

Traffic Technical Memorandum

for the

Railroad Avenue Bridges

Over Fornat Wash (Br. No. 56C0099; Federal Aid Project No. BRLO-5956(228))

and

Over East Channel Stubbe Wash (Br. No. 56C0101; Federal Aid Project No. BRLO-5956(229))

Submitted To

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TECHNICAL MEMORANDUM

Date: July 2, 2019

To: James Lu, Project Manager – CNS Engineers, Inc.

From: Frank Barrera, Senior Planner – KOA Corporation

Subject: Traffic Impact Analysis of Bridge Replacement on Railroad Avenue
(Br. No. 56C00999 and Br. No. 56C0101)

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INTRODUCTION

KOA Corporation (KOA) is pleased to submit this technical memorandum to document the traffic impacts of re-constructing two bridges located on Railroad Avenue in the census-designated community of Whitewater, California.

Project Description

The County of Riverside (County), in cooperation with California Department of Transportation (Caltrans), proposes to replace the following two (2) existing scour critical and structurally deficient timber bridges along Railroad Avenue near Whitewater in Riverside County, California. The locations of the two bridges are shown on Figure 1.

- Railroad Avenue Bridge over Fornat Wash (Br. No. 56C0099) (Federal Aid Project No. BRLO-5956(228))
- Railroad Avenue Bridge over East Channel Stubbe Wash (Br. No. 56C0101) (Federal Aid Project No. BRLO-5956(229))

Railroad Avenue is an approximately 5-mile stretch of road that runs parallel to Interstate 10 (I-10) and the Union Pacific Railroad (UPRR). It connects Haugen-Lehmann Way and I-10 at the east end and Main Street and I-10 at the west end. It mostly serves the sparsely populated Cabazon community. The average daily traffic (ADT) volume is approximately 211 vehicles. Periodically, the road carries detoured traffic from the heavily traveled I-10 when the freeway is temporarily closed for construction or emergency incidents. The road also serves as an access route for UPRR and utility maintenance crews. Therefore, it is important to maintain this frontage road in sound condition at all times.

The existing timber bridges carry two lanes (one lane in each direction) of traffic over Fornat and East Channel Stubbe Washes. The timber bridges are approximately 59 feet long and are 32 feet wide from curb-to-curb. The County proposes replacing the existing two 2-lane timber bridges along Railroad Avenue with new 2-lane modern bridges with a curb-to-curb roadway width of 32 feet at the same locations.

The bridges are listed in the federal Eligible Bridge List (EBL) as "Structurally Deficient" (SD) with a low Sufficiency Rating (SR) between 59.1 and 62.9. A Sufficiency Rating (SR) is essentially an overall rating of a bridge's fitness for the duty that it performs. The rating is based on a bridge's structural evaluation, functional/geometric obsolescence, and its essentiality to the public. A low SR may be due to structural defects, narrow lanes, low vertical clearance, or any of many possible issues. A bridge is healthy when its SR is more than 80.0. Bridges with SR equal to or less than 80.0 and more than 50.0 require rehabilitation or widening. When the SR falls less than 50.0, bridge replacement shall be considered for public safety. Although the Railroad Avenue bridges carry a status flag of SD with SR ratings between 50 and 80 (qualifying for major rehabilitation), it was determined that the bridges are well beyond their 50-year service life and it would be more cost-efficient to replace the bridges. Additionally, a scour Plan of Action (POA) was performed on the bridges by the County in 2013. The POA recommended total replacement of the bridges as the most cost-effective option due to the extent of the scour, structural instability and deterioration of various timber bridge elements.

The proposed project would replace the existing 2-lane timber bridges with new 2-lane modern bridges. The proposed road width would consist of two 12-foot-wide travel lanes, one lane in each direction, and a 4-foot-wide shoulder on each side. Modern traffic barriers/railings meeting current Caltrans safety design standards would be constructed. The proposed bridges would be approximately 60 feet long depending on the channel hydraulic capacity and water surface freeboard requirements. Potentially the elevation of Fornat Wash Bridge may increase, but by no more than two feet to meet freeboard requirements. The East Channel Stubbe Wash Bridge elevation would remain the same. Additionally, approach roadway improvements would be provided and channel improvements would be administered to avoid future scour problems. It is envisioned that the channel bottom will remain earthen.

Existing underground utilities along the north side of Railroad Avenue and suspended utilities (one 4-inch gas line and a telephone line) along the north side of the East Channel Stubbe Wash Bridge would be affected by construction and may require relocation.

All construction activities would be conducted within the existing roadway right of way with construction staging and material laydown areas on the roadway itself. Railroad Avenue between the two bridges to be replaced would be closed to continuous traffic during construction. The construction duration will be further determined during the project development. It is envisioned that the two bridges will be constructed one at a time to allow access to UPRR facilities and adjacent utilities from the Haugen-Lehmann Way/I-10 Interchange or the Main Street/I-10 Interchange. A Traffic Management Plan (TMP) would be prepared to address closure of the road and access to local utilities and properties.

The proposed construction would require a temporary construction easement (TCE) from UPRR for access to the channel bottom. However, construction activities are expected to stay at least 50 feet from live rail tracks to eliminate any effects on railroad operations. The Railroad Avenue bridges abut adjacent State Bridges (Br. No. 56-166 and Br. No. 56-168) that carry I-10 traffic over the same washes. Structural modifications to the State Bridges are not anticipated; however, this will be evaluated during design. An encroachment permit from Caltrans District 8 would be obtained prior to construction.

ANALYSIS METHODOLOGIES

This section documents the methodologies and assumptions used to conduct the analysis for the proposed bridge replacement project. To determine if any traffic impacts will result after the closure of Railroad Avenue due to bridge construction, three intersections, one roadway segment, and the I-10 freeway were evaluated.

New traffic counts were conducted at the study intersections and roadway segment. Traffic counts were conducted on December 4, 2018. For the study intersections, AM and PM peak hour intersection traffic counts were collected. For the study roadway segment, Average Daily Traffic (ADT) counts were collected. Additionally, Annual Average Daily Traffic (AADT) volumes were evaluated along the I-10 Freeway. AADT data was obtained from the Caltrans PEMS database. The traffic data was used to determine existing traffic conditions for the study intersections, roadway segment, and freeway segments.

The Highway Capacity Manual 2010 methodology was used to determine the existing Level of Service (LOS) of the study intersections. Existing Level of Service analysis of the study intersections was completed using Traffix, a traffic analysis software.

Table 1 shows the study intersections and roadway/freeway segments analyzed. Table 2 shows the roadway segment Level of Service definitions published in the Circulation Element (Chapter 4) of the Riverside County General Plan.

According to the Caltrans Guide for the Preparation of Traffic Impact Studies (December 2002), analysis for freeway segments are conducted using the most current HCM methodology. Freeway segments are based on peak hour HCM density analysis, by passenger car per mile per lane (pc/mi/ln), average speed, and demand to capacity ratios. Table 3 identifies the level of service thresholds for freeway segment locations. These measures indicate how well freeway segments can accommodate traffic flow. According to Caltrans, a target level of service of LOS C should be maintained for freeway segments. However, it is understood that this may not always be feasible.

FIGURE 1 - REGIONAL MAP



TABLE 1 – STUDY INTERSECTIONS AND SEGMENTS

#	Intersection
1	I-10 Eastbound Ramps/Railroad Avenue & Main Street
2	Haugen-Lehmann Way & I-10 Westbound Ramps
3	Haugen-Lehmann Way/Railroad Avenue & I-10 Eastbound ramps
#	Roadway Segment
4	Railroad Avenue west of Haugen-Lehmann Way/I-10 Eastbound ramps
#	Freeway Segment
5	I-10 Freeway west of Main Street Eastbound exit ramps
6	I-10 Freeway east of Main Street Eastbound exit ramps
7	I-10 Freeway west of Haugen-Lehmann Way
8	I-10 Freeway east of Haugen-Lehmann Way

TABLE 2 – LINK/VOLUME CAPACITY/LEVEL OF SERVICE FOR RIVERSIDE COUNTY ROADWAYS

Roadway Classification	Number of Lanes	Maximum Two-Way Traffic Volume (ADT) ⁽²⁾		
		LOS C	LOS D	LOS E
Collector	2	10,400	11,700	13,000
Secondary	4	20,700	23,300	25,900
Major	4	27,300	30,700	34,100
Arterial ⁽³⁾	2	14,400	16,200	18,000
Arterial	4	28,700	32,300	35,900
Mountain Arterial ⁽³⁾	2	12,900	14,500	16,100
Mountain Arterial	3	16,700	18,800	20,900
Mountain Arterial	4	29,800	33,500	37,200
Urban Arterial	4	28,700	32,300	35,900
Urban Arterial	6	43,100	48,500	53,900
Urban Arterial	8	57,400	64,600	71,800
Expressway	4	32,700	36,800	40,900
Expressway	6	49,000	55,200	61,300
Expressway	8	65,400	73,500	81,700
Freeway	4	61,200	68,900	76,500
Freeway	6	94,000	105,800	117,500
Freeway	8	128,400	144,500	160,500
Freeway	10	160,500	180,500	200,600
Ramp ⁽⁴⁾	1	16,000	18,000	20,000

Notes:

(1) All capacity figures are based on optimum conditions and are intended as guidelines for planning purposes only.

(2) Maximum two-way ADT values are based on the 1999 Modified Highway Capacity Manual Level of Service Tables as defined in the Riverside County Congestion Management Program.

(3) Two-lane roadways designed as future arterials that conform to arterial design standards for vertical and horizontal alignment are analyzed as arterials.

(4) Ramp capacity is given as one-way traffic volume.

TABLE 3 – CALTRANS BASIC FREEWAY SEGMENT LEVEL OF SERVICE THRESHOLDS

LOS	Maximum Density (pc/mi/ln)	Maximum Speed (mph)	Maximum V/C	Maximum Service Flow Rate (pc/hr/ln)
A	11	65.0	0.30	710
B	18	65.0	0.50	1,170
C	26	64.6	0.71	1,680
D	35	59.7	0.89	2,090
E	45	52.2	1.00	2,350

Note: pc/mi/ln = Passenger car per mile per lane; mph = Miles per hour; V/C = Volume/capacity;

Source: Caltrans Guide for the Preparation of Traffic Impact Studies, December 2002.

EXISTING CONDITION

Based on the intersection lane geometries depicted on Figure 2 and the existing AM and PM peak hour intersection traffic volumes illustrated on Figure 3, levels of service (LOS) were determined for each of the study intersections during the weekday AM and PM peak hours. Peak hour factors (PHF) based on existing traffic counts were utilized.

Table 4 summarizes the LOS values of the three study intersections for existing traffic conditions.

TABLE 4– INTERSECTION PERFORMANCE: EXISTING CONDITIONS

Study Intersection		AM Peak Hour		PM Peak Hour	
		Delay (sec)	LOS	Delay (sec)	LOS
1	I-10 Eastbound Ramps/Railroad Avenue & Main Street	13.0	B	11.9	B
2	Haugen-Lehmann Way & I-10 Westbound Ramps	9.1	A	9.1	A
3	Haugen-Lehmann Way/Railroad Avenue & I-10 Eastbound Ramps	9.4	A	9.4	A

LOS = Level-of-Service

As shown in Table 4, all study intersections are currently operating at LOS B or better during the weekday AM and PM peak hours. Table 5 summarizes the ADT and LOS values of the roadway and freeway segments for the existing traffic conditions.

TABLE 5– ROADWAY/FREEWAY SEGMENT PERFORMANCE: EXISTING CONDITIONS

Roadway/Freeway Segment		Roadway Section (Number of lanes)	Roadway Capacity (LOS E)	Existing 2018		
				ADT/AADT	V/C	LOS
4	Railroad Avenue west of Haugen-Lehmann Way & I-10 Eastbound ramps	2	13,000	339	0.026	<C
5	I-10 Freeway west of Main Street ramps	8	160,500	103,000	0.641	<C
6	I-10 Freeway east of Main Street ramps	8	160,500	108,000	0.673	<C
7	I-10 Freeway west of Haugen-Lehmann Way	8	160,500	113,000	0.704	<C
8	I-10 Freeway east of Haugen-Lehmann Way	8	160,500	113,000	0.704	<C

ADT = Average Daily Traffic; AADT = Annual Average Daily Traffic; LOS = Level-of-Service

As shown in Table 5, all roadway and freeway segments currently operate at a level of service better than LOS C. Existing traffic volumes (ADT/AADT) on Railroad Avenue and the I-10 Freeway are shown on Figure 3.

The Existing Year (2018) traffic analysis conditions worksheets for the three study intersections are provided in Appendix A of this report.

FIGURE 2 - EXISTING LANE GEOMETRY

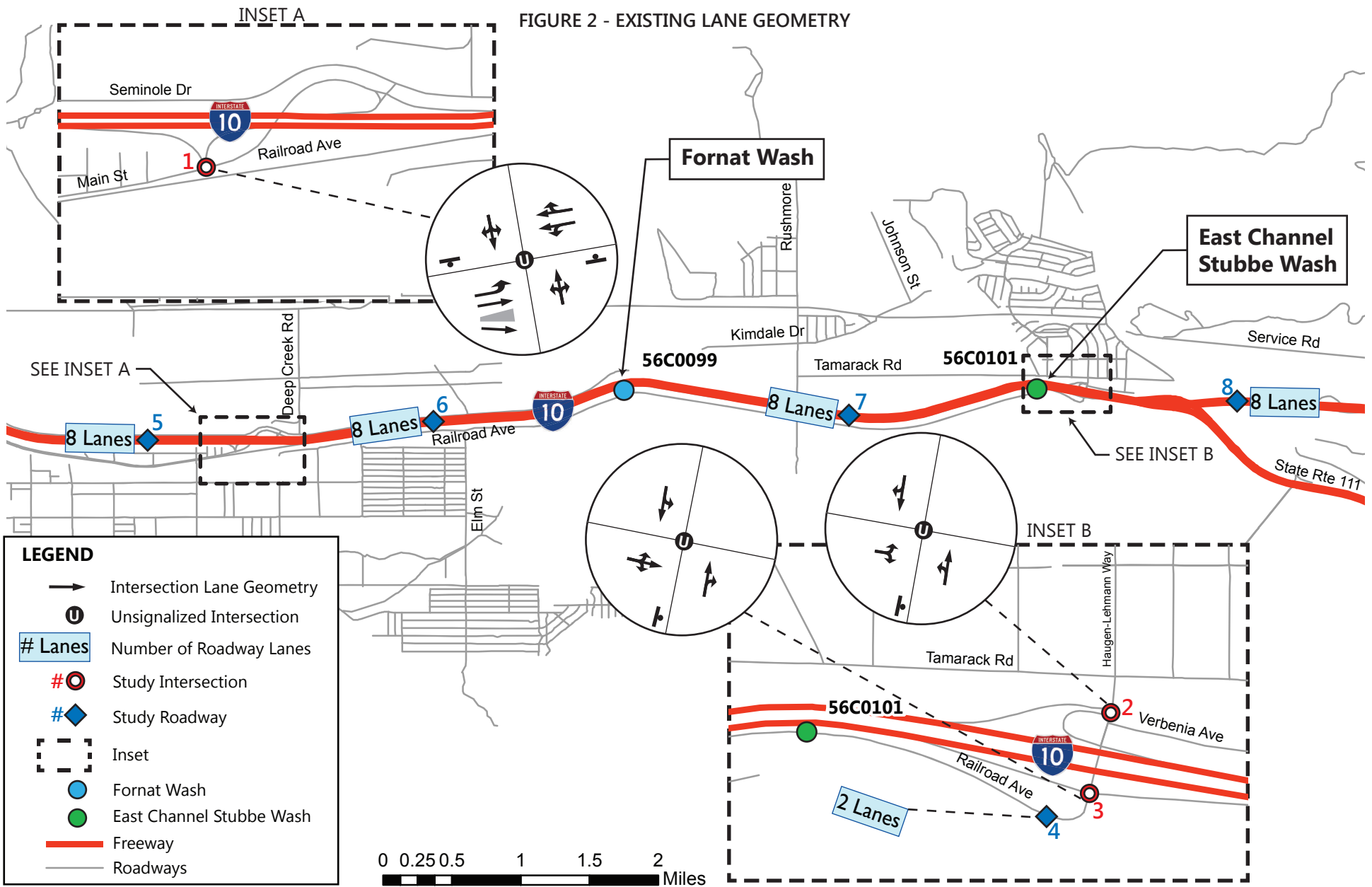
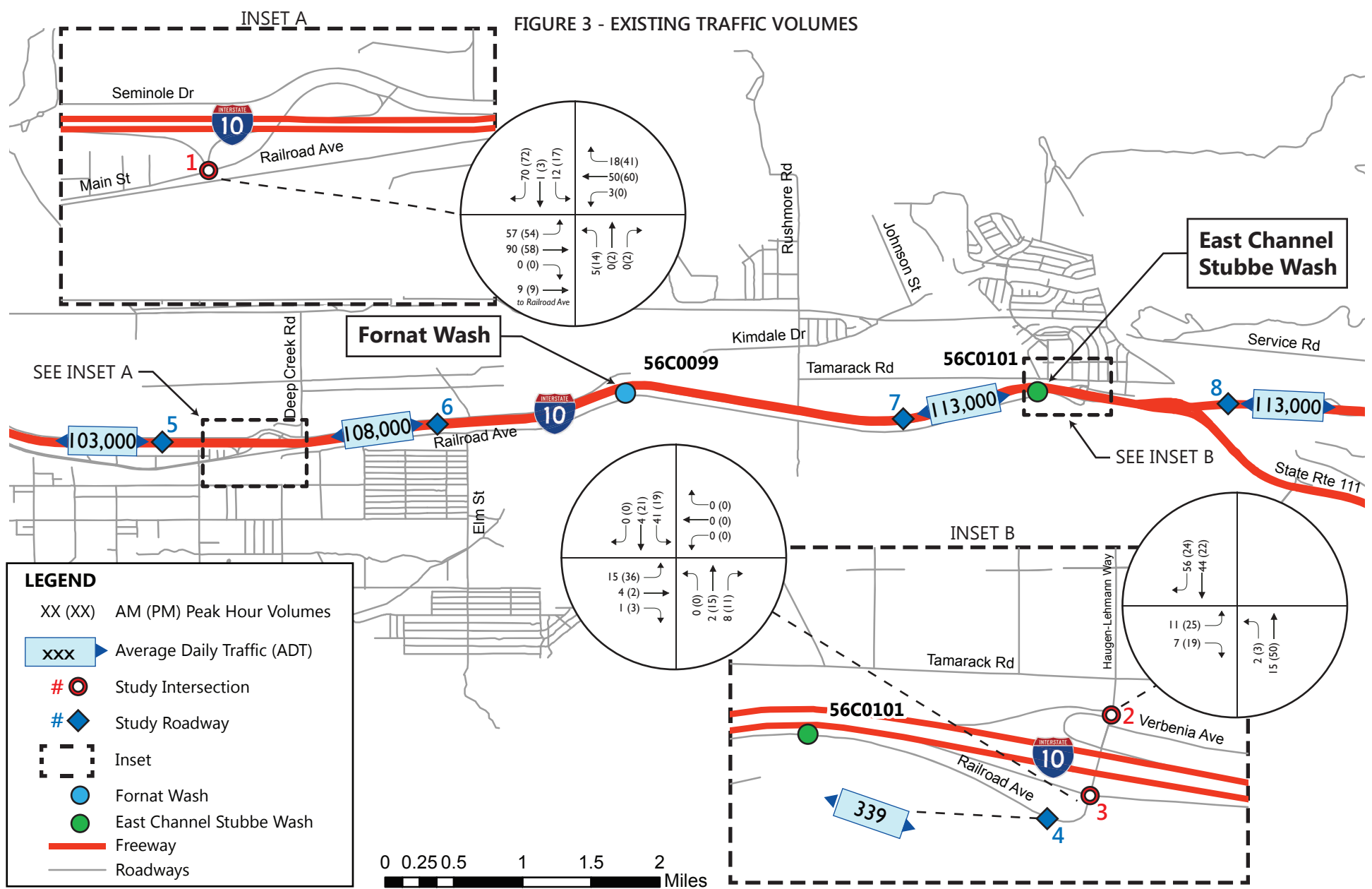


FIGURE 3 - EXISTING TRAFFIC VOLUMES



ANALYSIS OF CONSTRUCTION IMPACTS

When Railroad Avenue is closed for the construction of the two bridges, existing traffic travelling on Railroad Avenue will instead have to travel using the I-10 Freeway.

Table 6 summarizes the total traffic during the AM and PM peak hour observed entering and exiting Railroad Avenue at each of the two off-ramps analyzed. The total volume of vehicles heading in and out of Railroad Avenue at any ramp during any peak hour is not higher than 50 vehicles at the Haugen-Lehmann Way off-ramp and 30 vehicles at the Main Street off-ramp.

TABLE 6 – EXISTING VOLUMES ENTERING AND EXITING RAILROAD AVENUE

Study Intersection		AM Peak Hour		PM Peak Hour	
		In	Out	In	Out
1	I-10 Eastbound Ramps/Railroad Avenue & Main Street	13	5	12	18
3	Haugen-Lehmann Way & I-10 Eastbound ramps	5	10	24	26

Currently, the highest AADT count on the freeway segments within the vicinity of the construction area is 113,000 vehicles. An 8-lane freeway, as exemplified by this segment of the I-10, would be considered to be at LOS C, an acceptable level of traffic stress, for a maximum two-way ADT of 128,400, over 15,000 ADT higher than existing conditions. Since the ADT volumes along Railroad Avenue are only 339 vehicles, it can be expected that the closure of Railroad Avenue will have negligible traffic impacts to the I-10 freeway adjacent to the project study area.

The peak hour volume is only 18 vehicles during the AM peak hour and 30 vehicles during the PM peak hour entering and exiting Railroad Avenue at I-10 Eastbound ramps and Main Street, and 15 vehicles in the AM peak hour and 50 vehicles during the PM peak hour entering and exiting Railroad Avenue at Haugen-Lehmann Way and I-10 Eastbound ramps. These peak hour vehicle movements will be redistributed at the study intersections to use the I-10 freeway during the project construction. It can be expected that the closure of Railroad Avenue will have negligible traffic impacts at these study intersections as the study intersections currently operate at LOS B or better.

LOCAL ACCESS IMPACTS

The intersection of I-10 Eastbound ramps/Railroad Avenue at Main Street provides access to Main Street and Railroad Avenue. Since Railroad Avenue access can be closed at the south leg of the intersection, freeway ramp closures are not recommended as the I-10 Eastbound ramps provide access to local roadways via Main Street and the I-10 Westbound ramps. The intersection of I-10 Eastbound ramps at Haugen-Lehmann Way/Railroad Avenue provides access to the community and local roadways north of the I-10 Freeway. Since Railroad Avenue access can be closed at the south leg of the intersection, freeway ramp closures are not recommended as the I-10 Eastbound ramps provide access to the local roadways via Haugen-Lehmann Way and access to the I-10 Westbound ramps.

Additionally, other than the I-10 freeway as a detour route, there are no other viable detour routes between the I-10 Freeway Main Street Interchange and the I-10 Freeway Haugen-Lehmann Way Interchange with the closure of Railroad Avenue. Since Railroad Avenue will not be accessible during the construction of the new bridges, the I-10 intersection ramps at Main Street and Haugen-Lehmann Way should remain open for any traffic detours needed from eastbound to westbound directions and vice versa, due to traffic accidents or other situations that may occur along the I-10 Freeway segment between these two interchanges. There are also no intersections located along Railroad Avenue between the two I-10 Freeway interchanges as the roadway is located between the I-10 Freeway and the UPRR.

TRAFFIC IMPACT ANALYSIS CONCLUSION

Two bridges to be replaced on Railroad Avenue including the Fornat Wash Bridge (Br. No. 56C0099) and the East Channel Stubbe Wash (Br. No. 56C0101) will result in the closure of Railroad Avenue between Main Street and Haugen-Lehmann Way. KOA has determined that the existing volumes entering and exiting this roadway are very low, and that any traffic taking this route will instead travel on the freeway. Traffix, a traffic analysis software, was used to evaluate existing LOS of intersections adjacent to freeway on- and off-ramps and ADT volumes were taken from the PEMS network. Because the freeway and intersections adjacent to the on- and off-ramps for the freeway are all currently performing at an LOS C or better, it is expected that the shift of a low volume of traffic from Railroad Avenue to the freeway will not cause significant traffic impacts.

It is recommended that the I-10 intersection ramps at Main Street and Haugen-Lehmann Way remain open for any traffic detours needed from eastbound to westbound directions and vice versa.

TRAFFIC MANAGEMENT PLAN (TMP)

Traffic Impacts

Traffic flow along Railroad Avenue will be affected throughout the duration of the project due to the construction of the two bridges (Fornat Wash Bridge (Br. No. 56C0099) and East Channel Stubbe Wash Bridge (Br. No. 56C0101)). As discussed in the traffic analysis, the total volume of vehicles heading in and out of Railroad Avenue at any ramp during any peak hour is not higher than 50 vehicles at the I-10 Freeway Haugen-Lehmann Way Interchange and not higher than 30 vehicles at the I-10 Freeway Main Street Interchange. During the construction of the two bridges on Railroad Avenue, the I-10 Freeway mainlines would remain open along with the on/off-ramps at the two interchanges. Traffic that would typically travel along Railroad Avenue would be diverted to the I-10 Freeway.

UPRR and utility maintenance crew vehicles would be affected throughout the duration of the project. Portions of Railroad Avenue, west of the Fornat Wash Bridge and east of the East Channel Stubbe Wash Bridge would remain accessible for the UPRR and utility maintenance vehicles.

It is envisioned that the two bridges would be constructed one at a time to allow access to UPRR facilities and adjacent utilities from the Haugen-Lehmann Way/I-10 interchange or the Main Street/I-10 Interchange. This would allow UPRR and utility maintenance vehicles to have access to the areas between the two bridges during construction.

Emergency personnel will be allowed access through the construction site at all times.

Traffic Management Plan (TMP) and Public Outreach

A Traffic Management Plan (TMP) outlines steps to minimize traffic impacts and delays associate with this project. The TMP summarizes the procedures that may be used to minimize traffic impacts and the process for distribution of accurate and timely information to the public.

A TMP and public outreach will be conducted to inform the public of roadway closures for the construction of the new bridges on Railroad Avenue.



APPENDIX A:

STUDY INTERSECTION ANALYSIS WORKSHEETS

RCTD Bridge TCP
Existing Conditions
AM Peak Hour

Scenario Report

Scenario: Existing AM

Command: Existing AM
Volume: AM
Geometry: Default Geometry
Impact Fee: Default Impact Fee
Trip Generation: None
Trip Distribution: Existing
Paths: Default Path
Routes: Default Route
Configuration: Existing

RCTD Bridge TCP
Existing Conditions
AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base			Future			Change in
	LOS	Veh	C	LOS	Veh	C	
# 1 I-10 Eastbound Ramps/Railroad	B	13.0	0.104	B	13.0	0.104	+ 0.000 D/V
# 2 Haugen-Lehmann Way & I-10 West	A	9.1	0.026	A	9.1	0.026	+ 0.000 D/V
# 3 Haugen-Lehmann Way/Railroad Av	A	9.4	0.032	A	9.4	0.032	+ 0.000 D/V

RCTD Bridge TCP
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1 I-10 Eastbound Ramps/Railroad Ave & Main St

Average Delay (sec/veh): 4.6 Worst Case Level Of Service: B[13.0]

Street Name: I-10 Eastbound Ramps/Railroad Ave Main St
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R

Control: Stop Sign Stop Sign Uncontrolled Uncontrolled
Rights: Include Include Include Include
Lanes: 1 0 0 0 0 0 0 1! 0 0 0 0 1! 0 0

Volume Module:
Base Vol: 5 0 0 12 1 70 57 90 0 3 50 18
Growth 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
Initial Bse: 5 0 0 12 1 70 57 90 0 3 50 18
Added Vol: 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 5 0 0 12 1 70 57 90 0 3 50 18
User 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
PHF Adj: 0.63 0.63 0.63 0.67 0.67 0.67 0.67 0.67 0.67 0.89 0.89 0.89
PHF Volume: 8 0 0 18 1 105 85 134 0 3 56 20
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
FinalVolume: 8 0 0 18 1 105 85 134 0 3 56 20

Critical Gap Module:
Critical Gp: 7.1 xxxx xxxxx 7.1 6.5 6.2 4.1 xxxx xxxxx 4.1 xxxx xxxxx
FollowUpTIm: 3.5 xxxx xxxxx 3.5 4.0 3.3 2.2 xxxx xxxxx 2.2 xxxx xxxxx

Capacity Module:
Cnflct Vol: 430 xxxx xxxxx 377 377 66 77 xxxx xxxxx 134 xxxx xxxxx
Potent Cap.: 539 xxxx xxxxx 584 558 1003 1535 xxxx xxxxx 1463 xxxx xxxxx
Move Cap.: 460 xxxx xxxxx 557 524 1003 1535 xxxx xxxxx 1463 xxxx xxxxx
Volume/Cap: 0.02 xxxx xxxxx 0.03 0.00 0.10 0.06 xxxx xxxxx 0.00 xxxx xxxxx

Level Of Service Module:
2Way95thQ: 0.1 xxxx xxxxx xxxx xxxx xxxxx 0.2 xxxx xxxxx 0.0 xxxx xxxxx
Control Del: 13.0 xxxx xxxxx xxxxx xxxx xxxxx 7.5 xxxx xxxxx 7.5 xxxx xxxxx
LOS by Move: B * * * * * A * * * * * A * * * * *
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx xxxx 890 xxxxx xxxx xxxx xxxxx xxxx xxxx xxxxx
SharedQueue:xxxxxx xxxx xxxxx xxxxx 0.5 xxxxx 0.2 xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxxx xxxx xxxxx xxxxx 9.7 xxxxx 7.5 xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS: * * * * * A * * * * * A * * * * *
ApproachDel: 13.0 9.7 xxxxxxx xxxxxxx
ApproachLOS: B A * *

Note: Queue reported is the number of cars per lane.

RCTD Bridge TCP
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 Haugen-Lehmann Way & I-10 Westbound Ramps

Average Delay (sec/veh): 1.8 Worst Case Level Of Service: A[9.1]

Street Name: Haugen-Lehmann Way I-10 Westbound Ramps
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R

Control: Uncontrolled Uncontrolled Stop Sign Stop Sign
Rights: Include Include Include Include
Lanes: 0 1 0 0 0 0 0 0 1 0 0 0 1! 0 0 0 0 0 0 0

Volume Module:
Base Vol: 2 15 0 0 44 56 11 0 7 0 0 0
Growth 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
Initial Bse: 2 15 0 0 44 56 11 0 7 0 0 0
Added Vol: 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 2 15 0 0 44 56 11 0 7 0 0 0
User 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
PHF Adj: 0.73 0.73 0.73 0.72 0.72 0.72 0.49 0.49 0.49 0.86 0.86 0.86
PHF Volume: 3 20 0 0 61 78 23 0 14 0 0 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
FinalVolume: 3 20 0 0 61 78 23 0 14 0 0 0

Critical Gap Module:
Critical Gp: 4.1 xxxx xxxxx xxxxx xxxx xxxxx 6.4 6.5 6.2 xxxxx xxxx xxxxx
FollowUpTIm: 2.2 xxxx xxxxx xxxxx xxxx xxxxx 3.5 4.0 3.3 xxxxx xxxx xxxxx

Capacity Module:
Cnflct Vol: 139 xxxx xxxxx xxxx xxxx xxxxx 126 126 100 xxxx xxxx xxxxx
Potent Cap.: 1457 xxxx xxxxx xxxx xxxx xxxxx 873 768 961 xxxx xxxx xxxxx
Move Cap.: 1457 xxxx xxxxx xxxx xxxx xxxxx 872 767 961 xxxx xxxx xxxxx
Volume/Cap: 0.00 xxxx xxxxx xxxx xxxx xxxxx 0.03 0.00 0.01 xxxx xxxx xxxxx

Level Of Service Module:
2Way95thQ: 0.0 xxxx xxxxx xxxx xxxx xxxxx xxxx xxxx xxxxx xxxx xxxx xxxxx
Control Del: 7.5 xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move: A * * * * * * * * * * * * * * *
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx xxxx xxxx xxxxx xxxx 905 xxxxx xxxx xxxx xxxxx
SharedQueue: 0.0 xxxx xxxxx xxxxx xxxx xxxxx xxxxx 0.1 xxxxx xxxxx xxxx xxxxx
Shrd ConDel: 7.5 xxxx xxxxx xxxxx xxxx xxxxx xxxxx 9.1 xxxxx xxxxx xxxx xxxxx
Shared LOS: A * * * * * * * * * * * A * * * * *
ApproachDel: xxxxxx xxxxxx 9.1 xxxxxx
ApproachLOS: * * * * * A *

Note: Queue reported is the number of cars per lane.

RCTD Bridge TCP
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Haugen-Lehmann Way/Railroad Avenue & I-10 Eastbound Ramps

Average Delay (sec/veh): 6.1 Worst Case Level Of Service: A[9.4]

Street Name:Haugen-Lehmann Way/Raillroad Aven I-10 Eastbound Ramps
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R

Control: Uncontrolled Uncontrolled Stop Sign Stop Sign
Rights: Include Include Include Include
Lanes: 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0

Volume Module:
Base Vol: 0 2 8 41 4 0 15 4 1 0 0 0
Growth 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
Initial Bse: 0 2 8 41 4 0 15 4 1 0 0 0
Added Vol: 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 0 2 8 41 4 0 15 4 1 0 0 0
User 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
PHF Adj: 0.50 0.50 0.50 0.80 0.80 0.80 0.71 0.71 0.71 1.00 1.00 1.00
PHF Volume: 0 4 16 51 5 0 21 6 1 0 0 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
FinalVolume: 0 4 16 51 5 0 21 6 1 0 0 0

Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx 4.1 xxxx xxxxxx 6.4 6.5 6.2 xxxxxx xxxx xxxxxx
FollowUpTim:xxxxx xxxx xxxxxx 2.2 xxxx xxxxxx 3.5 4.0 3.3 xxxxxx xxxx xxxxxx

Capacity Module:
Cnflct Vol: xxxx xxxx xxxxxx 20 xxxx xxxxxx 119 127 5 xxxx xxxx xxxxxx
Potent Cap.: xxxx xxxx xxxxxx 1609 xxxx xxxxxx 882 767 1084 xxxx xxxx xxxxxx
Move Cap.: xxxx xxxx xxxxxx 1609 xxxx xxxxxx 860 742 1084 xxxx xxxx xxxxxx
Volume/Cap: xxxx xxxx xxxx 0.03 xxxx xxxx 0.02 0.01 0.00 xxxx xxxx xxxx

Level Of Service Module:
2Way95thQ: xxxx xxxx xxxxxx 0.1 xxxx xxxxxx xxxx xxxx xxxxxx xxxx xxxx xxxxxx
Control Del:xxxxx xxxx xxxxxx 7.3 xxxx xxxxxx xxxxxx xxxx xxxxxx xxxxxx xxxx xxxxxx
LOS by Move: * * * A * * * * * * * * * * *
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxxx xxxx xxxx xxxxxx xxxx 842 xxxxxx xxxx xxxx xxxxxx
SharedQueue:xxxxxx xxxx xxxxxx 0.1 xxxxx xxxxxx xxxxxx 0.1 xxxxxx xxxxxx xxxx xxxxxx
Shrd ConDel:xxxxxx xxxx xxxxxx 7.3 xxxxx xxxxxx xxxxxx 9.4 xxxxxx xxxxxx xxxx xxxxxx
Shared LOS: * * * A * * * A * * * * *
ApproachDel: xxxxxxx xxxxxxx 9.4 xxxxxxx
ApproachLOS: * * A *

Note: Queue reported is the number of cars per lane.

RCTD Bridge TCP
Existing Conditions
PM Peak Hour

Scenario Report

Scenario: Existing PM

Command: Existing PM
Volume: PM
Geometry: Default Geometry
Impact Fee: Default Impact Fee
Trip Generation: None
Trip Distribution: Existing
Paths: Default Path
Routes: Default Route
Configuration: Existing

RCTD Bridge TCP
Existing Conditions
PM Peak Hour

Impact Analysis Report
Level Of Service

Intersection		Base		Future		Change in
		LOS	Veh C	LOS	Veh C	
# 1 I-10 Eastbound Ramps/Railroad	B	11.9	0.087	B	11.9 0.087	+ 0.000 D/V
# 2 Haugen-Lehmann Way & I-10 West	A	9.1	0.034	A	9.1 0.034	+ 0.000 D/V
# 3 Haugen-Lehmann Way/Railroad Av	A	9.4	0.060	A	9.4 0.060	+ 0.000 D/V

RCTD Bridge TCP
Existing Conditions
PM Peak Hour

Level of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1 I-10 Eastbound Ramps/Railroad Ave & Main St

Average Delay (sec/veh): 5.0 Worst Case Level Of Service: B[11.9]

Street Name: I-10 Eastbound Ramps/Railroad Ave Main St
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R

Control: Stop Sign Stop Sign Uncontrolled Uncontrolled
Rights: Include Include Include Include
Lanes: 0 0 1! 0 0 0 0 1! 0 0 0 0 1 0 0 0 1 0

Volume Module:
Base Vol: 14 2 2 17 3 72 54 58 0 0 60 41
Growth 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
Initial Bse: 14 2 2 17 3 72 54 58 0 0 60 41
Added Vol: 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 14 2 2 17 3 72 54 58 0 0 60 41
User 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
PHF Adj: 0.45 0.45 0.45 0.85 0.85 0.85 0.78 0.78 0.78 0.84 0.84 0.84
PHF Volume: 31 4 4 20 4 85 70 75 0 0 71 49
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
FinalVolume: 31 4 4 20 4 85 70 75 0 0 71 49

Critical Gap Module:
Critical Gp: 7.1 6.5 6.2 7.1 6.5 6.2 4.1 xxxx xxxxx xxxxx xxxxx xxxxx
FollowUpTIm: 3.5 4.0 3.3 3.5 4.0 3.3 2.2 xxxx xxxxx xxxxx xxxxx xxxxx

Capacity Module:
Cnflct Vol: 354 334 75 314 310 96 120 xxxx xxxxx xxxxx xxxxx xxxxx
Potent Cap.: 605 590 992 643 608 966 1480 xxxx xxxxx xxxxx xxxxx xxxxx
Move Cap.: 529 561 992 612 578 966 1480 xxxx xxxxx xxxxx xxxxx xxxxx
Volume/Cap: 0.06 0.01 0.00 0.03 0.01 0.09 0.05 xxxx xxxxx xxxxx xxxxx xxxxx

Level Of Service Module:
2Way95thQ: xxxx xxxx xxxxx xxxx xxxx xxxxx 0.1 xxxx xxxxx xxxxx xxxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx 7.6 xxxx xxxxx xxxxx xxxxx xxxxx
LOS by Move: *
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT
Shared Cap.: xxxx 562 xxxxx xxxx 856 xxxxx xxxx xxxx xxxxx xxxxx xxxxx xxxxx
SharedQueue:xxxxx 0.2 xxxxx xxxxx 0.4 xxxxx 0.1 xxxx xxxxx xxxxx xxxxx xxxxx
Shrd ConDel:xxxxx 11.9 xxxxx xxxxx 9.8 xxxxx 7.6 xxxx xxxxx xxxxx xxxxx xxxxx
Shared LOS: * B * * * A * A * * * * * * * * * * * *
ApproachDel: 11.9 9.8 xxxxxxx xxxxxxx
ApproachLOS: B A *

Note: Queue reported is the number of cars per lane.

RCTD Bridge TCP
Existing Conditions
PM Peak Hour

Level of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 Haugen-Lehmann Way & I-10 Westbound Ramps

Average Delay (sec/veh): 2.6 Worst Case Level Of Service: A[9.1]

Street Name: Haugen-Lehmann Way I-10 Westbound Ramps
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R

Control: Uncontrolled Uncontrolled Stop Sign Stop Sign
Rights: Include Include Include Include
Lanes: 0 1 0 0 0 0 0 0 1 0 0 0 1! 0 0 0 0 0 0 0

Volume Module:
Base Vol: 3 50 0 0 22 24 25 0 19 0 0 0
Growth 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
Initial Bse: 3 50 0 0 22 24 25 0 19 0 0 0
Added Vol: 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 3 50 0 0 22 24 25 0 19 0 0 0
User 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
PHF Adj: 0.83 0.83 0.83 0.57 0.57 0.57 0.85 0.85 0.85 1.00 1.00 1.00
PHF Volume: 4 60 0 0 38 42 30 0 22 0 0 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
FinalVolume: 4 60 0 0 38 42 30 0 22 0 0 0

Critical Gap Module:
Critical Gp: 4.1 xxxx xxxxx xxxxx xxxx xxxxx 6.4 6.5 6.2 xxxxx xxxxx xxxxx
FollowUpTIm: 2.2 xxxx xxxxx xxxxx xxxx xxxxx 3.5 4.0 3.3 xxxxx xxxxx xxxxx

Capacity Module:
Cnflct Vol: 80 xxxx xxxxx xxxxx xxxxx xxxxx 127 127 59 xxxx xxxxx xxxxx
Potent Cap.: 1531 xxxx xxxxx xxxxx xxxxx xxxxx 873 767 1012 xxxx xxxxx xxxxx
Move Cap.: 1531 xxxx xxxxx xxxxx xxxxx xxxxx 871 766 1012 xxxx xxxxx xxxxx
Volume/Cap: 0.00 xxxx xxxxx xxxxx xxxxx xxxxx 0.03 0.00 0.02 xxxx xxxxx xxxxx

Level Of Service Module:
2Way95thQ: 0.0 xxxx xxxxx xxxxx xxxxx xxxxx xxxx xxxx xxxxx xxxxx xxxxx xxxxx
Control Del: 7.4 xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx
LOS by Move: A *
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx xxxxx xxxxx xxxxx xxxx 927 xxxxx xxxx xxxxx xxxxx
SharedQueue: 0.0 xxxx xxxxx xxxxx xxxxx xxxxx xxxxx 0.2 xxxxx xxxxx xxxxx xxxxx
Shrd ConDel: 7.4 xxxx xxxxx xxxxx xxxxx xxxxx xxxxx 9.1 xxxxx xxxxx xxxxx xxxxx
Shared LOS: A * * * * * * * * * * * A * * * * * *
ApproachDel: xxxxxxx xxxxxxx 9.1 xxxxxxx
ApproachLOS: * * * * * A *

Note: Queue reported is the number of cars per lane.

RCTD Bridge TCP
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Haugen-Lehmann Way/Railroad Avenue & I-10 Eastbound Ramps

Average Delay (sec/veh): 5.1 Worst Case Level Of Service: A[9.4]

Street Name:Haugen-Lehmann Way/Railroad Aven I-10 Eastbound Ramps
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R

Control: Uncontrolled Uncontrolled Stop Sign Stop Sign
Rights: Include Include Include Include
Lanes: 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0

Volume Module:
Base Vol: 0 15 11 19 21 0 36 2 3 0 0 0
Growth 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
Initial Bse: 0 15 11 19 21 0 36 2 3 0 0 0
Added Vol: 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 0 15 11 19 21 0 36 2 3 0 0 0
User 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
PHF Adj: 0.81 0.81 0.81 0.67 0.67 0.67 0.68 0.68 0.68 1.00 1.00 1.00
PHF Volume: 0 18 14 28 31 0 53 3 4 0 0 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
FinalVolume: 0 18 14 28 31 0 53 3 4 0 0 0

Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx 4.1 xxxx xxxxxx 6.4 6.5 6.2 xxxxxx xxxx xxxxxx
FollowUpTim:xxxxx xxxx xxxxxx 2.2 xxxx xxxxxx 3.5 4.0 3.3 xxxxxx xxxx xxxxxx

Capacity Module:
Cnflct Vol: xxxx xxxx xxxxxx 32 xxxx xxxxxx 114 120 31 xxxx xxxx xxxxxx
Potent Cap.: xxxx xxxx xxxxxx 1593 xxxx xxxxxx 888 774 1048 xxxx xxxx xxxxxx
Move Cap.: xxxx xxxx xxxxxx 1593 xxxx xxxxxx 875 760 1048 xxxx xxxx xxxxxx
Volume/Cap: xxxx xxxx xxxx 0.02 xxxx xxxx 0.06 0.00 0.00 xxxx xxxx xxxx

Level Of Service Module:
2Way95thQ: xxxx xxxx xxxxxx 0.1 xxxx xxxxxx xxxx xxxx xxxxxx xxxx xxxx xxxxxx
Control Del:xxxxx xxxx xxxxxx 7.3 xxxx xxxxxx xxxxxx xxxx xxxxxx xxxxxx xxxx xxxxxx
LOS by Move: * * * A * * * * * * * * * * *
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxxx xxxx xxxx xxxxxx xxxx 879 xxxxxx xxxx xxxx xxxxxx
SharedQueue:xxxxx xxxx xxxxxx 0.1 xxxx xxxxxx xxxxxx 0.2 xxxxxx xxxxxx xxxx xxxxxx
Shrd ConDel:xxxxx xxxx xxxxxx 7.3 xxxx xxxxxx xxxxxx 9.4 xxxxxx xxxxxx xxxx xxxxxx
Shared LOS: * * * A * * * A * * * * *
ApproachDel: xxxxxx xxxxxx 9.4 xxxxxx
ApproachLOS: * * A *

Note: Queue reported is the number of cars per lane.