

 INTERSECTION CONTROL EVALUATION

US 101 SOUTHBOUND RAMPS AT TERVEN AVENUE/ AIRPORT BOULEVARD

SALINAS, CALIFORNIA

Prepared for:

City of Salinas
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Salinas, California 93901
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August 2021

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Intersection Control Evaluation

US 101 Southbound Ramps at Terven Avenue/Airport Boulevard in Salinas, CA

INTRODUCTION

An Intersection Control Evaluation (ICE) was completed for the intersection of Terven Avenue and Airport Boulevard (the “study intersection”) in Salinas, California. The proposed project assumed in the ICE analysis is consistent with the *Transportation Impact Analysis – Draft for Airport Industrial Park*¹ (“Project TIA”), prepared by Kimley-Horn in September 2019. The study intersection will be impacted by the planned development of an industrial park project at the Salinas Municipal Airport which includes the proposed construction of 65,166 square feet of warehousing and 65,166 square feet of light industrial land uses (“Project”) located on the east side of US 101 across Airport Boulevard.

The existing four-legged intersection operates as signalized intersection with significant vehicle delay and queuing at each of the approaches. Background and project growths are expected to increase demand at the study intersection until the construction of Harris Road interchange is complete. The new interchange south of Salinas will create a shift in traffic volume and it will alleviate some of the traffic demand at the study intersection. Two of the intersection’s legs are on/off ramps for US 101 and will need to address HDM (highway design manual) standards. The purpose of this ICE is to determine a viable intersection layout to accommodate demand until the Harris Road interchange project is completed, and demand is relieved at the project intersection. The existing layout’s non-standard HDM designs will be noted.

The following intersection control improvement alternatives were evaluated in this ICE Analysis:

- Existing signal (no improvements)
- Improved traffic signal
- Roundabout

EXISTING CONDITION AND PROPOSED ALTERNATIVES

Existing Conditions

Airport Boulevard is a primary southwest to northeast arterial between industrial facilities and the Salinas Municipal Airport. US 101 splits Airport Boulevard in half. The project intersection is located along Airport Boulevard, just to the west of US 101. Airport Boulevard has two lanes in each direction with a two-way left-turn lane (TWLTL) and has a posted speed limit of 45 MPH. The northeasterly leg of the intersection is comprised of US 101 southbound (SB) on and off ramps. Terven Avenue runs northwest to southeast between South Sanborn Road to the north and merges with Airport Boulevard just south of the project intersection. Terven Avenue, the northwest leg of the intersection, has one lane in each direction with a posted speed limit of 25 MPH. The existing intersection has a continuous right-turn bypass lane on the eastbound (EB) approach and a yield-controlled right-turn bypass lane on the northbound (NB) approach onto the SB US 101 loop on-ramp. There are sidewalks on both sides of Terven Avenue and along the north side of Airport Boulevard. The existing intersection includes crosswalks across the north and west legs. There are no present bicycle facilities.

Analysis Scenarios

Design year traffic scenarios were developed using the traffic volume provided in the Project TIA to establish project baseline conditions and to evaluate the effectiveness of intersection control strategies at

¹ *Transportation Impact Analysis – Draft for Airport Industrial Park*, Kimley-Horn, September, 2019.

the study intersection. As directed by the city of Salinas (the “City”), TAMC, and Caltrans District 4, the weekday AM and PM peak-hour traffic analyses were completed for the following scenarios:

- Opening Year Plus Project (2025) Conditions
 - Includes project and background development anticipated to occur by the time the project is constructed. The volume forecasts are based on a list of pending and approved development projects provided by the City.
- Service Life Plus Project and Median Closures (2035) Conditions
 - Includes the project, background growth, and rerouted vehicles from anticipated median closures at five intersections south of the study intersection. This is the critical year – demand at the project intersection is the greatest it will be. Once the Harris Road interchange project is constructed, demand at the project intersection will be reduced.
- Service Life Plus Project after Interchange Opens (2036) Conditions
 - Includes the project and the decreased demand as a result of the shift in traffic from the completion of Harris Road interchange.
- Design Life Plus Project (2045) Conditions
 - Based on Cumulative plus Project volumes provided on Figures 13 of the original TIA.

See **Appendix A** for the intersection traffic volumes and heavy vehicle percentages that were used for the intersection analysis. In addition, **Appendix B** includes list of assumptions made for the ICE analysis of the study intersection.

The Existing Signal is projected to operate at LOS F for the peak 2035 design year, with a maximum delay of 110.1 seconds and a maximum 95th percentile queue of 875 feet on WB approach. **Table 1** below summarizes the operations for the existing traffic signal. See **Appendix C** for existing traffic signal synchro operational analysis worksheets.

Table 1: Existing Signal Operations

Design Year	AM			PM		
	LOS	Delay (s)	95% Queue (ft) (approach)	LOS	Delay (s)	95% Queue (ft) (approach)
2025	F	81.0	725 (WB)	E	64.3	675 (NB)
2035	F	110.1	875 (WB)	E	76.0	750 (NB)
2036	E	71.1	650 (WB)	D	40.7	250 (NB)
2045	E	83.1	700 (WB)	D	42.7	275 (NB)

Figure 1 illustrates the existing intersection control as well as potential design constraints and considerations. The existing design constraints and considerations at the study intersection include:

1. US 101 Ramp
2. Bridge overpass with available width for three vehicle travel lanes along with bike lane and sidewalk on each side of the bridge
3. Valero gas station right-of-way
4. PBI warehouse right-of-way

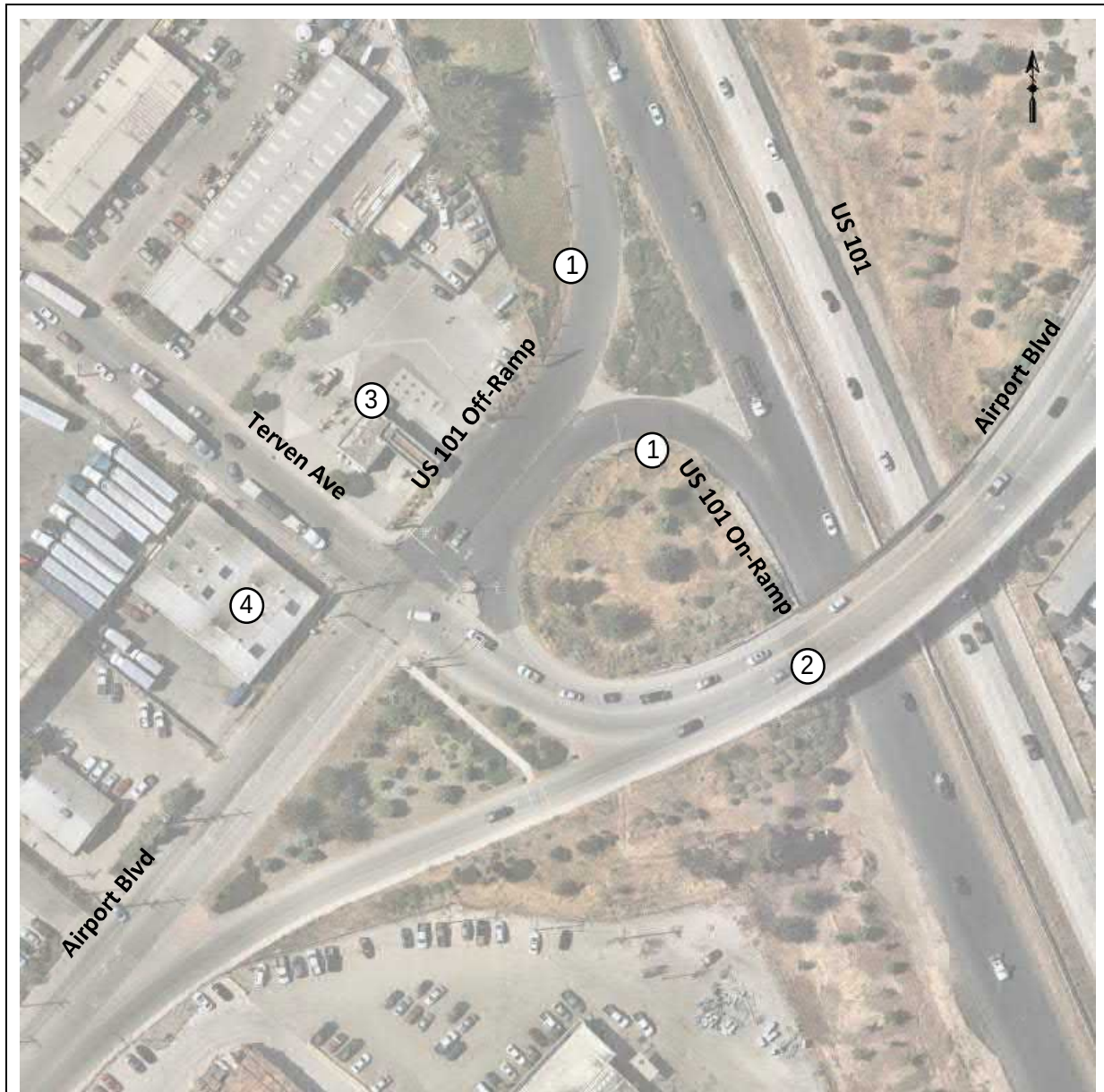


Figure 1: Existing Design Constraints on Improved Intersection Geometry

Planned Improvements

The proposed interchange at Harris Road which is planned to be fully constructed at around year 2035 will alleviate some of the demand at the study intersection. Because of this, the worst operations are expected to occur right before the interchange is completed. We assume construction of the Harris Road interchange will be completed at around year 2035.

Proposed Intersection Control Alternatives

Two intersection control alternatives were ultimately considered in the ICE Analysis for the intersection of US 101 Ramps at Terven Avenue/Airport Boulevard. The existing lane configuration was not deemed viable because it does not meet Caltrans LOS threshold of D. See **Appendix D** and **Appendix E** for the operational analysis worksheets for each alternative. The preliminary concept layouts for each alternative based on the operational analyses are included in **Appendix F**.

Alternative A: Improved Traffic Signal

This alternative includes dual, signal-controlled EB right-turn bypass lanes to accommodate the high right-turn volumes in the PM peak hour. The improved WB approach has dual left-turn lanes to accommodate the demand in the AM peak hour. The worst operations occur during the 2035 AM peak hour with a LOS of D and average delay of 51.9 seconds. The max 95th percentile queue length is the WB approach with 725 feet, which spills into the auxiliary lane on SB US 101. See **Table 2** below for the summary of Alternative A analysis. **Figure 2** to the right shows a concept layout of the improved traffic signal.

Table 2: Improved Traffic Signal Operations

Design Year	AM			PM		
	LOS	Delay (s)	95% Queue (ft) (approach)	LOS	Delay (s)	95% Queue (ft) (approach)
2025	D	44.3	575 (WB)	D	40.7	350 (SB)
2035	D	51.9	725 (WB)	D	43.7	500 (EB)
2036	C	32.7	400 (WB)	C	27.0	175 (EB)
2045	D	35.8	425 (WB)	C	30.6	275 (EB)



Figure 2: Improved Traffic Signal Concept Layout

Alternative B: Roundabout

This alternative includes a multi-lane roundabout with two WB through lanes to accommodate heavy off-ramp volumes. The worst operations will occur during the 2035 AM peak hour with a LOS C. The operations will improve once the Harris Road interchange opens. The maximum 95th percentile queue length occurs on the WB approach at year 2035 and is 325 feet. The WB queue will extend into the US 101 SB off-ramp but not into the auxiliary lane. **Table 3** below includes a summary of the roundabout operations. **Figure 3** to the right shows a concept layout of the proposed roundabout.

Table 3: Roundabout Operations

Design Year	AM			PM		
	LOS	Delay (s)	95% Queue (ft) (approach)	LOS	Delay (s)	95% Queue (ft) (approach)
2025	C	15.2	225 (WB)	B	11.8	125 (SB)
2035	C	21.7	325 (WB)	C	16.0	175 (SB)
2036	A	9.7	125 (WB)	A	6.1	50 (NB)
2045	B	11.0	150 (WB)	A	6.6	50 (SB)

**Figure 3: Roundabout Control Concept Layout**

Non-Standard Features

Table 4 identifies all known existing design deficiencies. Note that these are not necessarily all the non-standard features. These are the major design deficiencies we were able to identify without a sight visit nor topo survey.

Figure 4: Summary of Non-Standard Features

HDM Non-Standard Design Exceptions			
HDM Standards	Existing Signal	Proposed Signal	Proposed Roundabout
309.2(1)(a) - Minimum vertical clearance over the roadbed of the state facility 16'-6"	Posted sign stating 15'-1" clearance over the roadbed on the entrance to US 101 SB	Won't be able to address	Won't be able to address
501.3 - Minimum interchange spacing shall be one mile in urban areas	Less than 1 mile to the interchange at S Sanborn Rd	Won't be able to address	Won't be able to address
504.2(2) - Minimum deceleration length (DL) shown on Figure 504.2B shall be provided prior to the first curve beyond the	DL is approximately 300' which requires a radius of 1,000'. The current radius is 215'	No Change	No Change
504.2(2) - Design of freeway entrances and exits should conform to the standard designs in Figures 504.2A-B	Entrance does not match standard designs in 504.2A	No Change	No Change
504.3(8) - Radii for loop ramps should normally range from 150' to 200'	Loop radius is about 100'	No Change	Loop radius modified to 90'
504.8 - For new construction or major reconstruction, access rights shall be acquired on the opposite side of the local road from ramp terminals to preclude driveways or local roads within the ramp	The Valero currently has an access driveway within the ramp intersection.	No Change	Access to Valero gas station will not be accessible via exit ramp.

SUMMARY OF KEY PERFORMANCE MEASURES

Five performance metrics are evaluated at the study intersection to calculate the Benefit Cost (B/C) Ratio which measures the expected return on investment for each proposed intersection control. The performance measures used to calculate the **benefits** of the proposed improvement compared to the existing condition, or no project alternative are:

- **Safety Benefit** (of the proposed intersection control type)
- **Delay Reduction Benefit** (of the proposed intersection control type)
- **Emission Reduction Benefit** (of the proposed intersection control type)

Performance measures used to calculate the conceptual level **costs** of the proposed intersection control improvement compared to the existing condition, or no project alternative are:

- **Operations and Maintenance (O&M) Cost** (added costs of the proposed intersection control type)
- **Initial Capital Cost** (added costs of the proposed intersection control type)

Refer to **Appendix G** for a detailed description of each performance measure and the Cal B/C 2020 Value Comparison Table² that were used in this B/C Analysis.

PERFORMANCE MEASURE SUMMARY

The following figures show the cost of key performance measures for each control types at the intersection of US 101 SB Ramps at Terven Avenue/ Airport Boulevard assuming 20-years of intersection operations to calculate life-cycle costs. Each intersection control type corresponds to the proposed alternatives discussed on pages 2 and 3. **Table 5** below summarizes the costs associated with each alternative.

² Cal B/C 2020 Value Comparison Table, Caltrans, January 2020.

Table 5: Performance Measure Summary

LIFE CYCLE COST CALCULATIONS				
PERFORMANCE MEASURE LIFE CYCLE COST (NET PRESENT VALUE)				
Safety				
	Existing (Signal)	Proposed Signal	Roundabout	
Annual Cost of Collisions	\$ 177,612	\$ 176,442	\$ 56,129	
Discounted Life Cycle Cost of Collisions	\$ 3,729,860	\$ 3,705,292	\$ 1,178,719	
Delay				
	Existing (Signal)	Proposed Signal	Roundabout	
Annual Quantity (hours)	27,530	14,847	3,981	
Annual Cost	\$ 395,666	\$ 214,887	\$ 58,386	
Total Discounted Life Cycle Cost	\$ 8,308,990	\$ 4,512,637	\$ 1,226,107	
Emissions				
	Existing (Signal)	Proposed Signal	Roundabout	
Annual Cost	\$ 25,879	\$ 27,455	\$ 35,287	
Total Discounted Life Cycle Cost	\$ 351,700	\$ 373,123	\$ 479,559	
O&M				
	Existing (Signal)	Proposed Signal	Roundabout	
Annual O&M Costs	\$ 8,060	\$ 8,060	\$ 2,520	
Discounted Life Cycle O&M Costs	\$ 109,538	\$ 109,538	\$ 34,248	
Discounted Pavement Rehab Costs	\$ -	\$ 45,639	\$ 36,511	
Total O&M Costs	\$ 109,538	\$ 155,177	\$ 70,759	
Initial Capital				
	Existing (Signal)	Proposed Signal	Roundabout	
Approximate Initial Capital Costs	\$0	\$743,300	\$3,300,000	

Benefit Performance Measure Summary

Safety



Preferred Alternative:



Based on the lowest predicted life-cycle cost for safety, the preferred intersection control type for this intersection is a roundabout. See **Appendix H** for the Interactive Highway Safety Design Manual (IHSDM)'s KABCO values used for the safety analysis.

Delay

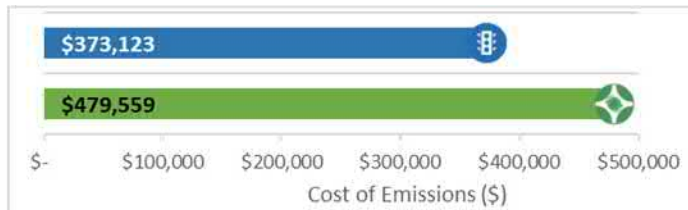


Preferred Alternative:



Based solely on the lowest predicted life-cycle cost for delay, the preferred intersection control type for this intersection is a roundabout.

Emissions



Preferred Alternative:



Based solely on the life-cycle cost for emissions, the preferred intersection control type for this intersection is a signal.

Cost Performance Measure Summary

O&M



Preferred Alternative:



Based solely on lowest expected annual O&M costs, the preferred intersection control type for this intersection is a roundabout.

Initial Capital Costs

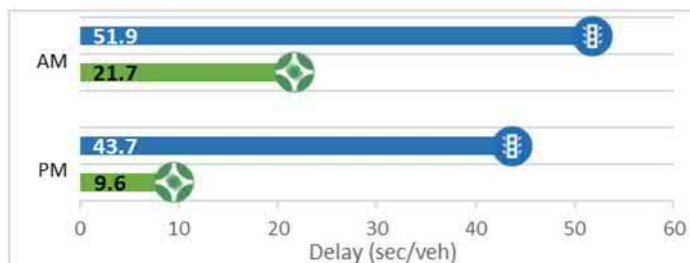


Preferred Alternative:



Based solely on lowest expected range of Initial Capital Costs, the preferred intersection control type for this intersection is a signal.

TRAFFIC OPERATIONS SUMMARY



The bar chart to the left compares the peak hour intersection delay for design year between the improved traffic signal and roundabout. The improved traffic signal operates with considerable delay compared to the roundabout.



The bar chart to the left illustrates the calculated average speeds through the study intersection used to determine AB 2766 cost effectiveness. The study limit on each leg was based on the largest of the 95% queue lengths of all the intersection control types. The improved traffic signal offers the highest average speed when compared to the roundabout.

B/C ANALYSIS SUMMARY**B/C Ratio Scoring**

The following equation illustrates the B/C ratio and **Table 6** provides the description of B/C ratio scoring:

$$\text{B/C Ratio Score} = \frac{\sum \text{Benefit Performance Measures}}{\sum \text{Cost Performance Measures}}$$

Table 6: Description of B/C Ratio Scoring

B/C Ratio Score	Description
B/C = 1.00	A B/C ratio of 1.00 is a neutral rating. This indicates that the ROI for existing signal is equal to improved signal/roundabout.
B/C < 1.00	A B/C ratio less than 1.00 indicates that the existing signal will provide a better ROI when compared to improved signal/roundabout.
B/C > 1.00	A B/C ratio greater than 1.00 indicates that improved signal/roundabout provides a better ROI when compared to the existing signal.
B/C = NA-R	When the cost of the improved signal/roundabout is less than the cost of the existing signal and the improved signal/roundabout provides benefit over the existing signal, a B/C ratio cannot be computed. This special case is denoted by "NA-R" and indicates that improved signal/roundabout provides a better ROI when compared to the existing signal.
The B/C score is based on the net present value using a discount rate of 4% through the life-cycle duration of 20 years for each of the five performance measures.	

Note: ROI=Return of Investment

The summary results of the stage 1 B/C analysis at the study intersection are summarized in **Table 7**. The stage 1 B/C analysis is based on comparing the improved signal and roundabout alternatives to the existing signal. Both the improved traffic signal and the roundabout have B/C ratios greater than 1.0, which indicate that they are both cost-effective intersection control types when compared to the existing signal.

Table 7: Summary of Life-Cycle B/C Analysis – Stage 1 B/C Ratios

LIFE CYCLE BENEFIT COST RATIO				
Total Benefits (B)				
Added Benefits Compared to Existing (Signal)	Existing (Signal)	Proposed Signal	Roundabout	
Safety	\$ -	\$ 24,569	\$	2,551,141
Delay	\$ -	\$ 3,796,353	\$	7,082,884
Emission	\$ -	\$ (21,423)	\$	(127,859)
Total Benefits	\$ -	\$ 3,799,498	\$	9,506,166
Total Costs (C)				
Added Cost Compared to Existing (Signal)	Existing (Signal)	Proposed Signal	Roundabout	
O&M	\$ -	\$ 45,639	\$	(38,779)
Initial Capital	\$ -	\$ 743,300	\$	3,300,000
Total Costs	\$ -	\$ 788,939	\$	3,261,221
B/C Ratio Compared to Existing (Signal)	N/A	4.82	2.91	

A second stage of B/C analysis was performed to determine the preferred alternative intersection control type between the improved traffic signal and a roundabout. Total benefits and costs were calculated based on directly comparing the roundabout to the signal. The preferred intersection control type, shown in **Table 8** is based solely on the B/C score and the expected return of investment for the 20-year life-cycle starting in 2025 and ending 2045. See **Appendix I** for the Life-Cycle B/C worksheet which includes a detailed breakdown of each performance measure life-cycle costs at the study intersection.

Table 8: Summary of Life-Cycle B/C Analysis – Stage 2 B/C Ratios

Benefit-Cost Ratio Calculations for Proposed Signal (A) vs Roundabout (B)							
Initial Capital Cost			Project Constraints				
B/C Target	Proposed Signal (A)	Roundabout (B)	Added Cost (C) = (B - A)	Added O&M Cost for Roundabout (D)	Total Benefits (E)	Total Costs (F) = (C + D)	B/C (G) = (E / F)
High	\$ 817,630	\$ 2,970,000	\$ 2,152,370			\$ 2,067,952	2.81
Low	\$ 668,970	\$ 3,630,000	\$ 2,961,030	\$ (84,418)	\$ 5,813,103	\$ 2,876,612	2.02
Roundabout Budget	\$ 743,300	\$ 6,640,822	\$ 5,897,522			\$ 5,813,103	1.00

Note: The 'High' value calculates the highest Roundabout B/C. Assuming the high Proposed Signal ICC and the low Roundabout ICC. The 'Low' value calculates the lowest Roundabout B/C. Assuming the low Proposed Signal ICC and the high Roundabout ICC.

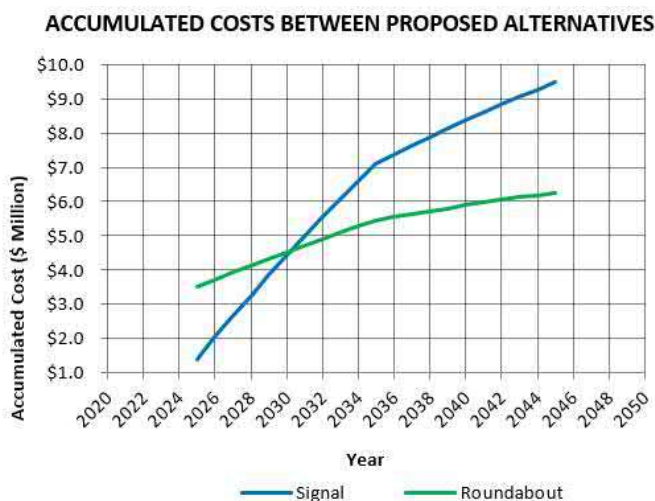


Figure 6: Accumulated Costs Between Proposed Alternatives

Figure 6 shows the accumulated cost of all five performance measures for each proposed alternative. This figure reflects the B/C ratio results between each alternative. The roundabout starts with a larger accumulated cost because of the greater initial capital cost, but because of the signal's greater societal costs the roundabout provides a greater return on investment after 2030. The slopes start to decrease in year 2035 due to the reduced demand once the Harris Road interchange opens. The roundabout is the preferred intersection control type for the entire 20-year analysis time period.

CONCLUSION AND RECOMMENDATIONS

An analysis of the estimated benefit and cost performance measures indicate that, when forecast traffic volumes are considered for a minimum 20-year service life, **a roundabout-controlled intersection is the preferred alternative** at the intersection of US 101 SB ramps at Terven Avenue/Airport Boulevard.

- The existing signal will have the longest delays and queue lengths out of all the intersection control alternatives at the study intersection.
- The improved traffic signal will perform at LOS D service year (2035) conditions with a maximum 95th percentile queue length of 725 feet on the US 101 SB off-ramp in the AM peak period and 500 feet on the EB Airport Boulevard approach in the PM peak period. The improved traffic signal will operate at LOS C and D in the 2045 peak periods.
- The roundabout will perform at LOS A and C at service year (2035) conditions with a maximum 95th percentile queue length of 175 feet on the Terven Ave approach in the PM peak hour and 325 feet on the US 101 SB off-ramp in the AM peak hour. The roundabout operates at LOS A and B in the 2045 peak periods.
- The B/C ratios for the intersection are 4.82 and 2.91 respectively, when the improved traffic signal and roundabout are compared to the existing signal. Since the B/C ratios are greater than 1.0, both improved signal and roundabout are more cost-effective and preferred when compared to the existing signal.
- The B/C ratio is 2.31 when comparing the roundabout and the improved traffic signal alternatives

to each other to determine the most preferred intersection control type at the study intersection. The roundabout alternative has a total added benefit of about \$5,706,667 when compared to the signal.

The most noteworthy performance measures driving the B/C Ratios are *delay*. The roundabout and traffic control alternatives have an added delay benefit of greater than \$7,000,000 and \$3,600,000 respectively when compared to the existing signal.

The existing intersection does not conform to the Highway Design Manual standards. Neither of the proposed alternatives will improve any of the existing non-standard designs due to high demand and tight constraints. The proposed roundabout will modify the US 101 SB on-ramp to have a radius of 90' (currently 100') and will eliminate access to the Valero gas station from the US 101 SB off-ramp.

Appendix

Appendix A – Traffic Volumes

Appendix B – List of Assumptions

Appendix C – Existing Traffic Signal Synchro Operational Analysis

Appendix D – Improved Traffic Signal Synchro Operational Analysis

Appendix E – Roundabout SIDRA Operational Analysis

Appendix F – Preliminary Concept Layouts for Improved Traffic Signal and Roundabout

Appendix G – Description of Benefit Cost Performance Measures and Caltrans Cal B/C 2020 Value Comparison Table

Appendix H – HSM Predictive Method Safety Analysis IHSDM KABCO Values

Appendix I – Life-Cycle Benefit-Cost Ratio Worksheet

Appendix A

Traffic Volumes

US 101 SB Off-Ramp at Terven Ave/Airport Blvd

10/28/2020

Scenario 1 - Opening Year (2025)																
AM 2025	NB				WB				SB				EB			
																
Vehicles	0	283	132	100	0	483	511	60	0	26	143	77	0	74	25	345
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	8.0%	28.0%	-	2.0%	14.0%	2.0%	-	43.0%	10.0%	12.0%	-	27.0%	55.0%	21.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PM 2025	NB				WB				SB				EB			
																
Vehicles	0	284	181	263	0	254	233	30	0	68	154	90	0	122	53	932
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	10.0%	6.0%	-	7.0%	26.0%	23.0%	-	19.0%	9.0%	37.0%	-	6.0%	28.0%	4.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTE: Minimum PHF used in operations analysis is =0.70

Scenario 2 - Service Life (2035) Before Interchange Opens - CRITICAL VOLUME																
AM 2035	NB				WB				SB				EB			
																
Vehicles	0	305	142	167	0	558	551	65	0	28	153	83	0	80	27	371
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	8.0%	28.0%	-	2.0%	14.0%	2.0%	-	43.0%	10.0%	12.0%	-	27.0%	55.0%	21.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PM 2035	NB				WB				SB				EB			
																
Vehicles	0	306	194	323	0	333	251	32	0	73	166	97	0	131	57	1004
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	10.0%	6.0%	-	7.0%	26.0%	23.0%	-	19.0%	9.0%	37.0%	-	6.0%	28.0%	4.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source:

US 101 SB Ramps at Terven Ave/Airport Blvd

Scenario 3 - Service Life (2036) After Interchange Opens

AM 2036	NB				WB				SB				EB			
																
Vehicles	0	272	148	102	0	436	336	78	0	9	90	29	0	71	21	273
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	8.0%	28.0%	-	2.0%	14.0%	2.0%	-	43.0%	10.0%	12.0%	-	27.0%	55.0%	21.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PM 2036	NB				WB				SB				EB			
																
Vehicles	0	140	96	202	0	202	170	29	0	36	86	48	0	70	26	584
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	10.0%	6.0%	-	7.0%	26.0%	23.0%	-	19.0%	9.0%	37.0%	-	6.0%	28.0%	4.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source:

Scenario 4 - Design Life (2045)

AM 2045	NB				WB				SB				EB			
																
Vehicles	0	291	158	108	0	464	360	84	0	10	96	31	0	76	23	292
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	8.0%	28.0%	-	2.0%	14.0%	2.0%	-	43.0%	10.0%	12.0%	-	27.0%	55.0%	21.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PM 2045	NB				WB				SB				EB			
																
Vehicles	0	148	99	217	0	240	182	31	0	38	101	51	0	75	28	629
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Truck %	-	10.0%	10.0%	6.0%	-	7.0%	26.0%	23.0%	-	19.0%	9.0%	37.0%	-	6.0%	28.0%	4.0%
Pedestrians	0				0				0				0			
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B

List of Assumptions

LIST OF ASSUMPTIONS

Traffic Data

- **Existing peak-hour turning movement volumes.** Traffic Count Data obtained from Airport Industrial Park TIA (2019).
- **Opening Year Plus Project (PP) (2025) peak-hour turning movement volumes.** Includes project and background development anticipated to occur by the time the project is constructed. The volume forecasts are based on a list of pending and approved development projects provided by the City.
- **Service Life PP and Median Closures (2035) peak-hour turning movement volumes.** Background Volumes were grown at the AMBAG Model annual growth rate of 0.75% for 10 years to 2035. Additional volumes were added from anticipated median closures at five intersections south of the study intersection.
- **Service Life PP after Interchange Closes (2036) peak-hour turning movement volumes.** Reduction in background Volumes were determined using the AMBAG Model annual growth rate of 0.75% for 9 years from the 2045 volumes down to the 2036 volumes.
- **Design Life PP (2045) peak-hour turning movement volumes.** Based on Cumulative PP volumes provided in figure 13 of the Airport Industrial Park TIA.
- **Opening Year PP (2025) ADT.** The ADTs are calculated using the PM peak hour traffic count data.
 - Terven Avenue: 20,680
 - Airport Boulevard: 17,140
- **Service Life PP and Median Closures (2035) ADT.** The ADTs are calculated using the PM peak hour traffic count data.
 - Terven Avenue: 23,263
 - Airport Boulevard: 18,466
- **Service Life PP after Interchange Closes PP (2036) ADT.** The ADTs are calculated using the PM peak hour traffic count data.
 - Terven Avenue: 13,207
 - Airport Boulevard: 10,385
- **Design Life PP (2045) ADT.** The ADTs are calculated using the PM peak hour traffic count data.
 - Terven Avenue: 14,340
 - Airport Boulevard: 11,130
- **Pedestrian counts.** Not provided.
- **Bicycle counts.** Not provided.

Opinion of Probable Cost

- **Initial capital costs.** Estimated ranges of initial capital costs from previous comparable projects.

Appendix C

Existing Traffic Signal Synchro Operational Analysis



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	80	27	525	620	451	109	183	84
v/c Ratio	0.52	0.15	1.26	0.66	0.98	0.25	0.60	0.23
Control Delay	59.1	43.3	173.1	39.5	77.5	5.7	51.5	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.1	43.3	173.1	39.5	77.5	5.7	51.5	3.6
Queue Length 50th (ft)	55	17	~467	207	317	0	120	0
Queue Length 95th (ft)	105	45	#718	291	#557	34	206	16
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	270	270	416	937	462	439	304	367
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.10	1.26	0.66	0.98	0.25	0.60	0.23

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	25	0	483	511	60	283	132	100	26	143	77
Future Volume (veh/h)	74	25	0	483	511	60	283	132	100	26	143	77
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1500	1085	0	1870	1693	1693	1781	1781	1485	1752	1752	1722
Adj Flow Rate, veh/h	80	27	0	525	555	65	308	143	0	28	155	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	0	2	14	14	8	8	28	10	10	12
Cap, veh/h	98	145	0	426	882	103	329	153		50	278	276
Arrive On Green	0.07	0.13	0.00	0.24	0.30	0.30	0.28	0.28	0.00	0.19	0.19	0.19
Sat Flow, veh/h	1428	1085	0	1781	2901	339	1176	546	1259	266	1473	1457
Grp Volume(v), veh/h	80	27	0	525	307	313	451	0	0	183	0	84
Grp Sat Flow(s),veh/h/ln	1428	1085	0	1781	1608	1632	1723	0	1259	1739	0	1457
Q Serve(g_s), s	6.1	2.4	0.0	26.3	18.1	18.2	28.1	0.0	0.0	10.5	0.0	5.5
Cycle Q Clear(g_c), s	6.1	2.4	0.0	26.3	18.1	18.2	28.1	0.0	0.0	10.5	0.0	5.5
Prop In Lane	1.00		0.00	1.00		0.21	0.68		1.00	0.15		1.00
Lane Grp Cap(c), veh/h	98	145	0	426	489	496	482	0		329	0	276
V/C Ratio(X)	0.82	0.19	0.00	1.23	0.63	0.63	0.94	0.00		0.56	0.00	0.30
Avail Cap(c_a), veh/h	277	145	0	426	489	496	482	0		329	0	276
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.6	42.3	0.0	41.9	32.9	32.9	38.6	0.0	0.0	40.4	0.0	38.4
Incr Delay (d2), s/veh	17.7	2.8	0.0	123.7	6.0	6.0	27.6	0.0	0.0	6.7	0.0	2.8
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	2.7	0.8	0.0	25.6	7.5	7.7	15.0	0.0	0.0	5.1	0.0	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.2	45.2	0.0	165.5	38.9	38.9	66.2	0.0	0.0	47.1	0.0	41.2
LnGrp LOS	E	D	A	F	D	D	E	A		D	A	D
Approach Vol, veh/h		107			1145			451	A		267	
Approach Delay, s/veh		62.4			97.0			66.2			45.2	
Approach LOS		E			F			E			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	30.0	20.0		25.0	11.2	38.8		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	28.3	4.4		12.5	8.1	20.2		30.1				
Green Ext Time (p_c), s	0.0	0.0		0.8	0.2	2.4		0.2				

Intersection Summary

HCM 6th Ctrl Delay 81.0

HCM 6th LOS F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	133	58	276	286	506	286	241	98
v/c Ratio	0.61	0.20	0.83	0.38	1.11	0.57	0.79	0.31
Control Delay	58.8	41.9	64.7	35.4	115.7	24.9	63.9	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.8	41.9	64.7	35.4	115.7	24.9	63.9	6.3
Queue Length 50th (ft)	93	36	191	86	~422	98	169	0
Queue Length 95th (ft)	157	77	#315	135	#675	201	#316	28
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	320	323	391	748	455	506	306	316
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.18	0.71	0.38	1.11	0.57	0.79	0.31

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	122	53	0	254	233	30	284	181	263	68	154	90
Future Volume (veh/h)	122	53	0	254	233	30	284	181	263	68	154	90
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	0	1796	1515	1515	1752	1752	1811	1767	1767	1352
Adj Flow Rate, veh/h	133	58	0	276	253	33	309	197	0	74	167	98
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	0	7	26	26	10	10	6	9	9	37
Cap, veh/h	164	278	0	308	698	90	293	187		102	230	218
Arrive On Green	0.10	0.19	0.00	0.18	0.27	0.27	0.28	0.28	0.00	0.19	0.19	0.19
Sat Flow, veh/h	1725	1485	0	1711	2563	331	1038	662	1535	534	1206	1144
Grp Volume(v), veh/h	133	58	0	276	141	145	506	0	0	241	0	98
Grp Sat Flow(s),veh/h/ln	1725	1485	0	1711	1439	1455	1700	0	1535	1740	0	1144
Q Serve(g_s), s	8.2	3.6	0.0	17.2	8.6	8.8	30.8	0.0	0.0	14.2	0.0	8.3
Cycle Q Clear(g_c), s	8.2	3.6	0.0	17.2	8.6	8.8	30.8	0.0	0.0	14.2	0.0	8.3
Prop In Lane	1.00		0.00	1.00		0.23	0.61		1.00	0.31		1.00
Lane Grp Cap(c), veh/h	164	278	0	308	392	396	480	0		332	0	218
V/C Ratio(X)	0.81	0.21	0.00	0.90	0.36	0.37	1.05	0.00		0.73	0.00	0.45
Avail Cap(c_a), veh/h	337	278	0	413	392	396	480	0		332	0	218
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.4	37.5	0.0	43.7	32.0	32.1	39.1	0.0	0.0	41.5	0.0	39.1
Incr Delay (d2), s/veh	10.9	1.7	0.0	17.5	2.6	2.6	56.1	0.0	0.0	13.0	0.0	6.6
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	4.1	1.5	0.0	8.5	3.2	3.3	19.6	0.0	0.0	7.3	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.3	39.2	0.0	61.2	34.6	34.7	95.2	0.0	0.0	54.5	0.0	45.6
LnGrp LOS	E	D	A	E	C	C	F	A		D	A	D
Approach Vol, veh/h		191			562			506	A		339	
Approach Delay, s/veh		53.2			47.7			95.2			51.9	
Approach LOS		D			D			F			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.4	25.7		25.0	14.1	35.0		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	19.2	5.6		16.2	10.2	10.8		32.8				
Green Ext Time (p_c), s	0.5	0.1		0.7	0.3	1.4		0.0				

Intersection Summary

HCM 6th Ctrl Delay 64.3

HCM 6th LOS E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	87	29	607	626	486	182	196	90
v/c Ratio	0.54	0.16	1.47	0.67	1.06	0.42	0.65	0.25
Control Delay	59.5	43.2	255.0	40.0	97.6	14.9	53.9	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.5	43.2	255.0	40.0	97.6	14.9	53.9	4.5
Queue Length 50th (ft)	60	18	~593	211	~378	30	131	0
Queue Length 95th (ft)	112	46	#862	297	#621	99	#223	21
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	269	269	414	931	460	437	303	366
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.11	1.47	0.67	1.06	0.42	0.65	0.25

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

1: Terven Ave/Terven Avenue & Airport Boulevard/US 101 SB Ramps

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	27	0	558	511	65	305	142	167	28	153	83
Future Volume (veh/h)	80	27	0	558	511	65	305	142	167	28	153	83
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
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1500	1085	0	1870	1693	1693	1781	1781	1485	1752	1752	1722
Adj Flow Rate, veh/h	87	29	0	607	555	71	332	154	0	30	166	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	0	2	14	14	8	8	28	10	10	12
Cap, veh/h	106	145	0	426	856	109	329	153		50	278	276
Arrive On Green	0.07	0.13	0.00	0.24	0.30	0.30	0.28	0.28	0.00	0.19	0.19	0.19
Sat Flow, veh/h	1428	1085	0	1781	2869	366	1177	546	1259	266	1472	1457
Grp Volume(v), veh/h	87	29	0	607	310	316	486	0	0	196	0	90
Grp Sat Flow(s),veh/h/ln	1428	1085	0	1781	1608	1627	1723	0	1259	1738	0	1457
Q Serve(g_s), s	6.6	2.6	0.0	26.3	18.5	18.6	30.8	0.0	0.0	11.3	0.0	5.9
Cycle Q Clear(g_c), s	6.6	2.6	0.0	26.3	18.5	18.6	30.8	0.0	0.0	11.3	0.0	5.9
Prop In Lane	1.00		0.00	1.00		0.22	0.68		1.00	0.15		1.00
Lane Grp Cap(c), veh/h	106	145	0	426	480	485	482	0		329	0	276
V/C Ratio(X)	0.82	0.20	0.00	1.43	0.65	0.65	1.01	0.00		0.60	0.00	0.33
Avail Cap(c_a), veh/h	277	145	0	426	480	485	482	0		329	0	276
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.2	42.4	0.0	41.9	33.6	33.6	39.6	0.0	0.0	40.8	0.0	38.5
Incr Delay (d2), s/veh	16.6	3.1	0.0	204.6	6.6	6.6	42.9	0.0	0.0	7.8	0.0	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	0.8	0.0	35.2	7.8	7.9	18.1	0.0	0.0	5.6	0.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.8	45.5	0.0	246.5	40.2	40.2	82.5	0.0	0.0	48.5	0.0	41.7
LnGrp LOS	E	D	A	F	D	D	F	A		D	A	D
Approach Vol, veh/h	116			1233			486			286		
Approach Delay, s/veh	61.5			141.7			82.5			46.4		
Approach LOS	E			F			F			D		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	30.0	20.0		25.0	11.9	38.1		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	28.3	4.6		13.3	8.6	20.6		32.8				
Green Ext Time (p_c), s	0.0	0.0		0.8	0.2	2.4		0.0				

Intersection Summary

HCM 6th Ctrl Delay 110.9

HCM 6th LOS F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	142	62	362	308	544	351	259	105
v/c Ratio	0.63	0.25	0.93	0.41	1.21	0.70	0.85	0.33
Control Delay	59.3	43.8	76.0	36.2	149.5	32.6	71.7	7.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.3	43.8	76.0	36.2	149.5	32.6	71.7	7.8
Queue Length 50th (ft)	100	40	261	95	~485	150	185	0
Queue Length 95th (ft)	166	81	#476	147	#748	278	#353	35
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	317	320	388	751	451	503	303	314
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.19	0.93	0.41	1.21	0.70	0.85	0.33

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	131	57	0	333	251	32	306	194	323	73	166	97
Future Volume (veh/h)	131	57	0	333	251	32	306	194	323	73	166	97
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	0	1796	1515	1515	1752	1752	1811	1767	1767	1352
Adj Flow Rate, veh/h	142	62	0	362	273	35	333	211	0	79	180	105
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	0	7	26	26	10	10	6	9	9	37
Cap, veh/h	173	214	0	389	695	88	292	185		101	229	217
Arrive On Green	0.10	0.14	0.00	0.23	0.27	0.27	0.28	0.28	0.00	0.19	0.19	0.19
Sat Flow, veh/h	1725	1485	0	1711	2569	326	1040	659	1535	531	1209	1144
Grp Volume(v), veh/h	142	62	0	362	152	156	544	0	0	259	0	105
Grp Sat Flow(s),veh/h/ln	1725	1485	0	1711	1439	1456	1700	0	1535	1740	0	1144
Q Serve(g_s), s	8.9	4.1	0.0	22.8	9.4	9.6	30.8	0.0	0.0	15.6	0.0	9.0
Cycle Q Clear(g_c), s	8.9	4.1	0.0	22.8	9.4	9.6	30.8	0.0	0.0	15.6	0.0	9.0
Prop In Lane	1.00		0.00	1.00		0.22	0.61		1.00	0.31		1.00
Lane Grp Cap(c), veh/h	173	214	0	389	389	394	477	0		330	0	217
V/C Ratio(X)	0.82	0.29	0.00	0.93	0.39	0.40	1.14	0.00		0.79	0.00	0.48
Avail Cap(c_a), veh/h	335	214	0	410	389	394	477	0		330	0	217
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.4	42.0	0.0	41.5	32.6	32.7	39.5	0.0	0.0	42.3	0.0	39.7
Incr Delay (d2), s/veh	10.8	3.4	0.0	27.1	2.9	3.0	85.7	0.0	0.0	17.0	0.0	7.6
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	4.3	1.7	0.0	12.1	3.5	3.6	23.5	0.0	0.0	8.3	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.2	45.4	0.0	68.7	35.5	35.7	125.2	0.0	0.0	59.3	0.0	47.2
LnGrp LOS	E	D	A	E	D	D	F	A		E	A	D
Approach Vol, veh/h		204			670			544	A		364	
Approach Delay, s/veh		55.0			53.5			125.2			55.8	
Approach LOS		D			D			F			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.7	21.1		25.0	14.7	35.0		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	24.8	6.1		17.6	10.9	11.6		32.8				
Green Ext Time (p_c), s	0.2	0.1		0.6	0.3	1.5		0.0				

Intersection Summary

HCM 6th Ctrl Delay 76.0

HCM 6th LOS E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	77	23	474	450	457	111	108	32
v/c Ratio	0.51	0.13	1.14	0.48	0.98	0.25	0.35	0.09
Control Delay	58.9	43.0	127.2	34.0	79.4	5.8	43.7	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.9	43.0	127.2	34.0	79.4	5.8	43.7	0.5
Queue Length 50th (ft)	52	15	~389	135	321	0	67	0
Queue Length 95th (ft)	102	39	#629	200	#564	35	127	0
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	271	271	416	944	464	439	311	367
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.08	1.14	0.48	0.98	0.25	0.35	0.09

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

US 101 SB at Terven Ave

After Interchange Opens PP (2036)

1: Terven Ave/Terven Avenue & Airport Boulevard/US 101 SB Ramps

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	21	0	436	336	78	272	148	102	9	90	29
Future Volume (veh/h)	71	21	0	436	336	78	272	148	102	9	90	29
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1500	1085	0	1870	1693	1693	1781	1781	1485	1752	1752	1722
Adj Flow Rate, veh/h	77	23	0	474	365	85	296	161	0	10	98	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	0	2	14	14	8	8	28	10	10	12
Cap, veh/h	94	145	0	426	796	183	313	170		31	299	276
Arrive On Green	0.07	0.13	0.00	0.24	0.31	0.31	0.28	0.28	0.00	0.19	0.19	0.19
Sat Flow, veh/h	1428	1085	0	1781	2595	598	1118	608	1259	161	1582	1457
Grp Volume(v), veh/h	77	23	0	474	225	225	457	0	0	108	0	32
Grp Sat Flow(s),veh/h/ln	1428	1085	0	1781	1608	1585	1726	0	1259	1744	0	1457
Q Serve(g_s), s	5.9	2.1	0.0	26.3	12.4	12.6	28.5	0.0	0.0	5.9	0.0	2.0
Cycle Q Clear(g_c), s	5.9	2.1	0.0	26.3	12.4	12.6	28.5	0.0	0.0	5.9	0.0	2.0
Prop In Lane	1.00		0.00	1.00		0.38	0.65		1.00	0.09		1.00
Lane Grp Cap(c), veh/h	94	145	0	426	493	486	483	0		330	0	276
V/C Ratio(X)	0.82	0.16	0.00	1.11	0.46	0.46	0.95	0.00		0.33	0.00	0.12
Avail Cap(c_a), veh/h	277	145	0	426	493	486	483	0		330	0	276
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.7	42.2	0.0	41.9	30.7	30.8	38.8	0.0	0.0	38.6	0.0	37.0
Incr Delay (d2), s/veh	18.2	2.3	0.0	78.0	3.0	3.2	29.5	0.0	0.0	2.6	0.0	0.9
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	2.6	0.7	0.0	20.2	5.0	5.1	15.4	0.0	0.0	2.8	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.9	44.5	0.0	119.8	33.7	34.0	68.2	0.0	0.0	41.2	0.0	37.8
LnGrp LOS	E	D	A	F	C	C	E	A		D	A	D
Approach Vol, veh/h		100			924			457	A		140	
Approach Delay, s/veh		63.3			78.0			68.2			40.4	
Approach LOS		E			E			E			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	30.0	20.0		25.0	11.0	39.0		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	28.3	4.1		7.9	7.9	14.6		30.5				
Green Ext Time (p_c), s	0.0	0.0		0.5	0.2	2.1		0.1				

Intersection Summary

HCM 6th Ctrl Delay 71.1

HCM 6th LOS E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	76	28	220	217	256	220	132	52
v/c Ratio	0.45	0.11	0.74	0.27	0.53	0.42	0.41	0.16
Control Delay	55.0	40.0	57.3	30.2	38.2	16.9	43.8	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.0	40.0	57.3	30.2	38.2	16.9	43.8	1.0
Queue Length 50th (ft)	51	16	148	58	152	51	82	0
Queue Length 95th (ft)	99	45	224	96	248	125	148	0
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	338	342	414	794	482	528	324	327
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.08	0.53	0.27	0.53	0.42	0.41	0.16
Intersection Summary								

US 101 SB at Terven Ave

After Interchange Opens PP (2036)

1: Terven Ave/Terven Avenue & Airport Boulevard/US 101 SB Ramps

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	26	0	202	170	29	140	96	202	36	86	48
Future Volume (veh/h)	70	26	0	202	170	29	140	96	202	36	86	48
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	0	1796	1515	1515	1752	1752	1811	1767	1767	1352
Adj Flow Rate, veh/h	76	28	0	220	185	32	152	104	0	39	93	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	0	7	26	26	10	10	6	9	9	37
Cap, veh/h	103	288	0	255	696	118	296	203		102	243	227
Arrive On Green	0.06	0.19	0.00	0.15	0.28	0.28	0.29	0.29	0.00	0.20	0.20	0.20
Sat Flow, veh/h	1725	1485	0	1711	2460	418	1010	691	1535	514	1227	1144
Grp Volume(v), veh/h	76	28	0	220	107	110	256	0	0	132	0	52
Grp Sat Flow(s),veh/h/ln	1725	1485	0	1711	1439	1439	1701	0	1535	1741	0	1144
Q Serve(g_s), s	4.5	1.6	0.0	13.2	6.0	6.2	13.1	0.0	0.0	6.9	0.0	4.0
Cycle Q Clear(g_c), s	4.5	1.6	0.0	13.2	6.0	6.2	13.1	0.0	0.0	6.9	0.0	4.0
Prop In Lane	1.00		0.00	1.00		0.29	0.59		1.00	0.30		1.00
Lane Grp Cap(c), veh/h	103	288	0	255	407	407	499	0		345	0	227
V/C Ratio(X)	0.74	0.10	0.00	0.86	0.26	0.27	0.51	0.00		0.38	0.00	0.23
Avail Cap(c_a), veh/h	350	288	0	429	407	407	499	0		345	0	227
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.6	34.8	0.0	43.6	29.1	29.2	30.8	0.0	0.0	36.5	0.0	35.3
Incr Delay (d2), s/veh	11.9	0.7	0.0	9.2	1.6	1.6	3.7	0.0	0.0	3.2	0.0	2.3
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	2.3	0.6	0.0	6.0	2.2	2.3	5.6	0.0	0.0	3.3	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.5	35.4	0.0	52.9	30.7	30.8	34.6	0.0	0.0	39.7	0.0	37.7
LnGrp LOS	E	D	A	D	C	C	C	A		D	A	D
Approach Vol, veh/h		104			437			256	A		184	
Approach Delay, s/veh		53.7			41.9			34.6			39.1	
Approach LOS		D			D			C			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.3	25.6		25.0	9.9	35.0		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	15.2	3.6		8.9	6.5	8.2		15.1				
Green Ext Time (p_c), s	0.4	0.0		0.7	0.2	1.0		1.1				

Intersection Summary

HCM 6th Ctrl Delay 40.7

HCM 6th LOS D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	83	25	504	482	488	117	115	34
v/c Ratio	0.54	0.14	1.21	0.51	1.05	0.27	0.37	0.09
Control Delay	59.3	42.9	154.5	35.0	97.2	6.6	44.5	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.3	42.9	154.5	35.0	97.2	6.6	44.5	0.5
Queue Length 50th (ft)	57	16	~437	148	~377	0	72	0
Queue Length 95th (ft)	107	42	#683	216	#621	40	135	0
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	270	270	415	940	463	438	310	366
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.09	1.21	0.51	1.05	0.27	0.37	0.09

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	23	0	464	360	84	291	158	108	10	96	31
Future Volume (veh/h)	76	23	0	464	360	84	291	158	108	10	96	31
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1500	1085	0	1870	1693	1693	1781	1781	1485	1752	1752	1722
Adj Flow Rate, veh/h	83	25	0	504	391	91	316	172	0	11	104	34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	0	2	14	14	8	8	28	10	10	12
Cap, veh/h	101	145	0	426	783	180	313	170		32	298	276
Arrive On Green	0.07	0.13	0.00	0.24	0.30	0.30	0.28	0.28	0.00	0.19	0.19	0.19
Sat Flow, veh/h	1428	1085	0	1781	2595	598	1117	608	1259	167	1577	1457
Grp Volume(v), veh/h	83	25	0	504	241	241	488	0	0	115	0	34
Grp Sat Flow(s),veh/h/ln	1428	1085	0	1781	1608	1585	1726	0	1259	1743	0	1457
Q Serve(g_s), s	6.3	2.2	0.0	26.3	13.5	13.8	30.8	0.0	0.0	6.3	0.0	2.1
Cycle Q Clear(g_c), s	6.3	2.2	0.0	26.3	13.5	13.8	30.8	0.0	0.0	6.3	0.0	2.1
Prop In Lane	1.00		0.00	1.00		0.38	0.65		1.00	0.10		1.00
Lane Grp Cap(c), veh/h	101	145	0	426	485	478	483	0		330	0	276
V/C Ratio(X)	0.82	0.17	0.00	1.18	0.50	0.50	1.01	0.00		0.35	0.00	0.12
Avail Cap(c_a), veh/h	277	145	0	426	485	478	483	0		330	0	276
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.4	42.3	0.0	41.9	31.5	31.6	39.6	0.0	0.0	38.7	0.0	37.0
Incr Delay (d2), s/veh	17.2	2.6	0.0	104.1	3.6	3.8	43.5	0.0	0.0	2.9	0.0	0.9
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	2.8	0.7	0.0	23.3	5.5	5.6	18.2	0.0	0.0	3.0	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.6	44.8	0.0	146.0	35.1	35.4	83.1	0.0	0.0	41.6	0.0	37.9
LnGrp LOS	E	D	A	F	D	D	F	A		D	A	D
Approach Vol, veh/h		108			986			488	A		149	
Approach Delay, s/veh		62.3			91.9			83.1			40.8	
Approach LOS		E			F			F			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	30.0	20.0		25.0	11.5	38.5		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	28.3	4.2		8.3	8.3	15.8		32.8				
Green Ext Time (p_c), s	0.0	0.0		0.5	0.2	2.2		0.0				

Intersection Summary

HCM 6th Ctrl Delay 83.1

HCM 6th LOS F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	82	30	261	232	269	236	151	55
v/c Ratio	0.47	0.12	0.80	0.29	0.56	0.45	0.47	0.17
Control Delay	55.5	41.4	60.0	30.9	39.4	18.4	45.5	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.5	41.4	60.0	30.9	39.4	18.4	45.5	1.1
Queue Length 50th (ft)	55	18	176	63	162	60	96	0
Queue Length 95th (ft)	105	48	268	104	263	141	169	0
Internal Link Dist (ft)		256		427	121		526	
Turn Bay Length (ft)	150		120			50		50
Base Capacity (vph)	336	339	411	799	478	525	324	325
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.09	0.64	0.29	0.56	0.45	0.47	0.17
Intersection Summary								

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	28	0	240	182	31	148	99	217	38	101	51
Future Volume (veh/h)	75	28	0	240	182	31	148	99	217	38	101	51
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	0	1796	1515	1515	1752	1752	1811	1767	1767	1352
Adj Flow Rate, veh/h	82	30	0	261	198	34	161	108	0	41	110	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	0	7	26	26	10	10	6	9	9	37
Cap, veh/h	106	254	0	295	696	117	298	200		94	251	226
Arrive On Green	0.06	0.17	0.00	0.17	0.28	0.28	0.29	0.29	0.00	0.20	0.20	0.20
Sat Flow, veh/h	1725	1485	0	1711	2463	416	1018	683	1535	473	1270	1144
Grp Volume(v), veh/h	82	30	0	261	114	118	269	0	0	151	0	55
Grp Sat Flow(s),veh/h/ln	1725	1485	0	1711	1439	1440	1701	0	1535	1743	0	1144
Q Serve(g_s), s	4.9	1.8	0.0	15.7	6.5	6.7	14.0	0.0	0.0	8.0	0.0	4.3
Cycle Q Clear(g_c), s	4.9	1.8	0.0	15.7	6.5	6.7	14.0	0.0	0.0	8.0	0.0	4.3
Prop In Lane	1.00		0.00	1.00		0.29	0.60		1.00	0.27		1.00
Lane Grp Cap(c), veh/h	106	254	0	295	406	407	498	0		345	0	226
V/C Ratio(X)	0.77	0.12	0.00	0.88	0.28	0.29	0.54	0.00		0.44	0.00	0.24
Avail Cap(c_a), veh/h	349	254	0	428	406	407	498	0		345	0	226
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	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.6	36.8	0.0	42.5	29.4	29.5	31.2	0.0	0.0	37.0	0.0	35.5
Incr Delay (d2), s/veh	13.4	0.9	0.0	14.2	1.7	1.8	4.2	0.0	0.0	4.0	0.0	2.5
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	2.5	0.7	0.0	7.5	2.4	2.4	6.0	0.0	0.0	3.8	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.0	37.8	0.0	56.7	31.1	31.3	35.4	0.0	0.0	41.1	0.0	38.1
LnGrp LOS	E	D	A	E	C	C	D	A		D	A	D
Approach Vol, veh/h		112			493			269	A		206	
Approach Delay, s/veh		55.5			44.7			35.4			40.3	
Approach LOS		E			D			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.8	23.3		25.0	10.2	35.0		35.0				
Change Period (Y+Rc), s	3.7	5.3		* 4.2	3.7	5.3		4.2				
Max Green Setting (Gmax), s	26.3	14.7		* 21	21.3	29.7		30.8				
Max Q Clear Time (g_c+I1), s	17.7	3.8		10.0	6.9	8.7		16.0				
Green Ext Time (p_c), s	0.5	0.1		0.7	0.2	1.1		1.2				

Intersection Summary

HCM 6th Ctrl Delay 42.7

HCM 6th LOS D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Appendix D

Improved Traffic Signal Synchro Operational Analysis



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	80	27	375	525	620	222	229	109	28	239
v/c Ratio	0.68	0.08	0.33	0.85	0.93	0.94	0.91	0.20	0.27	0.72
Control Delay	69.8	25.1	15.0	49.2	48.7	86.1	77.4	2.3	46.0	44.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.8	25.1	15.0	49.2	48.7	86.1	77.4	2.3	46.0	44.2
Queue Length 50th (ft)	45	11	71	148	337	133	136	0	15	114
Queue Length 95th (ft)	#116	32	106	#222	#566	#278	#278	15	42	#221
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	119	341	1149	658	670	235	251	538	107	331
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.08	0.33	0.80	0.93	0.94	0.91	0.20	0.26	0.72

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	25	345	483	511	60	283	132	100	26	143	77
Future Volume (veh/h)	74	25	345	483	511	60	283	132	100	26	143	77
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1500	1085	1589	1870	1693	1693	1752	1781	1485	1263	1752	1752
Adj Flow Rate, veh/h	80	27	375	525	555	65	226	258	0	28	155	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	21	2	14	14	10	8	28	43	10	10
Cap, veh/h	97	306	1029	600	576	67	254	560		47	205	111
Arrive On Green	0.07	0.28	0.28	0.17	0.39	0.39	0.15	0.31	0.00	0.04	0.19	0.19
Sat Flow, veh/h	1428	1085	2370	3456	1487	174	1668	1781	1259	1203	1069	579
Grp Volume(v), veh/h	80	27	375	525	0	620	226	258	0	28	0	239
Grp Sat Flow(s),veh/h/ln	1428	1085	1185	1728	0	1661	1668	1781	1259	1203	0	1648
Q Serve(g_s), s	4.9	1.6	9.4	13.1	0.0	32.3	11.8	10.3	0.0	2.0	0.0	12.1
Cycle Q Clear(g_c), s	4.9	1.6	9.4	13.1	0.0	32.3	11.8	10.3	0.0	2.0	0.0	12.1
Prop In Lane	1.00		1.00	1.00		0.10	1.00		1.00	1.00		0.35
Lane Grp Cap(c), veh/h	97	306	1029	600	0	644	254	560		47	0	316
V/C Ratio(X)	0.82	0.09	0.36	0.87	0.00	0.96	0.89	0.46		0.59	0.00	0.76
Avail Cap(c_a), veh/h	121	306	1029	668	0	644	254	560		103	0	316
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	40.7	23.4	16.8	35.6	0.0	26.5	36.8	24.3	0.0	41.8	0.0	33.8
Incr Delay (d2), s/veh	24.8	0.6	1.0	10.7	0.0	27.5	29.3	2.7	0.0	4.3	0.0	15.4
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	2.4	0.5	2.4	6.1	0.0	16.3	6.6	4.4	0.0	0.7	0.0	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.5	24.0	17.8	46.3	0.0	54.0	66.1	27.1	0.0	46.1	0.0	49.2
LnGrp LOS	E	C	B	D	A	D	E	C		D	A	D
Approach Vol, veh/h		482			1145			484	A		267	
Approach Delay, s/veh		26.1			50.5			45.3			48.9	
Approach LOS		C			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.1	30.2	18.0	21.2	9.7	39.6	7.2	32.0				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	17.1	24.7	13.5	* 17	7.5	34.3	7.6	* 24				
Max Q Clear Time (g_c+I1), s	15.1	11.4	13.8	14.1	6.9	34.3	4.0	12.3				
Green Ext Time (p_c), s	0.3	0.9	0.0	0.3	0.0	0.0	0.0	0.6				

Intersection Summary

HCM 6th Ctrl Delay 44.3

HCM 6th LOS D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	133	58	1013	276	286	247	259	286	74	265
v/c Ratio	0.69	0.10	0.59	0.93	0.52	0.85	0.84	0.44	0.56	0.99
Control Delay	64.2	22.0	13.6	87.1	31.5	68.9	66.8	6.2	63.9	95.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.2	22.0	13.6	87.1	31.5	68.9	66.8	6.2	63.9	95.7
Queue Length 50th (ft)	91	26	218	101	154	176	185	0	51	174
Queue Length 95th (ft)	152	54	282	#183	254	#315	#323	66	99	#347
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	256	584	1749	297	554	307	308	648	163	267
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.10	0.58	0.93	0.52	0.80	0.84	0.44	0.45	0.99

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	122	53	932	254	233	30	284	181	263	68	154	90
Future Volume (veh/h)	122	53	932	254	233	30	284	181	263	68	154	90
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	1841	1796	1515	1515	1752	1752	1811	1618	1767	1767
Adj Flow Rate, veh/h	133	58	1013	276	253	33	253	275	0	74	167	98
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	4	7	26	26	10	10	6	19	9	9
Cap, veh/h	161	598	1571	308	528	69	283	503		91	176	103
Arrive On Green	0.09	0.40	0.40	0.09	0.40	0.40	0.17	0.29	0.00	0.06	0.17	0.17
Sat Flow, veh/h	1725	1485	2745	3319	1313	171	1668	1752	1535	1541	1044	613
Grp Volume(v), veh/h	133	58	1013	276	0	286	253	275	0	74	0	265
Grp Sat Flow(s),veh/h/ln	1725	1485	1373	1659	0	1484	1668	1752	1535	1541	0	1656
Q Serve(g_s), s	8.1	2.6	26.7	8.8	0.0	15.2	15.8	14.2	0.0	5.1	0.0	16.9
Cycle Q Clear(g_c), s	8.1	2.6	26.7	8.8	0.0	15.2	15.8	14.2	0.0	5.1	0.0	16.9
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	1.00		0.37
Lane Grp Cap(c), veh/h	161	598	1571	308	0	597	283	503		91	0	280
V/C Ratio(X)	0.82	0.10	0.64	0.90	0.00	0.48	0.89	0.55		0.81	0.00	0.95
Avail Cap(c_a), veh/h	265	598	1571	308	0	597	337	503		169	0	280
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	47.4	19.8	15.5	47.8	0.0	23.6	43.3	32.1	0.0	49.6	0.0	43.8
Incr Delay (d2), s/veh	4.1	0.3	2.1	25.9	0.0	2.7	22.4	4.2	0.0	6.4	0.0	41.8
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	3.7	1.0	7.8	4.6	0.0	5.5	8.0	6.3	0.0	2.1	0.0	10.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.6	20.1	17.5	73.8	0.0	26.3	65.7	36.4	0.0	56.0	0.0	85.6
LnGrp LOS	D	C	B	E	A	C	E	D		E	A	F
Approach Vol, veh/h		1204			562			528	A		339	
Approach Delay, s/veh		21.4			49.6			50.5			79.1	
Approach LOS		C			D			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.6	48.2	22.6	22.2	13.7	48.1	10.0	34.8				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	9.9	42.9	21.5	* 18	16.4	36.4	11.7	* 29				
Max Q Clear Time (g_c+l1), s	10.8	28.7	17.8	18.9	10.1	17.2	7.1	16.2				
Green Ext Time (p_c), s	0.0	2.7	0.2	0.0	0.1	1.2	0.0	0.7				

Intersection Summary

HCM 6th Ctrl Delay 40.7

HCM 6th LOS D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	87	29	403	607	670	239	247	182	30	256
v/c Ratio	0.82	0.07	0.33	0.84	0.89	0.92	0.89	0.36	0.38	0.94
Control Delay	103.0	31.7	17.6	56.3	46.0	87.6	81.7	7.4	67.1	88.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	103.0	31.7	17.6	56.3	46.0	87.6	81.7	7.4	67.1	88.0
Queue Length 50th (ft)	67	16	97	233	467	192	197	1	23	185
Queue Length 95th (ft)	#159	42	147	287	#709	#350	#353	59	55	#351
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	111	387	1251	862	751	268	276	508	89	272
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.07	0.32	0.70	0.89	0.89	0.89	0.36	0.34	0.94

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	27	371	558	551	65	305	142	167	28	153	83
Future Volume (veh/h)	80	27	371	558	551	65	305	142	167	28	153	83
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1500	1085	1589	1870	1693	1693	1752	1781	1485	1263	1752	1752
Adj Flow Rate, veh/h	87	29	403	607	599	71	243	279	0	30	166	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	21	2	14	14	10	8	28	43	10	10
Cap, veh/h	104	362	1172	676	677	80	269	517		45	171	93
Arrive On Green	0.07	0.33	0.33	0.20	0.46	0.46	0.16	0.29	0.00	0.04	0.16	0.16
Sat Flow, veh/h	1428	1085	2370	3456	1485	176	1668	1781	1259	1203	1068	579
Grp Volume(v), veh/h	87	29	403	607	0	670	243	279	0	30	0	256
Grp Sat Flow(s),veh/h/ln	1428	1085	1185	1728	0	1661	1668	1781	1259	1203	0	1648
Q Serve(g_s), s	7.1	2.2	12.2	20.2	0.0	43.3	16.8	15.5	0.0	2.9	0.0	18.2
Cycle Q Clear(g_c), s	7.1	2.2	12.2	20.2	0.0	43.3	16.8	15.5	0.0	2.9	0.0	18.2
Prop In Lane	1.00		1.00	1.00		0.11	1.00		1.00	1.00		0.35
Lane Grp Cap(c), veh/h	104	362	1172	676	0	758	269	517		45	0	263
V/C Ratio(X)	0.84	0.08	0.34	0.90	0.00	0.88	0.90	0.54		0.67	0.00	0.97
Avail Cap(c_a), veh/h	113	362	1172	878	0	758	291	517		86	0	263
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	53.9	26.9	18.1	46.2	0.0	29.2	48.5	35.1	0.0	56.0	0.0	49.2
Incr Delay (d2), s/veh	35.1	0.4	0.8	8.6	0.0	14.2	28.4	4.0	0.0	6.3	0.0	48.9
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	3.6	0.6	3.3	9.2	0.0	19.0	8.9	7.1	0.0	1.0	0.0	11.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.0	27.3	18.9	54.8	0.0	43.4	76.9	39.1	0.0	62.3	0.0	98.1
LnGrp LOS	F	C	B	D	A	D	E	D		E	A	F
Approach Vol, veh/h		519			1277			522	A		286	
Approach Delay, s/veh		31.1			48.8			56.7			94.4	
Approach LOS		C			D			E			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	26.7	44.5	23.4	23.0	12.3	59.0	8.1	38.4				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	29.9	33.1	20.5	* 19	9.3	53.7	8.4	* 32				
Max Q Clear Time (g_c+I1), s	22.2	14.2	18.8	20.2	9.1	45.3	4.9	17.5				
Green Ext Time (p_c), s	0.8	1.1	0.1	0.0	0.0	2.3	0.0	0.7				

Intersection Summary

HCM 6th Ctrl Delay 51.9

HCM 6th LOS D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	142	62	1091	362	308	266	278	351	79	285
v/c Ratio	0.76	0.17	0.78	0.76	0.74	0.78	0.77	0.43	0.58	0.76
Control Delay	76.2	38.7	28.2	58.6	50.3	58.3	57.0	4.5	68.0	53.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.2	38.7	28.2	58.6	50.3	58.3	57.0	4.5	68.0	53.3
Queue Length 50th (ft)	105	37	362	138	213	197	206	0	59	190
Queue Length 95th (ft)	#198	80	488	188	#354	302	310	62	110	#334
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	213	360	1499	589	417	404	360	813	182	373
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.17	0.73	0.61	0.74	0.66	0.77	0.43	0.43	0.76

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	131	57	1004	333	251	32	306	194	323	73	166	97
Future Volume (veh/h)	131	57	1004	333	251	32	306	194	323	73	166	97
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	1841	1796	1515	1515	1752	1752	1811	1618	1767	1767
Adj Flow Rate, veh/h	142	62	1091	362	273	35	272	296	0	79	180	105
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	4	7	26	26	10	10	6	19	9	9
Cap, veh/h	170	384	1211	427	380	49	304	693		97	281	164
Arrive On Green	0.10	0.26	0.26	0.13	0.29	0.29	0.18	0.40	0.00	0.06	0.27	0.27
Sat Flow, veh/h	1725	1485	2745	3319	1316	169	1668	1752	1535	1541	1046	610
Grp Volume(v), veh/h	142	62	1091	362	0	308	272	296	0	79	0	285
Grp Sat Flow(s),veh/h/ln	1725	1485	1373	1659	0	1484	1668	1752	1535	1541	0	1657
Q Serve(g_s), s	8.9	3.5	28.4	11.7	0.0	20.4	17.5	13.5	0.0	5.6	0.0	16.7
Cycle Q Clear(g_c), s	8.9	3.5	28.4	11.7	0.0	20.4	17.5	13.5	0.0	5.6	0.0	16.7
Prop In Lane	1.00		1.00	1.00		0.11	1.00		1.00	1.00		0.37
Lane Grp Cap(c), veh/h	170	384	1211	427	0	429	304	693		97	0	445
V/C Ratio(X)	0.84	0.16	0.90	0.85	0.00	0.72	0.89	0.43		0.81	0.00	0.64
Avail Cap(c_a), veh/h	225	384	1211	620	0	429	449	693		192	0	445
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.6	31.5	28.4	46.7	0.0	35.0	43.8	24.1	0.0	50.8	0.0	35.4
Incr Delay (d2), s/veh	14.6	0.9	10.9	5.1	0.0	9.9	14.6	1.9	0.0	6.1	0.0	6.9
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	4.5	1.4	14.0	5.0	0.0	8.2	8.2	5.7	0.0	2.3	0.0	7.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.2	32.4	39.3	51.9	0.0	44.9	58.4	26.0	0.0	56.8	0.0	42.3
LnGrp LOS	E	C	D	D	A	D	E	C		E	A	D
Approach Vol, veh/h		1295			670			568	A		364	
Approach Delay, s/veh		41.6			48.7			41.5			45.4	
Approach LOS		D			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.8	33.7	24.5	33.7	14.5	37.0	10.6	47.6				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	20.5	25.5	29.5	* 27	14.3	31.7	13.7	* 43				
Max Q Clear Time (g_c+I1), s	13.7	30.4	19.5	18.7	10.9	22.4	7.6	15.5				
Green Ext Time (p_c), s	0.4	0.0	0.5	0.8	0.1	0.9	0.0	1.0				
Intersection Summary												
HCM 6th Ctrl Delay			43.7									
HCM 6th LOS			D									
Notes												
User approved volume balancing among the lanes for turning movement.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.												



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	77	23	297	474	450	225	232	111	10	130
v/c Ratio	0.59	0.08	0.27	0.75	0.76	0.80	0.77	0.18	0.10	0.38
Control Delay	59.2	29.3	14.8	41.9	36.0	55.6	51.5	2.0	41.0	31.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.2	29.3	14.8	41.9	36.0	55.6	51.5	2.0	41.0	31.5
Queue Length 50th (ft)	43	10	53	132	227	127	130	0	5	57
Queue Length 95th (ft)	#102	32	88	179	#389	#240	#236	15	22	111
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	137	283	1168	770	589	318	303	611	103	340
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.08	0.25	0.62	0.76	0.71	0.77	0.18	0.10	0.38

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	21	273	436	336	78	272	148	102	9	90	29
Future Volume (veh/h)	71	21	273	436	336	78	272	148	102	9	90	29
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1500	1085	1589	1870	1693	1693	1752	1781	1485	1263	1752	1752
Adj Flow Rate, veh/h	77	23	297	474	365	85	228	255	0	10	98	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	21	2	14	14	10	8	28	43	10	10
Cap, veh/h	100	282	993	565	469	109	266	634		21	258	84
Arrive On Green	0.07	0.26	0.26	0.16	0.35	0.35	0.16	0.36	0.00	0.02	0.20	0.20
Sat Flow, veh/h	1428	1085	2370	3456	1328	309	1668	1781	1259	1203	1265	413
Grp Volume(v), veh/h	77	23	297	474	0	450	228	255	0	10	0	130
Grp Sat Flow(s),veh/h/ln	1428	1085	1185	1728	0	1637	1668	1781	1259	1203	0	1677
Q Serve(g_s), s	4.4	1.3	6.9	11.1	0.0	20.4	11.1	8.9	0.0	0.7	0.0	5.6
Cycle Q Clear(g_c), s	4.4	1.3	6.9	11.1	0.0	20.4	11.1	8.9	0.0	0.7	0.0	5.6
Prop In Lane	1.00		1.00	1.00		0.19	1.00		1.00	1.00		0.25
Lane Grp Cap(c), veh/h	100	282	993	565	0	579	266	634		21	0	343
V/C Ratio(X)	0.77	0.08	0.30	0.84	0.00	0.78	0.86	0.40		0.48	0.00	0.38
Avail Cap(c_a), veh/h	143	282	993	802	0	579	353	634		101	0	343
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.0	23.3	16.0	33.7	0.0	24.0	34.0	20.1	0.0	40.5	0.0	28.5
Incr Delay (d2), s/veh	8.6	0.6	0.8	3.9	0.0	9.9	14.7	1.9	0.0	6.2	0.0	3.2
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	1.8	0.4	1.8	4.6	0.0	8.7	5.3	3.7	0.0	0.2	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.6	23.8	16.8	37.6	0.0	33.9	48.8	22.0	0.0	46.7	0.0	31.7
LnGrp LOS	D	C	B	D	A	C	D	C		D	A	C
Approach Vol, veh/h		397			924			483	A		140	
Approach Delay, s/veh		23.0			35.8			34.7			32.8	
Approach LOS		C			D			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.3	26.9	17.8	21.2	9.5	34.7	5.1	33.8				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	19.3	18.4	17.6	* 17	8.3	29.4	7.0	* 28				
Max Q Clear Time (g_c+I1), s	13.1	8.9	13.1	7.6	6.4	22.4	2.7	10.9				
Green Ext Time (p_c), s	0.5	0.6	0.3	0.3	0.0	1.2	0.0	0.7				

Intersection Summary

HCM 6th Ctrl Delay	32.7
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	76	28	635	220	217	126	130	220	39	145
v/c Ratio	0.45	0.06	0.45	0.58	0.41	0.56	0.54	0.33	0.30	0.41
Control Delay	46.0	23.5	14.3	42.3	25.1	43.9	42.3	4.9	45.1	28.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.0	23.5	14.3	42.3	25.1	43.9	42.3	4.9	45.1	28.0
Queue Length 50th (ft)	41	11	122	60	91	68	70	0	21	54
Queue Length 95th (ft)	84	32	165	96	163	125	127	50	53	117
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	208	456	1548	478	528	305	240	670	131	355
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.06	0.41	0.46	0.41	0.41	0.54	0.33	0.30	0.41
Intersection Summary										

US 101 SB at Terven Ave

After Interchange Opens PP (2036)

1: Terven Ave/Terven Avenue & Airport Boulevard/US 101 SB Ramps

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	26	584	202	170	29	140	96	202	36	86	48
Future Volume (veh/h)	70	26	584	202	170	29	140	96	202	36	86	48
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	1841	1796	1515	1515	1752	1752	1811	1618	1767	1767
Adj Flow Rate, veh/h	76	28	635	220	185	32	128	138	0	39	93	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	4	7	26	26	10	10	6	19	9	9
Cap, veh/h	121	470	1132	300	423	73	160	592		77	300	168
Arrive On Green	0.07	0.32	0.32	0.09	0.34	0.34	0.10	0.34	0.00	0.05	0.28	0.28
Sat Flow, veh/h	1725	1485	2745	3319	1258	218	1668	1752	1535	1541	1064	595
Grp Volume(v), veh/h	76	28	635	220	0	217	128	138	0	39	0	145
Grp Sat Flow(s),veh/h/ln	1725	1485	1373	1659	0	1476	1668	1752	1535	1541	0	1659
Q Serve(g_s), s	3.5	1.1	14.6	5.3	0.0	9.4	6.2	4.7	0.0	2.0	0.0	5.7
Cycle Q Clear(g_c), s	3.5	1.1	14.6	5.3	0.0	9.4	6.2	4.7	0.0	2.0	0.0	5.7
Prop In Lane	1.00		1.00	1.00		0.15	1.00		1.00	1.00		0.36
Lane Grp Cap(c), veh/h	121	470	1132	300	0	497	160	592		77	0	468
V/C Ratio(X)	0.63	0.06	0.56	0.73	0.00	0.44	0.80	0.23		0.50	0.00	0.31
Avail Cap(c_a), veh/h	216	470	1132	496	0	497	334	592		137	0	468
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.2	19.6	18.5	36.5	0.0	21.2	36.4	19.6	0.0	38.1	0.0	23.2
Incr Delay (d2), s/veh	2.0	0.2	2.0	1.3	0.0	2.8	8.8	0.9	0.0	1.9	0.0	1.7
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	1.5	0.4	4.4	2.1	0.0	3.3	2.8	1.9	0.0	0.8	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.2	19.8	20.5	37.8	0.0	24.0	45.2	20.5	0.0	40.0	0.0	24.9
LnGrp LOS	D	B	C	D	A	C	D	C		D	A	C
Approach Vol, veh/h		739			437			266	A		184	
Approach Delay, s/veh		22.4			30.9			32.4			28.1	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.1	31.3	12.4	27.4	9.5	33.0	7.8	32.0				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	12.3	25.7	16.5	* 18	10.3	27.7	7.3	* 28				
Max Q Clear Time (g_c+I1), s	7.3	16.6	8.2	7.7	5.5	11.4	4.0	6.7				
Green Ext Time (p_c), s	0.2	1.3	0.2	0.4	0.0	0.8	0.0	0.4				

Intersection Summary

HCM 6th Ctrl Delay	27.0
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	83	25	317	504	482	240	248	117	11	138
v/c Ratio	0.68	0.09	0.29	0.77	0.79	0.86	0.83	0.19	0.11	0.41
Control Delay	68.4	29.3	15.5	42.1	36.6	64.9	59.3	2.4	41.3	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.4	29.3	15.5	42.1	36.6	64.9	59.3	2.4	41.3	32.5
Queue Length 50th (ft)	47	11	59	140	242	140	143	0	6	61
Queue Length 95th (ft)	#119	33	96	188	#413	#274	#274	18	23	117
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	125	284	1131	795	610	294	298	604	101	335
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.09	0.28	0.63	0.79	0.82	0.83	0.19	0.11	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	23	292	464	360	84	291	158	108	10	96	31
Future Volume (veh/h)	76	23	292	464	360	84	291	158	108	10	96	31
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1500	1085	1589	1870	1693	1693	1752	1781	1485	1263	1752	1752
Adj Flow Rate, veh/h	83	25	317	504	391	91	244	273	0	11	104	34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	27	55	21	2	14	14	10	8	28	43	10	10
Cap, veh/h	100	281	1010	592	479	111	279	632		23	249	81
Arrive On Green	0.07	0.26	0.26	0.17	0.36	0.36	0.17	0.35	0.00	0.02	0.20	0.20
Sat Flow, veh/h	1428	1085	2370	3456	1328	309	1668	1781	1259	1203	1264	413
Grp Volume(v), veh/h	83	25	317	504	0	482	244	273	0	11	0	138
Grp Sat Flow(s),veh/h/ln	1428	1085	1185	1728	0	1637	1668	1781	1259	1203	0	1677
Q Serve(g_s), s	4.9	1.5	7.6	12.2	0.0	23.0	12.3	10.1	0.0	0.8	0.0	6.2
Cycle Q Clear(g_c), s	4.9	1.5	7.6	12.2	0.0	23.0	12.3	10.1	0.0	0.8	0.0	6.2
Prop In Lane	1.00		1.00	1.00		0.19	1.00		1.00	1.00		0.25
Lane Grp Cap(c), veh/h	100	281	1010	592	0	590	279	632		23	0	331
V/C Ratio(X)	0.83	0.09	0.31	0.85	0.00	0.82	0.88	0.43		0.49	0.00	0.42
Avail Cap(c_a), veh/h	128	281	1010	809	0	590	319	632		98	0	331
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	39.6	24.2	16.4	34.7	0.0	25.0	35.0	21.2	0.0	41.9	0.0	30.3
Incr Delay (d2), s/veh	23.9	0.6	0.8	4.9	0.0	11.9	20.8	2.1	0.0	5.9	0.0	3.8
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	2.4	0.4	2.0	5.2	0.0	10.0	6.3	4.2	0.0	0.3	0.0	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.5	24.9	17.2	39.6	0.0	36.9	55.9	23.4	0.0	47.8	0.0	34.1
LnGrp LOS	E	C	B	D	A	D	E	C		D	A	C
Approach Vol, veh/h		425			986			517	A		149	
Approach Delay, s/veh		26.7			38.3			38.7			35.2	
Approach LOS		C			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.5	27.7	18.9	21.2	9.7	36.4	5.3	34.8				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	20.2	18.6	16.5	* 17	7.7	31.1	7.0	* 27				
Max Q Clear Time (g_c+I1), s	14.2	9.6	14.3	8.2	6.9	25.0	2.8	12.1				
Green Ext Time (p_c), s	0.6	0.6	0.2	0.3	0.0	1.2	0.0	0.7				

Intersection Summary

HCM 6th Ctrl Delay 35.8

HCM 6th LOS D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	82	30	684	261	232	132	137	236	41	165
v/c Ratio	0.49	0.06	0.79	0.82	0.45	0.70	0.67	0.36	0.29	0.44
Control Delay	42.5	18.6	31.8	55.0	22.8	52.9	49.3	5.1	37.4	24.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	18.6	31.8	55.0	22.8	52.9	49.3	5.1	37.4	24.5
Queue Length 50th (ft)	37	10	163	62	82	63	65	0	18	53
Queue Length 95th (ft)	79	28	#255	#123	148	#143	#142	50	48	109
Internal Link Dist (ft)		526			427		121			526
Turn Bay Length (ft)	175		285	135		30		125	200	
Base Capacity (vph)	173	467	861	320	517	198	203	653	142	371
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.06	0.79	0.82	0.45	0.67	0.67	0.36	0.29	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	28	629	240	182	31	148	99	217	38	101	51
Future Volume (veh/h)	75	28	629	240	182	31	148	99	217	38	101	51
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1485	1841	1796	1515	1515	1752	1752	1811	1618	1767	1767
Adj Flow Rate, veh/h	82	30	684	261	198	34	134	145	0	41	110	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	28	4	7	26	26	10	10	6	19	9	9
Cap, veh/h	134	480	887	333	435	75	166	508		84	260	130
Arrive On Green	0.08	0.32	0.32	0.10	0.35	0.35	0.10	0.29	0.00	0.05	0.23	0.23
Sat Flow, veh/h	1725	1485	2745	3319	1259	216	1668	1752	1535	1541	1111	556
Grp Volume(v), veh/h	82	30	684	261	0	232	134	145	0	41	0	165
Grp Sat Flow(s),veh/h/ln	1725	1485	1373	1659	0	1476	1668	1752	1535	1541	0	1667
Q Serve(g_s), s	3.3	1.0	16.3	5.6	0.0	8.9	5.7	4.7	0.0	1.9	0.0	6.1
Cycle Q Clear(g_c), s	3.3	1.0	16.3	5.6	0.0	8.9	5.7	4.7	0.0	1.9	0.0	6.1
Prop In Lane	1.00		1.00	1.00		0.15	1.00		1.00	1.00		0.33
Lane Grp Cap(c), veh/h	134	480	887	333	0	510	166	508		84	0	389
V/C Ratio(X)	0.61	0.06	0.77	0.78	0.00	0.46	0.81	0.29		0.49	0.00	0.42
Avail Cap(c_a), veh/h	180	480	887	333	0	510	218	508		148	0	389
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	32.5	17.0	22.2	32.0	0.0	18.5	32.1	20.0	0.0	33.4	0.0	23.7
Incr Delay (d2), s/veh	1.7	0.3	6.4	10.6	0.0	2.9	15.2	1.4	0.0	1.7	0.0	3.4
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	1.4	0.4	5.4	2.6	0.0	3.1	2.8	1.9	0.0	0.7	0.0	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.1	17.3	28.6	42.6	0.0	21.4	47.2	21.4	0.0	35.1	0.0	27.1
LnGrp LOS	C	B	C	D	A	C	D	C		D	A	C
Approach Vol, veh/h		796			493			279	A		206	
Approach Delay, s/veh		28.8			32.6			33.8			28.7	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.0	28.8	11.8	21.2	9.4	30.4	7.6	25.3				
Change Period (Y+Rc), s	3.7	5.3	4.5	* 4.2	3.7	5.3	3.7	* 4.2				
Max Green Setting (Gmax), s	7.3	23.5	9.5	* 17	7.6	23.2	7.0	* 20				
Max Q Clear Time (g_c+I1), s	7.6	18.3	7.7	8.1	5.3	10.9	3.9	6.7				
Green Ext Time (p_c), s	0.0	1.0	0.1	0.4	0.0	0.7	0.0	0.3				

Intersection Summary

HCM 6th Ctrl Delay	30.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Appendix E

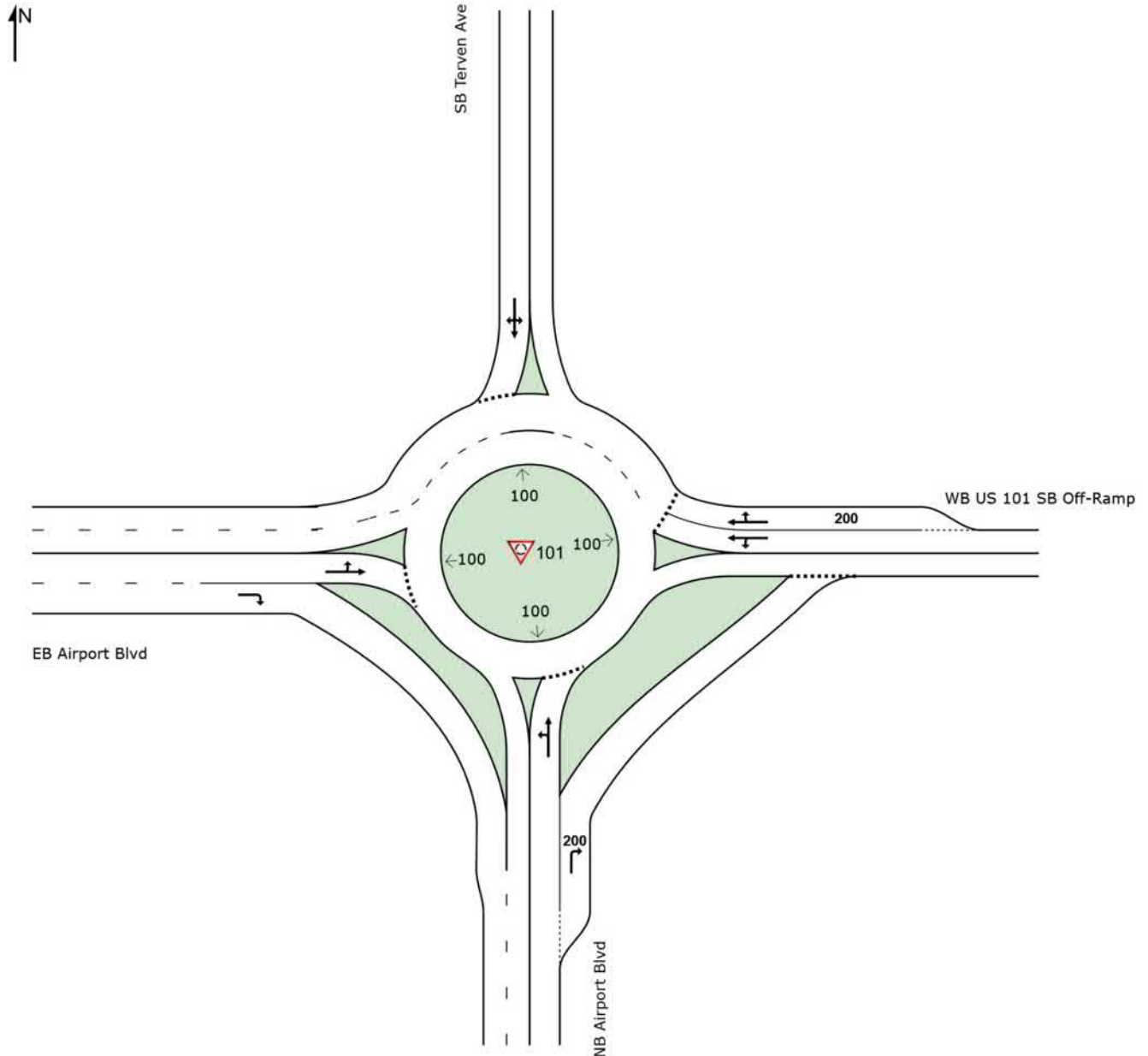
Roundabout SIDRA Operational Analysis

SITE LAYOUT

 **Site: 101 [Alt01a_2025AM_US101 SB @ Airport Blvd_DL (Site Folder: General)]**

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

 Site: 101 [Alt01a_2025AM_US101 SB @ Airport Blvd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB Airport Blvd													
Lane 1 ^d	451	9.4	1098	0.411	100	7.6	LOS A	2.1	55.9	Full	820	0.0	0.0
Lane 2	109	28.0	1029	0.106	100	4.4	LOS A	0.3	10.4	Short	200	0.0	NA
Approach	560	13.0		0.411		7.0	LOS A	2.1	55.9				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	597	3.5	840	0.711	100	17.7	LOS C	7.9	202.2	Full	615	0.0	0.0
Lane 2	548	12.6	771	0.711	100	18.9	LOS C	7.2	197.8	Short	200	0.0	NA
Approach	1146	7.8		0.711		18.3	LOS C	7.9	202.2				
North: SB Terven Ave													
Lane 1 ^d	267	14.1	358	0.748	100	38.4	LOS E	4.2	115.9	Full	1600	0.0	0.0
Approach	267	14.1		0.748		38.4	LOS E	4.2	115.9				
West: EB Airport Blvd													
Lane 1 ^d	108	34.1	537	0.200	100	9.4	LOS A	0.6	18.2	Full	1200	0.0	0.0
Lane 2	375	21.0	1384	0.271	100	0.1	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	483	23.9		0.271		2.2	LOS A	0.6	18.2				
Intersection	2455	12.8		0.748		14.7	LOS B	7.9	202.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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Project: K:\SAC_TPTO\City of Salinas, ICE - SB 101 Ramps at Terven Ave\03 Analysis Files\Sidra Files\SB101 at Terven_RAB.sip9

LANE SUMMARY

 Site: 101 [Alt01a_2025PM_US101 SB @ Airport Blvd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB Airport Blvd													
Lane 1 ^d	505	10.0	980	0.515	100	10.1	LOS B	3.1	84.8	Full	820	0.0	0.0
Lane 2	286	6.0	1156	0.247	100	5.4	LOS A	1.1	29.0	Short	200	0.0	NA
Approach	791	8.6		0.515		8.4	LOS A	3.1	84.8				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	302	8.6	724	0.417	100	10.6	LOS B	2.0	53.9	Full	615	0.0	0.0
Lane 2	260	25.6	625	0.417	100	11.9	LOS B	1.7	51.7	Short	200	0.0	NA
Approach	562	16.5		0.417		11.2	LOS B	2.0	53.9				
North: SB Terven Ave													
Lane 1 ^d	339	19.3	542	0.625	100	20.2	LOS C	3.6	103.9	Full	1600	0.0	0.0
Approach	339	19.3		0.625		20.2	LOS C	3.6	103.9				
West: EB Airport Blvd													
Lane 1 ^d	190	12.7	753	0.253	100	7.7	LOS A	0.9	25.7	Full	1200	0.0	0.0
Lane 2	1013	4.0	1610	0.629	100	0.3	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	1203	5.4		0.629		1.5	LOS A	0.9	25.7				
Intersection	2896	10.0		0.629		7.3	LOS A	3.6	103.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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Project: K:\SAC_TPTO\City of Salinas, ICE - SB 101 Ramps at Terven Ave\03 Analysis Files\Sidra Files\SB101 at Terven_RAB.sip9

LANE SUMMARY

 **Site: 101 [Alt01a_2035AM_US101 SB @ Airport Blvd (Site Folder: General)]**

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh Dist] ft		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: NB Airport Blvd													
Lane 1 ^d	486	9.4	1083	0.449	100	8.2	LOS A	2.4	63.2	Full	820	0.0	0.0
Lane 2	182	28.0	1023	0.177	100	5.2	LOS A	0.6	18.6	Short	200	0.0	NA
Approach	667	14.4		0.449		7.4	LOS A	2.4	63.2				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	667	3.1	810	0.823	100	25.6	LOS D	12.4	316.7	Full	615	0.0	0.0
Lane 2	609	12.6	741	0.823	100	27.4	LOS D	11.3	310.5	Short	200	0.0	NA
Approach	1276	7.6		0.823		26.5	LOS D	12.4	316.7				
North: SB Terven Ave													
Lane 1 ^d	287	14.1	313	0.917	100	68.9	LOS F	7.5	207.8	Full	1600	0.0	0.0
Approach	287	14.1		0.917		68.9	LOS F	7.5	207.8				
West: EB Airport Blvd													
Lane 1 ^d	116	34.1	491	0.237	100	10.8	LOS B	0.7	21.4	Full	1200	0.0	0.0
Lane 2	403	21.0	1384	0.291	100	0.1	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	520	23.9		0.291		2.5	LOS A	0.7	21.4				
Intersection	2750	13.0		0.917		21.7	LOS C	12.4	316.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 **Site: 101 [Alt01a_2035PM_US101 SB @ Airport Blvd (Site Folder: General)]**

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB Airport Blvd													
Lane 1 ^d	543	10.0	961	0.566	100	11.3	LOS B	4.5	121.9	Full	820	0.0	0.0
Lane 2	351	6.0	1144	0.307	100	6.1	LOS A	1.5	38.1	Short	200	0.0	NA
Approach	895	8.4		0.566		9.3	LOS A	4.5	121.9				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	362	7.0	700	0.517	100	13.1	LOS B	3.1	81.5	Full	615	0.0	0.0
Lane 2	308	25.7	596	0.516	100 ⁵	14.9	LOS B	2.6	78.4	Short	200	0.0	NA
Approach	670	15.6		0.517		14.0	LOS B	3.1	81.5				
North: SB Terven Ave													
Lane 1 ^d	365	19.3	480	0.761	100	31.4	LOS D	5.3	154.2	Full	1600	0.0	0.0
Approach	365	19.3		0.761		31.4	LOS D	5.3	154.2				
West: EB Airport Blvd													
Lane 1 ^d	204	12.7	680	0.301	100	9.1	LOS A	1.1	30.6	Full	1200	0.0	0.0
Lane 2	1091	4.0	1610	0.678	100	0.4	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	1296	5.4		0.678		1.7	LOS A	1.1	30.6				
Intersection	3225	9.9		0.761		9.6	LOS A	5.3	154.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

⁵ Lane under-utilisation found by the program

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [Alt01a_2036AM_US101 SB @ Airport Blvd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB Airport Blvd													
Lane 1 ^d	457	9.3	1136	0.402	100	7.3	LOS A	2.1	55.2	Full	820	0.0	0.0
Lane 2	111	28.0	1061	0.105	100	4.3	LOS A	0.3	10.4	Short	200	0.0	NA
Approach	567	13.0		0.402		6.7	LOS A	2.1	55.2				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	483	2.2	851	0.567	100	12.5	LOS B	4.3	110.1	Full	615	0.0	0.0
Lane 2	441	11.7	778	0.567	100	13.4	LOS B	3.9	107.2	Short	200	0.0	NA
Approach	924	6.7		0.567		12.9	LOS B	4.3	110.1				
North: SB Terven Ave													
Lane 1 ^d	139	12.8	460	0.303	100	12.7	LOS B	1.0	27.8	Full	1600	0.0	0.0
Approach	139	12.8		0.303		12.7	LOS B	1.0	27.8				
West: EB Airport Blvd													
Lane 1 ^d	100	33.4	614	0.163	100	7.8	LOS A	0.5	15.0	Full	1200	0.0	0.0
Lane 2	297	21.0	1384	0.214	100	0.1	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	397	24.1		0.214		2.0	LOS A	0.5	15.0				
Intersection	2027	12.3		0.567		9.0	LOS A	4.3	110.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 **Site: 101 [Alt01a_2036PM_US101 SB @ Airport Blvd (Site Folder: General)]**

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB Airport Blvd													
Lane 1 ^d	257	10.0	1113	0.231	100	5.4	LOS A	1.0	26.2	Full	820	0.0	0.0
Lane 2	220	6.0	1242	0.177	100	4.4	LOS A	0.8	19.7	Short	200	0.0	NA
Approach	476	8.2		0.231		4.9	LOS A	1.0	26.2				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	235	8.2	981	0.239	100	6.0	LOS A	0.9	24.6	Full	615	0.0	0.0
Lane 2	201	25.5	841	0.239	100	6.8	LOS A	0.8	23.1	Short	200	0.0	NA
Approach	436	16.2		0.239		6.3	LOS A	0.9	24.6				
North: SB Terven Ave													
Lane 1 ^d	185	19.0	709	0.261	100	8.1	LOS A	0.8	24.2	Full	1600	0.0	0.0
Approach	185	19.0		0.261		8.1	LOS A	0.8	24.2				
West: EB Airport Blvd													
Lane 1 ^d	104	12.0	895	0.117	100	5.1	LOS A	0.4	11.4	Full	1200	0.0	0.0
Lane 2	635	4.0	1610	0.394	100	0.1	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	739	5.1		0.394		0.8	LOS A	0.4	11.4				
Intersection	1836	9.9		0.394		3.9	LOS A	1.0	26.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [Alt01a_20] [AM_US101 SB @ Airport Blvd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB Airport Blvd													
Lane 1 ^d	488	9.3	1124	0.434	100	7.8	LOS A	2.3	61.6	Full	820	0.0	0.0
Lane 2	117	28.0	1056	0.111	100	4.4	LOS A	0.4	11.1	Short	200	0.0	NA
Approach	605	12.9		0.434		7.1	LOS A	2.3	61.6				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	515	2.3	821	0.628	100	14.6	LOS B	5.4	137.5	Full	615	0.0	0.0
Lane 2	472	11.7	751	0.628	100	15.7	LOS C	4.9	134.1	Short	200	0.0	NA
Approach	987	6.8		0.628		15.1	LOS C	5.4	137.5				
North: SB Terven Ave													
Lane 1 ^d	149	12.9	429	0.347	100	14.6	LOS B	1.2	33.4	Full	1600	0.0	0.0
Approach	149	12.9		0.347		14.6	LOS B	1.2	33.4				
West: EB Airport Blvd													
Lane 1 ^d	108	33.5	592	0.182	100	8.3	LOS A	0.5	16.7	Full	1200	0.0	0.0
Lane 2	317	21.0	1384	0.229	100	0.1	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	425	24.2		0.229		2.2	LOS A	0.5	16.7				
Intersection	2166	12.3		0.628		10.3	LOS B	5.4	137.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [Alt01a_20] PM_US101 SB @ Airport Blvd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB Airport Blvd													
Lane 1 ^d	268	10.0	1101	0.244	100	5.5	LOS A	1.0	27.9	Full	820	0.0	0.0
Lane 2	236	6.0	1236	0.191	100	4.6	LOS A	0.8	21.6	Short	200	0.0	NA
Approach	504	8.1		0.244		5.1	LOS A	1.0	27.9				
East: WB US 101 SB Off-Ramp													
Lane 1 ^d	266	7.3	970	0.274	100	6.4	LOS A	1.1	28.8	Full	615	0.0	0.0
Lane 2	227	25.6	828	0.274	100	7.3	LOS A	0.9	27.1	Short	200	0.0	NA
Approach	492	15.7		0.274		6.8	LOS A	1.1	28.8				
North: SB Terven Ave													
Lane 1 ^d	207	18.5	671	0.308	100	9.2	LOS A	1.0	29.0	Full	1600	0.0	0.0
Approach	207	18.5		0.308		9.2	LOS A	1.0	29.0				
West: EB Airport Blvd													
Lane 1 ^d	112	12.0	844	0.133	100	5.6	LOS A	0.5	12.9	Full	1200	0.0	0.0
Lane 2	684	4.0	1610	0.425	100	0.1	LOS A	0.0	0.0	Full	1200	0.0	0.0
Approach	796	5.1		0.425		0.9	LOS A	0.5	12.9				
Intersection	1999	9.9		0.425		4.2	LOS A	1.1	29.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

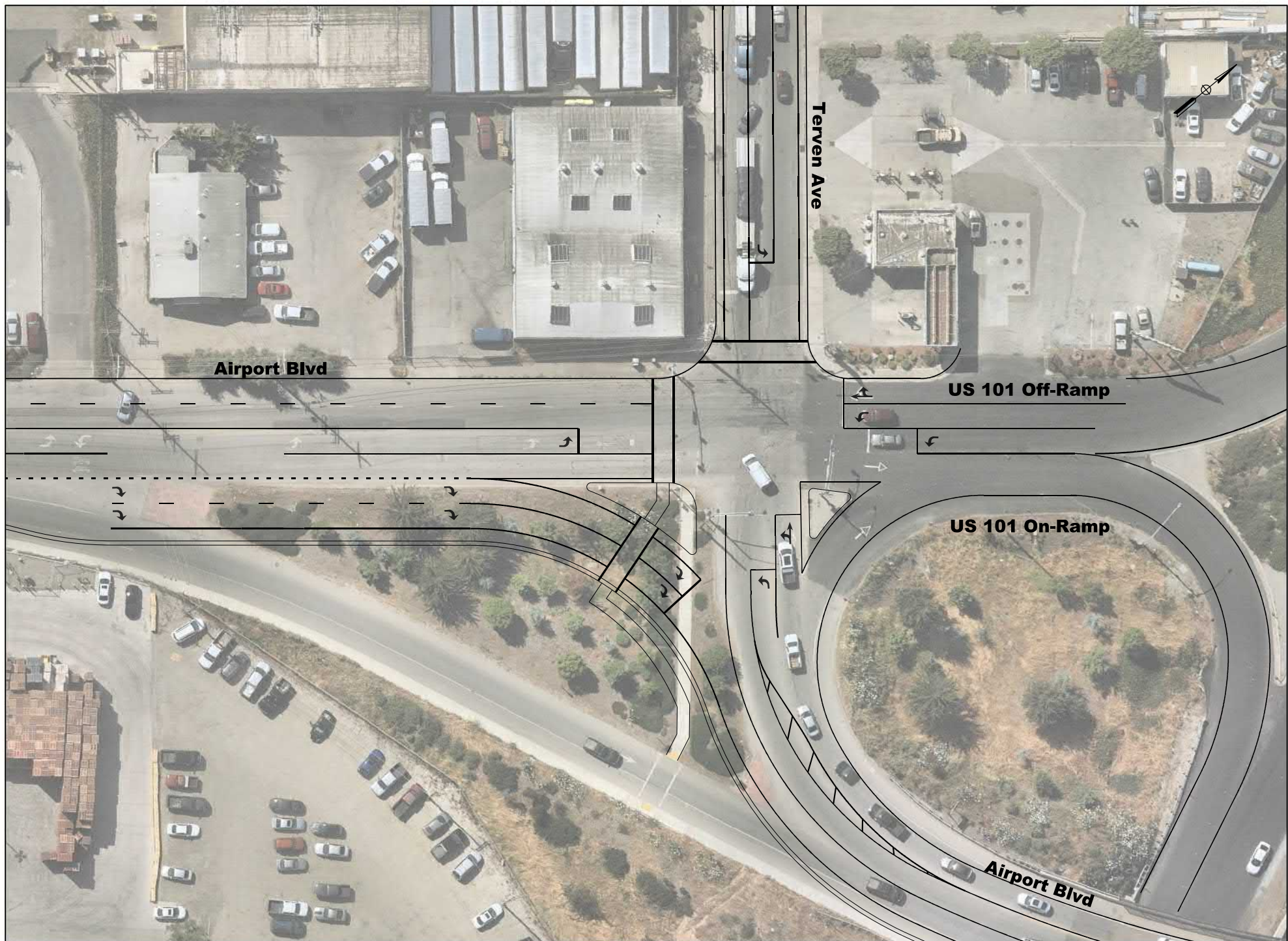
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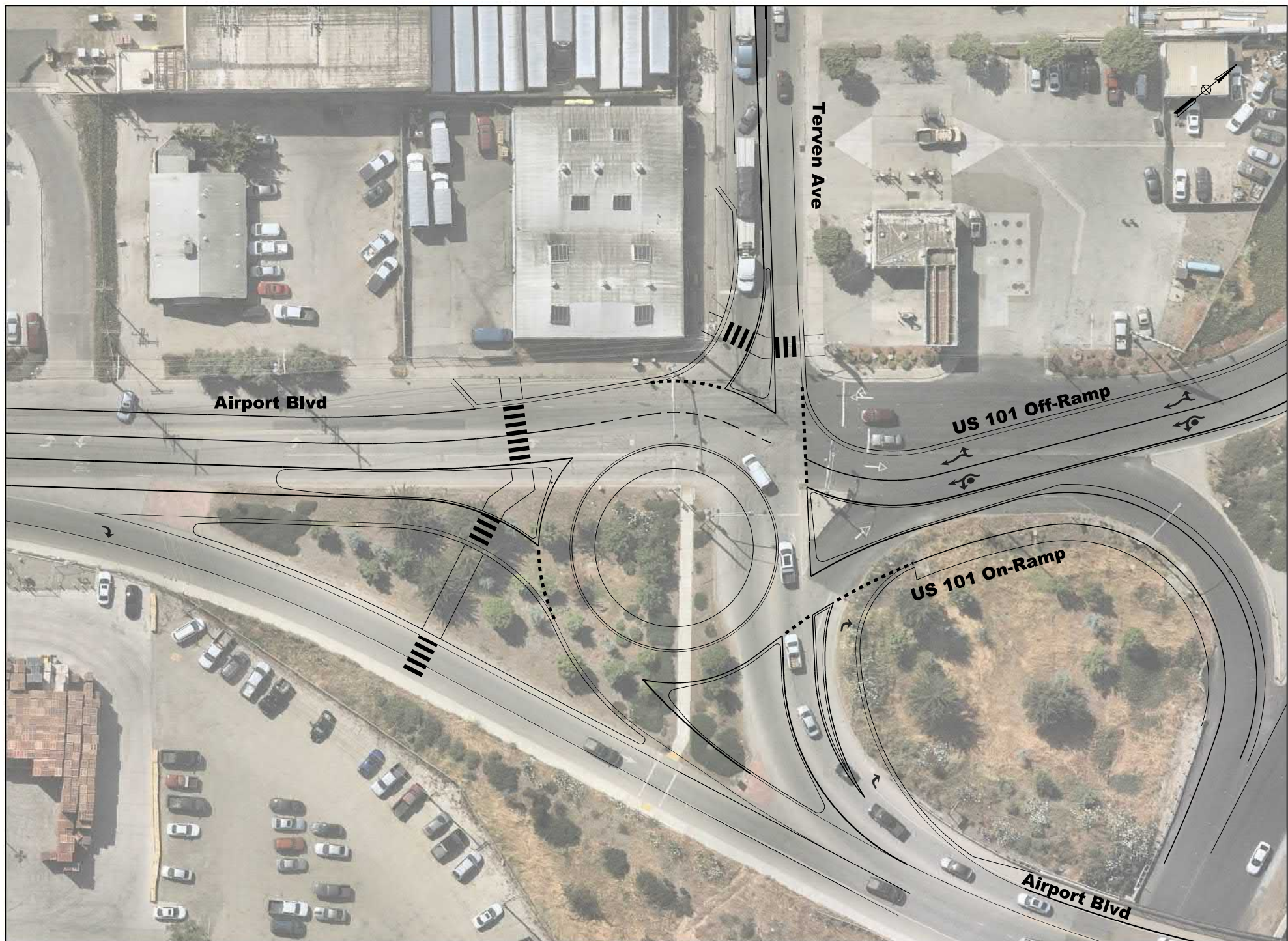
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Appendix F

Preliminary Concept Layouts for Improved Traffic Signal and Roundabout





Appendix G

Description of Benefit Cost Performance Measures and Caltrans Cal B/C 2020 Value Comparison Table

BACKGROUND ON BENEFIT COST ANALYSIS

The ICE Analysis is based on the results of a B/C analysis, which is an objective, data-driven calculation that helps inform investment decisions when stakeholders are evaluating intersection control improvements. The calculations identify cost effective improvements considering the full lifecycle of the improvement, typically 20 years.

Five performance metrics are typically evaluated for proposed conceptual control types at each study location to determine the B/C ratio. The metrics include:

- **Safety** – measuring the societal cost associated with the predicted number and severity of collisions.
- **Delay** – measuring the societal cost associated with the number of person-hours of delay.
- **Emissions** – measuring the societal cost associated with the exposure to health-based pollutants emitted by motor vehicles.
- **Operations and Maintenance** – measuring common annualized costs associated with operating and maintaining the intersection control.
- **Initial Capital Costs** – measuring the capital costs needed to plan, design, and construct the intersection improvement. The capital costs include construction, capital support, and right of way.

Benefit Performance Measures

The following performance measures are used to calculate the benefit, or cost savings, of the proposed intersection control improvement compared to the existing condition. For each performance measure, the proposed improvement provides a benefit if the calculated life-cycle cost of the proposed improvement is less than the life-cycle cost of the existing condition. The magnitude of the benefit is the difference between the life-cycle cost of the existing condition less the life-cycle cost of the proposed improvement.

Safety

Safety measures the societal cost associated with the predicted number and severity of collisions that may occur for the existing and each proposed intersection control type. The number of predicted collisions was calculated using Highway Safety Manual predictive methods and crash modification factors (CMF). Since CMFs and Safety Performance Functions (SPF) are statistical models based on historical crash data, the safety cost is only a *prediction* of crash severity distribution and does not perfectly represent the future crash data.

Delay

Delay measures the societal cost associated with the number of person-hours of delay at the intersection during the study period. Consistent with the Caltrans Vehicle Operation Cost Parameters 2020, vehicle occupancy of 1.15 is used to convert delay to person-hours of delay at a value of \$19.70 per vehicle-hour of delay, which is the weighted-average of automobile and truck.

Emissions

The emissions performance measure calculates the societal cost associated with exposure to health-based pollutants emitted by motor vehicles. Pollutant emissions are running emissions based on the average speed of vehicles traveling through the intersection during the study period. Pollutant emissions evaluated include reactive organic gasses (ROG), nitrogen oxides (NOx), and particulate matter (PM10). The societal cost of emissions is calculated using emission data from the California Air Resource Board (CARB) Methods to Find the Cost-Effectiveness of Funding Air Quality Projects, Table 4 Emission Factors by Speed,

September 2019 and cost per ton data from Caltrans Vehicle Operation Cost Parameters 2020 for emissions (Note: VOC is assumed to be synonymous with ROG).

Cost Performance Measures

The following performance measures are used to calculate the added cost of the proposed intersection control improvements compared to the existing control. For each performance measure, the proposed improvements add to the cost of the intersection if the calculated life-cycle cost of the proposed improvement is greater than the life-cycle cost of existing condition. The magnitude of the cost is the difference between the life-cycle cost of the proposed improvement less the life-cycle cost of the existing condition.

Operations and Maintenance (O&M)

The operations and maintenance performance measure incorporate common annualized costs associated with operating and maintaining the proposed type of intersection control. Common costs include signal timing and maintenance, power consumption for signal operations and intersection illumination, landscape maintenance, and pavement rehabilitation. Average annualized costs were used.

Initial Capital Costs

The initial capital costs performance measure estimates the capital costs needed to plan, design, and construct the proposed intersection improvement. The capital costs include construction, capital support, and right of way.

As described in the United States Department of Transportation’s Benefit-Cost Analysis Guidance for Discretionary Grant Programs (Jan. 2020 , p. 6), a blend of “localized data with national estimates or industry standards to complete a more robust analysis” can be applied. The default parameters for the 2020 INFRA Cal-B/C tool are a blend of California and national values assessed at a 2018 base year.

Users should revise default parameters if more applicable values exist for a project being assessed. Revisions can be made within the “Parameters” tab of the Excel workbook by entering a new value into the individual cell. In addition, assumptions identified in the “Project Information” tab (red or blue cells) can be adjusted based for a specific project, e.g., average vehicle occupancy, percent truck, roadway type, etc. The table below is a comparison of California and national values—assumed 2020 INFRA Cal-B/C values are highlighted in yellow.

Parameters	Cal-B/C Values	Fed. Values	Notes
Current Dollar Value applied in tool	2018	2018	All assumed Cal-B/C parameters are adjusted for 2018 dollars. Assumed Cal-B/C values in the model have been escalated to 2018 dollars, as recommended in the guidance.
Real Discount Rate	4.00%	7.00%	A sensitivity analysis of 3% is no longer required.
Average Vehicle Occupancy	Non-peak – 1.3 Peak – 1.15	1.67	Cal-B/C factors in peak and non-peak average vehicle occupancy, whereas the federal guidance uses a single AVO figure. Thus, the default values apply to California statewide average.
Period of analysis	Construction, plus 20 years after completion.	Construction, plus 20 years after completion in most situations.	Federal guidance suggests applying no more than 30 years for analytical purposes after project completion.

Travel Time Parameters			
Statewide Average Hourly Wage (\$/hr.)	\$28.44		California values extracted from BLS data.
Heavy and Light Truck Drivers Average Hourly Wage (\$/hr.)	\$21.20		California values extracted from BLS data.
Heavy and Light Truck Drivers Benefits and Costs (\$/hr.)	\$11.08		California values extracted from BLS data.
Automobile/Personal (\$/hr./per)	\$14.20	\$15.20	For calculation methodology, see Cal-B/C tech doc. (Volume 4), pp. II-37 to II-38. Link : https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0009451-cal-bctechsupplementvol4v4-a11y.pdf
Truck/Business (\$/hr./veh.)	\$32.30	\$29.50	For calculation methodology, see Cal-B/C tech doc. (Volume 4), pp. II-37 to II-38. Link: https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0009451-cal-bctechsupplementvol4v4-a11y.pdf
Auto & Truck Composite/All Purpose (\$/hr./veh)	\$19.70	\$25.55	Federal weighted average based on a typical distribution of local travel by surface modes (95.4% personal, 4.6% truck). California assumes a different distribution (91% personal, 9% truck). Applicants should apply their own distribution of business versus personal travel if available.
Transit/Transit Rail Operators (\$/hr./per)	\$14.20 (passenger)	\$15.20 (local personal travel)	Cal-B/C only values “transit” per passenger. Federal guidance states, for wait times, the value should be doubled. Values for personal travel based on local travel values and intercity personal travel are described in US DOT’s Value of Travel Time guidance. A valuation of the “transit operator” is also not a factor in the Cal-B/C model.
		\$21.30 (intercity personal travel)	
		\$50.20 (transit rail operator)	

Average Fuel Price

Automobile (regular unleaded) (\$/gal)	\$3.31		Fuel prices for gasoline and diesel were extracted the US Energy Information Administration's 2018 Petroleum and Other Liquids annual report. For calculation methodology, see Cal-B/C tech doc. (Volume 4), pp. II-37 to II-38. pp. II-37 to II-46. Link: https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0009451-cal-bctechsupplementvol4v4-a11y.pdf
Truck (diesel) (\$/gal.)	\$3.44		Fuel prices for gasoline and diesel were extracted the US Energy Information Administration's 2017 Petroleum and Other Liquids annual report. Link: https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0009451-cal-bctechsupplementvol4v4-a11y.pdf
State Sales Tax (gasoline)	2.25%		Value is applicable to California.
State Sales Tax (diesel)	13.00%		Value is applicable to California.
Average Local Sales Tax	0.50%		Value is applicable to California.
Federal Fuel Excise Tax (gasoline) (\$/gal.)	\$0.184		
Federal Fuel Excise Tax (diesel) (\$/gal.)	\$0.244		
State Fuel Excise Tax (gasoline) (\$/gal.)	\$0.417		Value is applicable to California (current rate increased on 7/19 to \$0.473)
State Fuel Excise Tax (diesel) (\$/gal.)	\$0.36		Value is applicable to California (reflective of Nov. 2017 SB-1 increase)

<i>Non-Fuel Cost Per Mile</i>			
Automobile	\$0.326		Federal guidance does not provide an estimate. Non-fuel costs are based on 2016 Cal-B/C estimate and escalated to 2018 using OMB Table 10.1 GDP. Cal-B/C auto value assessed at 3.13 cents (2016) and base value for truck is ATRI (2014) value.
Truck/Light Duty Vehicles	\$0.434	\$0.41	Cal-B/C breaks out fuel and non-fuel costs. US DOT Guidance factors in fuel costs when estimating vehicle operation costs. Truck was escalated using 2018 divided by 2014 indices, as the base year in the model was 2016.
Commercial Trucks		\$0.96	Cal-B/C breaks out fuel and non-fuel costs for commercial trucks. US DOT Guidance factors in fuel costs, repair, insurance, permits, license, etc.

<i>Accident Cost Parameters</i>			
Cost of Fatality/Killed	\$9.8M	\$9.6M	Accident costs are based on reported federal benefit-cost guidance rate for 2018. The assumed rate in the 2016 Cal-B/C model differs.
Level A (Severe)/Incapacitating	\$467,000	\$459,100	Accident costs are based on reported federal benefit-cost guidance rate for 2018. The assumed rate in the 2016 Cal-B/C model differs.

Level B (Moderate)/Non-incapacitating	\$127,100	\$125,000	Accident costs are based on reported federal benefit-cost guidance rate for 2018. The assumed rate in the 2016 Cal-B/C model differs.
Level (Minor)/Possible Injury	\$65,000	\$63,900	Accident costs are based on reported federal benefit-cost guidance rate for 2018. The assumed rate in the 2016 Cal-B/C model differs.
Cost of Property Damage (PDO)	\$4,374	\$4,400	Accident costs are based on reported federal benefit-cost guidance rate for 2018. The assumed rate in the 2016 Cal-B/C model differs.

Pollutant Emissions

CO	\$75 - \$160	\$0	Cal-B/C estimates are based on Corporate Average Fuel Economy for MY2017-MY2025 Passenger Cars and Light Trucks (August 2012), page 922, Table VIII-16, "Economic Values Used for Benefits Computations (2010 dollars)". Values are inflated from 2010 dollars to 2016 dollars using the GDP deflator. Cal-B/C rates vary depending on project location. Cal-B/C calculation methodology can be viewed in its tech. doc. vol. 4, pp. II-51 to II-61. Cal-B/C value differs based on geographic three regional categories within California. Link: https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0009451-cal-bctechsupplementvol4v4-a11y.pdf No value identified in the federal guidance document, thus, no value assessed.
CO₂	\$38	\$0.91	USDOT recommends using a monetary value of \$1 per metric ton (2018) for the social cost of carbon based on the <i>Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026</i> report. However, Cal-B/C's CO₂ unit of measurement is in short ton. Thus, the conversion value is \$1 per metric divided by 1.1023 short ton equals \$0.91.
NO_x	\$13,900 – \$63,900	\$8,600	Cal-B/C value differs based on three regional categories within California. Applied the 2018 federal rate.
PM₁₀	\$107,700 – \$523,300	\$387,300	Cal-B/C value differs based on three regional categories within California. Applied the 2018 federal rate.
SO₂	\$54,400 – \$196,600	\$50,100	Cal-B/C value differs based on three regional categories within California. Applied the 2018 federal rate.
VOC	\$1,025 – \$3,970	\$2,100	Cal-B/C value differs based on three regional categories within California. Applied the 2018 federal rate.

Appendix H

HSM Predictive Method Safety Analysis IHSDM KABCO Values

Existing Signal Safety Values								
Year	Total	CMF		K	A	B	C	O
2025	3.64	KABC	PDO	0.23%	2.26%	12.19%	37.57%	47.75%
		-	-	0.009	0.082	0.444	1.368	1.738
2035	3.82	KABC	PDO	0.24%	2.27%	12.24%	37.75%	47.50%
		-	-	0.009	0.087	0.468	1.443	1.816
2036	2.74	KABC	PDO	0.23%	2.22%	11.97%	36.90%	48.69%
		-	-	0.006	0.061	0.327	1.009	1.332
2045	2.85	KABC	PDO	0.23%	2.23%	12.01%	37.02%	48.52%
		-	-	0.007	0.064	0.343	1.056	1.384
Proposed Signal Safety Values								
Year	Total	CMF		K	A	B	C	O
2025	3.64	KABC	PDO	0.23%	2.26%	12.19%	37.59%	47.73%
		-	-	0.009	0.082	0.444	1.369	1.738
2035	3.82	KABC	PDO	0.24%	2.27%	12.25%	37.76%	47.49%
		-	-	0.009	0.087	0.468	1.444	1.816
2036	2.74	KABC	PDO	0.23%	2.22%	11.97%	36.91%	48.67%
		-	-	0.006	0.061	0.328	1.010	1.332
2045	2.85	KABC	PDO	0.23%	2.23%	12.01%	37.03%	48.50%
		-	-	0.007	0.064	0.343	1.057	1.384
Proposed Roundabout Safety Values								
Year	Total	CMF		K	A	B	C	O
2025	2.94	KABC	PDO	0.08%	0.80%	4.34%	13.37%	81.40%
		0.288	1.379	0.002	0.024	0.128	0.394	2.397
2035	3.09	KABC	PDO	0.08%	0.81%	4.36%	13.44%	81.31%
		0.288	1.385	0.003	0.025	0.135	0.416	2.515
2036	2.21	KABC	PDO	0.08%	0.79%	4.26%	13.13%	81.73%
		0.288	1.358	0.002	0.017	0.094	0.291	1.809
2045	2.31	KABC	PDO	0.08%	0.79%	4.27%	13.18%	81.67%
		0.288	1.362	0.002	0.018	0.099	0.304	1.885

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 29, 2021

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Report Overview

Report Generated: Jan 29, 2021 5:00 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 17:48:06 PST 2021

IHS DM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Existing - Signalized

Site Set Comment: Created Thu Jan 28 15:53:45 PST 2021

Site Set Version: v1

Evaluation Title: Existing - 2025

Evaluation Comment: Created Thu Jan 28 17:47:49 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2025

Last Year of Analysis: 2025

Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

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The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results. *[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2025: 20680	2025: 17140	yes	0	0	4	0	no	50	4	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	3.640	3.6402	1.9020	1.7382	0.26	3.6402
		Total	Total	3.640	3.6402	1.9020	1.7382	0.26	3.6402

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2025	3.64	1.90	52.249	1.74	47.751
Total	3.64	1.90	52.249	1.74	47.751
Average	3.64	1.90	52.249	1.74	47.751

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0085	0.0823	0.4436	1.3676	1.7382
Total	0.0085	0.0823	0.4436	1.3676	1.7382

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	1.34	36.8	0.96	26.3	2.30	63.2
Intersection	Collision with Bicycle	0.07	1.8	0.00	0.0	0.07	1.8
Intersection	Head-on Collision	0.17	4.6	0.08	2.2	0.25	6.8
Intersection	Other Multi-vehicle Collision	0.05	1.4	0.04	1.1	0.09	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.11	2.9	0.13	3.5
Intersection	Collision with Pedestrian	0.04	1.0	0.00	0.0	0.04	1.0
Intersection	Rear-end Collision	0.15	4.1	0.26	7.1	0.41	11.2
Intersection	Sideswipe	0.07	1.9	0.30	8.2	0.37	10.0
Intersection	Total Intersection Total Vehicle Crashes	1.90	52.3	1.74	47.7	3.64	100.0
Intersection	Total Intersection Crashes	1.90	52.3	1.74	47.7	3.64	100.0
	Total Crashes	1.90	52.3	1.74	47.7	3.64	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 28, 2021

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Report Overview

Report Generated: Jan 28, 2021 5:49 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 17:48:57 PST 2021

IHSDM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Existing - Signalized

Site Set Comment: Created Thu Jan 28 15:53:45 PST 2021

Site Set Version: v1

Evaluation Title: Existing - 2035

Evaluation Comment: Created Thu Jan 28 17:48:43 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2035

Last Year of Analysis: 2035

Empirical-Bayes Analysis: None

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Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2035: 23263	2035: 18466	yes	0	0	4	0	no	50	4	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	3.823	3.8226	2.0067	1.8159	0.25	3.8226
		Total	Total	3.823	3.8226	2.0067	1.8159	0.25	3.8226

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2035	3.82	2.01	52.496	1.82	47.504
Total	3.82	2.01	52.496	1.82	47.504
Average	3.82	2.01	52.496	1.82	47.504

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0090	0.0868	0.4680	1.4429	1.8159
Total	0.0090	0.0868	0.4680	1.4429	1.8159

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	1.42	37.0	1.00	26.2	2.42	63.3
Intersection	Collision with Bicycle	0.07	1.8	0.00	0.0	0.07	1.8
Intersection	Head-on Collision	0.18	4.6	0.08	2.2	0.26	6.8
Intersection	Other Multi-vehicle Collision	0.06	1.4	0.04	1.0	0.10	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.11	2.9	0.13	3.5
Intersection	Collision with Pedestrian	0.04	1.0	0.00	0.0	0.04	1.0
Intersection	Rear-end Collision	0.16	4.1	0.27	7.0	0.43	11.1
Intersection	Sideswipe	0.07	1.9	0.31	8.1	0.38	10.0
Intersection	Total Intersection Total Vehicle Crashes	2.01	52.5	1.82	47.5	3.82	100.0
Intersection	Total Intersection Crashes	2.01	52.5	1.82	47.5	3.82	100.0
	Total Crashes	2.01	52.5	1.82	47.5	3.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 28, 2021

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Report Overview

Report Generated: Jan 28, 2021 5:51 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 17:51:07 PST 2021

IHS DM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Existing - Signalized

Site Set Comment: Created Thu Jan 28 15:53:45 PST 2021

Site Set Version: v1

Evaluation Title: Existing - 2036

Evaluation Comment: Created Thu Jan 28 17:50:54 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2036

Last Year of Analysis: 2036

Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

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Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2036: 13207	2036: 10385	yes	0	0	4	0	no	50	4	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	2.735	2.7352	1.4035	1.3318	0.32	2.7352
		Total	Total	2.735	2.7352	1.4035	1.3318	0.32	2.7352

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2036	2.73	1.40	51.311	1.33	48.689
Total	2.73	1.40	51.311	1.33	48.689
Average	2.73	1.40	51.311	1.33	48.689

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0063	0.0607	0.3273	1.0092	1.3318
Total	0.0063	0.0607	0.3273	1.0092	1.3318

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	0.99	36.1	0.73	26.9	1.72	63.0
Intersection	Collision with Bicycle	0.05	1.8	0.00	0.0	0.05	1.8
Intersection	Head-on Collision	0.12	4.5	0.06	2.2	0.18	6.7
Intersection	Other Multi-vehicle Collision	0.04	1.4	0.03	1.1	0.07	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.08	3.0	0.10	3.5
Intersection	Collision with Pedestrian	0.03	1.1	0.00	0.0	0.03	1.1
Intersection	Rear-end Collision	0.11	4.0	0.20	7.2	0.31	11.2
Intersection	Sideswipe	0.05	1.8	0.23	8.3	0.28	10.2
Intersection	Total Intersection Total Vehicle Crashes	1.41	51.3	1.33	48.7	2.74	100.0
Intersection	Total Intersection Crashes	1.41	51.3	1.33	48.7	2.74	100.0
	Total Crashes	1.41	51.3	1.33	48.7	2.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 28, 2021

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Report Overview

Report Generated: Jan 28, 2021 5:52 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 17:51:25 PST 2021

IHSDM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Existing - Signalized

Site Set Comment: Created Thu Jan 28 15:53:45 PST 2021

Site Set Version: v1

Evaluation Title: Existing - 2045

Evaluation Comment: Created Thu Jan 28 17:51:13 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2045

Last Year of Analysis: 2045

Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

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Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2045: 14340	2045: 11130	yes	0	0	4	0	no	50	4	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	2.853	2.8525	1.4686	1.3840	0.31	2.8525
		Total	Total	2.853	2.8525	1.4686	1.3840	0.31	2.8525

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2045	2.85	1.47	51.483	1.38	48.517
Total	2.85	1.47	51.483	1.38	48.517
Average	2.85	1.47	51.483	1.38	48.517

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0066	0.0635	0.3425	1.0560	1.3840
Total	0.0066	0.0635	0.3425	1.0560	1.3840

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	1.03	36.2	0.76	26.8	1.80	63.0
Intersection	Collision with Bicycle	0.05	1.8	0.00	0.0	0.05	1.8
Intersection	Head-on Collision	0.13	4.5	0.06	2.2	0.19	6.7
Intersection	Other Multi-vehicle Collision	0.04	1.4	0.03	1.1	0.07	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.08	3.0	0.10	3.5
Intersection	Collision with Pedestrian	0.03	1.1	0.00	0.0	0.03	1.1
Intersection	Rear-end Collision	0.12	4.0	0.20	7.2	0.32	11.2
Intersection	Sideswipe	0.05	1.8	0.24	8.3	0.29	10.1
Intersection	Total Intersection Total Vehicle Crashes	1.47	51.5	1.38	48.5	2.85	100.0
Intersection	Total Intersection Crashes	1.47	51.5	1.38	48.5	2.85	100.0
	Total Crashes	1.47	51.5	1.38	48.5	2.85	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 28, 2021

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Report Overview

Report Generated: Jan 28, 2021 6:26 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 18:24:40 PST 2021

IHS DM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Proposed - Signal Alt 2

Site Set Comment: Created Thu Jan 28 17:31:38 PST 2021

Site Set Version: v1

Evaluation Title: Proposed

Evaluation Comment: Created Thu Jan 28 18:24:29 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2025

Last Year of Analysis: 2025

Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

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Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2025: 20680	2025: 17140	yes	0	0	4	0	no	50	5	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	3.642	3.6417	1.9034	1.7382	0.26	3.6417
		Total	Total	3.642	3.6417	1.9034	1.7382	0.26	3.6417

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2025	3.64	1.90	52.268	1.74	47.732
Total	3.64	1.90	52.268	1.74	47.732
Average	3.64	1.90	52.268	1.74	47.732

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0085	0.0823	0.4439	1.3687	1.7382
Total	0.0085	0.0823	0.4439	1.3687	1.7382

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	1.34	36.8	0.96	26.3	2.30	63.2
Intersection	Collision with Bicycle	0.07	1.8	0.00	0.0	0.07	1.8
Intersection	Head-on Collision	0.17	4.6	0.08	2.2	0.25	6.8
Intersection	Other Multi-vehicle Collision	0.05	1.4	0.04	1.1	0.09	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.11	2.9	0.13	3.5
Intersection	Collision with Pedestrian	0.04	1.0	0.00	0.0	0.04	1.0
Intersection	Rear-end Collision	0.15	4.1	0.26	7.1	0.41	11.2
Intersection	Sideswipe	0.07	1.9	0.30	8.2	0.37	10.0
Intersection	Total Intersection Total Vehicle Crashes	1.91	52.3	1.74	47.7	3.64	100.0
Intersection	Total Intersection Crashes	1.91	52.3	1.74	47.7	3.64	100.0
	Total Crashes	1.91	52.3	1.74	47.7	3.64	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 28, 2021

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Report Overview

Report Generated: Jan 28, 2021 6:26 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 18:25:00 PST 2021

IHS DM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Proposed - Signal Alt 2

Site Set Comment: Created Thu Jan 28 17:31:38 PST 2021

Site Set Version: v1

Evaluation Title: Proposed - 2035

Evaluation Comment: Created Thu Jan 28 18:24:46 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2035

Last Year of Analysis: 2035

Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

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Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2035: 23263	2035: 18466	yes	0	0	4	0	no	50	5	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	3.824	3.8241	2.0082	1.8159	0.25	3.8241
		Total	Total	3.824	3.8241	2.0082	1.8159	0.25	3.8241

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2035	3.82	2.01	52.515	1.82	47.485
Total	3.82	2.01	52.515	1.82	47.485
Average	3.82	2.01	52.515	1.82	47.485

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0090	0.0869	0.4683	1.4440	1.8159
Total	0.0090	0.0869	0.4683	1.4440	1.8159

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	1.42	37.0	1.00	26.2	2.42	63.2
Intersection	Collision with Bicycle	0.07	1.8	0.00	0.0	0.07	1.8
Intersection	Head-on Collision	0.18	4.6	0.08	2.2	0.26	6.8
Intersection	Other Multi-vehicle Collision	0.06	1.4	0.04	1.0	0.10	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.11	2.9	0.13	3.5
Intersection	Collision with Pedestrian	0.04	1.0	0.00	0.0	0.04	1.0
Intersection	Rear-end Collision	0.16	4.1	0.27	7.0	0.43	11.1
Intersection	Sideswipe	0.07	1.9	0.31	8.1	0.38	10.0
Intersection	Total Intersection Total Vehicle Crashes	2.01	52.5	1.82	47.5	3.83	100.0
Intersection	Total Intersection Crashes	2.01	52.5	1.82	47.5	3.83	100.0
	Total Crashes	2.01	52.5	1.82	47.5	3.83	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 28, 2021

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Report Overview

Report Generated: Jan 28, 2021 6:26 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 18:25:28 PST 2021

IHS DM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Proposed - Signal Alt 2

Site Set Comment: Created Thu Jan 28 17:31:38 PST 2021

Site Set Version: v1

Evaluation Title: Proposed - 2036

Evaluation Comment: Created Thu Jan 28 18:25:15 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2036

Last Year of Analysis: 2036

Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

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Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2036: 13207	2036: 10385	yes	0	0	4	0	no	50	5	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	2.736	2.7364	1.4047	1.3318	0.32	2.7364
		Total	Total	2.736	2.7364	1.4047	1.3318	0.32	2.7364

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2036	2.74	1.41	51.332	1.33	48.668
Total	2.74	1.41	51.332	1.33	48.668
Average	2.74	1.41	51.332	1.33	48.668

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0063	0.0608	0.3276	1.0100	1.3318
Total	0.0063	0.0608	0.3276	1.0100	1.3318

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	0.99	36.1	0.73	26.9	1.72	62.9
Intersection	Collision with Bicycle	0.05	1.8	0.00	0.0	0.05	1.8
Intersection	Head-on Collision	0.12	4.5	0.06	2.2	0.18	6.7
Intersection	Other Multi-vehicle Collision	0.04	1.4	0.03	1.1	0.07	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.08	3.0	0.10	3.5
Intersection	Collision with Pedestrian	0.03	1.1	0.00	0.0	0.03	1.1
Intersection	Rear-end Collision	0.11	4.0	0.20	7.2	0.31	11.2
Intersection	Sideswipe	0.05	1.8	0.23	8.3	0.28	10.2
Intersection	Total Intersection Total Vehicle Crashes	1.41	51.4	1.33	48.6	2.74	100.0
Intersection	Total Intersection Crashes	1.41	51.4	1.33	48.6	2.74	100.0
	Total Crashes	1.41	51.4	1.33	48.6	2.74	100.0

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Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

January 28, 2021

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Report Overview

Report Generated: Jan 28, 2021 6:26 PM

Report Template: System: Multi-Page [System] (sscpm2, Oct 12, 2020 9:15 AM)

Evaluation Date: Thu Jan 28 18:25:51 PST 2021

IHSDM Version: v16.0.0 (Sep 30, 2020)

Site Set Crash Prediction Module: v[ModuleInfo.moduleVersion] ([ModuleInfo.moduleDate])

User Name: jared.calise

Organization Name:

Phone:

E-Mail:

Project Title: Salinas ICE - US 101 SB at Terven Ave

Project Comment: Created Thu Jan 28 15:50:16 PST 2021

Project Unit System: U.S. Customary

Site Set: Proposed - Signal Alt 2

Site Set Comment: Created Thu Jan 28 17:31:38 PST 2021

Site Set Version: v1

Evaluation Title: Proposed - 2045

Evaluation Comment: Created Thu Jan 28 18:25:34 PST 2021

Policy for Superelevation: AASHTO 2011 U.S. Customary

Calibration: HSM Configuration

Crash Distribution: HSM Configuration

Model/CMF: HSM Configuration

First Year of Analysis: 2045

Last Year of Analysis: 2045

Empirical-Bayes Analysis: None

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Section Types

Urban Arterial Site Set CPM Evaluation

Site Type

Type: 4SG_GE6

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Presence of Lighting	Number of Approaches with Permissive Left-Turn Phasing	Number of Approaches with Permissive/Protected or Protected/Permissive Left-Turn Phasing	Number of Approaches with Protected Left-Turn Phasing	Number of Approaches on which Right Turn on Red is Prohibited	Presence of Red-Light Cameras	Pedestrian Volumes Crossing all Intersection Legs (crossings/day)	Max. Number of Lanes Crossed by Pedestrians	Number of Bus Stops within 1000 ft of Intersection	Number of Schools within 1000 ft of Intersection	Number of Alcohol Sales Establishments within 1000 ft of Intersection
1	4SG2x2ge6	Terven Ave	at Airport Blvd	2045: 14340	2045: 11130	yes	0	0	4	0	no	50	5	0	0	1

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4SG	Terven Ave	at Airport Blvd	2.854	2.8537	1.4698	1.3840	0.31	2.8537
		Total	Total	2.854	2.8537	1.4698	1.3840	0.31	2.8537

Table 3. Predicted Crash Frequencies by Year (4SG_GE6)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2045	2.85	1.47	51.504	1.38	48.496
Total	2.85	1.47	51.504	1.38	48.496
Average	2.85	1.47	51.504	1.38	48.496

Note: Fatal and Injury Crashes and Property Damage Only Crashes do not necessarily sum up to Total Crashes because the distribution of these three crashes had been derived

independently.

Table 4. Predicted USA 4SG_GE6 Sites Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0066	0.0636	0.3428	1.0568	1.3840
Total	0.0066	0.0636	0.3428	1.0568	1.3840

Table 5. Predicted 4SG_GE6 Crash Type Distribution

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Intersection	Angle Collision	1.03	36.2	0.76	26.8	1.80	63.0
Intersection	Collision with Bicycle	0.05	1.8	0.00	0.0	0.05	1.8
Intersection	Head-on Collision	0.13	4.5	0.06	2.2	0.19	6.7
Intersection	Other Multi-vehicle Collision	0.04	1.4	0.03	1.1	0.07	2.5
Intersection	Other Single-vehicle Collision	0.02	0.6	0.08	3.0	0.10	3.5
Intersection	Collision with Pedestrian	0.03	1.1	0.00	0.0	0.03	1.1
Intersection	Rear-end Collision	0.12	4.0	0.20	7.2	0.32	11.2
Intersection	Sideswipe	0.05	1.8	0.24	8.3	0.29	10.1
Intersection	Total Intersection Total Vehicle Crashes	1.47	51.5	1.38	48.5	2.85	100.0
Intersection	Total Intersection Crashes	1.47	51.5	1.38	48.5	2.85	100.0
	Total Crashes	1.47	51.5	1.38	48.5	2.85	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Appendix I

Life-Cycle Benefit-Cost Worksheet

LIFE CYCLE COST CALCULATIONS			
PERFORMANCE MEASURE LIFE CYCLE COST (NET PRESENT VALUE)			
Safety			
	Existing (Signal)	Proposed Signal	Roundabout
Annual Cost of Collisions	\$ 177,612	\$ 176,442	\$ 56,129
Discounted Life Cycle Cost of Collisions	\$ 3,729,860	\$ 3,705,292	\$ 1,178,719
Delay			
	Existing (Signal)	Proposed Signal	Roundabout
Annual Quantity (hours)	27,530	14,847	3,981
Annual Cost	\$ 395,666	\$ 214,887	\$ 58,386
Total Discounted Life Cycle Cost	\$ 8,308,990	\$ 4,512,637	\$ 1,226,107
Emissions			
	Existing (Signal)	Proposed Signal	Roundabout
Annual Cost	\$ 25,879	\$ 27,455	\$ 35,287
Total Discounted Life Cycle Cost	\$ 351,700	\$ 373,123	\$ 479,559
O&M			
	Existing (Signal)	Proposed Signal	Roundabout
Annual O&M Costs	\$ 8,060	\$ 8,060	\$ 2,520
Discounted Life Cycle O&M Costs	\$ 109,538	\$ 109,538	\$ 34,248
Discounted Pavement Rehab Costs	\$ -	\$ 45,639	\$ 36,511
Total O&M Costs	\$ 109,538	\$ 155,177	\$ 70,759
Initial Capital			
	Existing (Signal)	Proposed Signal	Roundabout
Approximate Initial Capital Costs	\$0	\$743,300	\$3,300,000

TOTAL PROJECT LIFE CYCLE SUMMARY FOR 20 YEARS

	Existing (Signal)	Proposed Signal	Roundabout
Safety	\$ 3,729,860	\$ 3,705,292	\$ 1,178,719
Delay	\$ 8,308,990	\$ 4,512,637	\$ 1,226,107
Emission	\$ 351,700	\$ 373,123	\$ 479,559
O&M	\$ 109,538	\$ 155,177	\$ 70,759
Initial Capital	\$ -	\$ 743,300	\$ 3,300,000
Total Net Present Value	\$ 12,500,089	\$ 9,489,529	\$ 6,255,143

LIFE CYCLE BENEFIT COST RATIO

Total Benefits (B)

Added Benefits Compared to Existing (Signal)	Existing (Signal)	Proposed Signal	Roundabout
Safety	\$ -	\$ 24,569	\$ 2,551,141
Delay	\$ -	\$ 3,796,353	\$ 7,082,884
Emission	\$ -	\$ (21,423)	\$ (127,859)
Total Benefits	\$ -	\$ 3,799,498	\$ 9,506,166

Total Costs (C)

Added Cost Compared to Existing (Signal)	Existing (Signal)	Proposed Signal	Roundabout
O&M	\$ -	\$ 45,639	\$ (38,779)
Initial Capital	\$ -	\$ 743,300	\$ 3,300,000
Total Costs	\$ -	\$ 788,939	\$ 3,261,221

B/C Ratio Compared to Existing (Signal)	N/A	4.82	2.91
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Benefit-Cost Ratio Calculations for Proposed Signal (A) vs Roundabout (B)							
B/C Target	Initial Capital Cost			Project Constraints			
	Proposed Signal	Roundabout	Added Cost	Added O&M Cost for	Total Benefits	Total Costs	B/C
	(A)	(B)	(C) = (B - A)	Roundabout (D)	(E)	(F) = (C + D)	(G) = (E / F)
High	\$ 817,630	\$ 2,970,000	\$ 2,152,370			\$ 2,067,952	2.81
Low	\$ 668,970	\$ 3,630,000	\$ 2,961,030	\$ (84,418)	\$ 5,813,103	\$ 2,876,612	2.02
Roundabout Budget	\$ 743,300	\$ 6,640,822	\$ 5,897,522			\$ 5,813,103	1.00

Note: The 'High' value calculates the highest Roundabout B/C. Assuming the high Proposed Signal ICC and the low Roundabout ICC.
The 'Low' value calculates the lowest Roundabout B/C. Assuming the low Proposed Signal ICC and the high Roundabout ICC.