 19.1 | 0.0 | 0.2 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | | | | 7.1 | 0.0 | 0.7 | 6.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.2 |
| LnGrp Delay(d),s/veh | | | | 65.8 | 0.0 | 42.3 | 5.4 | 2.6 | 0.0 | 0.0 | 0.0 | 2.6 |
| LnGrp LOS | | | | E | | D | A | A | | | | A |
| Approach Vol, veh/h | | | | | 225 | | | 555 | | | 27 | |
| Approach Delay, s/veh | | | | | 63.0 | | | 5.3 | | | 2.6 | |
| Approach LOS | | | | | E | | | A | | | A | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 90.9 | | | | 90.9 | | 19.1 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 82.5 | | | | 82.5 | | 18.5 |
| Max Q Clear Time (g_c+I1), s | | 18.3 | | | | 2.4 | | 14.4 |
| Green Ext Time (p_c), s | | 1.9 | | | | 0.1 | | 0.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 21.3 |
| HCM 2010 LOS | C |

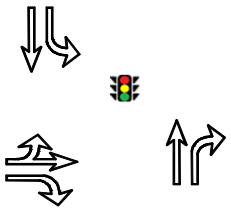
DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : I-15 SB RAMPS
N/S STREET : LAKE STREET
CONDITION : AM PEAK HOUR

INTERSECTION : 2
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS



## EXISTING GEOMETRICS

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **I-15 SB RAMPS** | | | | | | | |
| EB Left | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| EB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| EB Right | 200 | 30 | 230 | 10 | 240 | 50 | 290 |
| WB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LAKE STREET** | | | | | | | |
| NB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NB Thru | 500 | 35 | 535 | 20 | 555 | 110 | 665 |
| NB Right | 225 | 20 | 245 | 10 | 255 | 0 | 255 |
| SB Left | 20 | 0 | 20 | 5 | 25 | 0 | 25 |
| SB Thru | 440 | 20 | 460 | 20 | 480 | 0 | 480 |
| SB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTALS** | **1395** | **105** | **1500** | **75** | **1575** | **160** | **1735** |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 10 | 10 | 240 | 0 | 0 | 0 | 0 | 555 | 255 | 25 | 480 | 0 |
| Future Volume (veh/h) | 10 | 10 | 240 | 0 | 0 | 0 | 0 | 555 | 255 | 25 | 480 | 0 |
| Number | 7 | 4 | 14 | | | | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1810 | | | | 0 | 1845 | 1727 | 1863 | 1810 | 0 |
| Adj Flow Rate, veh/h | 11 | 11 | 258 | | | | 0 | 597 | 274 | 27 | 516 | 0 |
| Adj No. of Lanes | 0 | 1 | 1 | | | | 0 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | | | | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 5 | 2 | 5 | | | | 0 | 3 | 10 | 2 | 5 | 0 |
| Cap, veh/h | 175 | 175 | 296 | | | | 0 | 1282 | 1020 | 530 | 1258 | 0 |
| Arrive On Green | 0.19 | 0.19 | 0.19 | | | | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Sat Flow, veh/h | 909 | 909 | 1538 | | | | 0 | 1845 | 1468 | 633 | 1810 | 0 |
| Grp Volume(v), veh/h | 22 | 0 | 258 | | | | 0 | 597 | 274 | 27 | 516 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1817 | 0 | 1538 | | | | 0 | 1845 | 1468 | 633 | 1810 | 0 |
| Q Serve(g_s), s | 0.8 | 0.0 | 13.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.8 | 0.0 | 13.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Prop In Lane | 0.50 | | 1.00 | | | | 0.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 350 | 0 | 296 | | | | 0 | 1282 | 1020 | 530 | 1258 | 0 |
| V/C Ratio(X) | 0.06 | 0.00 | 0.87 | | | | 0.00 | 0.47 | 0.27 | 0.05 | 0.41 | 0.00 |
| Avail Cap(c_a), veh/h | 443 | 0 | 375 | | | | 0 | 1282 | 1020 | 530 | 1258 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | | | | 0.00 | 0.82 | 0.82 | 0.31 | 0.31 | 0.00 |
| Uniform Delay (d), s/veh | 26.4 | 0.0 | 31.3 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 16.4 | | | | 0.0 | 1.0 | 0.5 | 0.1 | 0.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.4 | 0.0 | 6.9 | | | | 0.0 | 0.4 | 0.2 | 0.0 | 0.1 | 0.0 |
| LnGrp Delay(d),s/veh | 26.5 | 0.0 | 47.8 | | | | 0.0 | 1.0 | 0.5 | 0.1 | 0.3 | 0.0 |
| LnGrp LOS | C | | D | | | | | A | A | A | A | |
| Approach Vol, veh/h | | 280 | | | | | | 871 | | | 543 | |
| Approach Delay, s/veh | | 46.1 | | | | | | 0.9 | | | 0.3 | |
| Approach LOS | | D | | | | | | A | | | A | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | | 6 | | |
| Phs Duration (G+Y+Rc), s | | 60.1 | | 19.9 | | 60.1 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 | | |
| Max Green Setting (Gmax), s | | 51.5 | | 19.5 | | 51.5 | | |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | 15.0 | | 2.0 | | |
| Green Ext Time (p_c), s | | 4.9 | | 0.4 | | 3.4 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 8.2 |
| HCM 2010 LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 10 | 10 | 290 | 0 | 0 | 0 | 0 | 665 | 255 | 25 | 480 | 0 |
| Future Volume (veh/h) | 10 | 10 | 290 | 0 | 0 | 0 | 0 | 665 | 255 | 25 | 480 | 0 |
| Number | 7 | 4 | 14 | | | | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1810 | | | | 0 | 1845 | 1727 | 1863 | 1810 | 0 |
| Adj Flow Rate, veh/h | 11 | 11 | 312 | | | | 0 | 715 | 274 | 27 | 516 | 0 |
| Adj No. of Lanes | 0 | 1 | 1 | | | | 0 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | | | | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 5 | 2 | 5 | | | | 0 | 3 | 10 | 2 | 5 | 0 |
| Cap, veh/h | 204 | 204 | 346 | | | | 0 | 1222 | 973 | 466 | 1199 | 0 |
| Arrive On Green | 0.22 | 0.22 | 0.22 | | | | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Sat Flow, veh/h | 909 | 909 | 1538 | | | | 0 | 1845 | 1468 | 567 | 1810 | 0 |
| Grp Volume(v), veh/h | 22 | 0 | 312 | | | | 0 | 715 | 274 | 27 | 516 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1817 | 0 | 1538 | | | | 0 | 1845 | 1468 | 567 | 1810 | 0 |
| Q Serve(g_s), s | 0.8 | 0.0 | 15.8 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.8 | 0.0 | 15.8 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Prop In Lane | 0.50 | | 1.00 | | | | 0.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 409 | 0 | 346 | | | | 0 | 1222 | 973 | 466 | 1199 | 0 |
| V/C Ratio(X) | 0.05 | 0.00 | 0.90 | | | | 0.00 | 0.59 | 0.28 | 0.06 | 0.43 | 0.00 |
| Avail Cap(c_a), veh/h | 443 | 0 | 375 | | | | 0 | 1222 | 973 | 466 | 1199 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | | | | 0.00 | 0.75 | 0.75 | 0.31 | 0.31 | 0.00 |
| Uniform Delay (d), s/veh | 24.3 | 0.0 | 30.1 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 23.1 | | | | 0.0 | 1.5 | 0.5 | 0.1 | 0.4 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.4 | 0.0 | 8.9 | | | | 0.0 | 0.5 | 0.1 | 0.0 | 0.1 | 0.0 |
| LnGrp Delay(d),s/veh | 24.4 | 0.0 | 53.2 | | | | 0.0 | 1.5 | 0.5 | 0.1 | 0.4 | 0.0 |
| LnGrp LOS | C | | D | | | | | A | A | A | A | |
| Approach Vol, veh/h | | 334 | | | | | | 989 | | | 543 | |
| Approach Delay, s/veh | | 51.3 | | | | | | 1.3 | | | 0.3 | |
| Approach LOS | | D | | | | | | A | | | A | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | | 6 | | |
| Phs Duration (G+Y+Rc), s | | 57.5 | | 22.5 | | 57.5 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 | | |
| Max Green Setting (Gmax), s | | 51.5 | | 19.5 | | 51.5 | | |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | 17.8 | | 2.0 | | |
| Green Ext Time (p_c), s | | 6.1 | | 0.2 | | 3.5 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 10.0 |
| HCM 2010 LOS | A |

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : I-15 SB RAMPS
N/S STREET : LAKE STREET
CONDITION : PM PEAK HOUR

INTERSECTION : 2
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 2 | | 4 | | 6 | | 8 |
| **I-15 SB RAMPS** | | | | | | | |
| EB Left | 15 | 0 | 15 | 5 | 20 | 0 | 20 |
| EB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| EB Right | 685 | 45 | 730 | 30 | 760 | 130 | 890 |
| WB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LAKE STREET** | | | | | | | |
| NB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NB Thru | 340 | 45 | 385 | 15 | 400 | 85 | 485 |
| NB Right | 155 | 30 | 185 | 10 | 195 | 0 | 195 |
| SB Left | 15 | 0 | 15 | 5 | 20 | 0 | 20 |
| SB Thru | 135 | 30 | 165 | 10 | 175 | 0 | 175 |
| SB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTALS** | **1350** | **150** | **1500** | **80** | **1580** | **215** | **1795** |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 10 | 760 | 0 | 0 | 0 | 0 | 400 | 195 | 20 | 175 | 0 |
| Future Volume (veh/h) | 20 | 10 | 760 | 0 | 0 | 0 | 0 | 400 | 195 | 20 | 175 | 0 |
| Number | 7 | 4 | 14 | | | | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1792 | 1863 | | | | 0 | 1810 | 1863 | 1863 | 1810 | 0 |
| Adj Flow Rate, veh/h | 22 | 11 | 835 | | | | 0 | 440 | 214 | 22 | 192 | 0 |
| Adj No. of Lanes | 0 | 1 | 1 | | | | 0 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | | | | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | | | | 0 | 5 | 2 | 2 | 5 | 0 |
| Cap, veh/h | 626 | 313 | 858 | | | | 0 | 681 | 596 | 267 | 681 | 0 |
| Arrive On Green | 0.54 | 0.54 | 0.54 | | | | 0.00 | 0.75 | 0.75 | 0.75 | 0.75 | 0.00 |
| Sat Flow, veh/h | 1156 | 578 | 1583 | | | | 0 | 1810 | 1583 | 776 | 1810 | 0 |
| Grp Volume(v), veh/h | 33 | 0 | 835 | | | | 0 | 440 | 214 | 22 | 192 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1735 | 0 | 1583 | | | | 0 | 1810 | 1583 | 776 | 1810 | 0 |
| Q Serve(g_s), s | 1.0 | 0.0 | 56.2 | | | | 0.0 | 12.9 | 5.0 | 1.6 | 3.7 | 0.0 |
| Cycle Q Clear(g_c), s | 1.0 | 0.0 | 56.2 | | | | 0.0 | 12.9 | 5.0 | 14.5 | 3.7 | 0.0 |
| Prop In Lane | 0.67 | | 1.00 | | | | 0.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 940 | 0 | 858 | | | | 0 | 681 | 596 | 267 | 681 | 0 |
| V/C Ratio(X) | 0.04 | 0.00 | 0.97 | | | | 0.00 | 0.65 | 0.36 | 0.08 | 0.28 | 0.00 |
| Avail Cap(c_a), veh/h | 970 | 0 | 885 | | | | 0 | 681 | 596 | 267 | 681 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | | | | 0.00 | 0.93 | 0.93 | 0.72 | 0.72 | 0.00 |
| Uniform Delay (d), s/veh | 11.8 | 0.0 | 24.4 | | | | 0.0 | 10.1 | 9.1 | 13.5 | 8.9 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 23.6 | | | | 0.0 | 4.3 | 1.6 | 0.4 | 0.7 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.0 | 30.0 | | | | 0.0 | 6.9 | 2.4 | 0.4 | 1.8 | 0.0 |
| LnGrp Delay(d),s/veh | 11.8 | 0.0 | 48.0 | | | | 0.0 | 14.4 | 10.7 | 14.0 | 9.7 | 0.0 |
| LnGrp LOS | B | | D | | | | | B | B | B | A | |
| Approach Vol, veh/h | | 868 | | | | | | 654 | | | 214 | |
| Approach Delay, s/veh | | 46.6 | | | | | | 13.2 | | | 10.1 | |
| Approach LOS | | D | | | | | | B | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | | 6 | | |
| Phs Duration (G+Y+Rc), s | | 45.9 | | 64.1 | | 45.9 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 | | |
| Max Green Setting (Gmax), s | | 39.5 | | 61.5 | | 39.5 | | |
| Max Q Clear Time (g_c+I1), s | | 14.9 | | 58.2 | | 16.5 | | |
| Green Ext Time (p_c), s | | 3.1 | | 1.3 | | 1.0 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 29.5 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 10 | 890 | 0 | 0 | 0 | 0 | 485 | 195 | 20 | 175 | 0 |
| Future Volume (veh/h) | 20 | 10 | 890 | 0 | 0 | 0 | 0 | 485 | 195 | 20 | 175 | 0 |
| Number | 7 | 4 | 14 | | | | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | | | | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1792 | 1863 | | | | 0 | 1810 | 1863 | 1863 | 1810 | 0 |
| Adj Flow Rate, veh/h | 22 | 11 | 978 | | | | 0 | 533 | 214 | 22 | 192 | 0 |
| Adj No. of Lanes | 0 | 1 | 1 | | | | 0 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | | | | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | | | | 0 | 5 | 2 | 2 | 5 | 0 |
| Cap, veh/h | 647 | 323 | 885 | | | | 0 | 650 | 569 | 177 | 650 | 0 |
| Arrive On Green | 0.56 | 0.56 | 0.56 | | | | 0.00 | 0.72 | 0.72 | 0.72 | 0.72 | 0.00 |
| Sat Flow, veh/h | 1156 | 578 | 1583 | | | | 0 | 1810 | 1583 | 711 | 1810 | 0 |
| Grp Volume(v), veh/h | 33 | 0 | 978 | | | | 0 | 533 | 214 | 22 | 192 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1735 | 0 | 1583 | | | | 0 | 1810 | 1583 | 711 | 1810 | 0 |
| Q Serve(g_s), s | 0.9 | 0.0 | 61.5 | | | | 0.0 | 22.2 | 5.7 | 2.5 | 4.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.9 | 0.0 | 61.5 | | | | 0.0 | 22.2 | 5.7 | 24.7 | 4.2 | 0.0 |
| Prop In Lane | 0.67 | | 1.00 | | | | 0.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 970 | 0 | 885 | | | | 0 | 650 | 569 | 177 | 650 | 0 |
| V/C Ratio(X) | 0.03 | 0.00 | 1.10 | | | | 0.00 | 0.82 | 0.38 | 0.12 | 0.30 | 0.00 |
| Avail Cap(c_a), veh/h | 970 | 0 | 885 | | | | 0 | 650 | 569 | 177 | 650 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | | | | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | | | | 0.00 | 0.90 | 0.90 | 0.67 | 0.67 | 0.00 |
| Uniform Delay (d), s/veh | 10.9 | 0.0 | 24.2 | | | | 0.0 | 13.1 | 10.7 | 21.5 | 10.5 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 63.2 | | | | 0.0 | 10.1 | 1.7 | 1.0 | 0.8 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.0 | 42.1 | | | | 0.0 | 12.5 | 2.6 | 0.5 | 2.2 | 0.0 |
| LnGrp Delay(d),s/veh | 10.9 | 0.0 | 87.4 | | | | 0.0 | 23.2 | 12.4 | 22.5 | 11.3 | 0.0 |
| LnGrp LOS | B | | F | | | | | C | B | C | B | |
| Approach Vol, veh/h | | 1011 | | | | | | 747 | | | 214 | |
| Approach Delay, s/veh | | 84.9 | | | | | | 20.1 | | | 12.5 | |
| Approach LOS | | F | | | | | | C | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | | 6 | | |
| Phs Duration (G+Y+Rc), s | | 44.0 | | 66.0 | | 44.0 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | | 4.5 | | |
| Max Green Setting (Gmax), s | | 39.5 | | 61.5 | | 39.5 | | |
| Max Q Clear Time (g_c+I1), s | | 24.2 | | 63.5 | | 26.7 | | |
| Green Ext Time (p_c), s | | 3.3 | | 0.0 | | 0.8 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 52.5 |
| HCM 2010 LOS | D |

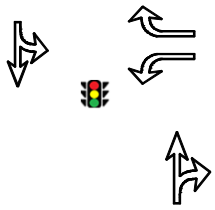
DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

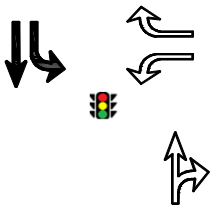
E/W STREET : PROJECT ACCESS
N/S STREET : LAKE STREET
CONDITION : AM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

## CONDITION DIAGRAMS



**EXISTING GEOMETRICS**



**PROPOSED GEOMETRICS**

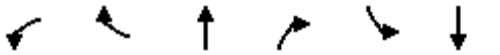
### TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **PROJECT ACCESS** | | | | | | | |
| EB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Left | 0 | 30 | 30 | 0 | 30 | 0 | 30 |
| WB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Right | 0 | 55 | 55 | 0 | 55 | 0 | 55 |
| **LAKE STREET** | | | | | | | |
| NB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NB Thru | 720 | 0 | 720 | 30 | 750 | 110 | 860 |
| NB Right | 0 | 30 | 30 | 0 | 30 | 0 | 30 |
| SB Left | 0 | 50 | 50 | 0 | 50 | 0 | 50 |
| SB Thru | 640 | 0 | 640 | 30 | 670 | 50 | 720 |
| SB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTALS** | **1360** | **165** | **1525** | **60** | **1585** | **160** | **1745** |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 30 | 55 | 750 | 30 | 50 | 670 |
| Future Volume (veh/h) | 30 | 55 | 750 | 30 | 50 | 670 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1800 | 1900 | 1900 | 1792 |
| Adj Flow Rate, veh/h | 32 | 59 | 798 | 32 | 53 | 713 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 0 | 1 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 20 | 20 | 5 | 5 | 5 | 5 |
| Cap, veh/h | 92 | 82 | 1421 | 57 | 107 | 1315 |
| Arrive On Green | 0.06 | 0.06 | 1.00 | 1.00 | 1.00 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1719 | 69 | 71 | 1591 |
| Grp Volume(v), veh/h | 32 | 59 | 0 | 830 | 766 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1787 | 1662 | 0 |
| Q Serve(g_s), s | 1.6 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.6 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.04 | 0.07 | |
| Lane Grp Cap(c), veh/h | 92 | 82 | 0 | 1478 | 1422 | 0 |
| V/C Ratio(X) | 0.35 | 0.72 | 0.00 | 0.56 | 0.54 | 0.00 |
| Avail Cap(c_a), veh/h | 339 | 303 | 0 | 1478 | 1422 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.82 | 0.88 | 0.00 |
| Uniform Delay (d), s/veh | 36.0 | 36.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 2.3 | 11.2 | 0.0 | 1.3 | 1.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.7 | 1.5 | 0.0 | 0.5 | 0.5 | 0.0 |
| LnGrp Delay(d),s/veh | 38.3 | 48.1 | 0.0 | 1.3 | 1.3 | 0.0 |
| LnGrp LOS | D | D | | A | A | |
| Approach Vol, veh/h | 91 | | 830 | | | 766 |
| Approach Delay, s/veh | 44.7 | | 1.3 | | | 1.3 |
| Approach LOS | D | | A | | | A |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 70.6 | | | | 70.6 | | 9.4 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 53.0 | | | | 53.0 | | 18.0 |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | | | 2.0 | | 5.4 |
| Green Ext Time (p_c), s | | 6.5 | | | | 6.2 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 3.6 |
| HCM 2010 LOS | A |



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 30 | 55 | 750 | 30 | 50 | 670 |
| Future Volume (veh/h) | 30 | 55 | 750 | 30 | 50 | 670 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1800 | 1900 | 1583 | 1810 |
| Adj Flow Rate, veh/h | 32 | 59 | 798 | 32 | 53 | 713 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 1 | 1 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 20 | 20 | 5 | 5 | 20 | 5 |
| Cap, veh/h | 92 | 82 | 1250 | 50 | 65 | 1496 |
| Arrive On Green | 0.06 | 0.06 | 1.00 | 1.00 | 0.09 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1719 | 69 | 1508 | 1810 |
| Grp Volume(v), veh/h | 32 | 59 | 0 | 830 | 53 | 713 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1787 | 1508 | 1810 |
| Q Serve(g_s), s | 1.6 | 3.4 | 0.0 | 0.0 | 2.8 | 0.0 |
| Cycle Q Clear(g_c), s | 1.6 | 3.4 | 0.0 | 0.0 | 2.8 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.04 | 1.00 | |
| Lane Grp Cap(c), veh/h | 92 | 82 | 0 | 1300 | 65 | 1496 |
| V/C Ratio(X) | 0.35 | 0.72 | 0.00 | 0.64 | 0.81 | 0.48 |
| Avail Cap(c_a), veh/h | 349 | 311 | 0 | 1300 | 198 | 1496 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.82 | 0.88 | 0.88 |
| Uniform Delay (d), s/veh | 36.0 | 36.9 | 0.0 | 0.0 | 36.2 | 0.0 |
| Incr Delay (d2), s/veh | 2.2 | 11.2 | 0.0 | 2.0 | 18.7 | 1.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.7 | 1.5 | 0.0 | 0.7 | 1.5 | 0.4 |
| LnGrp Delay(d),s/veh | 38.3 | 48.1 | 0.0 | 2.0 | 54.9 | 1.0 |
| LnGrp LOS | D | D | | A | D | A |
| Approach Vol, veh/h | 91 | | 830 | | | 766 |
| Approach Delay, s/veh | 44.7 | | 2.0 | | | 4.7 |
| Approach LOS | D | | A | | | A |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 8.0 | 62.7 | | | | 70.6 | | 9.4 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 10.5 | 37.5 | | | | 52.5 | | 18.5 |
| Max Q Clear Time (g_c+I1), s | 4.8 | 2.0 | | | | 2.0 | | 5.4 |
| Green Ext Time (p_c), s | 0.0 | 6.2 | | | | 5.0 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 5.5 |
| HCM 2010 LOS | A |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 30 | 55 | 860 | 30 | 50 | 720 |
| Future Volume (veh/h) | 30 | 55 | 860 | 30 | 50 | 720 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1801 | 1900 | 1900 | 1793 |
| Adj Flow Rate, veh/h | 32 | 59 | 915 | 32 | 53 | 766 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 0 | 1 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 20 | 20 | 5 | 5 | 5 | 5 |
| Cap, veh/h | 92 | 82 | 1430 | 50 | 102 | 1311 |
| Arrive On Green | 0.06 | 0.06 | 1.00 | 1.00 | 1.00 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1730 | 60 | 66 | 1586 |
| Grp Volume(v), veh/h | 32 | 59 | 0 | 947 | 819 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1790 | 1651 | 0 |
| Q Serve(g_s), s | 1.6 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.6 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.03 | 0.06 | |
| Lane Grp Cap(c), veh/h | 92 | 82 | 0 | 1480 | 1413 | 0 |
| V/C Ratio(X) | 0.35 | 0.72 | 0.00 | 0.64 | 0.58 | 0.00 |
| Avail Cap(c_a), veh/h | 339 | 303 | 0 | 1480 | 1413 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.77 | 0.86 | 0.00 |
| Uniform Delay (d), s/veh | 36.0 | 36.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 2.3 | 11.2 | 0.0 | 1.6 | 1.5 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.7 | 1.5 | 0.0 | 0.7 | 0.6 | 0.0 |
| LnGrp Delay(d),s/veh | 38.3 | 48.1 | 0.0 | 1.6 | 1.5 | 0.0 |
| LnGrp LOS | D | D | | A | A | |
| Approach Vol, veh/h | 91 | | 947 | | | 819 |
| Approach Delay, s/veh | 44.7 | | 1.6 | | | 1.5 |
| Approach LOS | D | | A | | | A |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 70.6 | | | | 70.6 | | 9.4 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 53.0 | | | | 53.0 | | 18.0 |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | | | 2.0 | | 5.4 |
| Green Ext Time (p_c), s | | 8.3 | | | | 7.0 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 3.7 |
| HCM 2010 LOS | A |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 40 | 80 | 510 | 40 | 80 | 850 |
| Future Volume (veh/h) | 40 | 80 | 510 | 40 | 80 | 850 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1823 | 1900 | 1583 | 1863 |
| Adj Flow Rate, veh/h | 43 | 87 | 554 | 43 | 87 | 924 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 1 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 20 | 20 | 3 | 3 | 20 | 2 |
| Cap, veh/h | 130 | 116 | 814 | 63 | 388 | 1493 |
| Arrive On Green | 0.09 | 0.09 | 0.98 | 0.98 | 0.52 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1670 | 130 | 1508 | 1863 |
| Grp Volume(v), veh/h | 43 | 87 | 0 | 597 | 87 | 924 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1800 | 1508 | 1863 |
| Q Serve(g_s), s | 2.1 | 5.1 | 0.0 | 2.0 | 2.5 | 0.0 |
| Cycle Q Clear(g_c), s | 2.1 | 5.1 | 0.0 | 2.0 | 2.5 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.07 | 1.00 | |
| Lane Grp Cap(c), veh/h | 130 | 116 | 0 | 878 | 388 | 1493 |
| V/C Ratio(X) | 0.33 | 0.75 | 0.00 | 0.68 | 0.22 | 0.62 |
| Avail Cap(c_a), veh/h | 339 | 303 | 0 | 878 | 388 | 1493 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.91 | 0.54 | 0.54 |
| Uniform Delay (d), s/veh | 34.4 | 35.7 | 0.0 | 0.5 | 15.0 | 0.0 |
| Incr Delay (d2), s/veh | 1.5 | 9.3 | 0.0 | 3.9 | 0.2 | 1.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.9 | 2.2 | 0.0 | 1.3 | 1.0 | 0.4 |
| LnGrp Delay(d),s/veh | 35.9 | 45.0 | 0.0 | 4.4 | 15.2 | 1.0 |
| LnGrp LOS | D | D | | A | B | A |
| Approach Vol, veh/h | 130 | | 597 | | | 1011 |
| Approach Delay, s/veh | 42.0 | | 4.4 | | | 2.3 |
| Approach LOS | D | | A | | | A |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 25.1 | 43.5 | | | | 68.6 | | 11.4 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 9.5 | 39.0 | | | | 53.0 | | 18.0 |
| Max Q Clear Time (g_c+I1), s | 4.5 | 4.0 | | | | 2.0 | | 7.1 |
| Green Ext Time (p_c), s | 0.1 | 3.8 | | | | 7.8 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 6.0 |
| HCM 2010 LOS | A |

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : PROJECT ACCESS
N/S STREET : LAKE STREET
CONDITION : PM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 2 | | 4 | | 6 | | 8 |
| **PROJECT ACCESS** | | | | | | | |
| EB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Left | 0 | 40 | 40 | 0 | 40 | 0 | 40 |
| WB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Right | 5 | 70 | 75 | 5 | 80 | 0 | 80 |
| **LAKE STREET** | | | | | | | |
| NB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NB Thru | 490 | 0 | 490 | 20 | 510 | 85 | 595 |
| NB Right | 0 | 40 | 40 | 0 | 40 | 0 | 40 |
| SB Left | 5 | 70 | 75 | 5 | 80 | 0 | 80 |
| SB Thru | 815 | 0 | 815 | 35 | 850 | 130 | 980 |
| SB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTALS** | **1315** | **220** | **1535** | **65** | **1600** | **215** | **1815** |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 40 | 80 | 510 | 40 | 80 | 850 |
| Future Volume (veh/h) | 40 | 80 | 510 | 40 | 80 | 850 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1823 | 1900 | 1900 | 1835 |
| Adj Flow Rate, veh/h | 43 | 87 | 554 | 43 | 87 | 924 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 0 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 20 | 20 | 3 | 3 | 2 | 2 |
| Cap, veh/h | 124 | 110 | 1397 | 108 | 133 | 1313 |
| Arrive On Green | 0.08 | 0.08 | 1.00 | 1.00 | 1.00 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1670 | 130 | 116 | 1570 |
| Grp Volume(v), veh/h | 43 | 87 | 0 | 597 | 1011 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1800 | 1686 | 0 |
| Q Serve(g_s), s | 3.0 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.0 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.07 | 0.09 | |
| Lane Grp Cap(c), veh/h | 124 | 110 | 0 | 1505 | 1445 | 0 |
| V/C Ratio(X) | 0.35 | 0.79 | 0.00 | 0.40 | 0.70 | 0.00 |
| Avail Cap(c_a), veh/h | 247 | 220 | 0 | 1505 | 1445 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.90 | 0.54 | 0.00 |
| Uniform Delay (d), s/veh | 47.7 | 49.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 1.7 | 11.7 | 0.0 | 0.7 | 1.6 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.3 | 2.9 | 0.0 | 0.3 | 0.6 | 0.0 |
| LnGrp Delay(d),s/veh | 49.4 | 61.2 | 0.0 | 0.7 | 1.6 | 0.0 |
| LnGrp LOS | D | E | | A | A | |
| Approach Vol, veh/h | 130 | | 597 | | | 1011 |
| Approach Delay, s/veh | 57.3 | | 0.7 | | | 1.6 |
| Approach LOS | E | | A | | | A |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 96.5 | | | | 96.5 | | 13.5 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 83.0 | | | | 83.0 | | 18.0 |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | | | 2.0 | | 9.0 |
| Green Ext Time (p_c), s | | 3.9 | | | | 10.5 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 5.4 |
| HCM 2010 LOS | A |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 30 | 55 | 860 | 30 | 50 | 720 |
| Future Volume (veh/h) | 30 | 55 | 860 | 30 | 50 | 720 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1801 | 1900 | 1583 | 1810 |
| Adj Flow Rate, veh/h | 32 | 59 | 915 | 32 | 53 | 766 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 1 | 1 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 20 | 20 | 5 | 5 | 20 | 5 |
| Cap, veh/h | 92 | 82 | 1258 | 44 | 65 | 1496 |
| Arrive On Green | 0.06 | 0.06 | 1.00 | 1.00 | 0.09 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1730 | 60 | 1508 | 1810 |
| Grp Volume(v), veh/h | 32 | 59 | 0 | 947 | 53 | 766 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1790 | 1508 | 1810 |
| Q Serve(g_s), s | 1.6 | 3.4 | 0.0 | 0.0 | 2.8 | 0.0 |
| Cycle Q Clear(g_c), s | 1.6 | 3.4 | 0.0 | 0.0 | 2.8 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.03 | 1.00 | |
| Lane Grp Cap(c), veh/h | 92 | 82 | 0 | 1302 | 65 | 1496 |
| V/C Ratio(X) | 0.35 | 0.72 | 0.00 | 0.73 | 0.81 | 0.51 |
| Avail Cap(c_a), veh/h | 341 | 304 | 0 | 1302 | 100 | 1496 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.77 | 0.86 | 0.86 |
| Uniform Delay (d), s/veh | 36.0 | 36.9 | 0.0 | 0.0 | 36.2 | 0.0 |
| Incr Delay (d2), s/veh | 2.3 | 11.2 | 0.0 | 2.8 | 21.7 | 1.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.7 | 1.5 | 0.0 | 1.0 | 1.5 | 0.5 |
| LnGrp Delay(d),s/veh | 38.3 | 48.1 | 0.0 | 2.8 | 57.9 | 1.1 |
| LnGrp LOS | D | D | | A | E | A |
| Approach Vol, veh/h | 91 | | 947 | | | 819 |
| Approach Delay, s/veh | 44.7 | | 2.8 | | | 4.8 |
| Approach LOS | D | | A | | | A |

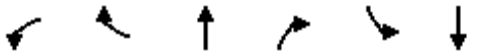
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 8.0 | 62.7 | | | | 70.6 | | 9.4 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 5.3 | 43.1 | | | | 52.9 | | 18.1 |
| Max Q Clear Time (g_c+I1), s | 4.8 | 2.0 | | | | 2.0 | | 5.4 |
| Green Ext Time (p_c), s | 0.0 | 8.1 | | | | 5.6 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 5.7 |
| HCM 2010 LOS | A |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 40 | 80 | 595 | 40 | 80 | 980 |
| Future Volume (veh/h) | 40 | 80 | 595 | 40 | 80 | 980 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1826 | 1900 | 1900 | 1838 |
| Adj Flow Rate, veh/h | 43 | 87 | 647 | 43 | 87 | 1065 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 0 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 20 | 20 | 3 | 3 | 2 | 2 |
| Cap, veh/h | 124 | 110 | 1416 | 94 | 121 | 1325 |
| Arrive On Green | 0.08 | 0.08 | 1.00 | 1.00 | 1.00 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1693 | 113 | 102 | 1585 |
| Grp Volume(v), veh/h | 43 | 87 | 0 | 690 | 1152 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1806 | 1687 | 0 |
| Q Serve(g_s), s | 3.0 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.0 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.06 | 0.08 | |
| Lane Grp Cap(c), veh/h | 124 | 110 | 0 | 1510 | 1446 | 0 |
| V/C Ratio(X) | 0.35 | 0.79 | 0.00 | 0.46 | 0.80 | 0.00 |
| Avail Cap(c_a), veh/h | 247 | 220 | 0 | 1510 | 1446 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.88 | 0.46 | 0.00 |
| Uniform Delay (d), s/veh | 47.7 | 49.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 1.7 | 11.7 | 0.0 | 0.9 | 2.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.3 | 2.9 | 0.0 | 0.4 | 0.9 | 0.0 |
| LnGrp Delay(d),s/veh | 49.4 | 61.2 | 0.0 | 0.9 | 2.2 | 0.0 |
| LnGrp LOS | D | E | | A | A | |
| Approach Vol, veh/h | 130 | | 690 | | | 1152 |
| Approach Delay, s/veh | 57.3 | | 0.9 | | | 2.2 |
| Approach LOS | E | | A | | | A |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | | 96.5 | | | | 96.5 | | 13.5 |
| Change Period (Y+Rc), s | | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | | 83.0 | | | | 83.0 | | 18.0 |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | | | 2.0 | | 9.0 |
| Green Ext Time (p_c), s | | 4.8 | | | | 14.7 | | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 5.4 |
| HCM 2010 LOS | A |



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 40 | 80 | 595 | 40 | 80 | 980 |
| Future Volume (veh/h) | 40 | 80 | 595 | 40 | 80 | 980 |
| Number | 3 | 18 | 2 | 12 | 1 | 6 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1583 | 1583 | 1826 | 1900 | 1583 | 1863 |
| Adj Flow Rate, veh/h | 43 | 87 | 647 | 43 | 87 | 1065 |
| Adj No. of Lanes | 1 | 1 | 1 | 0 | 1 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 20 | 20 | 3 | 3 | 20 | 2 |
| Cap, veh/h | 124 | 110 | 995 | 66 | 314 | 1558 |
| Arrive On Green | 0.08 | 0.08 | 1.00 | 1.00 | 0.28 | 1.00 |
| Sat Flow, veh/h | 1508 | 1346 | 1693 | 113 | 1508 | 1863 |
| Grp Volume(v), veh/h | 43 | 87 | 0 | 690 | 87 | 1065 |
| Grp Sat Flow(s),veh/h/ln | 1508 | 1346 | 0 | 1806 | 1508 | 1863 |
| Q Serve(g_s), s | 3.0 | 7.0 | 0.0 | 0.0 | 5.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.0 | 7.0 | 0.0 | 0.0 | 5.0 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | | 0.06 | 1.00 | |
| Lane Grp Cap(c), veh/h | 124 | 110 | 0 | 1061 | 314 | 1558 |
| V/C Ratio(X) | 0.35 | 0.79 | 0.00 | 0.65 | 0.28 | 0.68 |
| Avail Cap(c_a), veh/h | 247 | 220 | 0 | 1061 | 314 | 1558 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 1.33 | 1.33 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.88 | 0.45 | 0.45 |
| Uniform Delay (d), s/veh | 47.7 | 49.5 | 0.0 | 0.0 | 33.3 | 0.0 |
| Incr Delay (d2), s/veh | 1.7 | 11.7 | 0.0 | 2.7 | 0.2 | 1.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.3 | 2.9 | 0.0 | 0.8 | 2.1 | 0.5 |
| LnGrp Delay(d),s/veh | 49.4 | 61.2 | 0.0 | 2.7 | 33.5 | 1.1 |
| LnGrp LOS | D | E | | A | C | A |
| Approach Vol, veh/h | 130 | | 690 | | | 1152 |
| Approach Delay, s/veh | 57.3 | | 2.7 | | | 3.6 |
| Approach LOS | E | | A | | | A |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | | | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.4 | 69.1 | | | | 96.5 | | 13.5 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | | | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 13.9 | 64.6 | | | | 83.0 | | 18.0 |
| Max Q Clear Time (g_c+I1), s | 7.0 | 2.0 | | | | 2.0 | | 9.0 |
| Green Ext Time (p_c), s | 0.1 | 4.8 | | | | 10.9 | | 0.2 |

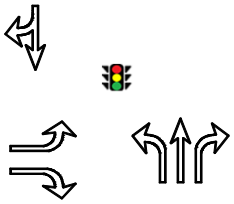
| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 6.8 |
| HCM 2010 LOS | A |

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : TEMESCAL CANYON ROAD
N/S STREET : LAKE STREET
CONDITION : AM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS



**EXISTING GEOMETRICS**

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **TEMESCAL CANYON ROA** | | | | | | | |
| EB Left | 215 | 10 | 225 | 10 | 235 | 0 | 235 |
| EB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Right | 75 | 0 | 75 | 5 | 80 | 0 | 80 |
| WB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LAKE STREET** | | | | | | | |
| NB Left | 300 | 0 | 300 | 15 | 315 | 0 | 315 |
| NB Thru | 510 | 20 | 530 | 25 | 555 | 110 | 665 |
| NB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Thru | 215 | 20 | 235 | 10 | 245 | 50 | 295 |
| SB Right | 425 | 10 | 435 | 20 | 455 | 0 | 455 |
| **TOTALS** | **1740** | **60** | **1800** | **85** | **1885** | **160** | **2045** |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 235 | 80 | 315 | 555 | 245 | 455 |
| Future Volume (veh/h) | 235 | 80 | 315 | 555 | 245 | 455 |
| Number | 7 | 14 | 5 | 2 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1810 | 1810 | 1827 | 1792 | 1797 | 1900 |
| Adj Flow Rate, veh/h | 242 | 82 | 325 | 572 | 253 | 469 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 5 | 5 | 4 | 6 | 9 | 9 |
| Cap, veh/h | 287 | 256 | 436 | 1292 | 234 | 433 |
| Arrive On Green | 0.17 | 0.17 | 0.25 | 0.72 | 0.69 | 0.69 |
| Sat Flow, veh/h | 1723 | 1538 | 1740 | 1792 | 565 | 1047 |
| Grp Volume(v), veh/h | 242 | 82 | 325 | 572 | 0 | 722 |
| Grp Sat Flow(s),veh/h/ln | 1723 | 1538 | 1740 | 1792 | 0 | 1612 |
| Q Serve(g_s), s | 10.9 | 3.8 | 13.8 | 10.5 | 0.0 | 33.1 |
| Cycle Q Clear(g_c), s | 10.9 | 3.8 | 13.8 | 10.5 | 0.0 | 33.1 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 0.65 |
| Lane Grp Cap(c), veh/h | 287 | 256 | 436 | 1292 | 0 | 667 |
| V/C Ratio(X) | 0.84 | 0.32 | 0.74 | 0.44 | 0.00 | 1.08 |
| Avail Cap(c_a), veh/h | 390 | 348 | 436 | 1292 | 0 | 667 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.67 | 1.67 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.82 |
| Uniform Delay (d), s/veh | 32.3 | 29.3 | 27.6 | 4.6 | 0.0 | 12.4 |
| Incr Delay (d2), s/veh | 11.7 | 0.7 | 6.8 | 1.1 | 0.0 | 56.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.1 | 3.4 | 7.4 | 5.5 | 0.0 | 24.3 |
| LnGrp Delay(d),s/veh | 44.0 | 30.1 | 34.4 | 5.7 | 0.0 | 68.6 |
| LnGrp LOS | D | C | C | A | | F |
| Approach Vol, veh/h | 324 | | | 897 | 722 | |
| Approach Delay, s/veh | 40.5 | | | 16.1 | 68.6 | |
| Approach LOS | D | | | B | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 62.2 | | 17.8 | 24.6 | 37.6 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | 4.5 | 4.5 | | |
| Max Green Setting (Gmax), s | | 52.9 | | 18.1 | 15.3 | 33.1 | | |
| Max Q Clear Time (g_c+I1), s | | 12.5 | | 12.9 | 15.8 | 35.1 | | |
| Green Ext Time (p_c), s | | 3.6 | | 0.4 | 0.0 | 0.0 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 39.7 |
| HCM 2010 LOS | D |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 235 | 80 | 315 | 665 | 295 | 455 |
| Future Volume (veh/h) | 235 | 80 | 315 | 665 | 295 | 455 |
| Number | 7 | 14 | 5 | 2 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1810 | 1810 | 1827 | 1792 | 1793 | 1900 |
| Adj Flow Rate, veh/h | 242 | 82 | 325 | 686 | 304 | 469 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 5 | 5 | 4 | 6 | 9 | 9 |
| Cap, veh/h | 287 | 256 | 436 | 1292 | 264 | 407 |
| Arrive On Green | 0.17 | 0.17 | 0.25 | 0.72 | 0.69 | 0.69 |
| Sat Flow, veh/h | 1723 | 1538 | 1740 | 1792 | 637 | 983 |
| Grp Volume(v), veh/h | 242 | 82 | 325 | 686 | 0 | 773 |
| Grp Sat Flow(s),veh/h/ln | 1723 | 1538 | 1740 | 1792 | 0 | 1620 |
| Q Serve(g_s), s | 10.9 | 3.8 | 13.8 | 13.8 | 0.0 | 33.1 |
| Cycle Q Clear(g_c), s | 10.9 | 3.8 | 13.8 | 13.8 | 0.0 | 33.1 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 0.61 |
| Lane Grp Cap(c), veh/h | 287 | 256 | 436 | 1292 | 0 | 670 |
| V/C Ratio(X) | 0.84 | 0.32 | 0.74 | 0.53 | 0.00 | 1.15 |
| Avail Cap(c_a), veh/h | 390 | 348 | 436 | 1292 | 0 | 670 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.67 | 1.67 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.78 |
| Uniform Delay (d), s/veh | 32.3 | 29.3 | 27.6 | 5.0 | 0.0 | 12.4 |
| Incr Delay (d2), s/veh | 11.7 | 0.7 | 6.8 | 1.6 | 0.0 | 82.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.1 | 3.4 | 7.4 | 7.2 | 0.0 | 29.3 |
| LnGrp Delay(d),s/veh | 44.0 | 30.1 | 34.4 | 6.6 | 0.0 | 94.6 |
| LnGrp LOS | D | C | C | A | | F |
| Approach Vol, veh/h | 324 | | | 1011 | 773 | |
| Approach Delay, s/veh | 40.5 | | | 15.5 | 94.6 | |
| Approach LOS | D | | | B | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 62.2 | | 17.8 | 24.6 | 37.6 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | 4.5 | 4.5 | | |
| Max Green Setting (Gmax), s | | 52.9 | | 18.1 | 15.3 | 33.1 | | |
| Max Q Clear Time (g_c+I1), s | | 15.8 | | 12.9 | 15.8 | 35.1 | | |
| Green Ext Time (p_c), s | | 4.6 | | 0.4 | 0.0 | 0.0 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 48.4 |
| HCM 2010 LOS | D |

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : TEMESCAL CANYON ROAD
N/S STREET : LAKE STREET
CONDITION : PM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 2 | | 4 | | 6 | | 8 |
| **TEMESCAL CANYON ROA** | | | | | | | |
| EB Left | 145 | 15 | 160 | 10 | 170 | 0 | 170 |
| EB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EB Right | 120 | 0 | 120 | 5 | 125 | 0 | 125 |
| WB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LAKE STREET** | | | | | | | |
| NB Left | 60 | 0 | 60 | 5 | 65 | 0 | 65 |
| NB Thru | 345 | 30 | 375 | 15 | 390 | 85 | 475 |
| NB Right | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SB Thru | 685 | 30 | 715 | 30 | 745 | 130 | 875 |
| SB Right | 135 | 15 | 150 | 10 | 160 | 0 | 160 |
| **TOTALS** | **1490** | **90** | **1580** | **75** | **1655** | **215** | **1870** |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 170 | 125 | 65 | 390 | 745 | 160 |
| Future Volume (veh/h) | 170 | 125 | 65 | 390 | 745 | 160 |
| Number | 7 | 14 | 5 | 2 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1845 | 1863 | 1863 | 1827 | 1848 | 1900 |
| Adj Flow Rate, veh/h | 185 | 136 | 71 | 424 | 810 | 174 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 3 | 2 | 2 | 4 | 3 | 3 |
| Cap, veh/h | 220 | 198 | 171 | 1449 | 967 | 208 |
| Arrive On Green | 0.13 | 0.13 | 0.10 | 0.79 | 1.00 | 1.00 |
| Sat Flow, veh/h | 1757 | 1583 | 1774 | 1827 | 1475 | 317 |
| Grp Volume(v), veh/h | 185 | 136 | 71 | 424 | 0 | 984 |
| Grp Sat Flow(s),veh/h/ln | 1757 | 1583 | 1774 | 1827 | 0 | 1792 |
| Q Serve(g_s), s | 11.3 | 9.0 | 4.1 | 6.9 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 11.3 | 9.0 | 4.1 | 6.9 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 0.18 |
| Lane Grp Cap(c), veh/h | 220 | 198 | 171 | 1449 | 0 | 1175 |
| V/C Ratio(X) | 0.84 | 0.69 | 0.41 | 0.29 | 0.00 | 0.84 |
| Avail Cap(c_a), veh/h | 295 | 266 | 171 | 1449 | 0 | 1175 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.66 |
| Uniform Delay (d), s/veh | 47.0 | 46.0 | 46.8 | 3.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 14.9 | 4.5 | 1.6 | 0.5 | 0.0 | 4.9 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.4 | 8.0 | 2.1 | 3.6 | 0.0 | 1.6 |
| LnGrp Delay(d),s/veh | 61.9 | 50.5 | 48.3 | 3.6 | 0.0 | 4.9 |
| LnGrp LOS | E | D | D | A | | A |
| Approach Vol, veh/h | 321 | | | 495 | 984 | |
| Approach Delay, s/veh | 57.1 | | | 10.0 | 4.9 | |
| Approach LOS | E | | | B | A | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 91.7 | | 18.3 | 15.1 | 76.6 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | 4.5 | 4.5 | | |
| Max Green Setting (Gmax), s | | 82.5 | | 18.5 | 5.9 | 72.1 | | |
| Max Q Clear Time (g_c+I1), s | | 8.9 | | 13.3 | 6.1 | 2.0 | | |
| Green Ext Time (p_c), s | | 2.5 | | 0.4 | 0.0 | 9.3 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 15.6 |
| HCM 2010 LOS | B |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 170 | 125 | 65 | 475 | 875 | 160 |
| Future Volume (veh/h) | 170 | 125 | 65 | 475 | 875 | 160 |
| Number | 7 | 14 | 5 | 2 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1845 | 1863 | 1863 | 1827 | 1847 | 1900 |
| Adj Flow Rate, veh/h | 185 | 136 | 71 | 516 | 951 | 174 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 3 | 2 | 2 | 4 | 3 | 3 |
| Cap, veh/h | 220 | 198 | 171 | 1449 | 996 | 182 |
| Arrive On Green | 0.13 | 0.13 | 0.10 | 0.79 | 1.00 | 1.00 |
| Sat Flow, veh/h | 1757 | 1583 | 1774 | 1827 | 1520 | 278 |
| Grp Volume(v), veh/h | 185 | 136 | 71 | 516 | 0 | 1125 |
| Grp Sat Flow(s),veh/h/ln | 1757 | 1583 | 1774 | 1827 | 0 | 1798 |
| Q Serve(g_s), s | 11.3 | 9.0 | 4.1 | 9.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 11.3 | 9.0 | 4.1 | 9.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 0.15 |
| Lane Grp Cap(c), veh/h | 220 | 198 | 171 | 1449 | 0 | 1179 |
| V/C Ratio(X) | 0.84 | 0.69 | 0.41 | 0.36 | 0.00 | 0.95 |
| Avail Cap(c_a), veh/h | 295 | 266 | 171 | 1449 | 0 | 1179 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.52 |
| Uniform Delay (d), s/veh | 47.0 | 46.0 | 46.8 | 3.3 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 14.9 | 4.5 | 1.6 | 0.7 | 0.0 | 10.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.4 | 8.0 | 2.1 | 4.7 | 0.0 | 3.5 |
| LnGrp Delay(d),s/veh | 61.9 | 50.5 | 48.3 | 4.0 | 0.0 | 10.8 |
| LnGrp LOS | E | D | D | A | | B |
| Approach Vol, veh/h | 321 | | | 587 | 1125 | |
| Approach Delay, s/veh | 57.1 | | | 9.3 | 10.8 | |
| Approach LOS | E | | | A | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 91.7 | | 18.3 | 15.1 | 76.6 | | |
| Change Period (Y+Rc), s | | 4.5 | | 4.5 | 4.5 | 4.5 | | |
| Max Green Setting (Gmax), s | | 82.5 | | 18.5 | 5.9 | 72.1 | | |
| Max Q Clear Time (g_c+I1), s | | 11.0 | | 13.3 | 6.1 | 2.0 | | |
| Green Ext Time (p_c), s | | 3.2 | | 0.4 | 0.0 | 12.8 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 17.7 |
| HCM 2010 LOS | B |

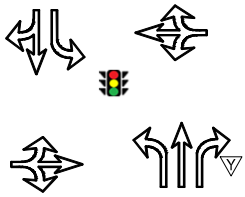
DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : NICHOLS RD
N/S STREET : LAKE STREET
CONDITION : AM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS



**EXISTING GEOMETRICS**

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **NICHOLS RD** | | | | | | | |
| EB Left | 25 | 0 | 25 | 5 | 30 | 0 | 30 |
| EB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| EB Right | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| WB Left | 155 | 0 | 155 | 10 | 165 | 20 | 185 |
| WB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| WB Right | 95 | 10 | 105 | 5 | 110 | 70 | 180 |
| **LAKE STREET** | | | | | | | |
| NB Left | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| NB Thru | 690 | 15 | 705 | 30 | 735 | 40 | 775 |
| NB Right | 335 | 0 | 335 | 15 | 350 | 20 | 370 |
| SB Left | 25 | 10 | 35 | 5 | 40 | 30 | 70 |
| SB Thru | 265 | 15 | 280 | 15 | 295 | 25 | 320 |
| SB Right | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| **TOTALS** | **1615** | **50** | **1665** | **110** | **1775** | **205** | **1980** |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 30 | 10 | 10 | 165 | 10 | 110 | 10 | 735 | 350 | 40 | 295 | 10 |
| Future Volume (veh/h) | 30 | 10 | 10 | 165 | 10 | 110 | 10 | 735 | 350 | 40 | 295 | 10 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 985 | 1900 | 1900 | 1835 | 1900 | 1267 | 1863 | 1863 | 1624 | 1740 | 1900 |
| Adj Flow Rate, veh/h | 32 | 11 | 11 | 174 | 11 | 116 | 11 | 774 | 0 | 42 | 311 | 11 |
| Adj No. of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 80 | 80 | 80 | 2 | 2 | 2 | 50 | 2 | 2 | 17 | 6 | 6 |
| Cap, veh/h | 158 | 43 | 33 | 262 | 17 | 130 | 131 | 920 | 782 | 178 | 835 | 30 |
| Arrive On Green | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.11 | 0.49 | 0.00 | 0.11 | 0.50 | 0.50 |
| Sat Flow, veh/h | 389 | 192 | 149 | 858 | 77 | 586 | 1206 | 1863 | 1583 | 1547 | 1670 | 59 |
| Grp Volume(v), veh/h | 54 | 0 | 0 | 301 | 0 | 0 | 11 | 774 | 0 | 42 | 0 | 322 |
| Grp Sat Flow(s),veh/h/ln | 731 | 0 | 0 | 1521 | 0 | 0 | 1206 | 1863 | 1583 | 1547 | 0 | 1729 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 10.6 | 0.0 | 0.0 | 0.7 | 28.8 | 0.0 | 2.0 | 0.0 | 9.2 |
| Cycle Q Clear(g_c), s | 4.6 | 0.0 | 0.0 | 15.2 | 0.0 | 0.0 | 0.7 | 28.8 | 0.0 | 2.0 | 0.0 | 9.2 |
| Prop In Lane | 0.59 | | 0.20 | 0.58 | | 0.39 | 1.00 | | 1.00 | 1.00 | | 0.03 |
| Lane Grp Cap(c), veh/h | 234 | 0 | 0 | 409 | 0 | 0 | 131 | 920 | 782 | 178 | 0 | 865 |
| V/C Ratio(X) | 0.23 | 0.00 | 0.00 | 0.74 | 0.00 | 0.00 | 0.08 | 0.84 | 0.00 | 0.24 | 0.00 | 0.37 |
| Avail Cap(c_a), veh/h | 269 | 0 | 0 | 476 | 0 | 0 | 131 | 920 | 782 | 178 | 0 | 865 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 25.9 | 0.0 | 0.0 | 29.8 | 0.0 | 0.0 | 32.1 | 17.5 | 0.0 | 32.2 | 0.0 | 12.3 |
| Incr Delay (d2), s/veh | 0.5 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.3 | 9.2 | 0.0 | 0.7 | 0.0 | 1.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.0 | 0.0 | 0.0 | 7.0 | 0.0 | 0.0 | 0.2 | 17.0 | 0.0 | 0.9 | 0.0 | 4.6 |
| LnGrp Delay(d),s/veh | 26.4 | 0.0 | 0.0 | 34.8 | 0.0 | 0.0 | 32.3 | 26.7 | 0.0 | 32.9 | 0.0 | 13.5 |
| LnGrp LOS | C | | | C | | | C | C | | C | | B |
| Approach Vol, veh/h | | 54 | | | 301 | | | 785 | | | 364 | |
| Approach Delay, s/veh | | 26.4 | | | 34.8 | | | 26.8 | | | 15.8 | |
| Approach LOS | | C | | | C | | | C | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 13.7 | 44.0 | | 22.3 | 13.2 | 44.5 | | 22.3 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 5.5 | 39.5 | | 21.5 | 5.0 | 40.0 | | 21.5 |
| Max Q Clear Time (g_c+I1), s | 4.0 | 30.8 | | 6.6 | 2.7 | 11.2 | | 17.2 |
| Green Ext Time (p_c), s | 0.0 | 3.1 | | 0.2 | 0.0 | 1.7 | | 0.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 25.7 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 30 | 10 | 10 | 185 | 10 | 180 | 10 | 775 | 370 | 70 | 320 | 10 |
| Future Volume (veh/h) | 30 | 10 | 10 | 185 | 10 | 180 | 10 | 775 | 370 | 70 | 320 | 10 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 985 | 1900 | 1900 | 1836 | 1900 | 1267 | 1863 | 1863 | 1624 | 1744 | 1900 |
| Adj Flow Rate, veh/h | 32 | 11 | 11 | 195 | 11 | 189 | 11 | 816 | 0 | 74 | 337 | 11 |
| Adj No. of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 80 | 80 | 80 | 2 | 2 | 2 | 50 | 2 | 2 | 17 | 6 | 6 |
| Cap, veh/h | 166 | 45 | 36 | 264 | 16 | 196 | 75 | 920 | 782 | 106 | 840 | 27 |
| Arrive On Green | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 | 0.06 | 0.49 | 0.00 | 0.07 | 0.50 | 0.50 |
| Sat Flow, veh/h | 349 | 169 | 133 | 734 | 61 | 729 | 1206 | 1863 | 1583 | 1547 | 1679 | 55 |
| Grp Volume(v), veh/h | 54 | 0 | 0 | 395 | 0 | 0 | 11 | 816 | 0 | 74 | 0 | 348 |
| Grp Sat Flow(s),veh/h/ln | 650 | 0 | 0 | 1524 | 0 | 0 | 1206 | 1863 | 1583 | 1547 | 0 | 1734 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 15.7 | 0.0 | 0.0 | 0.7 | 31.6 | 0.0 | 3.7 | 0.0 | 10.0 |
| Cycle Q Clear(g_c), s | 4.7 | 0.0 | 0.0 | 20.4 | 0.0 | 0.0 | 0.7 | 31.6 | 0.0 | 3.7 | 0.0 | 10.0 |
| Prop In Lane | 0.59 | | 0.20 | 0.49 | | 0.48 | 1.00 | | 1.00 | 1.00 | | 0.03 |
| Lane Grp Cap(c), veh/h | 246 | 0 | 0 | 477 | 0 | 0 | 75 | 920 | 782 | 106 | 0 | 867 |
| V/C Ratio(X) | 0.22 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 | 0.15 | 0.89 | 0.00 | 0.70 | 0.00 | 0.40 |
| Avail Cap(c_a), veh/h | 246 | 0 | 0 | 477 | 0 | 0 | 75 | 920 | 782 | 106 | 0 | 867 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 23.0 | 0.0 | 0.0 | 28.5 | 0.0 | 0.0 | 35.5 | 18.2 | 0.0 | 36.4 | 0.0 | 12.5 |
| Incr Delay (d2), s/veh | 0.4 | 0.0 | 0.0 | 11.6 | 0.0 | 0.0 | 0.9 | 12.4 | 0.0 | 17.9 | 0.0 | 1.4 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.0 | 0.0 | 0.0 | 10.1 | 0.0 | 0.0 | 0.2 | 19.3 | 0.0 | 2.1 | 0.0 | 5.1 |
| LnGrp Delay(d),s/veh | 23.4 | 0.0 | 0.0 | 40.1 | 0.0 | 0.0 | 36.4 | 30.6 | 0.0 | 54.4 | 0.0 | 13.9 |
| LnGrp LOS | C | | | D | | | D | C | | D | | B |
| Approach Vol, veh/h | | 54 | | | 395 | | | 827 | | | 422 | |
| Approach Delay, s/veh | | 23.4 | | | 40.1 | | | 30.7 | | | 21.0 | |
| Approach LOS | | C | | | D | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 10.0 | 44.0 | | 26.0 | 9.5 | 44.5 | | 26.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 5.5 | 39.5 | | 21.5 | 5.0 | 40.0 | | 21.5 |
| Max Q Clear Time (g_c+I1), s | 5.7 | 33.6 | | 6.7 | 2.7 | 12.0 | | 22.4 |
| Green Ext Time (p_c), s | 0.0 | 2.6 | | 0.2 | 0.0 | 1.8 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 30.2 |
| HCM 2010 LOS | C |

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| TURN MOVEMENTS | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 2 |

E/W STREET : NICHOLS RD
N/S STREET : LAKE STREET
CONDITION : PM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2.0%
OPENING YEAR : 2019

# CONDITION DIAGRAMS

## TURN MOVEMENTS

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 2 | | 4 | | 6 | | 8 |
| **NICHOLS RD** | | | | | | | |
| EB Left | 10 | 0 | 10 | 5 | 15 | 0 | 15 |
| EB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| EB Right | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| WB Left | 300 | 0 | 300 | 15 | 315 | 20 | 335 |
| WB Thru | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| WB Right | 20 | 15 | 35 | 5 | 40 | 50 | 90 |
| **LAKE STREET** | | | | | | | |
| NB Left | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| NB Thru | 380 | 20 | 400 | 20 | 420 | 35 | 455 |
| NB Right | 160 | 0 | 160 | 10 | 170 | 25 | 195 |
| SB Left | 70 | 15 | 85 | 5 | 90 | 80 | 170 |
| SB Thru | 735 | 20 | 755 | 30 | 785 | 50 | 835 |
| SB Right | 5 | 0 | 5 | 5 | 10 | 0 | 10 |
| **TOTALS** | **1700** | **70** | **1770** | **115** | **1885** | **260** | **2145** |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 15 | 10 | 10 | 315 | 10 | 40 | 10 | 420 | 170 | 90 | 785 | 10 |
| Future Volume (veh/h) | 15 | 10 | 10 | 315 | 10 | 40 | 10 | 420 | 170 | 90 | 785 | 10 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1484 | 1900 | 1900 | 1863 | 1900 | 1863 | 1845 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 17 | 11 | 11 | 358 | 11 | 45 | 11 | 477 | 0 | 102 | 892 | 11 |
| Adj No. of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| Percent Heavy Veh, % | 20 | 20 | 20 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 216 | 133 | 119 | 441 | 12 | 48 | 22 | 733 | 629 | 309 | 1027 | 13 |
| Arrive On Green | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.01 | 0.40 | 0.00 | 0.17 | 0.56 | 0.56 |
| Sat Flow, veh/h | 553 | 436 | 388 | 1243 | 38 | 156 | 1774 | 1845 | 1583 | 1774 | 1836 | 23 |
| Grp Volume(v), veh/h | 39 | 0 | 0 | 414 | 0 | 0 | 11 | 477 | 0 | 102 | 0 | 903 |
| Grp Sat Flow(s),veh/h/ln | 1377 | 0 | 0 | 1437 | 0 | 0 | 1774 | 1845 | 1583 | 1774 | 0 | 1859 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 28.7 | 0.0 | 0.0 | 0.7 | 23.1 | 0.0 | 5.5 | 0.0 | 45.8 |
| Cycle Q Clear(g_c), s | 2.2 | 0.0 | 0.0 | 30.8 | 0.0 | 0.0 | 0.7 | 23.1 | 0.0 | 5.5 | 0.0 | 45.8 |
| Prop In Lane | 0.44 | | 0.28 | 0.86 | | 0.11 | 1.00 | | 1.00 | 1.00 | | 0.01 |
| Lane Grp Cap(c), veh/h | 468 | 0 | 0 | 500 | 0 | 0 | 22 | 733 | 629 | 309 | 0 | 1040 |
| V/C Ratio(X) | 0.08 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 | 0.51 | 0.65 | 0.00 | 0.33 | 0.00 | 0.87 |
| Avail Cap(c_a), veh/h | 500 | 0 | 0 | 537 | 0 | 0 | 81 | 733 | 629 | 309 | 0 | 1040 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 27.3 | 0.0 | 0.0 | 37.0 | 0.0 | 0.0 | 54.0 | 26.9 | 0.0 | 39.8 | 0.0 | 20.8 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 0.0 | 9.8 | 0.0 | 0.0 | 17.2 | 4.5 | 0.0 | 0.6 | 0.0 | 9.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.9 | 0.0 | 0.0 | 13.6 | 0.0 | 0.0 | 0.4 | 12.7 | 0.0 | 2.8 | 0.0 | 26.2 |
| LnGrp Delay(d),s/veh | 27.3 | 0.0 | 0.0 | 46.8 | 0.0 | 0.0 | 71.2 | 31.4 | 0.0 | 40.4 | 0.0 | 30.6 |
| LnGrp LOS | C | | | D | | | E | C | | D | | C |
| Approach Vol, veh/h | | 39 | | | 414 | | | 488 | | | 1005 | |
| Approach Delay, s/veh | | 27.3 | | | 46.8 | | | 32.3 | | | 31.6 | |
| Approach LOS | | C | | | D | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 23.7 | 48.2 | | 38.1 | 5.8 | 66.0 | | 38.1 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 16.3 | 43.7 | | 36.5 | 5.0 | 55.0 | | 36.5 |
| Max Q Clear Time (g_c+I1), s | 7.5 | 25.1 | | 4.2 | 2.7 | 47.8 | | 32.8 |
| Green Ext Time (p_c), s | 0.1 | 2.4 | | 0.1 | 0.0 | 3.4 | | 0.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 34.9 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 15 | 10 | 10 | 335 | 10 | 90 | 10 | 455 | 195 | 170 | 835 | 10 |
| Future Volume (veh/h) | 15 | 10 | 10 | 335 | 10 | 90 | 10 | 455 | 195 | 170 | 835 | 10 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1484 | 1900 | 1900 | 1863 | 1900 | 1863 | 1845 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 17 | 11 | 11 | 381 | 11 | 102 | 11 | 517 | 0 | 193 | 949 | 11 |
| Adj No. of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| Percent Heavy Veh, % | 20 | 20 | 20 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 224 | 138 | 124 | 429 | 11 | 99 | 23 | 733 | 629 | 263 | 979 | 11 |
| Arrive On Green | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.01 | 0.40 | 0.00 | 0.15 | 0.53 | 0.53 |
| Sat Flow, veh/h | 532 | 416 | 373 | 1118 | 32 | 299 | 1774 | 1845 | 1583 | 1774 | 1838 | 21 |
| Grp Volume(v), veh/h | 39 | 0 | 0 | 494 | 0 | 0 | 11 | 517 | 0 | 193 | 0 | 960 |
| Grp Sat Flow(s),veh/h/ln | 1322 | 0 | 0 | 1450 | 0 | 0 | 1774 | 1845 | 1583 | 1774 | 0 | 1859 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 34.4 | 0.0 | 0.0 | 0.7 | 25.8 | 0.0 | 11.4 | 0.0 | 54.9 |
| Cycle Q Clear(g_c), s | 2.1 | 0.0 | 0.0 | 36.5 | 0.0 | 0.0 | 0.7 | 25.8 | 0.0 | 11.4 | 0.0 | 54.9 |
| Prop In Lane | 0.44 | | 0.28 | 0.77 | | 0.21 | 1.00 | | 1.00 | 1.00 | | 0.01 |
| Lane Grp Cap(c), veh/h | 485 | 0 | 0 | 539 | 0 | 0 | 23 | 733 | 629 | 263 | 0 | 990 |
| V/C Ratio(X) | 0.08 | 0.00 | 0.00 | 0.92 | 0.00 | 0.00 | 0.48 | 0.71 | 0.00 | 0.73 | 0.00 | 0.97 |
| Avail Cap(c_a), veh/h | 485 | 0 | 0 | 539 | 0 | 0 | 81 | 733 | 629 | 263 | 0 | 990 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 25.3 | 0.0 | 0.0 | 37.0 | 0.0 | 0.0 | 53.9 | 27.8 | 0.0 | 44.8 | 0.0 | 24.9 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 0.0 | 20.5 | 0.0 | 0.0 | 14.6 | 5.6 | 0.0 | 10.2 | 0.0 | 22.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.8 | 0.0 | 0.0 | 18.0 | 0.0 | 0.0 | 0.4 | 14.2 | 0.0 | 6.4 | 0.0 | 34.1 |
| LnGrp Delay(d),s/veh | 25.3 | 0.0 | 0.0 | 57.5 | 0.0 | 0.0 | 68.5 | 33.4 | 0.0 | 54.9 | 0.0 | 47.0 |
| LnGrp LOS | C | | | E | | | E | C | | D | | D |
| Approach Vol, veh/h | | 39 | | | 494 | | | 528 | | | 1153 | |
| Approach Delay, s/veh | | 25.3 | | | 57.5 | | | 34.1 | | | 48.4 | |
| Approach LOS | | C | | | E | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 20.8 | 48.2 | | 41.0 | 5.9 | 63.1 | | 41.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 16.3 | 43.7 | | 36.5 | 5.0 | 55.0 | | 36.5 |
| Max Q Clear Time (g_c+I1), s | 13.4 | 27.8 | | 4.1 | 2.7 | 56.9 | | 38.5 |
| Green Ext Time (p_c), s | 0.1 | 2.6 | | 0.1 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 46.6 |
| HCM 2010 LOS | D |

DAVID EVANS AND ASSOCIATES INC.

# ATTACHMENT C - QUEUING ANALYSIS

## LAKE STREET / I-15 PROPERTY PROJECT
## LAKE ELSINORE, CALIFORNIA

## Intersection: 1: Lake St. & I-15 NB Ramps

| Movement | WB | WB | NB | SB |
|---|---|---|---|---|
| Directions Served | L | TR | L | TR |
| Maximum Queue (ft) | 610 | 88 | 315 | 52 |
| Average Queue (ft) | 282 | 26 | 102 | 10 |
| 95th Queue (ft) | 484 | 63 | 191 | 36 |
| Link Distance (ft) | 595 | 595 | | 282 |
| Upstream Blk Time (%) | 0 | | | |
| Queuing Penalty (veh) | 0 | | | |
| Storage Bay Dist (ft) | | | 280 | |
| Storage Blk Time (%) | | | 0 | |
| Queuing Penalty (veh) | | | 0 | |

## Intersection: 2: Lake St. & I-15 SB Ramps

| Movement | EB | EB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|
| Directions Served | LT | R | T | R | L | T |
| Maximum Queue (ft) | 50 | 207 | 132 | 130 | 50 | 195 |
| Average Queue (ft) | 17 | 80 | 32 | 31 | 15 | 32 |
| 95th Queue (ft) | 46 | 147 | 94 | 88 | 43 | 115 |
| Link Distance (ft) | 703 | | 174 | | | 529 |
| Upstream Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |
| Storage Bay Dist (ft) | | 280 | | 200 | 150 | |
| Storage Blk Time (%) | | | | | | 1 |
| Queuing Penalty (veh) | | | | | | 0 |

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB |
|---|---|---|---|---|
| Directions Served | L | R | TR | LT |
| Maximum Queue (ft) | 79 | 122 | 154 | 188 |
| Average Queue (ft) | 28 | 50 | 34 | 115 |
| 95th Queue (ft) | 63 | 96 | 98 | 208 |
| Link Distance (ft) | 148 | 148 | 561 | 174 |
| Upstream Blk Time (%) | | | | 4 |
| Queuing Penalty (veh) | | | | 26 |
| Storage Bay Dist (ft) | | | | |
| Storage Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |

## Zone Summary

Zone wide Queuing Penalty: 26

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|
| Directions Served | L | R | TR | L | T |
| Maximum Queue (ft) | 78 | 111 | 322 | 129 | 156 |
| Average Queue (ft) | 27 | 48 | 98 | 45 | 44 |
| 95th Queue (ft) | 61 | 92 | 218 | 95 | 111 |
| Link Distance (ft) | 143 | 143 | 559 | | 175 |
| Upstream Blk Time (%) | | | | | 0 |
| Queuing Penalty (veh) | | | | | 0 |
| Storage Bay Dist (ft) | | | | 125 | |
| Storage Blk Time (%) | | | | 0 | 0 |
| Queuing Penalty (veh) | | | | 1 | 0 |

## Intersection: 1: Lake St. & I-15 NB Ramps

| Movement | WB | WB | NB | SB |
|---|---|---|---|---|
| Directions Served | L | TR | L | TR |
| Maximum Queue (ft) | 279 | 48 | 91 | 50 |
| Average Queue (ft) | 141 | 13 | 22 | 5 |
| 95th Queue (ft) | 242 | 37 | 69 | 24 |
| Link Distance (ft) | 595 | 595 | | 282 |
| Upstream Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |
| Storage Bay Dist (ft) | | | 280 | |
| Storage Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |

## Intersection: 2: Lake St. & I-15 SB Ramps

| Movement | EB | EB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|
| Directions Served | LT | R | T | R | L | T |
| Maximum Queue (ft) | 742 | 370 | 183 | 174 | 72 | 327 |
| Average Queue (ft) | 490 | 336 | 138 | 82 | 18 | 130 |
| 95th Queue (ft) | 981 | 444 | 214 | 155 | 52 | 259 |
| Link Distance (ft) | 703 | | 174 | | | 529 |
| Upstream Blk Time (%) | 34 | | 16 | 0 | | |
| Queuing Penalty (veh) | 0 | | 97 | 0 | | |
| Storage Bay Dist (ft) | | 280 | | 200 | 150 | |
| Storage Blk Time (%) | | 44 | 16 | 0 | | 9 |
| Queuing Penalty (veh) | | 13 | 32 | 1 | | 2 |

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB |
|---|---|---|---|---|
| Directions Served | L | R | TR | LT |
| Maximum Queue (ft) | 140 | 184 | 374 | 194 |
| Average Queue (ft) | 38 | 67 | 104 | 173 |
| 95th Queue (ft) | 91 | 143 | 261 | 226 |
| Link Distance (ft) | 148 | 148 | 561 | 174 |
| Upstream Blk Time (%) | 0 | 3 | | 17 |
| Queuing Penalty (veh) | 0 | 0 | | 162 |
| Storage Bay Dist (ft) | | | | |
| Storage Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |

## Zone Summary

Zone wide Queuing Penalty: 306

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|
| Directions Served | L | R | TR | L | T |
| Maximum Queue (ft) | 88 | 166 | 289 | 174 | 192 |
| Average Queue (ft) | 37 | 52 | 94 | 81 | 116 |
| 95th Queue (ft) | 82 | 102 | 222 | 148 | 231 |
| Link Distance (ft) | 143 | 143 | 560 | | 174 |
| Upstream Blk Time (%) | | 0 | | 0 | 1 |
| Queuing Penalty (veh) | | 0 | | 0 | 14 |
| Storage Bay Dist (ft) | | | | 125 | |
| Storage Blk Time (%) | | | | 1 | 5 |
| Queuing Penalty (veh) | | | | 10 | 4 |

## Intersection: 1: Lake St. & I-15 NB Ramps

| Movement | WB | WB | NB | NB | SB |
|---|---|---|---|---|---|
| Directions Served | L | TR | L | T | TR |
| Maximum Queue (ft) | 619 | 634 | 298 | 28 | 52 |
| Average Queue (ft) | 363 | 60 | 134 | 2 | 5 |
| 95th Queue (ft) | 598 | 240 | 247 | 13 | 25 |
| Link Distance (ft) | 595 | 595 | | 529 | 282 |
| Upstream Blk Time (%) | 2 | 0 | | | |
| Queuing Penalty (veh) | 0 | 0 | | | |
| Storage Bay Dist (ft) | | | 280 | | |
| Storage Blk Time (%) | | | 0 | | |
| Queuing Penalty (veh) | | | 0 | | |

## Intersection: 2: Lake St. & I-15 SB Ramps

| Movement | EB | EB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|
| Directions Served | LT | R | T | R | L | T |
| Maximum Queue (ft) | 742 | 370 | 180 | 174 | 239 | 544 |
| Average Queue (ft) | 518 | 320 | 102 | 68 | 31 | 212 |
| 95th Queue (ft) | 990 | 489 | 207 | 163 | 101 | 473 |
| Link Distance (ft) | 703 | | 174 | | | 529 |
| Upstream Blk Time (%) | 44 | | 1 | 0 | | 1 |
| Queuing Penalty (veh) | 0 | | 12 | 0 | | 3 |
| Storage Bay Dist (ft) | | 280 | | 200 | 150 | |
| Storage Blk Time (%) | | 74 | 1 | 0 | | 23 |
| Queuing Penalty (veh) | | 15 | 3 | 1 | | 6 |

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB |
|---|---|---|---|---|
| Directions Served | L | R | TR | LT |
| Maximum Queue (ft) | 94 | 164 | 340 | 191 |
| Average Queue (ft) | 37 | 46 | 104 | 178 |
| 95th Queue (ft) | 90 | 115 | 236 | 218 |
| Link Distance (ft) | 148 | 148 | 561 | 174 |
| Upstream Blk Time (%) | | 2 | | 30 |
| Queuing Penalty (veh) | | 0 | | 232 |
| Storage Bay Dist (ft) | | | | |
| Storage Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |

## Zone Summary

Zone wide Queuing Penalty: 271

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|
| Directions Served | L | R | TR | L | T |
| Maximum Queue (ft) | 94 | 158 | 524 | 126 | 185 |
| Average Queue (ft) | 35 | 46 | 198 | 59 | 56 |
| 95th Queue (ft) | 89 | 112 | 428 | 113 | 156 |
| Link Distance (ft) | 143 | 143 | 560 | | 174 |
| Upstream Blk Time (%) | | 2 | | | 2 |
| Queuing Penalty (veh) | | 0 | | | 12 |
| Storage Bay Dist (ft) | | | | 125 | |
| Storage Blk Time (%) | | | | 2 | 3 |
| Queuing Penalty (veh) | | | | 14 | 2 |

## Intersection: 1: Lake St. & I-15 NB Ramps

| Movement | WB | WB | NB | SB |
|---|---|---|---|---|
| Directions Served | L | TR | L | TR |
| Maximum Queue (ft) | 276 | 70 | 128 | 30 |
| Average Queue (ft) | 157 | 15 | 21 | 4 |
| 95th Queue (ft) | 269 | 41 | 82 | 21 |
| Link Distance (ft) | 595 | 595 | | 282 |
| Upstream Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |
| Storage Bay Dist (ft) | | | 280 | |
| Storage Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |

## Intersection: 2: Lake St. & I-15 SB Ramps

| Movement | EB | EB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|
| Directions Served | LT | R | T | R | L | T |
| Maximum Queue (ft) | 742 | 370 | 190 | 174 | 240 | 540 |
| Average Queue (ft) | 636 | 358 | 169 | 106 | 52 | 300 |
| 95th Queue (ft) | 989 | 421 | 218 | 199 | 191 | 580 |
| Link Distance (ft) | 703 | | 174 | | | 529 |
| Upstream Blk Time (%) | 63 | | 37 | 1 | | 3 |
| Queuing Penalty (veh) | 0 | | 252 | 0 | | 7 |
| Storage Bay Dist (ft) | | 280 | | 200 | 150 | |
| Storage Blk Time (%) | | 63 | 37 | 1 | | 50 |
| Queuing Penalty (veh) | | 19 | 73 | 7 | | 10 |

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB |
|---|---|---|---|---|
| Directions Served | L | R | TR | LT |
| Maximum Queue (ft) | 172 | 212 | 582 | 212 |
| Average Queue (ft) | 61 | 154 | 446 | 182 |
| 95th Queue (ft) | 138 | 242 | 758 | 219 |
| Link Distance (ft) | 148 | 148 | 561 | 174 |
| Upstream Blk Time (%) | 3 | 81 | 6 | 34 |
| Queuing Penalty (veh) | 0 | 0 | 42 | 358 |
| Storage Bay Dist (ft) | | | | |
| Storage Blk Time (%) | | | | |
| Queuing Penalty (veh) | | | | |

## Zone Summary

Zone wide Queuing Penalty: 766

## Intersection: 3: Lake St. & Project Access

| Movement | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|
| Directions Served | L | R | TR | L | T |
| Maximum Queue (ft) | 182 | 195 | 395 | 174 | 214 |
| Average Queue (ft) | 50 | 126 | 125 | 99 | 170 |
| 95th Queue (ft) | 132 | 219 | 274 | 182 | 254 |
| Link Distance (ft) | 143 | 143 | 560 | | 174 |
| Upstream Blk Time (%) | 1 | 49 | | 0 | 11 |
| Queuing Penalty (veh) | 0 | 0 | | 0 | 114 |
| Storage Bay Dist (ft) | | | | 125 | |
| Storage Blk Time (%) | | | | 6 | 16 |
| Queuing Penalty (veh) | | | | 60 | 13 |

DAVID EVANS AND ASSOCIATES INC.

# ATTACHMENT D - TRAFFIC SIGNAL WARRANT WORKSHEETS

## LAKE STREET / I-15 PROPERTY PROJECT
## LAKE ELSINORE, CALIFORNIA

## *Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)*

COUNT DATE _____
CALC TNM DATE 9-30-19
CHK _____ DATE _____

DIST _____ CO _____ RTE _____ PM _____

Major St: LAKE ST
Minor St: PROJECT ACCESS

Critical Approach Speed 50 mph
Critical Approach Speed _____ mph

Speed limit or critical speed on major street traffic > 40 mph..... ☒
or
In built up area of isolated community of < 10,000 population..... ☐ } RURAL (R)

☐ URBAN (U)

**WARRANT 1 - Eight Hour Vehicular Volume** SATISFIED YES ☐ NO ☐ N/A
**(Condition A or Condition B or combination of A and B must be satisfied)**

**Condition A - Minimum Vehicle Volume** 100% SATISFIED YES ☐ NO ☐
80% SATISFIED YES ☐ NO ☐

| APPROACH LANES | MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS) U | R | U | R | Hour |
|---|---|---|---|---|---|
| | 1 | | 2 or More | | |
| Both Approaches Major Street | 500 (400) | 350 (280) | 600 (480) | 420 (336) | |
| Highest Approach Minor Street | 150 (120) | 105 (84) | 200 (160) | 140 (112) | |

**Condition B - Interruption of Continuous Traffic** 100% SATISFIED YES ☐ NO ☐ N/A
80% SATISFIED YES ☐ NO ☐

| APPROACH LANES | MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS) U | R | U | R | Hour |
|---|---|---|---|---|---|
| | 1 | | 2 or More | | |
| Both Approaches Major Street | 750 (600) | 525 (420) | 900 (720) | 630 (504) | 1286 |
| Highest Approach Minor Street | 75 (60) | 53 (42) | 100 (80) | 70 (56) | 31 |

**Combination of Conditions A & B** SATISFIED YES ☐ NO ☐

| REQUIREMENT | CONDITION | ✓ | FULFILLED |
|---|---|---|---|
| TWO CONDITIONS SATISFIED 80% | A. MINIMUM VEHICULAR VOLUME | | Yes ☐ No ☐ |
| | AND, B. INTERRUPTION OF CONTINUOUS TRAFFIC | | |
| AND, AN ADEQUATE TRIAL OF OTHER ALTERNATIVES THAT COULD CAUSE LESS DELAY AND INCONVENIENCE TO TRAFFIC HAS FAILED TO SOLVE THE TRAFFIC PROBLEMS | | | Yes ☐ No ☐ |

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

*Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)*

**WARRANT 2 - Four Hour Vehicular Volume** **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

| APPROACH LANES | One | 2 or More | | | | Hour |
|---|---|---|---|---|---|---|
| Both Approaches - Major Street | | | | | | |
| Higher Approach - Minor Street | | | | | | |

| | |
|---|---|
| *All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS) | Yes ☐ No ☐ |
| OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS) | Yes ☐ No ☐ |

**WARRANT 3 - Peak Hour** **SATISFIED YES ☐ NO ☒**
**(Part A or Part B must be satisfied)**

**PART A** **SATISFIED YES ☐ NO ☒**

**(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)**

| | |
|---|---|
| 1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND | Yes ☐ No ☒ |
| 2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND | Yes ☐ No ☒ |
| 3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. | Yes ☒ No ☐ |

**PART B** **SATISFIED YES ☐ NO ☒**

| APPROACH LANES | One | 2 or More | AM PEAK Hour |
|---|---|---|---|
| Both Approaches - Major Street | | X | 1500 |
| Higher Approach - Minor Street | | X | 85 |

| | |
|---|---|
| The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS) | Yes ☐ No ☐ |
| OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS) | Yes ☐ No ☒ |

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

*Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 3 of 5)*

**WARRANT 4 - Pedestrian Volume**
**(Parts 1 and 2 Must Be Satisfied)**

**SATISFIED YES ☐ NO ☐** N/A

**Part 1** (Parts A or B must be satisfied)

| | Hours - - -> | | | | |
|---|---|---|---|---|---|
| A. | Vehicles per hour for any 4 hours | | | | |
| | Pedestrians per hour for any 4 hours | | | | |

**Figure 4C-5 or Figure 4C-6**
**SATISFIED YES ☐ NO ☐**

| | Hours - - -> | | | | |
|---|---|---|---|---|---|
| B. | Vehicles per hour for any 1 hour | | | | |
| | Pedestrians per hour for any 1 hour | | | | |

**Figure 4C-7 or Figure 4C-8**
**SATISFIED YES ☐ NO ☐**

**Part 2** **SATISFIED YES ☐ NO ☐**

| | |
|---|---|
| AND, The distance to the nearest traffic signal along the major street is greater than 300 ft | Yes ☐ No ☐ |
| OR, The proposed traffic signal will not restrict progressive traffic flow along the major street. | Yes ☐ No ☐ |

---

**WARRANT 5 - School Crossing**
**(Parts A and B Must Be Satisfied)**

**SATISFIED YES ☐ NO ☐** N/A

**Part A**
**Gap/Minutes and # of Children**

**SATISFIED YES ☐ NO ☐**

| Gaps vs Minutes | Hour |
|---|---|
| Minutes Children Using Crossing | |
| Number of Adequate Gaps | |
| School Age Pedestrians Crossing Street / hr | |

Gaps < Minutes YES ☐ NO ☐
AND Children > 20/hr YES ☐ NO ☐

| | |
|---|---|
| AND, Consideration has been given to less restrictive remedial measures. | Yes ☐ No ☐ |

**Part B** **SATISFIED YES ☐ NO ☐**

| | |
|---|---|
| The distance to the nearest traffic signal along the major street is greater than 300 ft | Yes ☐ No ☐ |
| OR, The proposed signal will not restrict the progressive movement of traffic. | Yes ☐ No ☐ |

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

*Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 4 of 5)*

**WARRANT 6 - Coordinated Signal System** **SATISFIED YES ☐ NO ☐** N/A
**(All Parts Must Be Satisfied)**

| MINIMUM REQUIREMENTS | DISTANCE TO NEAREST SIGNAL | |
|---|---|---|
| ≥ 1000 ft | N _____ ft, S _____ ft, E _____ ft, W _____ ft | Yes ☐ No ☐ |
| On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning. | | Yes ☐ No ☐ |
| OR, On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation. | | |

**WARRANT 7 - Crash Experience Warrant** **SATISFIED YES ☐ NO ☐** N/A
**(All Parts Must Be Satisfied)**

| | | | |
|---|---|---|---|
| Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency. | | | Yes ☐ No ☐ |
| REQUIREMENTS | Number of crashes reported within a 12 month period susceptible to correction by a traffic signal, and involving injury or damage exceeding the requirements for a reportable crash. | | Yes ☐ No ☐ |
| 5 OR MORE | | | |
| REQUIREMENTS | CONDITIONS | ✓ | |
| ONE CONDITION SATISFIED 80% | Warrant 1, Condition A - Minimum Vehicular Volume | | Yes ☐ No ☐ |
| | OR, Warrant 1, Condition B - Interruption of Continuous Traffic | | |
| | OR, Warrant 4, Pedestrian Volume Condition Ped Vol ≥ 80% of Figure 4C-5 through Figure 4C-8 | | |

**WARRANT 8 - Roadway Network** **SATISFIED YES ☐ NO ☐** N/A
**(All Parts Must Be Satisfied)**

| MINIMUM VOLUME REQUIREMENTS | ENTERING VOLUMES - ALL APPROACHES | ✓ | FULFILLED |
|---|---|---|---|
| 1000 Veh/Hr | During Typical Weekday Peak Hour _____ Veh/Hr and has 5-year projected traffic volumes that meet one or more of Warrants 1, 2, and 3 during an average weekday. | | Yes ☐ No ☐ |
| | OR<br>During Each of Any 5 Hrs. of a Sat. or Sun _____ Veh/Hr | | |

| CHARACTERISTICS OF MAJOR ROUTES | MAJOR ROUTE A | MAJOR ROUTE B | |
|---|---|---|---|
| Hwy. System Serving as Principal Network for Through Traffic | | | |
| Rural or Suburban Highway Outside Of, Entering, or Traversing a City | | | |
| Appears as Major Route on an Official Plan | | | |
| Any Major Route Characteristics Met, Both Streets | | | Yes ☐ No ☐ |

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

## *Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 5 of 5)*

**WARRANT 9 - Intersection Near a Grade Crossing** **SATISFIED YES ☐ NO ☐ N/A**
**(Both Parts A and B Must Be Satisfied)**

| | |
|---|---|
| **PART A**<br><br>A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach. Track Center Line to Limit Line _____ ft | Yes ☐ No ☐ |
| **PART B**<br><br>**There is one minor street approach lane at the track crossing** - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-9.<br><br>Major Street - Total of both approaches: _____ VPH<br>Minor Street - Crosses the track (one direction only, approaching the intersection):<br>_____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calculate AF) = _____ VPH | Yes ☐ No ☐ |
| **OR, There are two or more minor street approach lanes at the track crossing** -<br>During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-10.<br><br>Major Street - Total of both approaches : _____ VPH<br>Minor Street - Crosses the track (one direction only, approaching the intersection):<br>_____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calcualte AF) = _____ VPH | |

The minor street approach volume may be multiplied by up to three following adjustment factors (AF) as described in Section 4C.10.

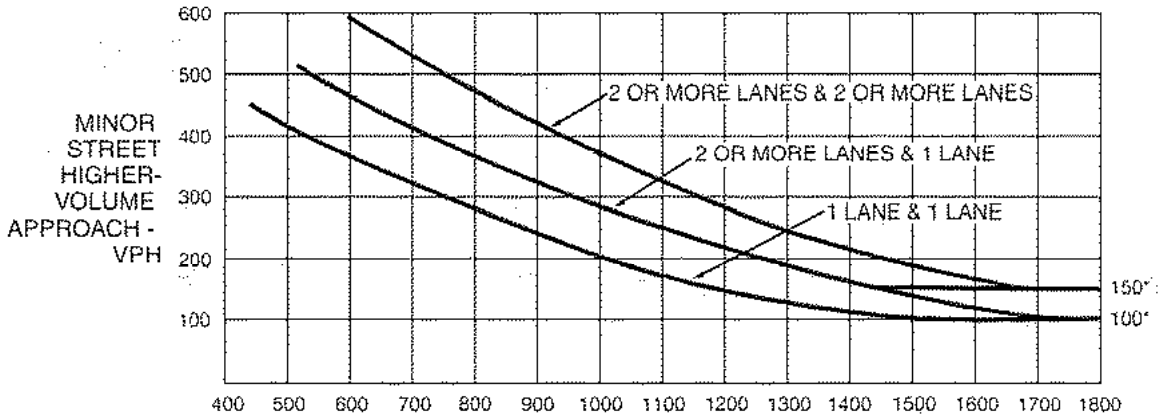
1- Number of Rail Traffic per Day_____ Adjustment factor from table 4C-2____

2- Percentage of High-Occupancy Buses on Minor Street Approach_____ Adjustment factor from table 4C-3____

3- Percentage of Tractor-Trailer Trucks on Minor Street Approach_____ Adjustment factor from table 4C-4____

NOTE: If no data is availale or known, then use AF = 1 (no adjustment)

**Figure 4C-3. Warrant 3, Peak Hour**




*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

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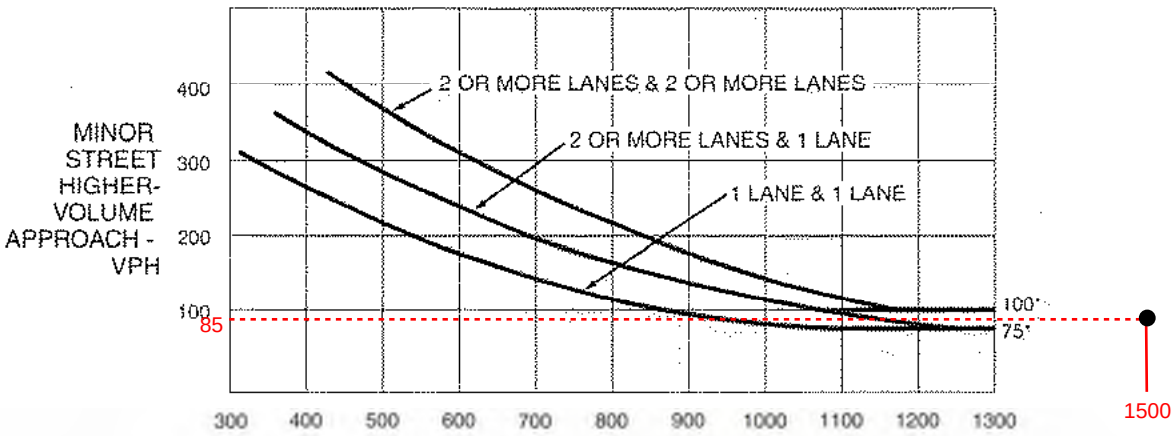
**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**

**(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**




*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

*Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)*

**WARRANT 2 - Four Hour Vehicular Volume** **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

| APPROACH LANES | One | 2 or More | | | | Hour |
|---|---|---|---|---|---|---|
| Both Approaches - Major Street | | | | | | |
| Higher Approach - Minor Street | | | | | | |

| | |
|---|---|
| *All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS) | Yes ☐ No ☐ |
| OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS) | Yes ☐ No ☐ |

**WARRANT 3 - Peak Hour** **SATISFIED YES ☒ NO ☐**
**(Part A or Part B must be satisfied)**

**PART A** **SATISFIED YES ☐ NO ☒**

**(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)**

| | |
|---|---|
| 1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND | Yes ☐ No ☒ |
| 2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND | Yes ☐ No ☒ |
| 3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. | Yes ☒ No ☐ |

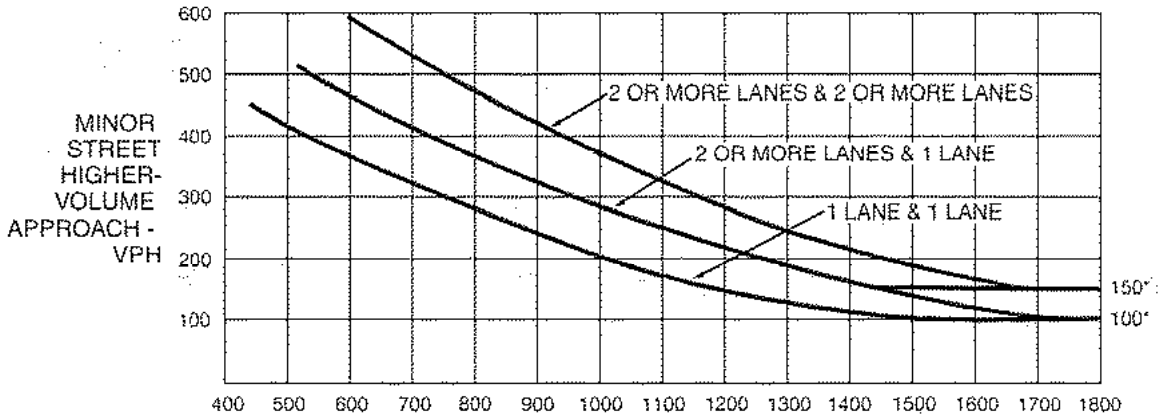
**PART B** **SATISFIED YES ☒ NO ☐**

| APPROACH LANES | One | 2 or More | PM PEAK Hour |
|---|---|---|---|
| Both Approaches - Major Street | | X | 1480 |
| Higher Approach - Minor Street | | X | 120 |

| | |
|---|---|
| The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS) | Yes ☐ No ☐ |
| OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS) | Yes ☒ No ☐ |

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

**Figure 4C-3. Warrant 3, Peak Hour**




*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

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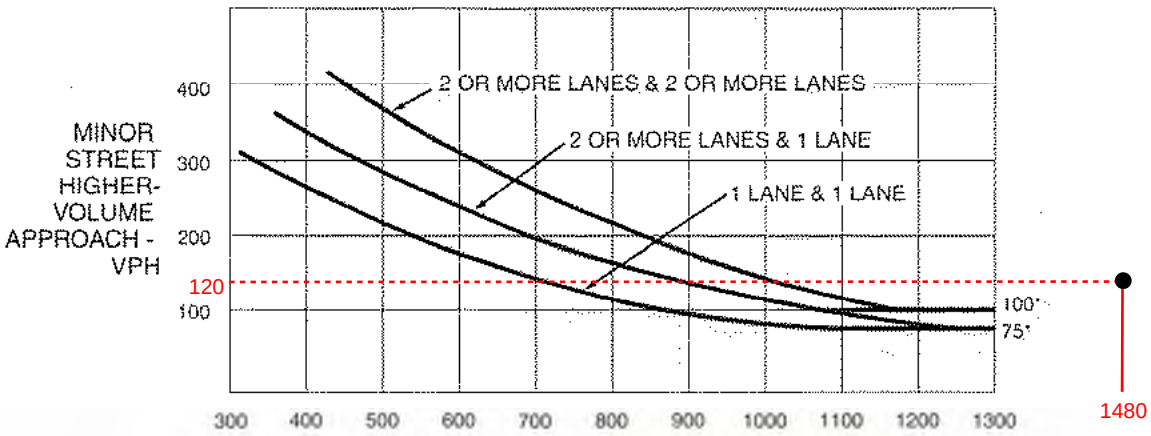
**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**

**(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**




*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

*Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)*

**WARRANT 2 - Four Hour Vehicular Volume** **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

| APPROACH LANES | One | 2 or More | | | | Hour |
|---|---|---|---|---|---|---|
| Both Approaches - Major Street | | | | | | |
| Higher Approach - Minor Street | | | | | | |

| | | |
|---|---|---|
| *All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS) | Yes ☐ | No ☐ |
| OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS) | Yes ☐ | No ☐ |

**WARRANT 3 - Peak Hour** **SATISFIED YES ☒ NO ☐**
**(Part A or Part B must be satisfied)**

**PART A** **SATISFIED YES ☐ NO ☒**

**(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)**

| | | |
|---|---|---|
| 1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND | Yes ☐ | No ☒ |
| 2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND | Yes ☐ | No ☒ |
| 3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. | Yes ☒ | No ☐ |

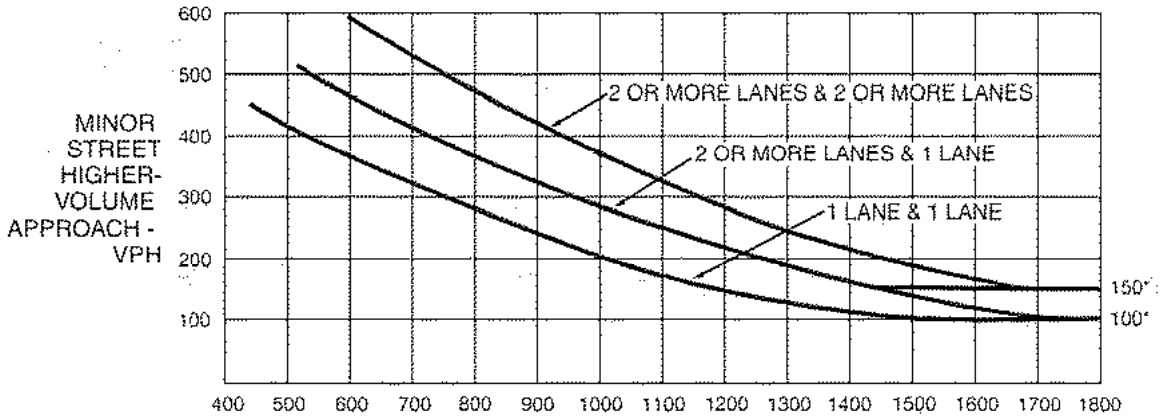
**PART B** **SATISFIED YES ☒ NO ☐**

| APPROACH LANES | One | 2 or More | PM PEAK Hour |
|---|---|---|---|
| Both Approaches - Major Street | | X | 1660 |
| Higher Approach - Minor Street | | X | 85 |

| | | |
|---|---|---|
| The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS) | Yes ☐ | No ☐ |
| OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS) | Yes ☒ | No ☐ |

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

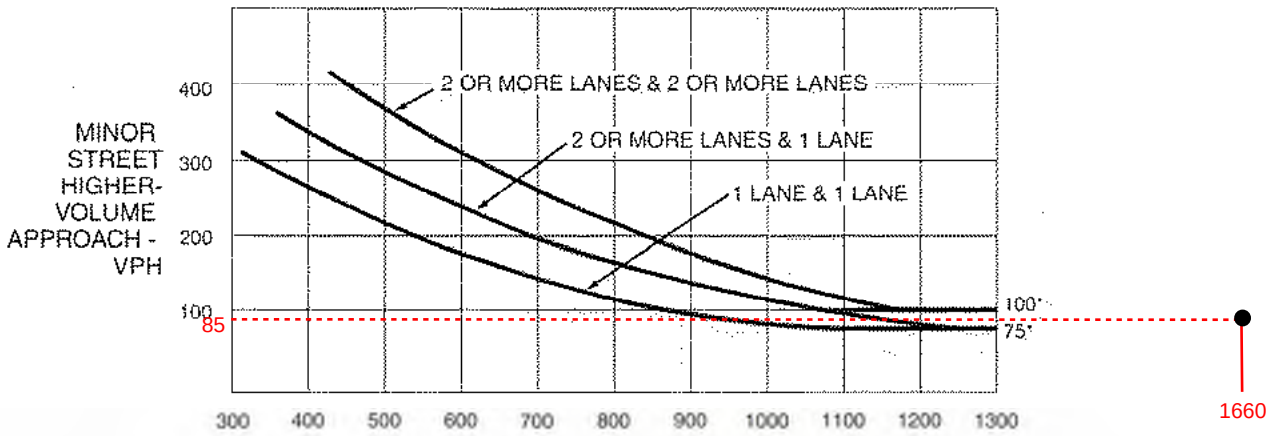
**Figure 4C-3. Warrant 3, Peak Hour**




*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

---

**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**
**(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**




*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

*Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)*

**WARRANT 2 - Four Hour Vehicular Volume** **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

| APPROACH LANES | One | 2 or More | | | | Hour |
|---|---|---|---|---|---|---|
| Both Approaches - Major Street | | | | | | |
| Higher Approach - Minor Street | | | | | | |

| | |
|---|---|
| *All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS) | Yes ☐ No ☐ |
| OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS) | Yes ☐ No ☐ |

**WARRANT 3 - Peak Hour** **SATISFIED YES ☒ NO ☐**
**(Part A or Part B must be satisfied)**

**PART A** **SATISFIED YES ☐ NO ☒**

**(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)**

| | |
|---|---|
| 1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND | Yes ☐ No ☒ |
| 2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND | Yes ☐ No ☒ |
| 3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. | Yes ☒ No ☐ |

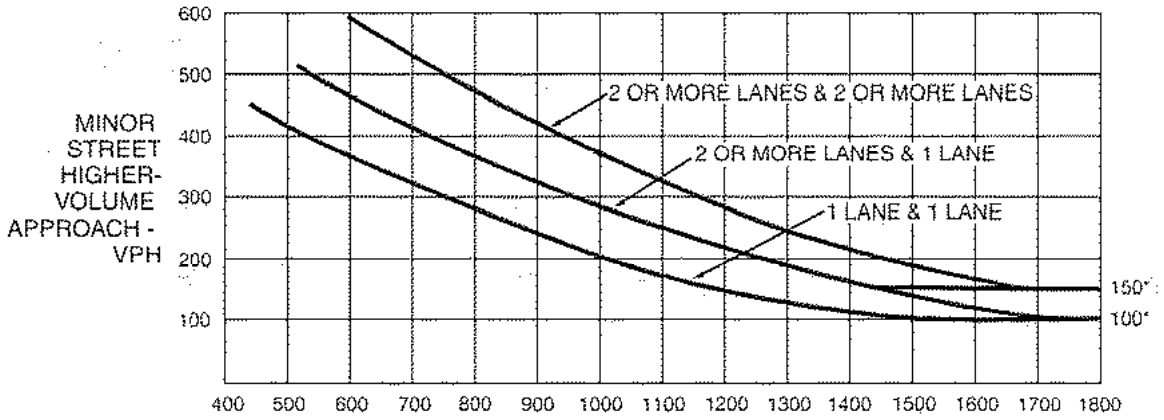
**PART B** **SATISFIED YES ☒ NO ☐**

| APPROACH LANES | One | 2 or More | PM PEAK Hour |
|---|---|---|---|
| Both Approaches - Major Street | | X | 1695 |
| Higher Approach - Minor Street | | X | 120 |

| | |
|---|---|
| The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS) | Yes ☐ No ☐ |
| OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS) | Yes ☒ No ☐ |

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

**Figure 4C-3. Warrant 3, Peak Hour**

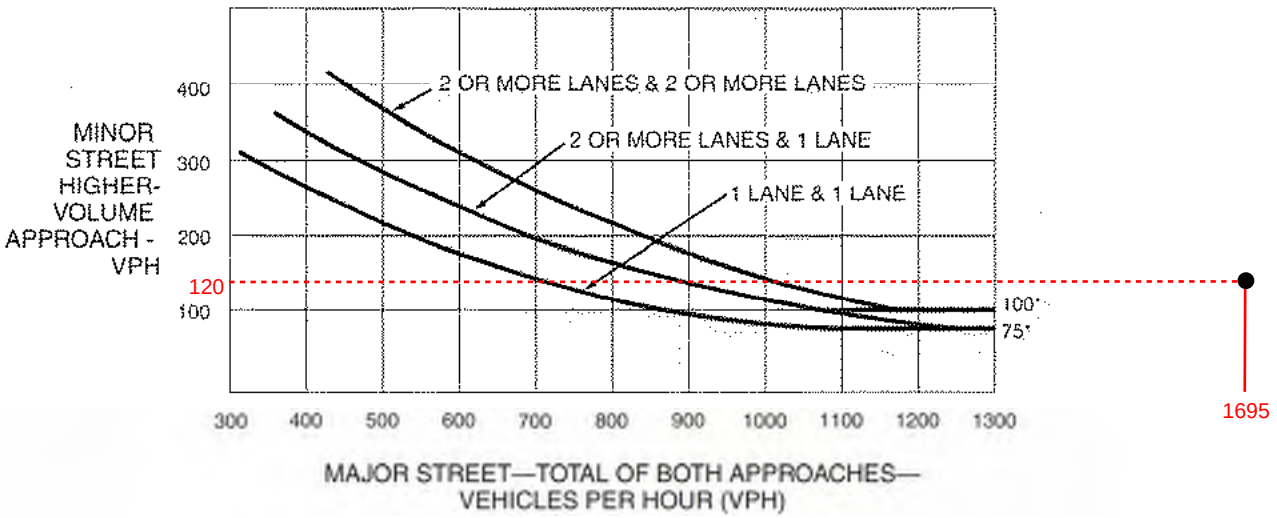



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

---

**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**

**(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**




*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

DAVID EVANS AND ASSOCIATES INC.

# ATTACHMENT E - FREEWAY SEGMENT CAPACITY ANALYSIS

## LAKE STREET / I-15 PROPERTY PROJECT
## LAKE ELSINORE, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| FREEWAY VOLUMES | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 1 |

FREEWAY : NORTHBOUND I-15

AM GROWTH FACTOR : 25%

PM GROWTH FACTOR : 21%

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **S. OF LAKE ST** | | | | | | | |
| AM | 1930 | 20 | 1950 | 130 | 2080 | 0 | 2080 |
| PM | 1850 | 30 | 1880 | 90 | 1970 | 0 | 1970 |
| **BETWEEN RAMPS** | | | | | | | |
| AM | 1440 | 0 | 1440 | 90 | 1530 | 0 | 1530 |
| PM | 1700 | 0 | 1700 | 80 | 1780 | 0 | 1780 |
| **N. OF LAKE ST** | | | | | | | |
| AM | 1970 | 35 | 2005 | 130 | 2135 | 110 | 2245 |
| PM | 2050 | 45 | 2095 | 100 | 2195 | 85 | 2280 |

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2080 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 565 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 780 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 780 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 11.1 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 1970 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 535 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 739 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 739 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 10.6 | pc/mi/ln |
| Level of service, LOS | A | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2080 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 565 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 780 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 780 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 11.1 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.1

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 1970 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 535 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 739 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 739 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 10.6 | pc/mi/ln |
| Level of service, LOS | A | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 1530 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 416 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 574 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 574 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 8.2 | pc/mi/ln |
| Level of service, LOS | A | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 1780 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 484 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 667 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 667 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 9.5 | pc/mi/ln |
| Level of service, LOS | A | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 1530 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 416 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 574 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 574 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 8.2 | pc/mi/ln |
| Level of service, LOS | A | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 1780 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 484 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 667 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 667 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 9.5 | pc/mi/ln |
| Level of service, LOS | A | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | North of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2135 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 580 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 801 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 801 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 11.4 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | North of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2195 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 596 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 823 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 823 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 11.8 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | North of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2245 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 610 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 842 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 842 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 12.0 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 NB |
| From/To: | North of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2280 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 620 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 855 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 855 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 12.2 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET OF |
|---|---|---|---|---|
| FREEWAY VOLUMES | TNM | 27-Sep-19 | LSTP0000-0001 | 1 OF 1 |

FREEWAY : SOUTHBOUND I-15

AM GROWTH FACTOR : 8%

PM GROWTH FACTOR : 9%

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **N. OF LAKE ST** | | | | | | | |
| AM | 2970 | 30 | 3000 | 20 | 3020 | 50 | 3070 |
| PM | 4250 | 45 | 4295 | 40 | 4335 | 130 | 4465 |
| **BETWEEN RAMPS** | | | | | | | |
| AM | 2770 | 0 | 2770 | 20 | 2790 | 0 | 2790 |
| PM | 3560 | 0 | 3560 | 30 | 3590 | 0 | 3590 |
| **S. OF LAKE ST** | | | | | | | |
| AM | 3010 | 20 | 3030 | 20 | 3050 | 0 | 3050 |
| PM | 3730 | 30 | 3760 | 40 | 3800 | 0 | 3800 |

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | North Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3020 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 821 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1132 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1132 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 16.2 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.1

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | North Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 4335 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 1178 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1626 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1626 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 67.9 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 23.9 | pc/mi/ln |
| Level of service, LOS | C | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | North Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3070 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 834 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1151 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1151 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 16.4 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | North Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 4465 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 1213 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1674 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1674 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 67.4 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 24.8 | pc/mi/ln |
| Level of service, LOS | C | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2790 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 758 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1046 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1046 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 14.9 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3590 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 976 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1346 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1346 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 69.8 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 19.3 | pc/mi/ln |
| Level of service, LOS | C | |

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.1

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 2790 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 758 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1046 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1046 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 14.9 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.1

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | Between Ramps |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3590 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 976 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5* | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1346 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1346 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 69.8 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 19.3 | pc/mi/ln |
| Level of service, LOS | C | |

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.1

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3050 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 829 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1144 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1144 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 16.3 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.1

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3800 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 1033 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1425 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1425 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 69.4 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 20.5 | pc/mi/ln |
| Level of service, LOS | C | |

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.1

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | AM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3050 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 829 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1144 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1144 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 70.0 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 16.3 | pc/mi/ln |
| Level of service, LOS | B | |

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

## Operational Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency or Company: | David Evans and Associates, In |
| Date Performed: | 09/23/2019 |
| Analysis Time Period: | PM Peak Hour |
| Freeway/Direction: | I-15 SB |
| From/To: | South of Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Flow Inputs and Adjustments

| | | |
|---|---|---|
| Volume, V | 3800 | veh/h |
| Peak-hour factor, PHF | 0.92 | |
| Peak 15-min volume, v15 | 1033 | v |
| Trucks and buses | 7 | % |
| Recreational vehicles | 0 | % |
| Terrain type: | Level | |
| Grade | - | % |
| Segment length | - | mi |
| Trucks and buses PCE, ET | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | |
| Heavy vehicle adjustment, fHV | 0.966 | |
| Driver population factor, fp | 1.00 | |
| Flow rate, vp | 1425 | pc/h/ln |

## Speed Inputs and Adjustments

| | | |
|---|---|---|
| Lane width | - | ft |
| Right-side lateral clearance | - | ft |
| Total ramp density, TRD | - | ramps/mi |
| Number of lanes, N | 3 | |
| Free-flow speed: | Measured | |
| FFS or BFFS | 70.0 | mi/h |
| Lane width adjustment, fLW | - | mi/h |
| Lateral clearance adjustment, fLC | - | mi/h |
| TRD adjustment | - | mi/h |
| Free-flow speed, FFS | 70.0 | mi/h |

## LOS and Performance Measures

| | | |
|---|---|---|
| Flow rate, vp | 1425 | pc/h/ln |
| Free-flow speed, FFS | 70.0 | mi/h |
| Average passenger-car speed, S | 69.4 | mi/h |
| Number of lanes, N | 3 | |
| Density, D | 20.5 | pc/mi/ln |
| Level of service, LOS | C | |

Overall results are not computed when free-flow speed is less than 55 mph.

DAVID EVANS AND ASSOCIATES INC.

# ATTACHMENT F - MERGE/DIVERGE - RAMP JUNCTION CAPACITY ANALYSIS

## LAKE STREET / I-15 PROPERTY PROJECT
## LAKE ELSINORE, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET | OF |
|---|---|---|---|---|---|
| MERGE/DIVERGE | TNM | 24-Sep-19 | LSTP0000-0001 | 1 | OF 1 |

SEGMENT NAME : Off-Ramp at Lake Street

FREEWAY : I-15 Freeway – Northbound

AM MAINLINE GROWTH FACTOR : 25%

PM MAINLINE GROWTH FACTOR : 21%

RAMP GROWTH FACTOR : 4%

# CONDITION DIAGRAMS

## EXISTING GEOMETRICS

### DIVERGE

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **FREEWAY MAINLINE** | | | | | | | |
| AM | 1930 | 20 | 1950 | 130 | 2080 | 0 | 2080 |
| PM | 1850 | 30 | 1880 | 90 | 1970 | 0 | 1970 |
| **RAMP** | | | | | | | |
| AM | 500 | 20 | 520 | 40 | 560 | 0 | 560 |
| PM | 160 | 30 | 190 | 15 | 205 | 0 | 205 |
| **ADJACENT RAMP** | | | | | | | |
| AM | 540 | 60 | 600 | 40 | 640 | 110 | 750 |
| PM | 350 | 80 | 430 | 25 | 455 | 85 | 540 |

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 2080 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 560 | vph |
| Length of first accel/decel lane | 320 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 640 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | | Ramp | | Adjacent Ramp | | |
|---|---|---|---|---|---|---|---|
| Volume, V (vph) | 2080 | | 560 | | 640 | | vph |
| Peak-hour factor, PHF | 0.92 | | 0.92 | | 0.92 | | |
| Peak 15-min volume, v15 | 565 | | 152 | | 174 | | v |
| Trucks and buses | 7 | | 7 | | 5 | | % |
| Recreational vehicles | 0 | | 0 | | 0 | | % |
| Terrain type: | Level | | Level | | Level | | |
| Grade | 0.00 | % | 0.00 | % | 0.00 | % | |
| Length | 0.00 | mi | 0.00 | mi | 0.00 | mi | |
| Trucks and buses PCE, ET | 1.5 | | 1.5 | | 1.5 | | |
| Recreational vehicle PCE, ER | 1.2 | | 1.2 | | 1.2 | | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.966 | 0.976 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 2340 | 630 | 713 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.673 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1780 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 2340 | 7200 | No |
| $v_{FO} = v_F - v_R$ | 1710 | 7200 | No |
| $v_R$ | 630 | 2000 | No |
| $v_3$ or $v_{av34}$ | 560 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 1780 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 1780 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 16.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.485

Space mean speed in ramp influence area, $S_R$ = 56.4 mph

Space mean speed in outer lanes, $S_O$ = 76.8 mph

Space mean speed for all vehicles, $S$ = 60.3 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |

Description: Lake Street/I-15 Property Traffic Impact Analysis Addendum

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 1970 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 205 | vph |
| Length of first accel/decel lane | 320 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 455 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | | Ramp | | Adjacent Ramp | | |
|---|---|---|---|---|---|---|---|
| Volume, V (vph) | 1970 | | 205 | | 455 | | vph |
| Peak-hour factor, PHF | 0.92 | | 0.92 | | 0.92 | | |
| Peak 15-min volume, v15 | 535 | | 56 | | 124 | | v |
| Trucks and buses | 7 | | 2 | | 5 | | % |
| Recreational vehicles | 0 | | 0 | | 0 | | % |
| Terrain type: | Level | | Level | | Level | | |
| Grade | 0.00 | % | 0.00 | % | 0.00 | % | |
| Length | 0.00 | mi | 0.00 | mi | 0.00 | mi | |
| Trucks and buses PCE, ET | 1.5 | | 1.5 | | 1.5 | | |
| Recreational vehicle PCE, ER | 1.2 | | 1.2 | | 1.2 | | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.990 | 0.976 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 2216 | 225 | 507 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.694 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1607 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 2216 | 7200 | No |
| $v_{FO} = v_F - v_R$ | 1991 | 7200 | No |
| $v_R$ | 225 | 2000 | No |
| $v_3$ or $v_{av34}$ | 609 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 1607 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 1607 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.448

Space mean speed in ramp influence area, $S_R$ = 57.4 mph

Space mean speed in outer lanes, $S_O$ = 76.8 mph

Space mean speed for all vehicles, $S$ = 61.7 mph

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 2080 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 560 | vph |
| Length of first accel/decel lane | 320 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 750 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | | Ramp | | Adjacent Ramp | | |
|---|---|---|---|---|---|---|---|
| Volume, V (vph) | 2080 | | 560 | | 750 | | vph |
| Peak-hour factor, PHF | 0.92 | | 0.92 | | 0.92 | | |
| Peak 15-min volume, v15 | 565 | | 152 | | 204 | | v |
| Trucks and buses | 7 | | 7 | | 5 | | % |
| Recreational vehicles | 0 | | 0 | | 0 | | % |
| Terrain type: | Level | | Level | | Level | | |
| Grade | 0.00 | % | 0.00 | % | 0.00 | % | |
| Length | 0.00 | mi | 0.00 | mi | 0.00 | mi | |
| Trucks and buses PCE, ET | 1.5 | | 1.5 | | 1.5 | | |
| Recreational vehicle PCE, ER | 1.2 | | 1.2 | | 1.2 | | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.966 | 0.976 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 2340 | 630 | 836 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.673 Using Equation 5

$v_{12} = v_R + (v - v_F) P_{FD}$ = 1780 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 2340 | 7200 | No |
| $v_{FO} = v - v_R$ | 1710 | 7200 | No |
| $v_R$ | 630 | 2000 | No |
| $v_3$ or $v_{av34}$ | 560 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 1780 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 1780 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 16.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.485

Space mean speed in ramp influence area, $S_R$ = 56.4 mph

Space mean speed in outer lanes, $S_O$ = 76.8 mph

Space mean speed for all vehicles, $S$ = 60.3 mph

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 1970 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 205 | vph |
| Length of first accel/decel lane | 320 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 540 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | | Ramp | | Adjacent Ramp | | |
|---|---|---|---|---|---|---|---|
| Volume, V (vph) | 1970 | | 205 | | 540 | | vph |
| Peak-hour factor, PHF | 0.92 | | 0.92 | | 0.92 | | |
| Peak 15-min volume, v15 | 535 | | 56 | | 147 | | v |
| Trucks and buses | 7 | | 2 | | 5 | | % |
| Recreational vehicles | 0 | | 0 | | 0 | | % |
| Terrain type: | Level | | Level | | Level | | |
| Grade | 0.00 | % | 0.00 | % | 0.00 | % | |
| Length | 0.00 | mi | 0.00 | mi | 0.00 | mi | |
| Trucks and buses PCE, ET | 1.5 | | 1.5 | | 1.5 | | |
| Recreational vehicle PCE, ER | 1.2 | | 1.2 | | 1.2 | | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.990 | 0.976 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 2216 | 225 | 602 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.694 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1607 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 2216 | 7200 | No |
| $v_{FO} = v_F - v_R$ | 1991 | 7200 | No |
| $v_R$ | 225 | 2000 | No |
| $v_3$ or $v_{av34}$ | 609 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 1607 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 1607 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.448

Space mean speed in ramp influence area, $S_R$ = 57.4 mph

Space mean speed in outer lanes, $S_0$ = 76.8 mph

Space mean speed for all vehicles, $S$ = 61.7 mph

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET | OF |
|---|---|---|---|---|---|
| MERGE/DIVERGE | TNM | 24-Sep-19 | LSTP0000-0001 | 1 | OF 1 |

SEGMENT NAME : On-Ramp at Lake Street

FREEWAY : I-15 Freeway – Northbound

AM MAINLINE GROWTH FACTOR : 25%

PM MAINLINE GROWTH FACTOR : 21%

RAMP GROWTH FACTOR : 4%

# CONDITION DIAGRAMS

## EXISTING GEOMETRICS

### MERGE

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **BETWEEN RAMPS** | | | | | | | |
| AM | 1440 | 0 | 1440 | 90 | 1530 | 0 | 1530 |
| PM | 1700 | 0 | 1700 | 80 | 1780 | 0 | 1780 |
| **RAMP** | | | | | | | |
| AM | 540 | 60 | 600 | 40 | 640 | 110 | 750 |
| PM | 350 | 80 | 430 | 25 | 455 | 85 | 540 |
| **ADJACENT RAMP** | | | | | | | |
| AM | 500 | 20 | 520 | 40 | 560 | 0 | 560 |
| PM | 160 | 30 | 190 | 15 | 205 | 0 | 205 |

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 1530 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 640 | vph |
| Length of first accel/decel lane | 650 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 560 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 1530 | 640 | 560 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 416 | 174 | 152 | v |
| Trucks and buses | 7 | 5 | 7 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.976 | 0.966 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 1721 | 713 | 630 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 237.68 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.596 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1025 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 2434 | 7200 | No |
| $v_3$ or $v_{av34}$ | 696 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 1025 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 2434 | 4600 | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 14.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

| | | |
|---|---|---|
| Intermediate speed variable, | $M_S$ = 0.298 | |
| Space mean speed in ramp influence area, | $S_R$ = 61.7 | mph |
| Space mean speed in outer lanes, | $S_O$ = 69.3 | mph |
| Space mean speed for all vehicles, | $S$ = 63.7 | mph |

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 1780 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 455 | vph |
| Length of first accel/decel lane | 650 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 205 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 1780 | 455 | 205 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 484 | 124 | 56 | v |
| Trucks and buses | 7 | 5 | 2 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.976 | 0.990 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 2002 | 507 | 225 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 253.73 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.596 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1193 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 2509 | 7200 | No |
| $v_3$ or $v_{av34}$ | 809 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ > 2700 pc/h? | | No | |
| Is $v_3$ or $v_{av34}$ > 1.5 $v_{12}$ /2 | | No | |

If yes, $v_{12A}$ = 1193 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 2509 | 4600 | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 14.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

Intermediate speed variable, $M_S$ = 0.297

Space mean speed in ramp influence area, $S_R$ = 61.7 mph

Space mean speed in outer lanes, $S_0$ = 68.9 mph

Space mean speed for all vehicles, $S$ = 63.8 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 1530 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 750 | vph |
| Length of first accel/decel lane | 650 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 560 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 1530 | 750 | 560 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 416 | 204 | 152 | v |
| Trucks and buses | 7 | 5 | 7 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.976 | 0.966 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 1721 | 836 | 630 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 264.00 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.596 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1025 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 2557 | 7200 | No |
| $v_3$ or $v_{av34}$ | 696 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 1025 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 2557 | 4600 | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 15.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

| | | |
|---|---|---|
| Intermediate speed variable, | $M_S$ = 0.301 | |
| Space mean speed in ramp influence area, | $S_R$ = 61.6 | mph |
| Space mean speed in outer lanes, | $S_O$ = 69.3 | mph |
| Space mean speed for all vehicles, | $S$ = 63.5 | mph |

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 NB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 1780 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 540 | vph |
| Length of first accel/decel lane | 650 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 205 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3215 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 1780 | 540 | 205 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 484 | 147 | 56 | v |
| Trucks and buses | 7 | 5 | 2 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.976 | 0.990 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 2002 | 602 | 225 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 274.06 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.596 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1193 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 2604 | 7200 | No |
| $v_3$ or $v_{av34}$ | 809 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ > 2700 pc/h? | | No | |
| Is $v_3$ or $v_{av34}$ > 1.5 $v_{12}$ /2 | | No | |

If yes, $v_{12A}$ = 1193 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 2604 | 4600 | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 15.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

Intermediate speed variable, $M_S$ = 0.299

Space mean speed in ramp influence area, $S_R$ = 61.6 mph

Space mean speed in outer lanes, $S_O$ = 68.9 mph

Space mean speed for all vehicles, $S$ = 63.7 mph

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET | OF |
|---|---|---|---|---|---|
| MERGE/DIVERGE | TNM | 24-Sep-19 | LSTP0000-0001 | 1 | OF 1 |

SEGMENT NAME : Off-Ramp at Lake Street

FREEWAY : I-15 Freeway – Southbound

AM MAINLINE GROWTH FACTOR : 8%

PM MAINLINE GROWTH FACTOR : 9%

RAMP GROWTH FACTOR : 4%

# CONDITION DIAGRAMS

## EXISTING GEOMETRICS

### DIVERGE

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **FREEWAY MAINLINE** | | | | | | | |
| AM | 2970 | 30 | 3000 | 20 | 3020 | 50 | 3070 |
| PM | 4250 | 45 | 4295 | 40 | 4335 | 130 | 4465 |
| **RAMP** | | | | | | | |
| AM | 200 | 30 | 230 | 30 | 260 | 50 | 310 |
| PM | 700 | 45 | 745 | 45 | 790 | 130 | 920 |
| **ADJACENT RAMP** | | | | | | | |
| AM | 240 | 20 | 260 | 30 | 290 | 0 | 290 |
| PM | 170 | 30 | 200 | 25 | 225 | 0 | 225 |

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 3020 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 260 | vph |
| Length of first accel/decel lane | 370 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 290 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | | Ramp | | Adjacent Ramp | | |
|---|---|---|---|---|---|---|---|
| Volume, V (vph) | 3020 | | 260 | | 290 | | vph |
| Peak-hour factor, PHF | 0.92 | | 0.92 | | 0.92 | | |
| Peak 15-min volume, v15 | 821 | | 71 | | 79 | | v |
| Trucks and buses | 7 | | 6 | | 11 | | % |
| Recreational vehicles | 0 | | 0 | | 0 | | % |
| Terrain type: | Level | | Level | | Level | | |
| Grade | 0.00 | % | 0.00 | % | 0.00 | % | |
| Length | 0.00 | mi | 0.00 | mi | 0.00 | mi | |
| Trucks and buses PCE, ET | 1.5 | | 1.5* | | 1.5 | | |
| Recreational vehicle PCE, ER | 1.2 | | 1.2 | | 1.2 | | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, $f_{HV}$ | 0.966 | 0.971 | 0.948 | |
| Driver population factor, $f_P$ | 1.00 | 1.00 | 1.00 | |
| Flow rate, $v_p$ | 3397 | 291 | 333 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.662 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2346 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 3397 | 7200 | No |
| $v_{FO} = v_F - v_R$ | 3106 | 7200 | No |
| $v_R$ | 291 | 2000 | No |
| $v_3$ or $v_{av34}$ | 1051 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 2346 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 2346 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.454

Space mean speed in ramp influence area, $S_R$ = 57.3 mph

Space mean speed in outer lanes, $S_O$ = 76.6 mph

Space mean speed for all vehicles, $S$ = 62.1 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/23/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 4335 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 790 | vph |
| Length of first accel/decel lane | 370 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 225 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | | Ramp | | Adjacent Ramp | | |
|---|---|---|---|---|---|---|---|
| Volume, V (vph) | 4335 | | 790 | | 225 | | vph |
| Peak-hour factor, PHF | 0.92 | | 0.92 | | 0.92 | | |
| Peak 15-min volume, v15 | 1178 | | 215 | | 61 | | v |
| Trucks and buses | 7 | | 2 | | 2 | | % |
| Recreational vehicles | 0 | | 0 | | 0 | | % |
| Terrain type: | Level | | Level | | Level | | |
| Grade | 0.00 | % | 0.00 | % | 0.00 | % | |
| Length | 0.00 | mi | 0.00 | mi | 0.00 | mi | |
| Trucks and buses PCE, ET | 1.5 | | 1.5* | | 1.5 | | |
| Recreational vehicle PCE, ER | 1.2 | | 1.2 | | 1.2 | | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.990 | 0.990 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 4877 | 867 | 247 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.598 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3266 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 4877 | 7200 | No |
| $v_{FO} = v_F - v_R$ | 4010 | 7200 | No |
| $v_R$ | 867 | 2000 | No |
| $v_3$ or $v_{av34}$ | 1611 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 3266 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 3266 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D$ = 29.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.506

Space mean speed in ramp influence area, $S_R$ = 55.8 mph

Space mean speed in outer lanes, $S_O$ = 74.4 mph

Space mean speed for all vehicles, $S$ = 60.8 mph

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 3070 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 310 | vph |
| Length of first accel/decel lane | 370 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 290 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 3070 | 310 | 290 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 834 | 84 | 79 | v |
| Trucks and buses | 7 | 6 | 11 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | 0.00 % | 0.00 % | 0.00 % | |
| Length | 0.00 mi | 0.00 mi | 0.00 mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5* | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.971 | 0.948 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 3454 | 347 | 333 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.658 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2390 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 3454 | 7200 | No |
| $v_{FO} = v_F - v_R$ | 3107 | 7200 | No |
| $v_R$ | 347 | 2000 | No |
| $v_3$ or $v_{av34}$ | 1064 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 2390 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 2390 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D$ = 21.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.459

Space mean speed in ramp influence area, $S_R$ = 57.1 mph

Space mean speed in outer lanes, $S_O$ = 76.5 mph

Space mean speed for all vehicles, $S$ = 62.0 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Diverge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/23/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB Off-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Diverge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 4465 | vph |

## Off Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-Flow speed on ramp | 35.0 | mph |
| Volume on ramp | 920 | vph |
| Length of first accel/decel lane | 370 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent ramp | 225 | vph |
| Position of adjacent ramp | Downstream | |
| Type of adjacent ramp | On | |
| Distance to adjacent ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | | Ramp | | Adjacent Ramp | | |
|---|---|---|---|---|---|---|---|
| Volume, V (vph) | 4465 | | 920 | | 225 | | vph |
| Peak-hour factor, PHF | 0.92 | | 0.92 | | 0.92 | | |
| Peak 15-min volume, v15 | 1213 | | 250 | | 61 | | v |
| Trucks and buses | 7 | | 2 | | 2 | | % |
| Recreational vehicles | 0 | | 0 | | 0 | | % |
| Terrain type: | Level | | Level | | Level | | |
| Grade | 0.00 | % | 0.00 | % | 0.00 | % | |
| Length | 0.00 | mi | 0.00 | mi | 0.00 | mi | |
| Trucks and buses PCE, ET | 1.5 | | 1.5* | | 1.5 | | |
| Recreational vehicle PCE, ER | 1.2 | | 1.2 | | 1.2 | | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.990 | 0.990 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 5023 | 1010 | 247 | pcph |

## Estimation of V12 Diverge Areas

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.588 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3370 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{Fi} = v_F$ | 5023 | 7200 | No |
| $v_{FO} = v_F - v_R$ | 4013 | 7200 | No |
| $v_R$ | 1010 | 2000 | No |
| $v_3$ or $v_{av34}$ | 1653 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 3370 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{12}$ | 3370 | 4400 | No |

## Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 29.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

## Speed Estimation

Intermediate speed variable, $D_S$ = 0.519

Space mean speed in ramp influence area, $S_R$ = 55.5 mph

Space mean speed in outer lanes, $S_O$ = 74.2 mph

Space mean speed for all vehicles, $S$ = 60.5 mph

DAVID EVANS AND ASSOCIATES INC.

| SUBJECT | BY | DATE | JOB NO. | SHEET | OF |
|---|---|---|---|---|---|
| MERGE/DIVERGE | TNM | 24-Sep-19 | LSTP0000-0001 | 1 | OF 1 |

SEGMENT NAME : On-Ramp at Lake Street

FREEWAY : I-15 Freeway – Southbound

AM MAINLINE GROWTH FACTOR : 8%

PM MAINLINE GROWTH FACTOR : 9%

RAMP GROWTH FACTOR : 4%

# CONDITION DIAGRAMS

## EXISTING GEOMETRICS

### DIVERGE

| Condition | Existing Condition Traffic | Project Trips | Existing + Project Traffic | Ambient Growth | Existing Ambient + Project Traffic | Cumulative Project Trips | Existing Ambient + Project Cumulative Traffic |
|---|---|---|---|---|---|---|---|
| | 1 | | 3 | | 5 | | 7 |
| **FREEWAY MAINLINE** | | | | | | | |
| AM | 2770 | 0 | 2770 | 20 | 2790 | 0 | 2790 |
| PM | 3560 | 0 | 3560 | 30 | 3590 | 0 | 3590 |
| **RAMP** | | | | | | | |
| AM | 240 | 20 | 260 | 30 | 290 | 0 | 290 |
| PM | 170 | 30 | 200 | 25 | 225 | 0 | 225 |
| **ADJACENT RAMP** | | | | | | | |
| AM | 200 | 30 | 230 | 30 | 260 | 50 | 310 |
| PM | 700 | 45 | 745 | 45 | 790 | 130 | 920 |

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 2790 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 290 | vph |
| Length of first accel/decel lane | 750 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 260 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 2790 | 290 | 260 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 758 | 79 | 71 | v |
| Trucks and buses | 7 | 11 | 6 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.948 | 0.971 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 3139 | 333 | 291 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 504.21 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1879 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 3472 | 7200 | No |
| $v_3$ or $v_{av34}$ | 1260 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 1879 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 3472 | 4600 | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 17.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

| | | |
|---|---|---|
| Intermediate speed variable, | $M_S$ = 0.304 | |
| Space mean speed in ramp influence area, | $S_R$ = 61.5 | mph |
| Space mean speed in outer lanes, | $S_O$ = 67.3 | mph |
| Space mean speed for all vehicles, | $S$ = 63.5 | mph |

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAP (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 3590 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 225 | vph |
| Length of first accel/decel lane | 750 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 790 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 3590 | 225 | 790 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 976 | 61 | 215 | v |
| Trucks and buses | 7 | 2 | 2 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.990 | 0.990 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 4039 | 247 | 867 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 678.40 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2417 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 4286 | 7200 | No |
| $v_3$ or $v_{av34}$ | 1622 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ > 2700 pc/h? | | No | |
| Is $v_3$ or $v_{av34}$ > 1.5 $v_{12}$ /2 | | No | |

If yes, $v_{12A}$ = 2417 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 4286 | 4600 | No |

## Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 21.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: C

## Speed Estimation

| | | | |
|---|---|---|---|
| Intermediate speed variable, | $M_S$ = 0.324 | | |
| Space mean speed in ramp influence area, | $S_R$ = 60.9 | mph | |
| Space mean speed in outer lanes, | $S_0$ = 66.0 | mph | |
| Space mean speed for all vehicles, | $S$ = 62.7 | mph | |

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | AM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 2790 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 290 | vph |
| Length of first accel/decel lane | 750 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 310 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 2790 | 290 | 310 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 758 | 79 | 84 | v |
| Trucks and buses | 7 | 11 | 6 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.948 | 0.971 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 3139 | 333 | 347 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 504.21 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1879 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 3472 | 7200 | No |
| $v_3$ or $v_{av34}$ | 1260 pc/h | (Equation 13-14 or 13-17) | |

Is $v_3$ or $v_{av34}$ > 2700 pc/h? No

Is $v_3$ or $v_{av34}$ > 1.5 $v_{12}$ /2 No

If yes, $v_{12A}$ = 1879 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 3472 | 4600 | No |

## Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 17.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: B

## Speed Estimation

| | | | |
|---|---|---|---|
| Intermediate speed variable, | $M_S$ = 0.304 | | |
| Space mean speed in ramp influence area, | $S_R$ = 61.5 | mph | |
| Space mean speed in outer lanes, | $S_0$ = 67.3 | mph | |
| Space mean speed for all vehicles, | $S$ = 63.5 | mph | |

HCS 2010: Freeway Merge and Diverge Segments Release 6.1

Phone: Fax:
E-mail:

## Merge Analysis

| | |
|---|---|
| Analyst: | TNM |
| Agency/Co.: | David Evans and Associates, In |
| Date performed: | 09/24/2019 |
| Analysis time period: | PM Peak Hour |
| Freeway/Dir of Travel: | I-15 SB On-Ramp |
| Junction: | Lake St. |
| Jurisdiction: | Caltrans |
| Analysis Year: | EAPC (2019) |
| Description: | Lake Street/I-15 Property Traffic Impact Analysis Addendum |

## Freeway Data

| | | |
|---|---|---|
| Type of analysis | Merge | |
| Number of lanes in freeway | 3 | |
| Free-flow speed on freeway | 70.0 | mph |
| Volume on freeway | 3590 | vph |

## On Ramp Data

| | | |
|---|---|---|
| Side of freeway | Right | |
| Number of lanes in ramp | 1 | |
| Free-flow speed on ramp | 35.0 | mph |
| Volume on ramp | 225 | vph |
| Length of first accel/decel lane | 750 | ft |
| Length of second accel/decel lane | | ft |

## Adjacent Ramp Data (if one exists)

| | | |
|---|---|---|
| Does adjacent ramp exist? | Yes | |
| Volume on adjacent Ramp | 920 | vph |
| Position of adjacent Ramp | Upstream | |
| Type of adjacent Ramp | Off | |
| Distance to adjacent Ramp | 3390 | ft |

## Conversion to pc/h Under Base Conditions

| Junction Components | Freeway | Ramp | Adjacent Ramp | |
|---|---|---|---|---|
| Volume, V (vph) | 3590 | 225 | 920 | vph |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | |
| Peak 15-min volume, v15 | 976 | 61 | 250 | v |
| Trucks and buses | 7 | 2 | 2 | % |
| Recreational vehicles | 0 | 0 | 0 | % |
| Terrain type: | Level | Level | Level | |
| Grade | % | % | % | |
| Length | mi | mi | mi | |
| Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5 | |
| Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2 | |

| | | | | |
|---|---|---|---|---|
| Heavy vehicle adjustment, fHV | 0.966 | 0.990 | 0.990 | |
| Driver population factor, fP | 1.00 | 1.00 | 1.00 | |
| Flow rate, vp | 4039 | 247 | 1010 | pcph |

## Estimation of V12 Merge Areas

$L_{EQ}$ = 678.40 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2417 pc/h

## Capacity Checks

| | Actual | Maximum | LOS F? |
|---|---|---|---|
| $v_{FO}$ | 4286 | 7200 | No |
| $v_3$ or $v_{av34}$ | 1622 pc/h | (Equation 13-14 or 13-17) | |
| Is $v_3$ or $v_{av34}$ | > 2700 pc/h? | No | |
| Is $v_3$ or $v_{av34}$ | > 1.5 $v_{12}$ /2 | No | |

If yes, $v_{12A}$ = 2417 (Equation 13-15, 13-16, 13-18, or 13-19)

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | Violation? |
|---|---|---|---|
| $v_{R12}$ | 4286 | 4600 | No |

## Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 21.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence: C

## Speed Estimation

| | | |
|---|---|---|
| Intermediate speed variable, | $M_S$ = 0.324 | |
| Space mean speed in ramp influence area, | $S_R$ = 60.9 | mph |
| Space mean speed in outer lanes, | $S_0$ = 66.0 | mph |
| Space mean speed for all vehicles, | $S$ = 62.7 | mph |