260 E. Baker St. | Suite 200 | Costa Mesa, CA 92626 | (949) 660-1994
urbanxroads.com

January 31, 2017

Mr. Neal Holdridge
Trammell Crow Company
3501 Jamboree Road, Suite 230
Newport Beach, CA 92660

SUBJECT: KNOX BUSINESS PARK SUPPLEMENTAL ANALYSIS

Dear Mr. Neal Holdridge:

This letter serves as a supplement to the *Knox Business Park Traffic Impact Analysis* (dated June 8, 2015) (referred to as "2015 Traffic Study"). The 2015 Traffic Study evaluated a total of 1,259,050 square feet (sf) of high-cube warehouse / distribution center use within 2 buildings. However, the Project has recently been updated to include the development of a total of 1,114,022 sf of high-cube warehouse / distribution center use within 2 buildings, which results in a net reduction of 145,028 sf from the Project evaluated in the 2015 Traffic Study.

SUMMARY OF FINDINGS

Based on the results of this analysis, no additional impacts are anticipated with the proposed changes to the Project from those previously disclosed in the 2015 Traffic Study.

PROJECT OVERVIEW

Building D located on the southeast corner of Decker Road and Oleander Avenue was proposed to consist of 703,040 sf of high-cube warehouse / distribution center use and is proposed to remain unchanged. However, Building E was previously assumed to consist of 556,010 sf of high-cube warehouse / distribution center use and has since been reduced to 410,982 sf. Exhibit 1 shows the proposed Building E. Access to Building E would be provided via two proposed driveways on Oleander Avenue. The western driveway would provide access to passenger cars only and the eastern driveway would provide access to trucks only. It is our understanding that a 3rd driveway may potentially provide access to passenger cars only and would be located approximately mid-point between the western and eastern driveways for Building E.

TRIP GENERATION

Trip generation represents the amount of traffic which is both attracted to and produced by a development. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to and produced by the specific land uses being proposed for a given development. The trip generation rates used for this assessment are based upon information collected by the Institute of Transportation Engineers (ITE) as provided in their Trip

Generation manual (9th Edition, 2012). The ITE Trip Generation manual is a nationally recognized source for estimating site specific trip generation.

Consistent with the 2015 Traffic Study, the ITE High-Cube Warehouse / Distribution Center land use (ITE Land Use Code 152) has been utilized for the purposes of this supplemental analysis. The trip generation for the proposed Project is shown in Table 1. The proposed Project is anticipated to generate a net total of approximately 2,936 passenger car equivalent (PCE) based trip-ends per day with 172 PCE AM peak hour trips and 200 PCE PM peak hour trips. This results in a reduction in trip generation from the Project previously evaluated in the 2015 Traffic Study. The proposed Project is anticipated to generate 382 fewer PCE trip-ends per day with 23 fewer PCE AM peak hour trips and 25 fewer PCE PM peak hour trips.

TABLE 1: PROJECT TRIP GENERATION SUMMARY (IN PCE)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Building D	703.040	TSF							
Passenger Cars:			39	17	56	17	39	56	731
Truck Trips:									
2-axle:			*5*	*2*	*7*	*3*	*6*	*9*	*148*
3-axle:			*5*	*2*	*7*	*3*	*7*	*10*	*159*
4+-axle:			*26*	*12*	*38*	*16*	*35*	*51*	*814*
- Net Truck Trips (PCE)[2]			*36*	*16*	*52*	*22*	*48*	*70*	*1,122*
BUILDING D TOTAL NET TRIPS (PCE)[3]			***75***	***34***	***108***	***39***	***87***	***126***	***1,853***
Building E	410.982	TSF							
Passenger Cars:			23	10	33	10	23	33	427
Truck Trips:									
2-axle:			*3*	*1*	*4*	*2*	*4*	*5*	*87*
3-axle:			*3*	*1*	*4*	*2*	*4*	*6*	*93*
4+-axle:			*15*	*7*	*22*	*9*	*20*	*30*	*476*
- Net Truck Trips (PCE)[2]			*21*	*10*	*31*	*13*	*28*	*41*	*656*
BUILDING E TOTAL NET TRIPS (PCE)[3]			***44***	***20***	***64***	***23***	***51***	***74***	***1,083***
TOTAL (Revised Project):			**119**	**53**	**172**	**62**	**138**	**200**	**2,936**
TOTAL (From Traffic Study):			**135**	**60**	**195**	**70**	**156**	**225**	**3,319**
TOTAL (PCE):			**-15**	**-7**	**-23**	**-8**	**-18**	**-25**	**-382**

[1] TSF = thousand square feet

[2] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.

[3] TOTAL NET TRIPS (PCE) = Passenger Cars + Net Truck Trips (PCE).

FINDINGS

No additional analysis is necessary as the proposed Project is anticipated to generate fewer trips than the Project evaluated in the 2015 Traffic Study. Building E previously included 3 points of access along Oleander Avenue. It is anticipated that although the Project is proposing to provide 2 points of access to Building E, the peak hour operations at these driveways would continue to operate at acceptable levels of service (LOS) during the peak hours. The driveways for Building E were found to operate at LOS A or LOS B during the peak hours for Horizon Year (2035) traffic conditions.

The 2015 Traffic Study previously identified 2 impacted intersections that were subject to fair share contributions from the Project. These intersections are Decker Road at Oleander Avenue and Harvill Avenue at Harley Knox Boulevard. Based on the revised overall Project trip generation, the fair share percentage for each of these cumulatively impacted intersections is shown in Table 2. Consistent with the 2015 Traffic Study, the fair share percentage is provided in bold text and represents the most deficient peak hour.

TABLE 2: PROJECT FAIR SHARE CALCULATIONS

#	Intersection		Existing	Project	2035 WP Volume	Total New Traffic	Project % of New Traffic
4	Decker Rd. / Oleander Av.						
		AM:	5	64	1,727	1,722	5.6%
		PM:	8	74	2,073	2,065	**5.5%**
8	Harvill Av. / Harley Knox Bl.						
		AM:	718	150	2,288	1,570	10.8%
		PM:	829	177	4,856	4,027	**5.0%**

BOLD = Denotes highest deficient peak hour.

If you have any questions, please contact me directly at (949) 336-5982.

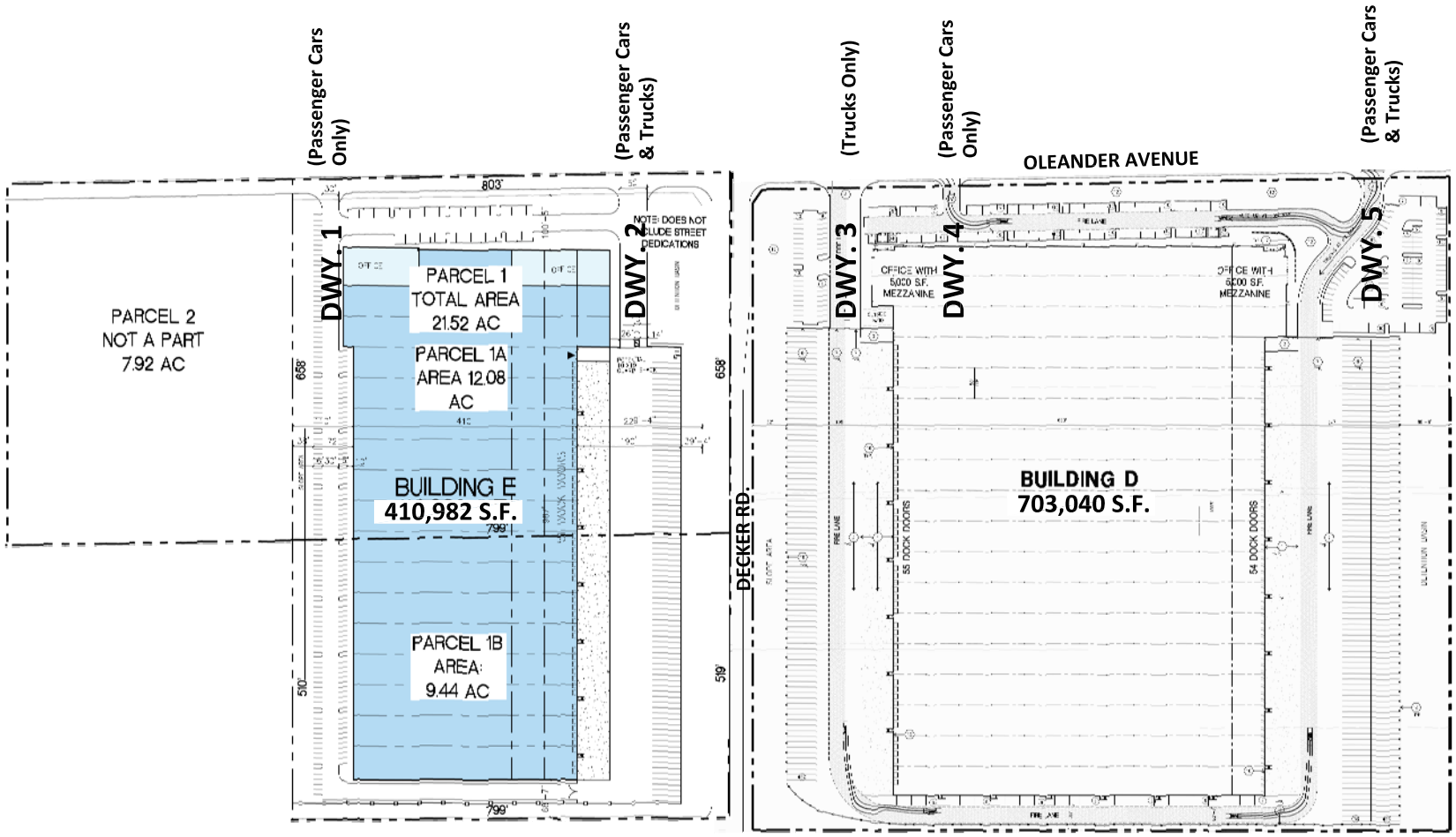
Respectfully submitted,

URBAN CROSSROADS, INC.

Charlene So

Charlene So, PE
Senior Associate

EXHIBIT 1: PRELIMINARY SITE PLAN



N

Knox Business Park

TRAFFIC IMPACT ANALYSIS

COUNTY OF RIVERSIDE

PREPARED BY:

Aric Evatt, PTP
aevatt@urbanxroads.com
(949) 660-1994 x204

Charlene So, PE
cso@urbanxroads.com
(949) 660-1994 x222

JUNE 8, 2015

TABLE OF CONTENTS

APPENDICES

LIST OF EXHIBITS

This Page Intentionally Left Blank

LIST OF TABLES

LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CMP	Congestion Management Program
DIF	Development Impact Fee
E+P	Existing Plus Project
EAP	Existing Plus Ambient Growth Plus Project
EAPC	Existing Plus Ambient Growth Plus Project Plus Cumulative
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HOV	High Occupancy Vehicle
ITE	Institute of Transportation Engineers
LOS	Level of Service
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NP	No Project (or Without Project)
PCE	Passenger Car Equivalents
PeMS	Caltrans Performance Measurement System
PHF	Peak Hour Factor
Project	Knox Business Park
RivTAM	Riverside County Transportation Analysis Model
RTA	Riverside Transit Authority
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SHS	State Highway System
sf	Square Feet
TIA	Traffic Impact Analysis
TUMF	Transportation Uniform Mitigation Fee
WP	With Project
WRCOG	Western Riverside Council of Governments

This Page Intentionally Left Blank

1 INTRODUCTION

This report presents the results of the traffic impact analysis (TIA) for the proposed Knox Business Park ("Project") located south of Oleander Avenue and on either side of Decker Road in the County of Riverside as shown on Exhibit 1-1.

The purpose of this traffic impact analysis is to evaluate the potential circulation system deficiencies that may result from the development of the proposed Project, and to recommend improvements to achieve acceptable circulation system operational conditions. As directed by County of Riverside staff, this traffic study has been prepared in accordance with the County of Riverside's *Traffic Impact Analysis Preparation Guide* (August 2008), the California Department of Transportation (Caltrans) *Guide for the Preparation of Traffic Impact Studies* (December 2002), and consultation with County of Riverside staff during the scoping process. (1) (2) The approved Project Traffic Study Scoping agreement is provided in Appendix 1.1 of this TIA.

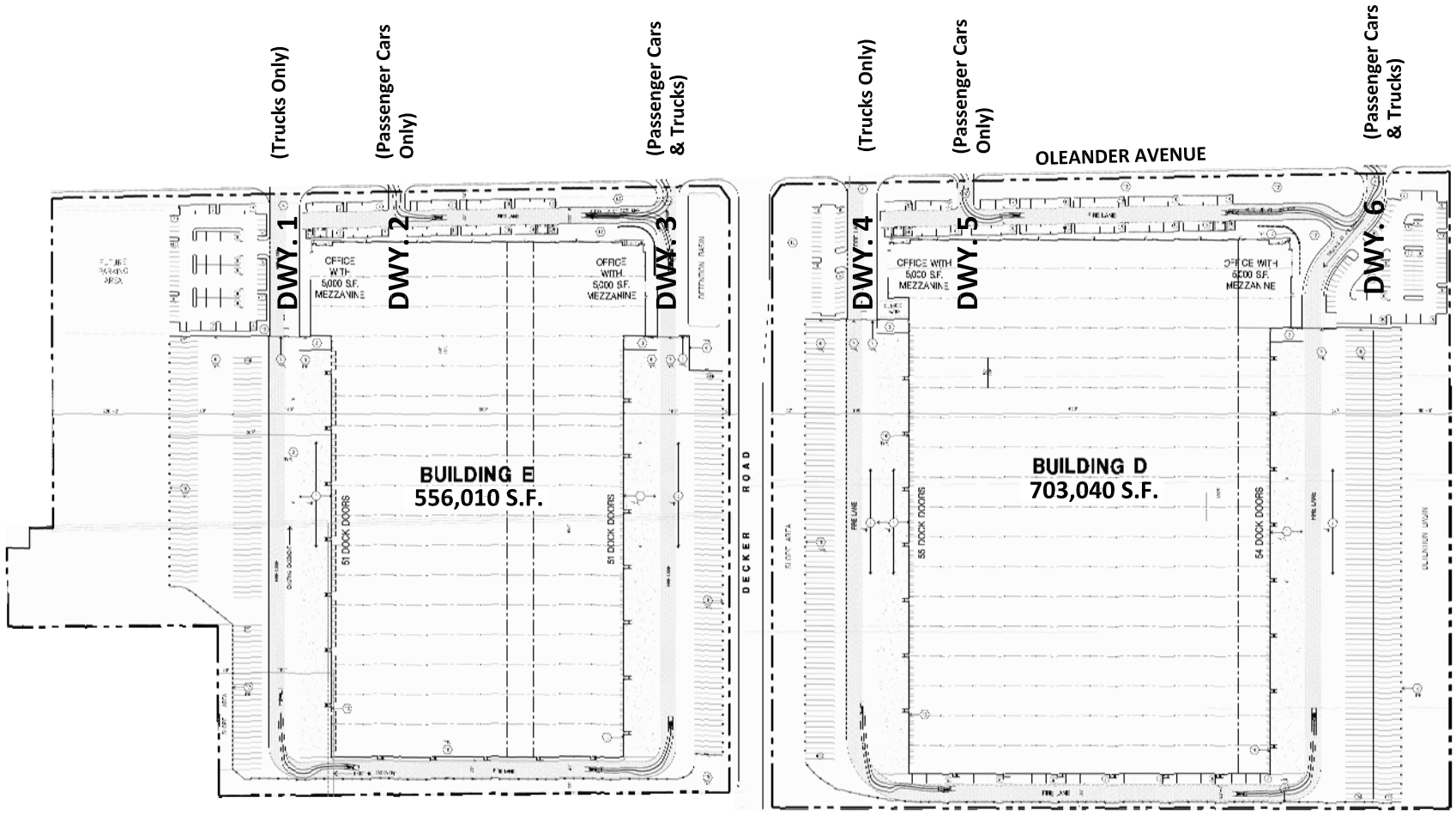
1.1 PROJECT OVERVIEW

The Project is proposed to consist of a total of 1,259,050 square feet (sf) of high-cube warehouse use/distribution center within two buildings. Building D located on the southeast corner of Decker Road and Oleander Avenue is proposed to consist of 703,040 sf of high-cube warehouse/distribution center use and Building E, located on the southwest corner of Decker Road and Oleander Avenue, is proposed to consist of 556,010 sf of high-cube warehouse/distribution center use. The Project is anticipated to be constructed and occupied by Year 2017.

The Project is proposed to have access on Oleander Avenue via Driveways 1 through 6. All Project access points are assumed to allow full-access. Driveways 1 and 4 are proposed for truck access only, Driveways 2 and 5 are proposed for passenger car access only, and Driveways 3 and 6 are proposed to allow access for both trucks and passenger cars. Regional access to the project site is provided via the I-215 Freeway at Harley Knox Boulevard interchange.

Trips generated by the Project's proposed land uses have been estimated based on trip generation rates collected by the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 9th Edition, 2012. (3) The Project is estimated to generate a net total of 3,319 passenger-car-equivalent (PCE) trip-ends per day on a typical weekday with approximately 195 net AM PCE peak hour trips and 226 net PM PCE peak hour trips. The assumptions and methods used to estimate the Project's trip generation characteristics are discussed in greater detail in Section 4.1 *Project Trip Generation* of this report.

EXHIBIT 1-1: PRELIMINARY SITE PLAN



High-cube warehouse/distribution centers are a unique land use type within the larger, more generalized industrial land use category. ITE's most recent edition of the Trip Generation manual (ITE 9th Edition), published in 2012, defines "high-cube warehouses" being "…used for storage of materials, goods and merchandise prior to their distribution to retail outlets, distribution centers or other warehouses. These facilities are typically characterized by ceiling heights of at least 24 feet with small employment counts due to a high level of mechanization." (3) This definition is widely accepted by other engineering and planning disciplines. Over the years, the proliferation of high-cube warehouse/distribution center buildings throughout Southern California, and most notably the Inland Empire, has prompted both the public and private sectors to conduct numerous studies to understand the trip generation characteristics of these unique buildings, and their associated impacts on the transportation system.

1.2 ANALYSIS SCENARIOS

For the purposes of this traffic study, potential impacts to traffic and circulation have been assessed for each of the following conditions:

- Existing (2015) (1 scenario)
- Existing plus Project (1 scenario)
- Existing plus Ambient Growth plus Project (EAP) (2017) (1 scenario)
- Existing plus Ambient Growth plus Project plus Cumulative (EAPC) (2017) (1 scenario)
- Horizon Year (2035), Without and With Project (2 scenarios)

1.2.1 EXISTING (2015) CONDITIONS

Information for Existing (2015) conditions is disclosed to represent the baseline traffic conditions as they existed at the time this report was prepared.

1.2.2 EXISTING PLUS PROJECT CONDITIONS

The Existing plus Project (E+P) analysis determines circulation system deficiencies that would occur on the existing roadway system in the scenario of the Project being placed upon Existing conditions. The E+P scenario has been provided for information purposes.

1.2.3 EXISTING PLUS AMBIENT GROWTH PLUS PROJECT (2017) CONDITIONS

The Existing plus Ambient Growth plus Project (EAP) (2017) conditions analysis determines the significant traffic impacts based on a comparison of the EAP traffic conditions to Existing conditions (i.e., baseline conditions). To account for background traffic growth, an ambient growth from Existing conditions of 4.04% (2 percent per year over 2 years, compounded annually) is included for EAP traffic conditions. Cumulative development projects are not included as part of the EAP analysis. For the purposes of this traffic analysis, the EAP scenario has been utilized to discern significant Project impacts consistent with the County of Riverside traffic study guidelines.

1.2.4 EXISTING PLUS AMBIENT GROWTH PLUS PROJECT PLUS CUMULATIVE (2017) CONDITIONS

The Existing plus Ambient Growth plus Project plus Cumulative (2017) (EAPC) conditions analysis will be utilized to determine if improvements funded through regional transportation mitigation fee programs, such as the Transportation Uniform Mitigation Fee (TUMF) and County Development Impact Fee (DIF) programs, or other approved funding mechanism can accommodate the near-term cumulative traffic at the target level of service (LOS) identified in the County of Riverside General Plan. (4) If the "funded" improvements can provide the target LOS, then the Project's payment into TUMF and/or DIF will be considered as near-term cumulative mitigation through the conditions of approval. Other improvements needed beyond the "funded" improvements (such as localized improvements to non-TUMF facilities) are identified as such. To account for background traffic, other known cumulative development projects in the study area were included in addition to 4.04% of ambient growth for EAPC traffic conditions in conjunction with traffic associated with the proposed Project. Although it is unlikely that these cumulative projects would be fully built and occupied by Year 2017, they have been included in an effort to conduct a conservative analysis and overstate and opposed to understate potential traffic impacts.

The currently adopted Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan (RTP) (April 2012) growth forecasts for the unincorporated areas of the County of Riverside identifies projected growth in population of 349,100 in 2008 to 710,600 in 2035, or a 103.5 percent increase over the 27 year period. (5) The change in population equates to roughly a 2.67 percent growth rate compounded annually. Similarly, growth over the same 27 year period in households is projected to increase by 119.0 percent, or 2.95 percent annual growth rate. Finally, growth in employment over the same 27 year period is projected to increase by 198.8 percent, or a 4.14 percent annual growth rate.

Based on a comparison of Existing traffic volumes to the Horizon Year (2035) forecasts, the average growth rate is estimated at approximately 6.50 percent compounded annually between Existing and Horizon Year (2035) traffic conditions. The annual growth rate at each individual intersection is not lower than 5.20 percent compounded annually to as high as 9.27 percent compounded annually over the same time period. Therefore, the annual growth rate utilized for the purposes of this analysis would appear to conservatively approximate the anticipated regional growth in traffic volumes in the County of Riverside for both EAPC and Horizon Year (2035) traffic conditions, especially when considered along with the addition of project-related traffic. As such, the growth in traffic volumes assumed in this traffic impact analysis would tend to overstate as opposed to understate the potential impacts to traffic and circulation.

1.2.5 HORIZON YEAR (2035) CONDITIONS

The Horizon Year (2035) Without Project traffic conditions were derived from the Riverside County Transportation Analysis Model (RivTAM) using accepted procedures for model forecast refinement and smoothing. The traffic forecasts reflect the area-wide growth anticipated between Existing conditions and Horizon Year conditions. The Horizon Year With Project traffic forecasts were determined by adding the Project traffic to the Horizon Year Without Project traffic

forecasts from the RivTAM model. The Horizon Year traffic forecasts used in the traffic analysis were refined with existing peak hour traffic count data collected at intersection analysis locations. The initial estimate of the future peak hour turning movements has, therefore, been reviewed for reasonableness. The reasonableness checks performed include a review of traffic flow conservation in addition to a comparison with the Existing and EAPC traffic volumes. Where necessary, the Horizon Year volumes have been adjusted to achieve flow conservation, reasonable growth, and reasonable diversion between parallel routes.

The Horizon Year Without and With Project traffic conditions analyses will be utilized to determine if improvements funded through regional transportation mitigation fee programs, such as the TUMF and DIF programs, or other approved funding mechanism can accommodate the long-range cumulative traffic at the target LOS identified in the County of Riverside General Plan. (4) If the "funded" improvements can provide the target LOS, then the Project's payment into TUMF and/or DIF will be considered as long-range cumulative mitigation through the conditions of approval. Other improvements needed beyond the "funded" improvements (such as localized improvements to non-TUMF facilities) are identified as such.

Post-processing worksheets for Horizon Year (2035) Without Project traffic conditions are provided in Appendix 4.2.

1.3 STUDY AREA

To ensure that this TIA satisfies the County of Riverside's traffic study requirements, Urban Crossroads, Inc. prepared a project traffic study scoping package for review by County of Riverside staff prior to the preparation of this report. The scoping agreement provides an outline of the Project study area, trip generation, trip distribution, and analysis methodology and is included in Appendix 1.1.

1.3.1 INTERSECTIONS

The following 11 study area intersections shown on Exhibit 1-2 and listed in Table 1-1 were selected for this TIA based on consultation with County of Riverside staff. The study area includes intersections where the Project is anticipated to contribute 50 or more peak hour trips per the County of Riverside's traffic study guidelines. (1) Furthermore, the rationale for evaluating intersections where a project would contribute 50 or more peak-hour trips is standard industry practice and supported by substantial evidence. It should also be noted that the 50 peak hour trip threshold is used by several other lead agencies throughout southern California including Caltrans, County of Riverside, County of San Bernardino, and the County of Orange. The 50 peak hour trip threshold is based on the desire to analyze potential impacts when the project contributes 3 percent or more of the capacity of a typical signalized intersection. According to the Orange County CMP Guidelines, the 50 peak hour threshold represents less than 3 percent of capacity of a signalized intersection for critical movements, estimated based on the Highway Capacity Manual (HCM) at approximately 1700 vehicles per hour. The following 11 study area intersections were determined to be the only intersections between the Project and the I-215 Freeway where the Project is anticipated to contribute 50 or more peak hour trips.

EXHIBIT 1-2: LOCATION MAP

LEGEND:

0 = INTERSECTION ANALYSIS LOCATION

0 = CMP INTERSECTION ANALYSIS LOCATION

N

TABLE 1-1: INTERSECTION ANALYSIS LOCATIONS

ID	Intersection Location	Jurisdiction	CMP?
1	Driveway 1 / Oleander Avenue – Future Intersection	County of Riverside	No
2	Driveway 2 / Oleander Avenue – Future Intersection	County of Riverside	No
3	Driveway 3 / Oleander Avenue – Future Intersection	County of Riverside	No
4	Decker Road / Oleander Avenue – Future Intersection	County of Riverside	No
5	Driveway 4 / Oleander Avenue – Future Intersection	County of Riverside	No
6	Driveway 5 / Oleander Avenue – Future Intersection	County of Riverside	No
7	Driveway 6 / Oleander Avenue – Future Intersection	County of Riverside	No
8	Harvill Avenue / Harley Knox Boulevard	County of Riverside	No
9	Harvill Avenue / Oleander Avenue	County of Riverside	No
10	I-215 Southbound Ramps / Harley Knox Boulevard	Caltrans, County of Riverside	Yes
11	I-215 Northbound Ramps / Harley Knox Boulevard	Caltrans, City of Perris	Yes

In effect, acting as the lead agency, these jurisdictions have established 50 project trips as the threshold for when to analyze signalized intersections. Therefore, a project trip contribution of less than 50 peak hour trips is considered less than significant and is typically not evaluated.

The intent of a CMP is to more directly link land use, transportation, and air quality, thereby prompting reasonable growth management programs that will effectively utilize new transportation funds, alleviate traffic congestion and related impacts, and improve air quality. Counties within California have developed CMPs with varying methods and strategies to meet the intent of the CMP legislation. The County of Riverside CMP became effective with the passage of Proposition 111 in 1990 and updated most recently updated in 2011. The Riverside County Transportation Commission (RCTC) adopted the 2011 CMP for County of Riverside in December 2011. (4) There are two study area intersections that are ramp-to-arterial intersections with the I-215 Freeway, which are identified as CMP facilities.

1.3.2 FREEWAY MAINLINE SEGMENTS

Study area freeway mainline analysis locations were selected based on Caltrans traffic study guidelines, which may require the analysis of State highway facilities. (2) This study evaluates the following freeway segments adjacent to the point of entry to the State Highway System (SHS), where the Project is anticipated to contribute 50 or more peak hour trips (see Table 1-2):

TABLE 1-2: FREEWAY MAINLINE SEGMENT ANALYSIS LOCATIONS

ID	Freeway Mainline Segments
1	I-215 Freeway – Southbound, North of Harley Knox Boulevard
2	I-215 Freeway – Southbound, South of Harley Knox Boulevard
3	I-215 Freeway – Northbound, North of Harley Knox Boulevard
4	I-215 Freeway – Northbound, South of Harley Knox Boulevard

1.3.3 FREEWAY MERGE/DIVERGE RAMP JUNCTIONS

The study area freeway merge/diverge ramp junction analysis locations include the following freeway ramp junctions for each direction of flow as shown on Table 1-3, where the Project is anticipated to contribute 50 or more peak hour trips:

TABLE 1-3: FREEWAY MERGE/DIVERGE RAMP JUNCTION ANALYSIS LOCATIONS

ID	Freeway Merge/Diverge Ramp Junctions
1	I-215 Freeway – Southbound, Off-Ramp at Harley Knox Boulevard (Diverge)
2	I-215 Freeway – Southbound, On-Ramp at Harley Knox Boulevard (Merge)
3	I-215 Freeway – Northbound, On-Ramp at Harley Knox Boulevard (Merge)
4	I-215 Freeway – Northbound, Off-Ramp at Harley Knox Boulevard (Diverge)

1.4 SUMMARY OF PROJECT IMPACTS

The study area intersections are currently operating at acceptable LOS during the peak hours and the study area intersections are anticipated to continue to operate acceptably with the addition of Project traffic (as defined by a comparison of Existing to both the E+P and EAP traffic analysis scenarios). Similarly, the I-215 Freeway mainline segments and merge/diverge ramp junctions are currently operating at acceptable LOS and are anticipated to continue to operate acceptably with the addition of Project traffic.

As such, the Project's contribution to the study area intersections, I-215 Freeway, and freeway ramps at Harley Knox Boulevard are anticipated to be less than significant.

1.5 SUMMARY OF CUMULATIVE IMPACTS

Cumulative traffic impacts are deficiencies that are not directly caused by the Project, but occur as a result of regional growth combined with that or other nearby cumulative development projects. The Project's contribution to a particular cumulative transportation deficiency is deemed significant cumulative impacts if the Project adds significant traffic to the forecasted deficiency (as measured by the 50 or more peak hour trip threshold).

1.5.1 EAPC (2017) CONDITIONS

The following study area intersections are anticipated to operate at unacceptable LOS during the peak hours under EAPC (2017) traffic conditions:

ID	Intersection Location
8	Harvill Avenue / Harley Knox Boulevard – LOS F AM and PM peak hours
10	I-215 Southbound Ramps / Harley Knox Boulevard – LOS F AM and PM peak hours
11	I-215 Northbound Ramps / Harley Knox Boulevard – LOS F PM peak hour only

There are queuing issues anticipated at the I-215 Southbound off-ramps during the AM peak hour only. However, these queuing issues are anticipated to be improved with the implementation of the recommended intersection improvements.

Similar to Existing, E+P, and EAP traffic conditions, the I-215 Freeway mainline and merge/diverge ramp junctions are anticipated to operate at acceptable LOS under EAPC traffic conditions. As such, no improvement have been identified or assessed.

1.5.2 HORIZON YEAR (2035) CONDITIONS

Based on the assessment of Horizon Year Without and With Project traffic conditions, the following additional intersection was identified to operate at a deficient LOS, in addition to those previously identified under EAPC traffic conditions:

ID	Intersection Location
4	Decker Road / Oleander Avenue – LOS F AM and PM peak hours

There are queuing issues anticipated at both the I-215 Southbound and I-215 Northbound off-ramps during the AM and PM peak hours. However, these queuing issues are anticipated to be improved with the implementation of the recommended intersection improvements for Horizon Year traffic conditions.

All of the I-215 Freeway mainline segments and the merge/diverge ramp junctions at Harley Knox Boulevard are anticipated to operate at unacceptable LOS under Horizon Year Without Project traffic conditions. The addition of Project traffic is not anticipated to result in any additional deficiencies. Planned improvements (I-215 North Project) for the I-215 Freeway are anticipated to improve the peak hour LOS, however, the following I-215 Freeway mainline segments and ramp junctions are anticipated to continue to operate at unacceptable LOS:

ID	Freeway Mainline Segments
1	I-215 Freeway – Southbound, North of Harley Knox Boulevard – LOS E AM and PM peak hours
3	I-215 Freeway – Northbound, North of Harley Knox Boulevard – LOS E AM and PM peak hours

ID	Freeway Merge/Diverge Ramp Junctions
1	I-215 Freeway – Southbound, Off-Ramp at Harley Knox Boulevard – LOS F AM peak hour; LOS E PM peak hour
3	I-215 Freeway – Northbound, On-Ramp at Harley Knox Boulevard – LOS E AM and PM peak hours

There are no additional improvements planned along the I-215 Freeway in addition to those planned as part of the I-215 North Project. However, the Project is anticipated to contribute less than 1.0 percent to the total Horizon Year traffic forecasts on the deficient freeway mainline segments and ramp junctions along the I-215 Freeway and the addition of Project traffic is not anticipated to result in a change in the LOS letter grade. As such, the Project's impact is considered less-than-significant to these freeway facilities.

1.6 RECOMMENDED IMPROVEMENTS

Table 1-4 lists the recommended improvements necessary to reduce the identified intersection LOS deficiencies by traffic condition. For improvements that do not appear to be in TUMF or DIF, a fair share contribution based on the Project's percentage contribution may be imposed in order to mitigate the Project's share of impacts in lieu of construction. These fees are collected as part of a funding mechanism aimed at ensuring that regional highways and arterial expansions keep pace with the projected vehicle trip increases. Alternatively, minor fair share responsibilities may be waived when collection is infeasible or where other mitigation assignments substantially exceed the Project's demonstrated impacts.

The improvements listed in Table 1-4 are comprised of lane additions/modifications, installation of signals and signal modifications. The improvements that are covered either by the TUMF program or the DIF program have been identified as such. Lane additions are shown as the number of lanes required and the direction of travel. Depending on the width of the existing pavement and right-of-way, these improvements may involve only striping modifications or they may involve construction of additional pavement width. Additional discussion of the relevant pre-existing transportation impact fee programs is provided below. There are no other applicable pre-existing funding programs for the study area aside from TUMF and DIF.

1.7 LOCAL AND REGIONAL FUNDING MECHANISMS

Transportation improvements throughout the County of Riverside are funded through a combination of project mitigation, fair share contributions or development impact fee programs, such as Transportation Uniform Mitigation Fee (TUMF) program or the County's Development Impact Fee (DIF) program. Identification and timing of needed improvements is generally determined through local jurisdictions based upon a variety of factors.

1.7.1 TRANSPORTATION UNIFORM MITIGATION FEE (TUMF) PROGRAM

The Western Riverside Council of Governments (WRCOG) is responsible for establishing and updating TUMF rates. The County may grant to developers a credit against the specific components of fees for the dedication of land or the construction of facilities identified in the list of improvements funded by each of these fee programs. Fees are based upon projected land uses and a related transportation needs to address growth based upon a 2009 Nexus study.

TUMF is an ambitious regional program created to address cumulative impacts of growth throughout western Riverside County. Program guidelines are being handled on an iterative basis. Exemptions, credits, reimbursements and local administration are being deferred to primary agencies. The County of Riverside serves this function for the proposed Project. Fees submitted to the County are passed on to the WRCOG as the ultimate program administrator.

Table 1-4

Summary of Improvements by Analysis Scenario

#	Intersection Location	Jurisdiction	E+P Recommended Improvements	EAP (2017) Recommended Improvements	EAPC (2017) Recommended Improvements	2035 Without Project Recommended Improvements	2035 With Project Recommended Improvements	Improvements in TUMF or DIF?[1]	Fair Share %[3]
4	Decker Rd. / Oleander Av.	County of Riverside	Install stop control on NB approach[2]	Same	Same	Install a traffic signal	Same	No	5.4%
			NB left turn lane[2]	Same	Same	Same	Same	No	
			NB through lane (to be striped out until northern leg is constructed)[2]	Same	Same	Same	Same	No	
			NB shared through-right turn lane (to be utilized as a right turn lane until northern leg is constructed)[2]	Same	Same	Same	Same	No	
			EB shared through-right turn lane[2]	Same	Same	Same	Same	No	
			WB left turn lane[2]	Same	Same	Same	Same	No	
			WB through lane[2]	Same	Same	Same	Same	No	
						SB left turn lane	Same	No	
						SB through lane	Same	No	
						SB shared through-right turn lane	Same	No	
8	Harvill Av. / Harley Knox Bl.	County of Riverside	None	None	Modify traffic signal to implement overlap phasing on the NB right turn lanes	Same	Same	No	5.0%
						Modify traffic signal to implement overlap phasing on the EB right turn lane	Same	No	
10	I-215 SB Ramps / Harley Knox Bl	Caltrans, County of Riverside	None	None	Restripe SB ramp to provide 1 SB left turn lane and 1 shared SB left-through-right turn lane	Restripe SB ramp to provide 1 SB left turn lane and 1 shared through-right turn lane	Same	Yes (TUMF)[4]	NA[5]
					2nd WB left urn lane	Same	Same	Yes (TUMF)[4]	
						2nd SB left turn lane	Same	Yes (TUMF)[4]	
11	I-215 NB Ramps / Harley Knox Bl	Caltrans, City of Perris	None	None	2nd EB left turn lane	Same	Same	Yes (TUMF)[4]	NA[5]
					WB free-right turn lane	Same	Same	Yes (TUMF)[4]	

[1] Improvements are included wholly or partially in one or more of the following: County of Riverside TUMF or DIF programs for local, regional, and specific plan components. Final determination on extent of the improvements included and covered by these fee programs is to be established by the governing lead agency.

[2] To be constructed as part of Project's site adjacent improvements.

[3] Program improvements constructed by the Project may be eligible for fee credit, at the discretion of the County. See Table 1-5 for fair share calculations.

[4] Although the interchange is identified as a TUMF interchange, the interchange is not currently identified on the Central Zone 5-Year Transportation Improvement Program Amendment (adopted January 6, 2014).

[5] Fair share percentage is not shown as the recommended improvements at this location are included in a pre-existing fee program.

TUMF guidelines empower a local zone committee to prioritize and arbitrate certain projects. The Project is located in the Central Zone. The zone has developed a 5-year capital improvement program to prioritize public construction of certain roads. TUMF is focused on improvements necessitated by regional growth. Cajalco Expressway / Ramona Expressway is a designated TUMF roadway within the Project's traffic study area.

1.7.2 DEVELOPMENT IMPACT FEE (DIF) PROGRAM

The Project is located within the County's Mead Valley Area Plan and therefore will be subject to County of Riverside Development Impact Fees (DIF) in an effort by the County to mitigate development throughout its unincorporated area. The DIF program consists of two separate transportation components: Roads, Bridges and Major Improvements component and the Traffic Signals component. Eligible facilities for funding by the County DIF program are identified on the County's Public Needs List, which currently extends through the year 2020.

The cost of signalizing DIF network intersections is identified under the Traffic Signals component of the DIF program. County staff generally defines DIF eligible intersections as those consisting of two intersecting general plan roadways. If the intersection meets this requirement, it is potentially eligible for up to $235,000 of credit, which is subject to negotiations with the County.

1.7.3 FAIR SHARE CONTRIBUTION

Project mitigation may include a combination of fee payments to established programs (e.g., TUMF and/or DIF), construction of specific improvements, payment of a fair share contribution toward future improvements or a combination of these approaches. Improvements constructed by development may be eligible for a fee credit or reimbursement through the program where appropriate (to be determined at the County of Riverside's discretion).

When off-site improvements are identified with a minor share of responsibility assigned to proposed development, the approving jurisdiction may elect to collect a fair share contribution or require the development to construct improvements. Detailed fair share calculations, for each peak hour, has been provided on Table 1-5 for the applicable deficient intersections shown previously on Table 1-4. Improvements included in a defined program and constructed by development may be eligible for a fee credit or reimbursement through the program where appropriate.

1.8 SITE ADJACENT ROADWAY AND SITE ACCESS IMPROVEMENTS

This section summarizes Project site access and on-site circulation recommendations.

The Project is proposed to have access on Oleander Avenue via Driveways 1 through 6. All Project access points are assumed to allow full-access (i.e., full turning movements). Driveways 1 and 4 are proposed for truck access only, Driveways 2 and 5 are proposed for passenger car access only, and Driveways 3 and 6 are proposed to allow access for both trucks and passenger cars. Regional access to the project site is provided via the I-215 Freeway at Harley Knox Boulevard interchange. Roadway improvements necessary to provide site access and on-site

Table 1-5

Project Fair Share Calculations for Intersections

#	Intersection		Existing	Project	2035 WP Volume	Total New Traffic	Project % of New Traffic
4	Decker Rd. / Oleander Av.						
		AM:	5	97	1,760	1,755	5.5%
		PM:	8	113	2,112	2,104	**5.4%**
8	Harvill Av. / Harley Knox Bl.						
		AM:	718	169	2,307	1,589	10.6%
		PM:	829	201	4,880	4,051	**5.0%**

BOLD = Denotes highest deficient peak hour.

circulation are assumed to be constructed in conjunction with site development and are described below. These improvements are required to be in place prior to occupancy. Exhibit 1-3 illustrates the site-adjacent roadway improvement recommendations and site access improvements. Construction of on-site and site adjacent improvements are recommended to occur in conjunction with adjacent Project development activity or as needed for Project access purposes.

Oleander Avenue –Oleander Avenue is an east-west oriented roadway located along the Project's northern boundary. Construct Oleander Avenue from the Project's western boundary to the eastern Project boundary at its ultimate half-section width as an industrial collector (78-foot right-of-way), in compliance with applicable County of Riverside standards. The Project will also construct a minimum of one lane in the westbound direction in order to provide access to the site.

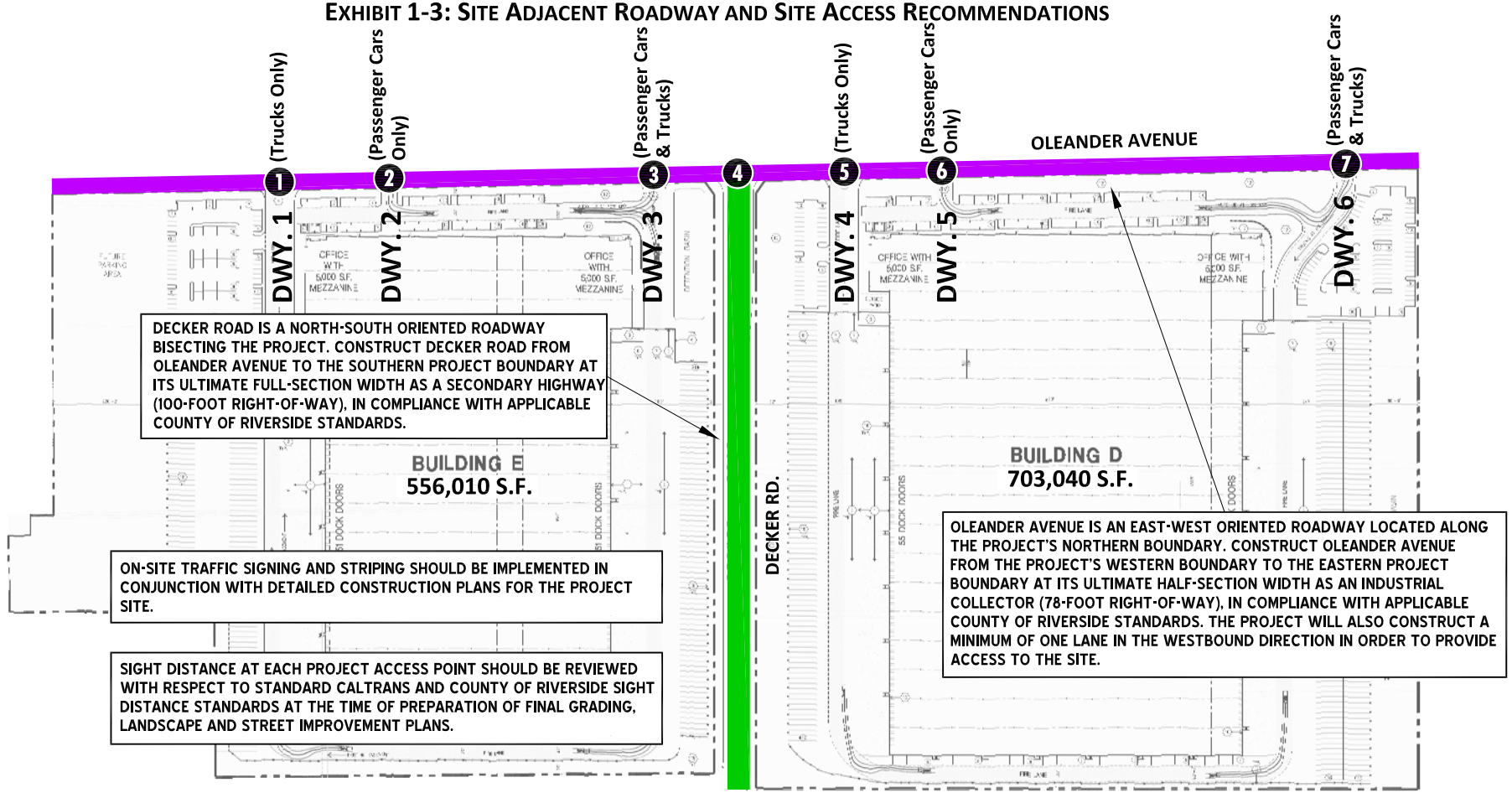
Decker Road – Decker Road is a north-south oriented roadway bisecting the Project. Construct Decker Road from Oleander Avenue to the southern Project boundary at its ultimate full-section width as a secondary highway (100-foot right-of-way), in compliance with applicable County of Riverside standards.

1.9 TRUCK ACCESS AND CIRCULATION

Due to the typical wide turning radius of large trucks, a truck turning template has been overlaid on the site plan at each applicable Project driveway anticipated to be utilized by heavy trucks in order to determine appropriate curb radii and to verify that trucks will have sufficient space to execute turning maneuvers. For the purposes of this evaluation, the WB-67 class truck template has been utilized. WB-67 class trucks are approximately 73.5 feet in length.

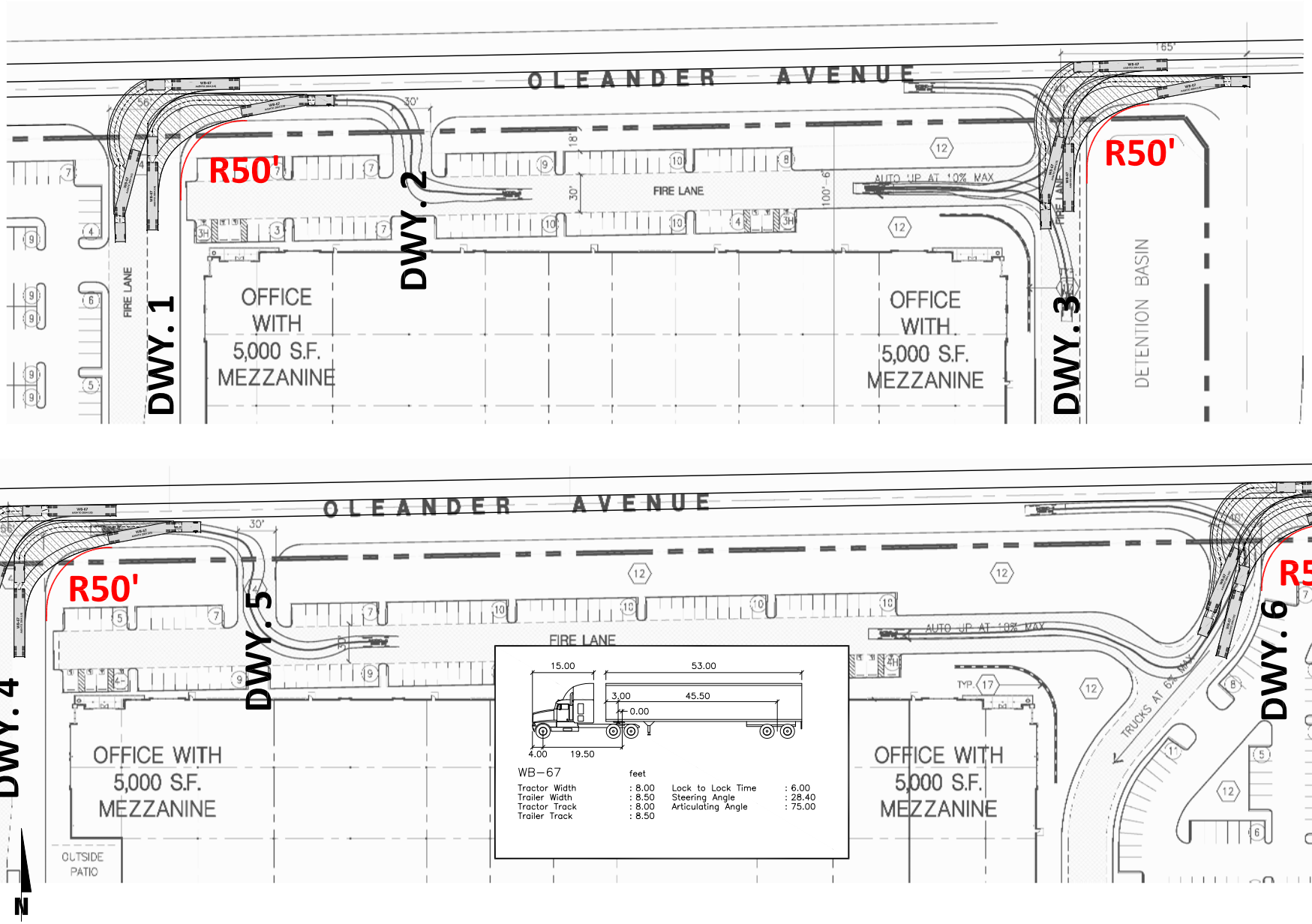
Exhibit 1-4 illustrates the proposed truck access for the site and circulation for each of the applicable Project driveways. As shown on Exhibit 1-4, the Project driveways will need to provide a minimum 50-foot curb radius on the southeast corner of each Project driveway in order to accommodate the ingress and egress of WB-67 trucks (or smaller). A truck turning template has not been overlaid on Driveways 2 and 5 as they are anticipated to provide access to passenger car parking only and would not likely be utilized by heavy trucks.

EXHIBIT 1-3: SITE ADJACENT ROADWAY AND SITE ACCESS RECOMMENDATIONS



URBAN CROSSROADS

EXHIBIT 1-4: TRUCK ACCESS AND CIRCULATION



2 METHODOLOGIES

This section of the report presents the methodologies used to perform the traffic analyses summarized in this report. The methodologies described are generally consistent with County of Riverside and Caltrans traffic study guidelines. (1) (2)

2.1 LEVEL OF SERVICE

Traffic operations of roadway facilities are described using the term "Level of Service" (LOS). LOS is a qualitative description of traffic flow based on several factors such as speed, travel time, delay, and freedom to maneuver. Six levels are typically defined ranging from LOS A, representing completely free-flow conditions, to LOS F, representing breakdown in flow resulting in stop-and-go conditions. LOS E represents operations at or near capacity, an unstable level where vehicles are operating with the minimum spacing for maintaining uniform flow.

2.2 INTERSECTION CAPACITY ANALYSIS

The definitions of LOS for interrupted traffic flow (flow restrained by the existence of traffic signals and other traffic control devices) differ slightly depending on the type of traffic control. The LOS is typically dependent on the quality of traffic flow at the intersections along a roadway. The *Highway Capacity Manual* (HCM) methodology expresses the LOS at an intersection in terms of delay time for the various intersection approaches. (6) The HCM uses different procedures depending on the type of intersection control.

2.2.1 SIGNALIZED INTERSECTIONS

County of Riverside

The County of Riverside requires signalized intersection operations analysis based on the methodology described in the HCM. (6) Intersection LOS operations are based on an intersection's average control delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For signalized intersections LOS is directly related to the average control delay per vehicle and is correlated to a LOS designation as described in Table 2-1. Study area intersections have been evaluated using the Synchro (Version 8 Build 806) analysis software package.

Synchro is a macroscopic traffic software program that is based on the signalized intersection capacity analysis as specified in the HCM. Macroscopic level models represent traffic in terms of aggregate measures for each movement at the study intersections. Equations are used to determine measures of effectiveness such as delay and queue length. The level of service and capacity analysis performed by Synchro takes into consideration optimization and coordination of signalized intersections within a network.

TABLE 2-1: SIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Operations with very low delay occurring with favorable progression and/or short cycle length.	0 to 10.00	A	F
Operations with low delay occurring with good progression and/or short cycle lengths.	10.01 to 20.00	B	F
Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.01 to 35.00	C	F
Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.01 to 55.00	D	F
Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.01 to 80.00	E	F
Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths	80.01 and up	F	F

Source: HCM

The peak hour traffic volumes have been adjusted using a peak hour factor (PHF) to reflect peak 15 minute volumes. Common practice for LOS analysis is to use a peak 15-minute rate of flow. However, flow rates are typically expressed in vehicles per hour. The PHF is the relationship between the peak 15-minute flow rate and the full hourly volume (e.g. PHF = [Hourly Volume] / [4 x Peak 15-minute Flow Rate]). The use of a 15-minute PHF produces a more detailed analysis as compared to analyzing vehicles per hour. Existing PHFs have been used for all analysis scenarios. Per the HCM, PHF values over 0.95 often are indicative of high traffic volumes with capacity constraints on peak hour flows while lower PHF values are indicative of greater variability of flow during the peak hour. (6)

California Department of Transportation (Caltrans)

Per the Caltrans *Guide for the Preparation of Traffic Impact Studies*, the traffic modeling and signal timing optimization software package Synchro (Version 8 Build 806) has also been utilized to analyze signalized intersections under Caltrans' jurisdiction, which include interchange to arterial ramps (i.e. I-215 Freeway ramps at Harley Knox Boulevard). (2) Signal timing for the freeway arterial-to-ramp intersections have been obtained from Caltrans District 8 and were utilized for the purposes of this analysis.

2.2.2 UNSIGNALIZED INTERSECTIONS

The County of Riverside requires the operations of unsignalized intersections be evaluated using the methodology described the HCM. (6) The LOS rating is based on the weighted average control delay expressed in seconds per vehicle (see Table 2-2).

TABLE 2-2: UNSIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay Per Vehicle (Seconds)	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Little or no delays.	0 to 10.00	A	F
Short traffic delays.	10.01 to 15.00	B	F
Average traffic delays.	15.01 to 25.00	C	F
Long traffic delays.	25.01 to 35.00	D	F
Very long traffic delays.	35.01 to 50.00	E	F
Extreme traffic delays with intersection capacity exceeded.	> 50.00	F	F

Source: HCM

At two-way or side-street stop-controlled intersections, LOS is calculated for each controlled movement and for the left turn movement from the major street, as well as for the intersection as a whole. For approaches composed of a single lane, the delay is computed as the average of all movements in that lane. For all-way stop controlled intersections, LOS is computed for the intersection as a whole.

2.3 FREEWAY OFF-RAMP QUEUING ANALYSIS

The study area for this TIA includes the freeway-to-arterial interchange of the I-215 Freeway at Harley Knox Boulevard off-ramps. Consistent with Caltrans requirements, the 95th percentile queuing of vehicles has been assessed at the off-ramps to determine potential queuing impacts at the freeway ramp intersections on Harley Knox Boulevard. Specifically, the queuing analysis is utilized to identify any potential queuing and "spill back" onto the I-215 Freeway mainline from the off-ramps.

The traffic progression analysis tool and HCM intersection analysis program, Synchro, has been used to assess the potential impacts/needs of the intersections with traffic added from the proposed Project. Storage (turn-pocket) length recommendations at the ramps have been based upon the 95th percentile queue resulting from the Synchro progression analysis. The queue length reported is for the lane with the highest queue in the lane group.

There are two footnotes which appear on the Synchro outputs. One footnote indicates if the 95th percentile cycle exceeds capacity. Traffic is simulated for two complete cycles of the 95th percentile traffic in Synchro in order to account for the effects of spillover between cycles. In practice, the 95th percentile queue shown will rarely be exceeded and the queues shown with the footnote are acceptable for the design of storage bays. The other footnote indicates whether or not the volume for the 95th percentile queue is metered by an upstream signal. In many cases, the 95th percentile queue will not be experienced and may potentially be less than

the 50th percentile queue due to upstream metering. If the upstream intersection is at or near capacity, the 50th percentile queue represents the maximum queue experienced.

A vehicle is considered queued whenever it is traveling at less than 10 feet/second. A vehicle will only become queued when it is either at the stop bar or behind another queued vehicle. Although only the 95th percentile queue has been reported in the tables, the 50th percentile queue can be found in the appendix alongside the 95th percentile queue for each ramp location. The 50th percentile maximum queue is the maximum back of queue on a typical cycle during the peak hour, while the 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes during the peak hour. In other words, if traffic were observed for 100 cycles, the 95th percentile queue would be the queue experienced with the 95th busiest cycle (or 5% of the time). The 50th percentile or average queue represents the typical queue length for peak hour traffic conditions, while the 95th percentile queue is derived from the average queue plus 1.65 standard deviations. The 95th percentile queue is not necessarily ever observed, it is simply based on statistical calculations.

2.4 TRAFFIC SIGNAL WARRANT ANALYSIS METHODOLOGY

The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or ascertain the potential need for installation of a traffic signal at an otherwise unsignalized intersection. This TIA uses the signal warrant criteria presented in the latest edition of the Federal Highway Administration's (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*, as amended by *the MUTCD 2014 California Supplement*, for all study area intersections. (7)

The signal warrant criteria for Existing study area intersections are based upon several factors, including volume of vehicular and pedestrian traffic, frequency of accidents, and location of school areas. Both the FHWA's *MUTCD* and the *MUTCD 2014 California Supplement* indicate that the installation of a traffic signal should be considered if one or more of the signal warrants are met. (7) Specifically, this TIA utilizes the Peak Hour Volume-based Warrant 3 as the appropriate representative traffic signal warrant analysis for existing traffic conditions. Warrant 3 criteria are basically identical for both the FHWA's *MUTCD* and the *MUTCD 2014 California Supplement*. Warrant 3 is appropriate to use for this TIA because it provides specialized warrant criteria for intersections with rural characteristics (e.g. located in communities with populations of less than 10,000 persons or with adjacent major streets operating above 40 miles per hour). For the purposes of this study, the speed limit was the basis for determining whether Urban or Rural warrants were used for a given intersection.

Future unsignalized intersections, that currently do not exist, have been assessed regarding the potential need for new traffic signals based on future average daily traffic (ADT) volumes, using the Caltrans planning level ADT-based signal warrant analysis worksheets.

As shown on Table 2-3, traffic signal warrant analyses were performed for the following unsignalized study area intersections during the peak weekday conditions wherein the Project is anticipated to contribute the highest trips:

TABLE 2-3: TRAFFIC SIGNAL WARRANT ANALYSIS LOCATIONS

ID	Intersection Location	Jurisdiction	CMP?
1	Driveway 1 / Oleander Avenue – Future Intersection	County of Riverside	No
2	Driveway 2 / Oleander Avenue – Future Intersection	County of Riverside	No
3	Driveway 3 / Oleander Avenue – Future Intersection	County of Riverside	No
4	Decker Road / Oleander Avenue – Future Intersection	County of Riverside	No
5	Driveway 4 / Oleander Avenue – Future Intersection	County of Riverside	No
6	Driveway 5 / Oleander Avenue – Future Intersection	County of Riverside	No
7	Driveway 6 / Oleander Avenue – Future Intersection	County of Riverside	No

The Existing conditions traffic signal warrant analysis is presented in the subsequent section, Section 3 *Area Conditions* of this report. The traffic signal warrant analyses for future conditions are presented in Section 5 *E+P Traffic Analysis,* Section 6 *EAP (2017) Traffic Analysis,* Section 7 *EAPC (2017) Traffic Analysis,* and Section 8 *Horizon Year (2035) Traffic Analysis* of this report.

It is important to note that a signal warrant defines the minimum condition under which the installation of a traffic signal might be warranted. Meeting this threshold condition does not require that a traffic control signal be installed at a particular location, but rather, that other traffic factors and conditions be evaluated in order to determine whether the signal is truly justified. It should also be noted that signal warrants do not necessarily correlate with LOS. An intersection may satisfy a signal warrant condition and operate at or above acceptable LOS or operate below acceptable LOS and not meet a signal warrant.

2.5 FREEWAY MAINLINE SEGMENT ANALYSIS METHODOLOGY

Consistent with recent Caltrans guidance and because impacts to freeway segments dissipate with distance from the point of State Highway System (SHS) entry, quantitative study of freeway segments beyond those immediately adjacent to the point of entry is not required. As such, the traffic study has evaluated the freeway segments along the I-215 Freeway where the Project is anticipated to contribute 50 or more peak hour trips. Because impacts to freeway segments dissipate with distance from the point of SHS entry, quantitative evaluation of freeway segments with less than 50 peak hour trips is not necessary.

The freeway system in the study area has been broken into segments defined by the freeway-to-arterial interchange locations. The freeway segments have been evaluated in this TIA based upon peak hour directional volumes. The freeway segment analysis is based on the methodology described in the HCM and performed using HCS2010 software. The performance measure preferred by Caltrans to calculate LOS is density. Density is expressed in terms of passenger cars per mile per lane. Table 2-4 illustrates the freeway segment LOS descriptions for each density range utilized for this analysis.

The number of lanes for existing baseline conditions has been obtained from field observations conducted by Urban Crossroads in April 2015. These existing freeway geometrics have been utilized for Existing, E+P, EAP, EAPC, and Horizon Year Without and With Project conditions.

The I-215 Freeway mainline volume data were obtained from the Caltrans Performance Measurement System (PeMS) website for the segments of the I-215 Freeway interchange, north of Harley Knox Boulevard. The data was obtained from April 2015. In an effort to conduct a conservative analysis, the maximum value observed within the three day period was utilized for the weekday morning (AM) and weekday evening (PM) peak hours. In addition, truck traffic, represented as a percentage of total traffic, has been utilized for the purposes of this analysis in an effort to not overstate traffic volumes and peak hour deficiencies. As such, actual vehicles (as opposed to PCE volumes) have been utilized for the purposes of the basic freeway segment analysis. (8)

TABLE 2-4: DESCRIPTION OF FREEWAY MAINLINE LOS

Level of Service	Description	Density Range (pc/mi/ln)[1]
A	Free-flow operations in which vehicles are relatively unimpeded in their ability to maneuver within the traffic stream. Effects of incidents are easily absorbed.	0.0 – 11.0
B	Relative free-flow operations in which vehicle maneuvers within the traffic stream are slightly restricted. Effects of minor incidents are easily absorbed.	11.1 – 18.0
C	Travel is still at relative free-flow speeds, but freedom to maneuver within the traffic stream is noticeably restricted. Minor incidents may be absorbed, but local deterioration in service will be substantial. Queues begin to form behind significant blockages.	18.1 – 26.0
D	Speeds begin to decline slightly and flows and densities begin to increase more quickly. Freedom to maneuver is noticeably limited. Minor incidents can be expected to create queuing as the traffic stream has little space to absorb disruptions.	26.1 – 35.0
E	Operation at capacity. Vehicles are closely spaced with little room to maneuver. Any disruption in the traffic stream can establish a disruption wave that propagates throughout the upstream traffic flow. Any incident can be expected to produce a serious disruption in traffic flow and extensive queuing.	35.1 – 45.0
F	Breakdown in vehicle flow.	>45.0

[1] pc/mi/ln = passenger cars per mile per lane. Source: HCM

2.6 FREEWAY MERGE/DIVERGE RAMP JUNCTION ANALYSIS

The freeway system in the study area has been broken into segments defined by freeway-to-arterial interchange locations resulting in two existing on and off ramp locations. Although the HCM indicates the influence area for a merge/diverge junction is 1,500 feet, the analysis presented in this traffic study has been performed at all ramp locations with respect to the nearest on or off ramp at each interchange in an effort to be consistent with Caltrans guidance/comments on other projects Urban Crossroads has worked on in the region.

The merge/diverge analysis is based on the HCM Ramps and Ramp Junctions analysis method and performed using HCS+ software. The measure of effectiveness (reported in passenger car/mile/lane) are calculated based on the existing number of travel lanes, number of lanes at the on and off ramps both at the analysis junction and at upstream and downstream locations (if applicable) and acceleration/deceleration lengths at each merge/diverge point. Table 2-5

presents the merge/diverge area level of service descriptions for each density range utilized for this analysis.

TABLE 2-5: DESCRIPTION OF FREEWAY MERGE AND DIVERGE LOS

Level of Service	Density Range (pc/mi/ln)[1]
A	≤10.0
B	10.0 – 20.0
C	20.0 – 28.0
D	28.0 – 35.0
E	>35.0
F	Demand Exceeds Capacity

[1] pc/mi/ln = passenger cars per mile per lane. Source: HCM

Similar to the basic freeway segment analysis, the I-215 Freeway mainline volume data were obtained from the Caltrans maintained PeMS website for the segments of the I-215 Freeway interchange, north of Harley Knox Boulevard. The ramp data (per the count data presented in Appendix 3.1) were then utilized to flow conserve the mainline volumes to determine the remaining I-215 Freeway mainline segment volumes. Flow conservation checks ensure that traffic flows from north to south (and vice versa) of the interchange area with no unexplained loss of vehicles. The data was obtained from April 2015. In an effort to conduct a conservative analysis, the maximum value observed within the three day period was utilized for the weekday morning (AM) and weekday evening (PM) peak hours. In addition, truck traffic, represented as a percentage of total traffic, has been utilized for the purposes of this analysis in an effort to not overstate traffic volumes and peak hour deficiencies. (8) As such, actual vehicles (as opposed to PCE volumes) have been utilized for the purposes of the freeway ramp junction (merge/diverge) analysis.

2.7 MINIMUM LEVEL OF SERVICE (LOS)

The definition of an intersection deficiency has been obtained from each of the applicable surrounding jurisdictions.

2.7.1 COUNTY OF RIVERSIDE

County of Riverside General Plan Policy C 2.1 states that the County will maintain the following County-wide target level of service (LOS): LOS "C" on all County-maintained roads and conventional State Highways. As an exception, LOS "D" may be allowed in Community Development areas at intersections of any combination of Secondary Highways, Major Highways, Arterial Highways, Urban Arterial Highways, Expressways or conventional State Highways. LOS "E" may be allowed in designated Community Centers to the extent that it would support transit-oriented development and pedestrian communities. As the Project is located within a Community Development area, LOS "D" has been considered acceptable at any intersection within the County of Riverside because all of the study area intersections are classified as Secondary Highways or a higher classification.

2.7.2 CMP

In an effort to more directly link land use, transportation and air quality and promote reasonable growth, the County of Riverside adopted a Congestion Management Plan (CMP) (December 2011). The Riverside County Transportation Commission (RCTC) monitors the CMP roadway network system to minimize LOS deficiencies. Within the project study area, the I-215 Freeway is recognized as a key transportation facility within the CMP system. Although Caltrans utilizes LOS D as their stated threshold, RCTC has adopted LOS E as the minimum standard for intersections and segments along the CMP System of Highways and Roadways. However, for the purposes of this traffic impact analysis, LOS D has been considered to be the limit of acceptable traffic operations for the I-215 Freeway mainline segments and ramp junctions in an effort to be conservative.

2.7.3 CALTRANS

Caltrans endeavors to maintain a target LOS at the transition between LOS C and LOS D on SHS facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than this target LOS, the existing LOS should be maintained. Caltrans acknowledges that the region-wide goal for an acceptable LOS on all freeways, roadway segments, and intersections is LOS D. Consistent with the County of Riverside LOS threshold of LOS D and in excess of the CMP stated LOS threshold of LOS E, LOS D will be used as the target LOS for freeway ramps, freeway segments, and freeway merge/diverge ramp junctions.

2.8 THRESHOLDS OF SIGNIFICANCE

This section outlines the methodology used in this analysis related to identifying circulation system deficiencies.

2.8.1 INTERSECTIONS

For the purposes of this analysis, the following thresholds of significance have been applied to study area intersections located within the County of Riverside to identify significant impacts through a comparison of Existing (2015) and EAP (2017) traffic conditions:

- If an intersection is projected to operate at an acceptable level of service (i.e., LOS D or better) under Existing (2015) traffic conditions and the addition of project traffic, as measured by 50 or more peak hour trips, is expected to cause the intersection to operate at an unacceptable level of service (i.e., LOS E or F), the impact is considered significant;
- If an intersection is projected to operate at LOS E or LOS F under Existing (2015), and the addition of project traffic, as measured by 50 or more peak hour trips, the impact is considered significant.

Cumulative traffic impacts are deficiencies that are not directly caused by the Project, but occur as a result of regional growth combined with that or other nearby cumulative development projects. The Project's contribution to a particular cumulative transportation deficiency is

deemed a significant cumulative if the Project adds significant traffic to the forecasted deficiency (as measured by the 50 or more peak hour trip threshold). A Project's contribution to a significant cumulative impact can be reduced to less than significant if the Project is required to implement or fund its fair share of improvements designed to alleviate the potential cumulative impact. If full funding of future cumulative improvements is not reasonably assured, a temporary unmitigated cumulative impact may occur until the needed improvement is fully funded and constructed.

2.8.2 CALTRANS FACILITIES

To determine whether the addition of project traffic to the SHS freeway segments would result in a deficiency, the following will be utilized:

- The traffic study finds that the LOS of a segment will degrade from D or better to E or F.
- The traffic study finds that the project will exacerbate an already deficient condition by contributing 50 or more peak hour trips. A segment that is operating at or near capacity is deemed to be deficient.

2.9 PROJECT FAIR SHARE CALCULATION METHODOLOGY

In cases where this TIA identifies that the Project would contribute additional traffic volumes to cumulative traffic deficiencies, Project fair share costs of improvements necessary to address deficiencies have been identified. The Project's fair share cost of improvements is determined based on the following equation, which is the ratio of Project traffic to new traffic, and new traffic is total future (Horizon Year) traffic less existing baseline traffic:

Project Fair Share % = Project Traffic / (2035 With Project Total Traffic – Existing Traffic)

This Page Intentionally Left Blank

3 AREA CONDITIONS

This section provides a summary of the existing circulation network, the County of Riverside General Plan Circulation Network, and a review of existing peak hour intersection operations, and traffic signal warrant, and freeway mainline operations analyses.

3.1 EXISTING CIRCULATION NETWORK

Pursuant to the agreement with County of Riverside staff (Appendix 1.1), the study area includes a total of 11 existing and future intersections as shown previously on Exhibit 1-2 where the Project is anticipated to contribute 50 or more peak hour trips. Exhibit 3-1 illustrates the study area intersections located near the proposed Project and identifies the number of through traffic lanes for existing roadways and intersection traffic controls.

3.2 COUNTY OF RIVERSIDE GENERAL PLAN CIRCULATION ELEMENT

As noted previously, the Project site is located within the County of Riverside. However, the study area includes intersections within the neighboring jurisdiction of Perris (e.g., the I-215 Northbound Ramps at Harley Knox Boulevard.

3.2.1 COUNTY OF RIVERSIDE

The roadway classifications and planned (ultimate) roadway cross-sections of the major roadways within the study area, as identified on the County of Riverside General Plan Circulation Element, are described subsequently. Exhibit 3-2 shows the County of Riverside General Plan Circulation Element, and Exhibit 3-3 illustrates the County of Riverside General Plan roadway cross-sections.

Urban Arterial Highways are 6 to 8 lanes with a minimum right-of-way of 152-feet. These highways are primarily for through traffic where traffic volumes exceed four-lane capacities. Access from other streets or highways shall be limited to approximately one-quarter mile intervals. The following study area roadway within the County of Riverside is classified as an Urban Arterial Highway:

- Harley Knox Boulevard

Major Highways are 4 lanes with a minimum right-of-way of 118-feet. These highways are intended to serve property zoned for major industrial and commercial uses, or to serve through traffic. Intersections with other streets or highways may be limited to approximately 660-foot intervals. The following study area roadway within the County of Riverside is classified as a Major Highway:

- Harvill Avenue

EXHIBIT 3-1: EXISTING NUMBER OF THROUGH LANES AND INTERSECTION CONTROLS

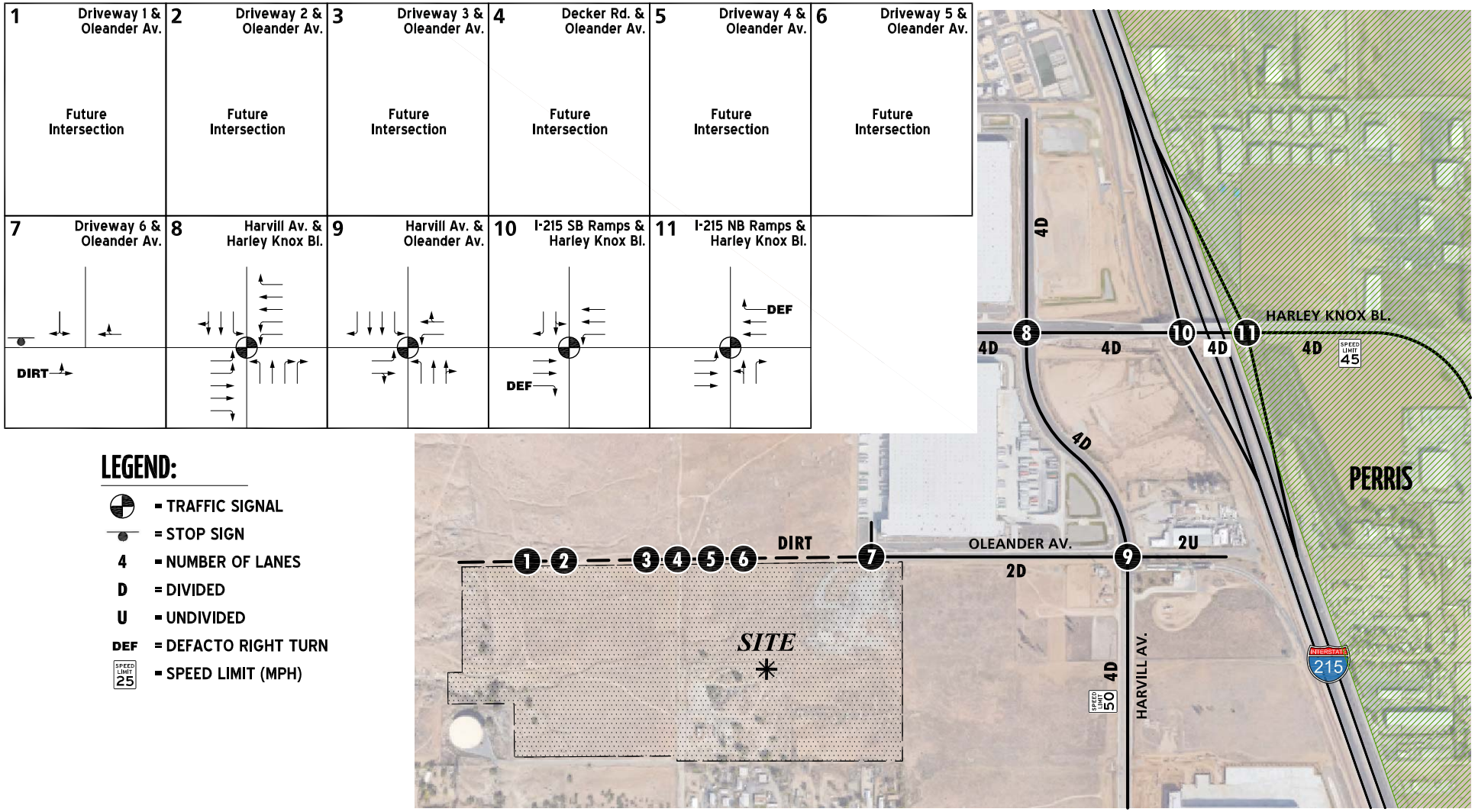
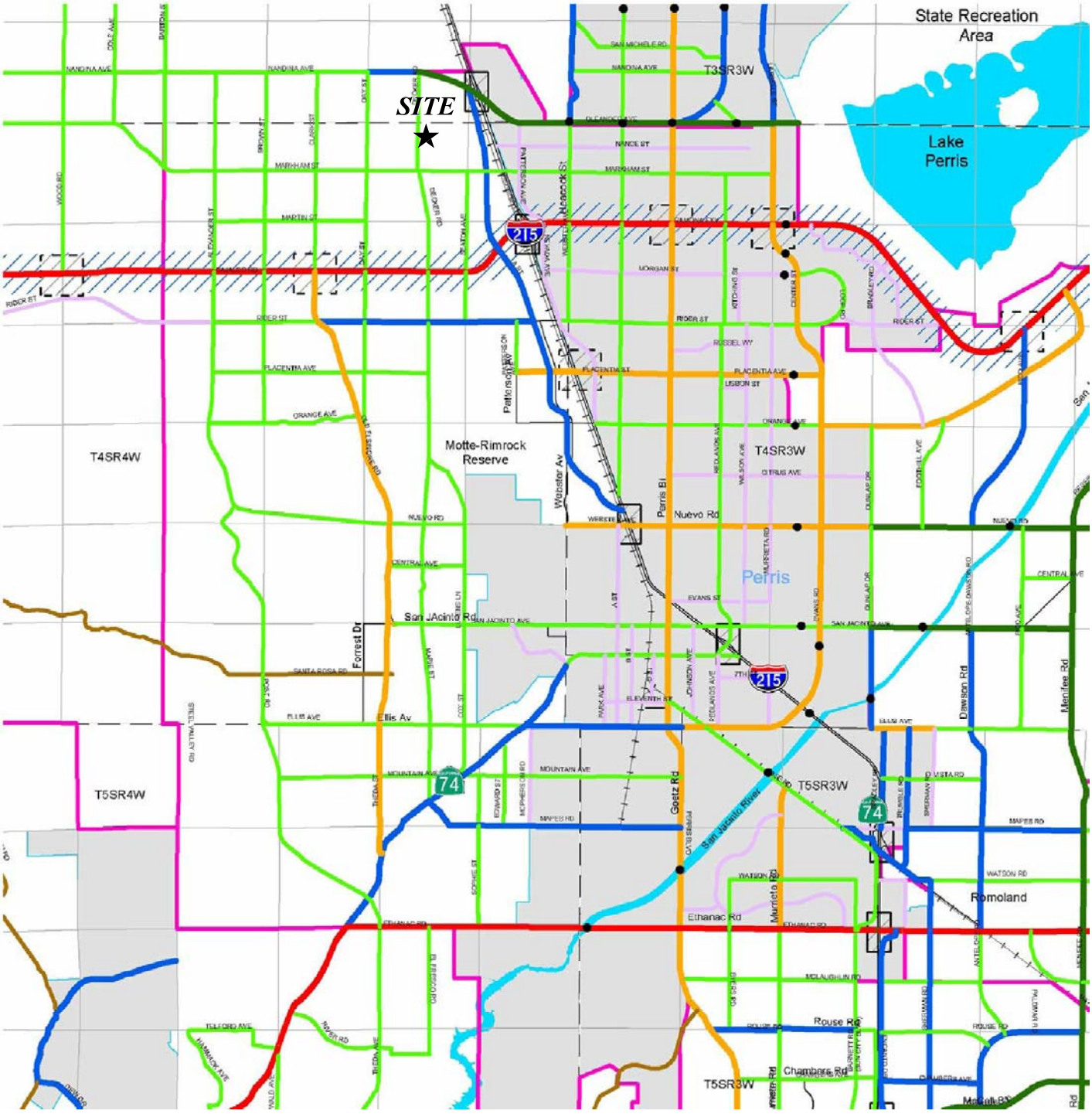
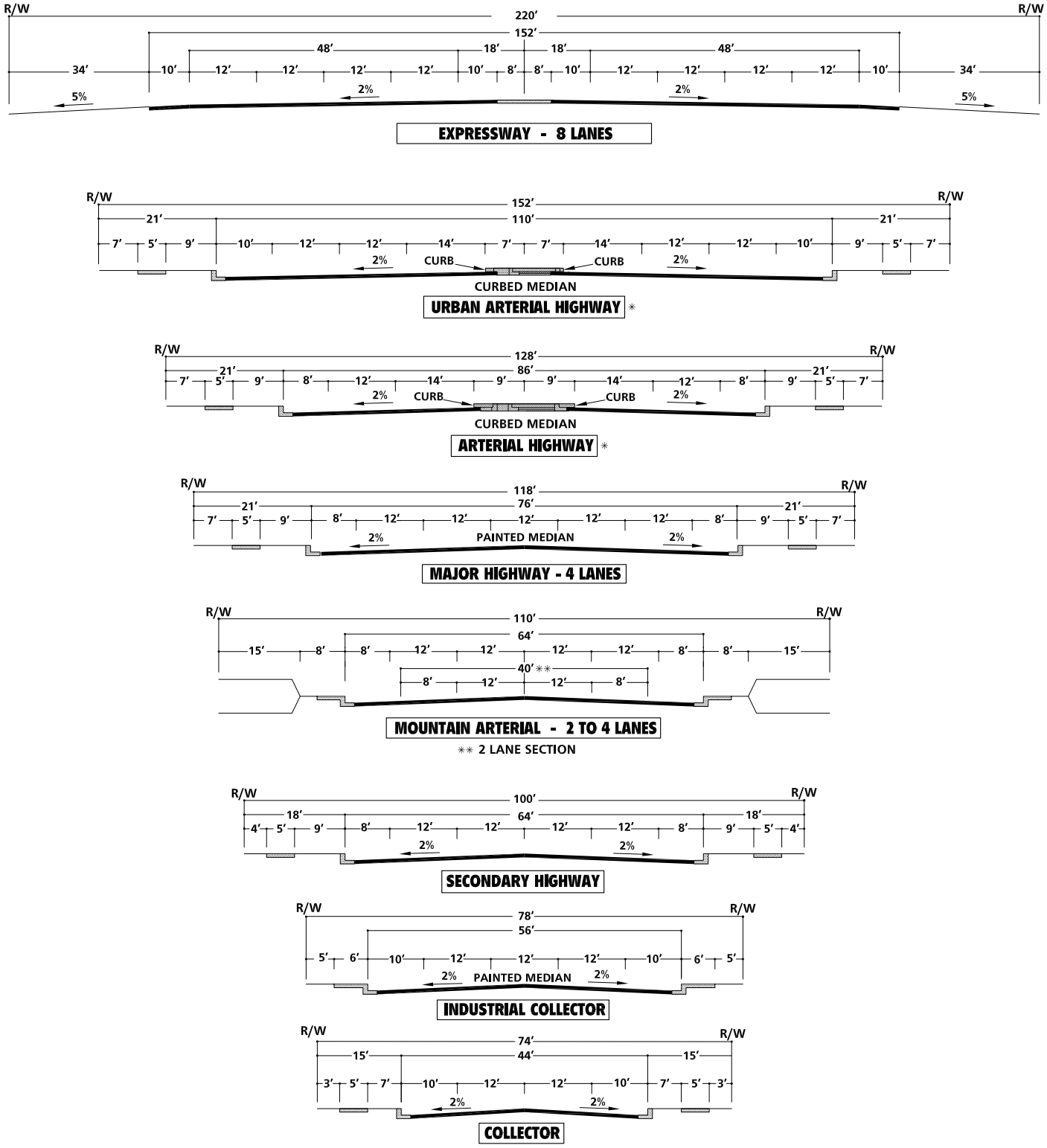


EXHIBIT 3-2: RIVERSIDE COUNTY GENERAL PLAN CIRCULATION ELEMENT



SOURCE: RIVERSIDE COUNTY INTEGRATED PROJECT (RCIP) (OCTOBER 7, 2003)

EXHIBIT 3-3: RIVERSIDE COUNTY GENERAL PLAN ROADWAY CROSS-SECTIONS



✳ *IMPROVEMENTS MAY BE RECONFIGURED TO ACCOMMODATE EXCLUSIVE TRANSIT LANES OR ALTERNATIVE LANE ARRANGEMENTS ADDITIONAL RIGHT OF WAY MAY BE REQUIRED AT INTERSECTIONS TO ACCOMMODATE ULTIMATE IMPROVEMENTS FOR STATE HIGHWAYS SHALL CONFORM TO CALTRANS DESIGN STANDARDS.*

NOT TO SCALE

SOURCE: COUNTY OF RIVERSIDE

Secondary Highways are 4 lanes, generally with no turn lanes, and a minimum right-of-way of 100-feet. These highways are intended to serve through traffic along longer routes between major traffic generating areas or to serve property zoned for multiple residential, secondary industrial or commercial uses. Intersections with other streets and highways may be limited to 330-foot intervals. The following study area roadway within the County of Riverside is classified as a Secondary Highway:

- Decker Road

Industrial Collectors are 2 lanes and have a minimum right-of-way of 78-feet. Industrial Collectors are circulatory streets with a continuous left-turn lane with at least one end connecting to a road of equal or greater classification. The following study area roadway within the County of Riverside is classified as an Industrial Collector:

- Oleander Avenue

3.2.2 CITY OF PERRIS

The roadway classifications and planned (ultimate) roadway cross-sections of the major roadways within the City of Perris as identified in the City of Perris General Plan Circulation Element are described subsequently. The circulation plan and proposed roadway cross-sections defined within the City of Perris are shown on Exhibits 3-4 and 3-5.

Arterial Streets in general vary from a curb-to-curb width of 64 feet to 86 feet in accordance with the General Plan roadway cross sections. The following study area roadway within the City of Perris is classified as an Arterial:

- Harley Knox Boulevard, east of the I-215 Freeway

3.3 TRUCK ROUTES

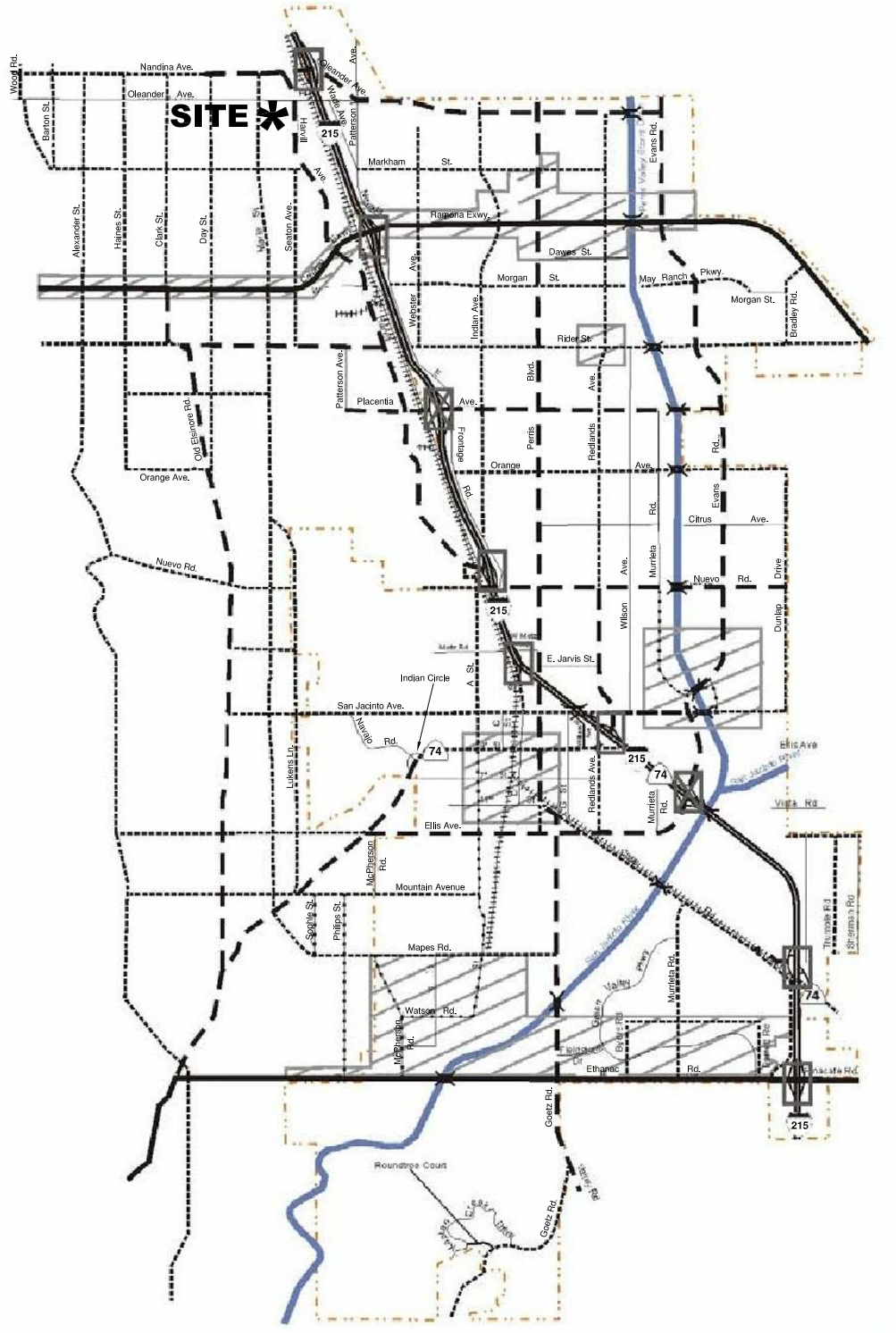
While the County of Riverside's General Plan recognizes the trucking industry and the importance of the region's role in the movement of goods, there are no truck routes defined within the County. However, the City of Perris has a designated truck route map, which is shown on Exhibit 3-6. As shown, Harley Knox Boulevard, east of the I-215 Freeway, is identified as designated City of Perris truck route.

3.4 BICYCLE & PEDESTRIAN FACILITIES

Field observations conducted in April 2015 indicate nominal pedestrian and bicycle activity within the study area. Exhibit 3-7 illustrates the existing pedestrian facilities, including sidewalks and crosswalk locations.

In an effort to promote alternative modes of transportation, the County of Riverside also includes a trails and bikeway system. The trails and bikeway system, shown on Exhibit 3-8, shows the proposed trails are connected with major features within the County. There are proposed Community Trails along Oleander Avenue, Harvill Avenue (north of Oleander Avenue), and Harley Knox Boulevard within the study area.

EXHIBIT 3-4: CITY OF PERRIS GENERAL PLAN CIRCULATION ELEMENT

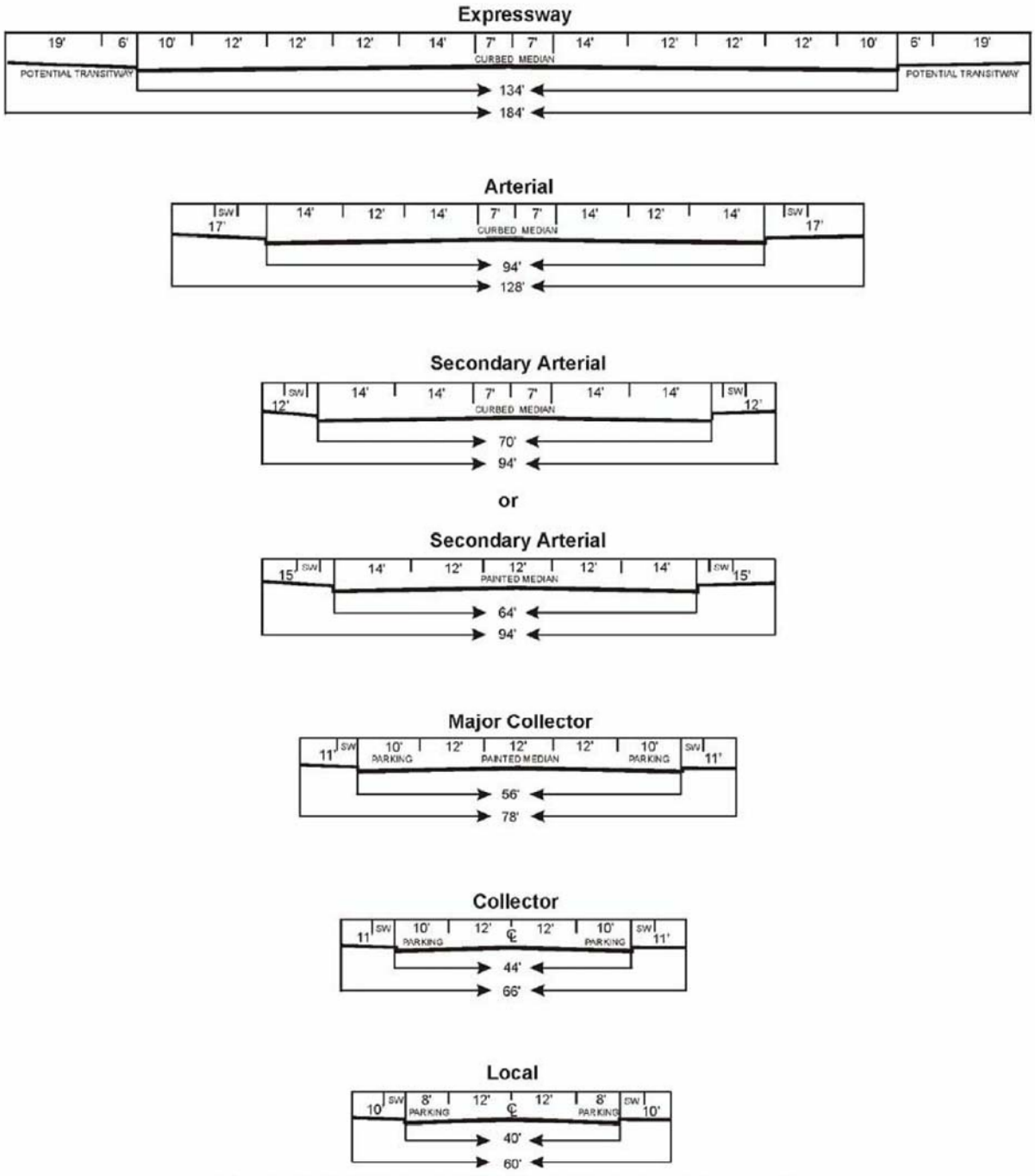


SOURCE: CITY OF PERRIS (June 14, 2005)

09347 - perris-ce.dwg

URBAN CROSSROADS

EXHIBIT 3-5: CITY OF PERRIS GENERAL PLAN ROADWAY CROSS-SECTIONS

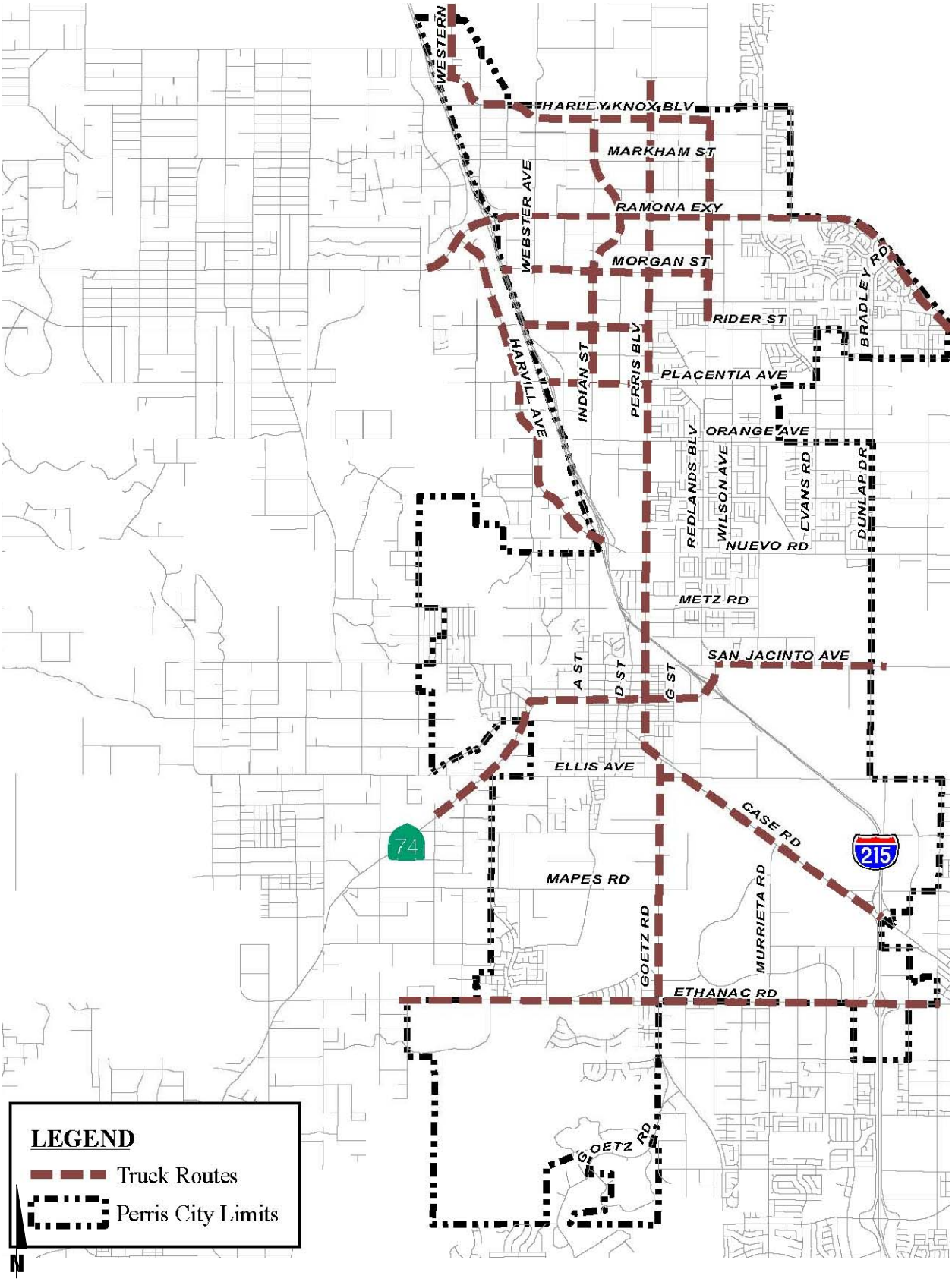


Specific details for each cross-section follow in Figures 4.1 A - 4.1 F

Legend

SW	Sidewalk or Trail (at least 4 feet)
PARKING	Parking or Bike Lane
PAINTED MEDIAN	Center Median and/or Continuous Left Turning Lane
CURBED MEDIAN	Landscaped Center Median

EXHIBIT 3-6: CITY OF PERRIS TRUCK ROUTES



09347-perris-trucks.dwg

EXHIBIT 3-7: EXISTING PEDESTRIAN FACILITIES

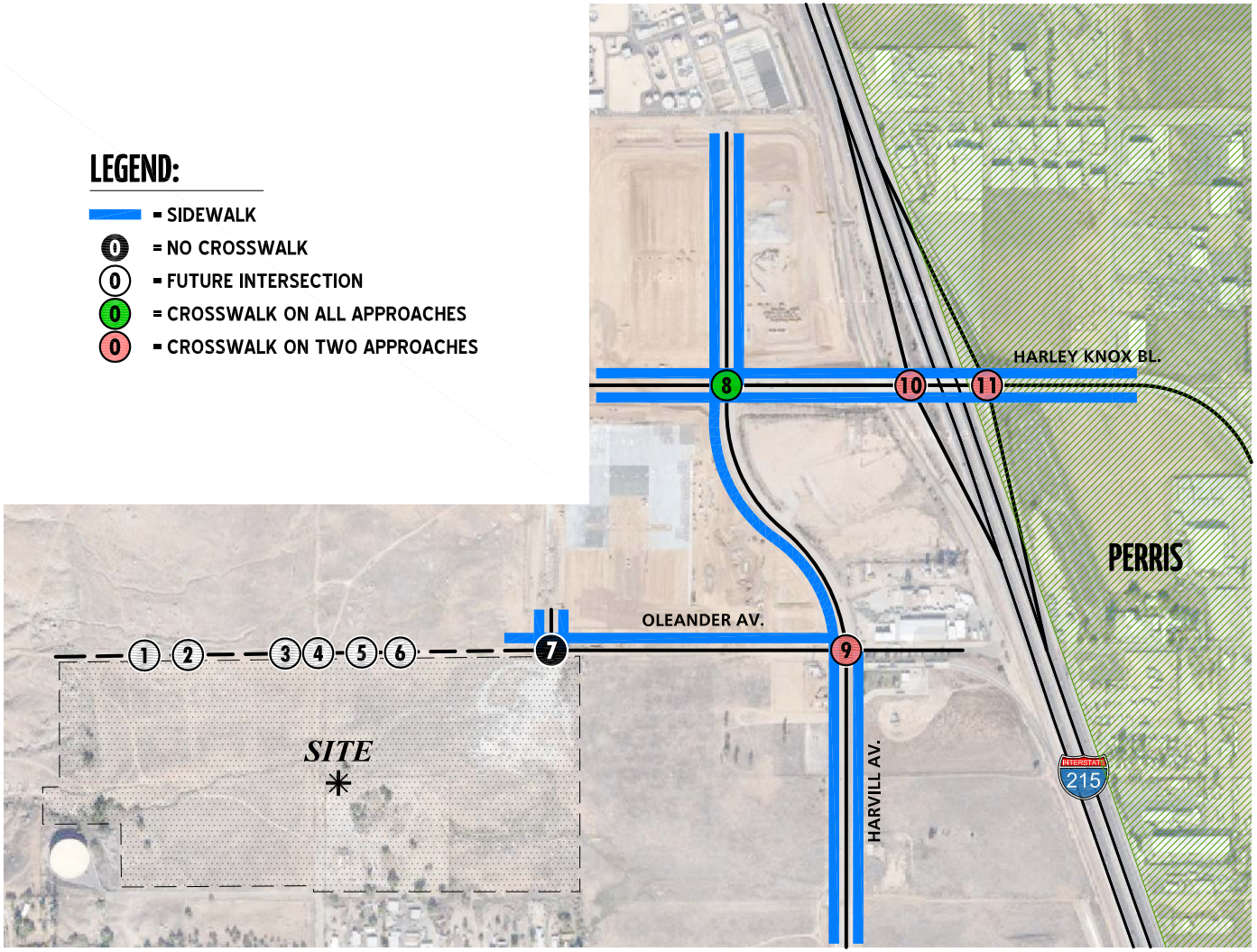
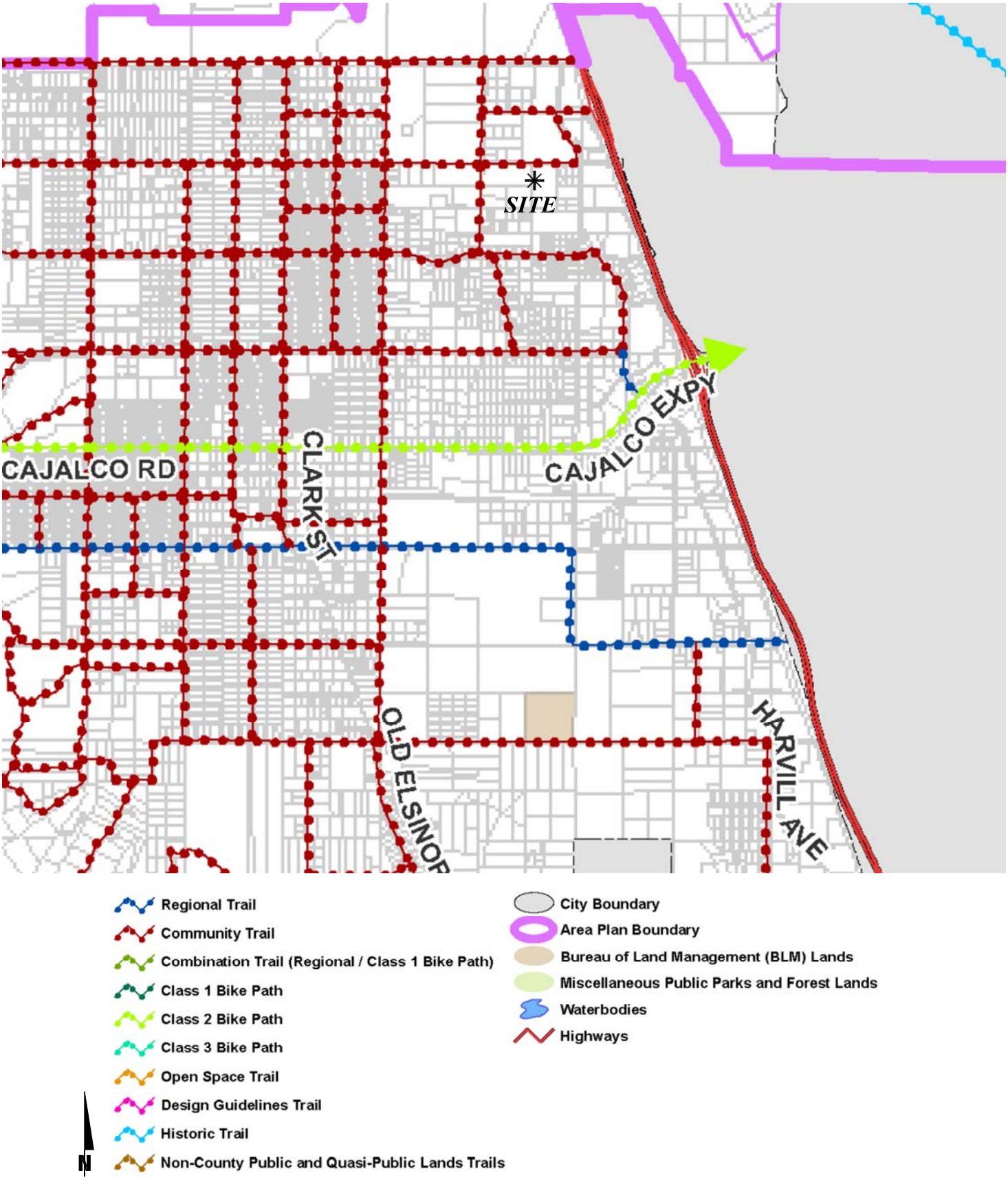


EXHIBIT 3-8: RIVERSIDE COUNTY TRAILS AND BIKEWAY SYSTEM



09347 - rc-trails.dwg

3.5 TRANSIT SERVICE

The study area is currently served by the Riverside Transit Authority (RTA), a public transit agency serving the unincorporated Riverside County region. There are currently no existing bus routes that serve the roadways within the study area in close proximity to the proposed Project. Transit service is reviewed and updated by RTA periodically to address ridership, budget and community demand needs. Changes in land use can affect these periodic adjustments which may lead to either enhanced or reduced service where appropriate. As such, it is recommended that the applicant work in conjunction with RTA to potentially provide bus service to the site.

3.6 EXISTING (2015) TRAFFIC COUNTS

The intersection LOS analysis is based on the traffic volumes observed during the peak hour conditions using traffic count data collected in April 2015. The following peak hours were selected for analysis:

- Weekday AM Peak Hour (peak hour between 7:00 AM and 9:00 AM)
- Weekday PM Peak Hour (peak hour between 4:00 PM and 6:00 PM)

The weekday AM and weekday PM peak hour count data is representative of typical weekday peak hour traffic conditions in the study area. There were no observations made in the field that would indicate atypical traffic conditions on the count dates, such as construction activity or detour routes and near-by schools were in session and operating on normal schedules. The raw manual peak hour turning movement traffic count data sheets are included in Appendix 3.1. These raw turning volumes have been flow conserved between intersections with limited access, no access and where there are currently no uses generating traffic (e.g., between ramp-to-arterial intersections, etc.). The traffic counts collected in April 2015 include the vehicle classifications as shown below:

- Passenger Cars
- 2-Axle Trucks
- 3-Axle Trucks
- 4 or More Axle Trucks

To represent the impact large trucks, buses and recreational vehicles have on traffic flow; all trucks were converted into PCEs. By their size alone, these vehicles occupy the same space as two or more passenger cars. In addition, the time it takes for them to accelerate and slow-down is also much longer than for passenger cars, and varies depending on the type of vehicle and number of axles. For the purpose of this analysis, a PCE factor of 1.5 has been applied to 2-axle trucks, 2.0 for 3-axle trucks and 3.0 for 4+-axle trucks to estimate each turning movement. These factors are consistent with the values recommended for use in the San Bernardino County CMP and are in excess of the factor recommended for use in the County of Riverside traffic study guidelines. (9) Although the County of Riverside has a recommended PCE factor of 2.0, the San Bernardino County CMP PCE factors have been utilized in an effort to conduct a more conservative analysis.

Existing weekday average daily traffic (ADT) volumes on arterial highways throughout the study area are shown on Exhibit 3-9. Where actual 24-hour tube count data was not available, Existing ADT volumes were based upon factored intersection peak hour counts collected by Urban Crossroads, Inc. using the following formula for each intersection leg:

Weekday PM Peak Hour (Approach Volume + Exit Volume) x 12.2094 = Leg Volume

A comparison of the PM peak hour and daily traffic volumes of various roadway segments within the study area indicated that the peak-to-daily relationship is approximately 8.19 percent. As such, the above equation utilizing a factor of 12.2094 estimates the ADT volumes on the study area roadway segments assuming a peak-to-daily relationship of approximately 8.19 percent (i.e., 1/0.0819 = 12.2094) and was assumed to sufficiently estimate average daily traffic (ADT) volumes for planning-level analyses. Existing weekday AM and weekday PM peak hour intersection volumes (in PCE) are also shown on Exhibit 3-9.

3.7 INTERSECTION OPERATIONS ANALYSIS

Existing peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2.2 *Intersection Capacity Analysis* of this report. The intersection operations analysis results are summarized in Table 3-1 which indicates that the existing study area intersections are currently operating at an acceptable LOS during the peak hours (i.e., LOS D or better).

Consistent with Table 3-1, a summary of the peak hour intersection LOS for Existing conditions are shown on Exhibit 3-10. The intersection operations analysis worksheets are included in Appendix 3.2 of this TIA.

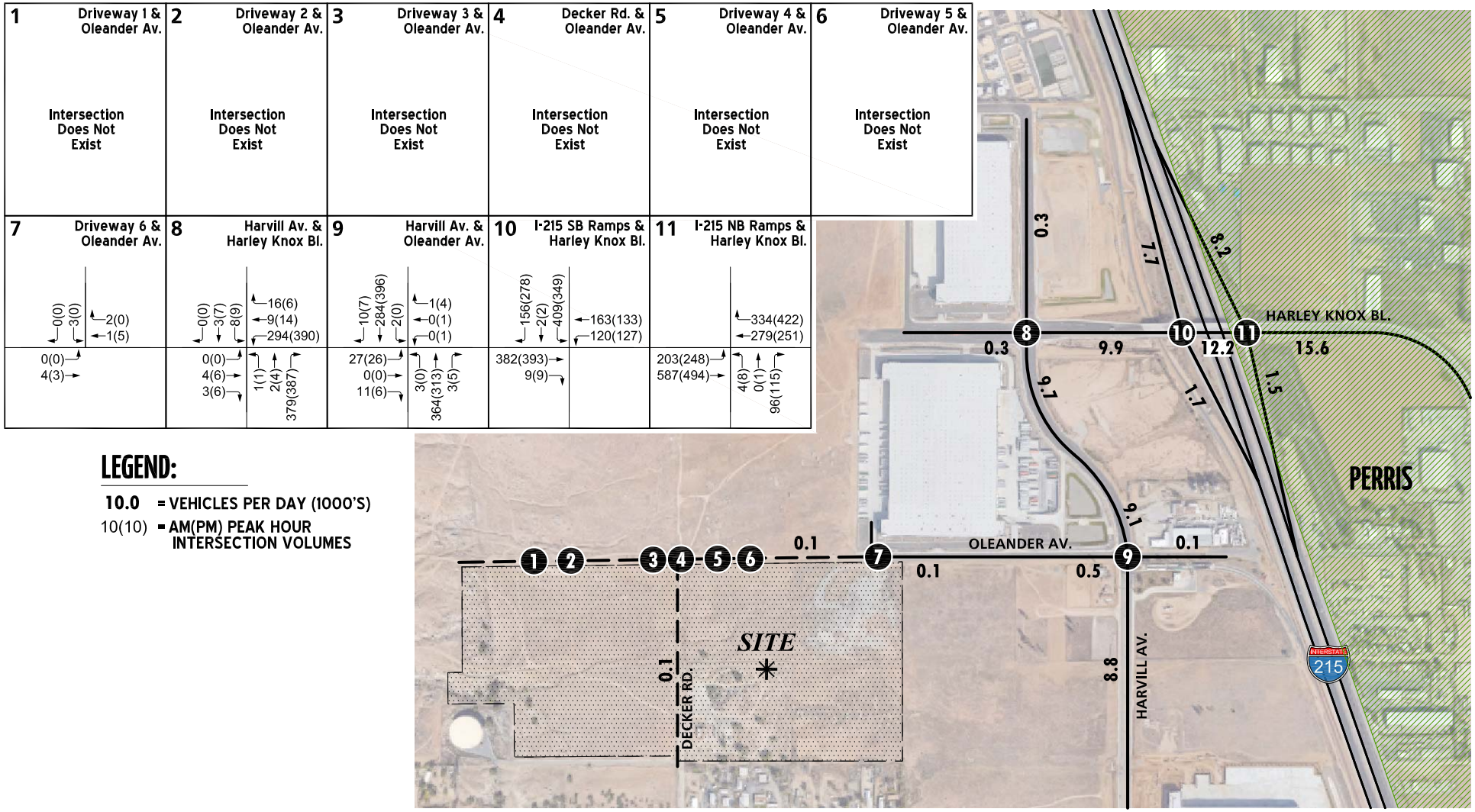
3.8 TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants for Existing traffic conditions are based on existing peak hour intersection turning volumes. No study area intersections currently warrant a traffic signal for Existing traffic conditions. Existing conditions traffic signal warrant analysis worksheets are provided in Appendix 3.3.

3.9 OFF-RAMP QUEUING ANALYSIS

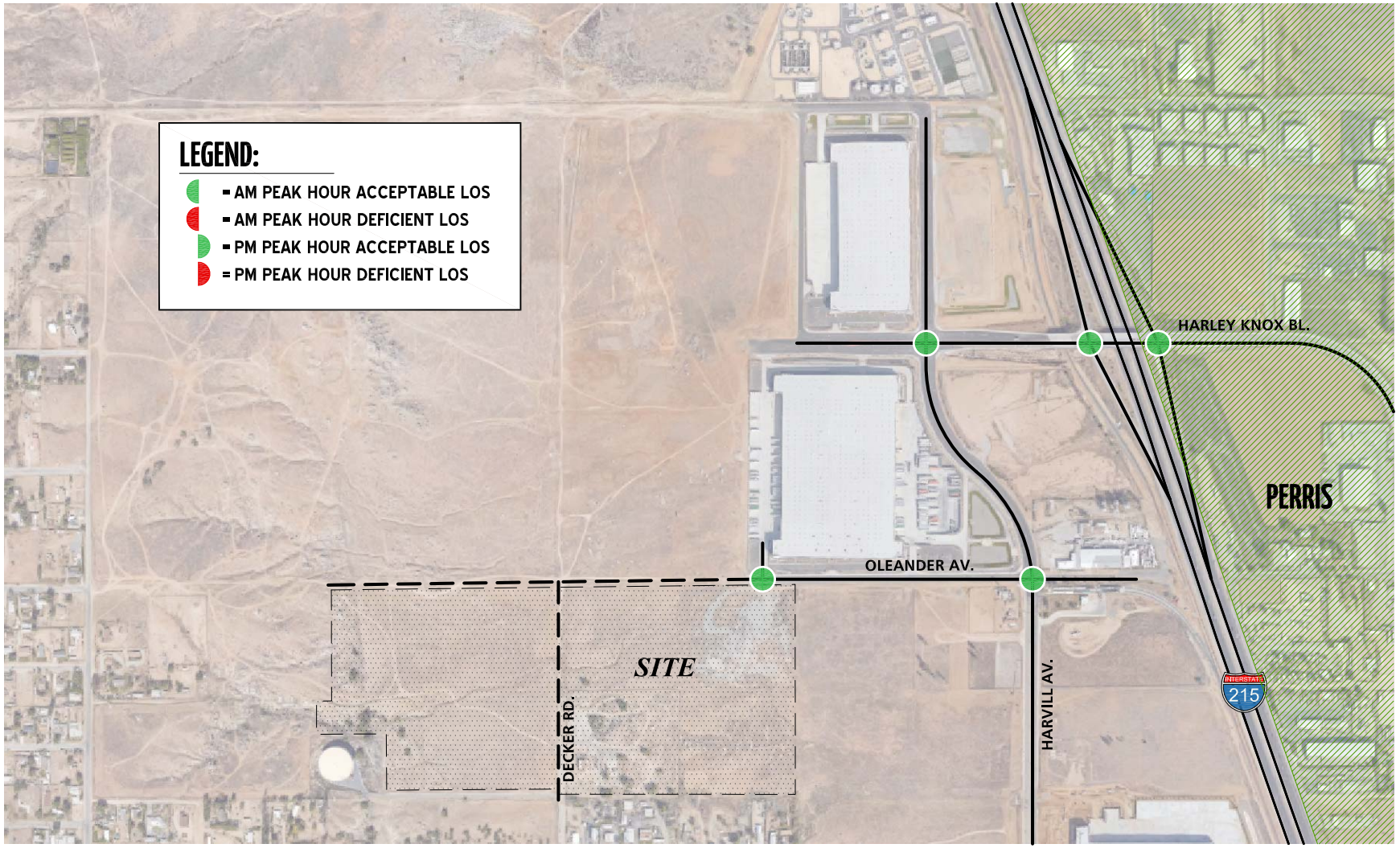
A queuing analysis was performed for the off-ramps at the I-215 Freeway and Harley Knox Boulevard interchange to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 3-2. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown on Table 3-2, there are no movements that are currently experiencing queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows. Worksheets for Existing traffic conditions off-ramp queuing analysis are provided in Appendix 3.4.

EXHIBIT 3-9: EXISTING (2015) TRAFFIC VOLUMES



URBAN CROSSROADS

EXHIBIT 3-10: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EXISTING (2015) CONDITIONS



URBAN CROSSROADS

Table 3-1

Intersection Analysis for Existing (2015) Conditions

#	Intersection	Traffic Control[3]	Intersection Approach Lanes[1]												Delay[2] (secs.)		Level of Service		Acceptable LOS
			Northbound			Southbound			Eastbound			Westbound							
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	
1	Dwy. 1 / Oleander Av.		Future Intersection																C
2	Dwy. 2 / Oleander Av.		Future Intersection																C
3	Dwy. 3 / Oleander Av.		Future Intersection																C
4	Decker Rd. / Oleander Av.		Future Intersection																D
5	Dwy. 4 / Oleander Av.		Future Intersection																C
6	Dwy. 5 / Oleander Av.		Future Intersection																C
7	Dwy. 6 / Oleander Av.	CSS	0	0	0	0	1	0	0	1	0	0	1	0	8.9	0.0	A	A	C
8	Harvill Av. / Harley Knox Bl.	TS	1	1	2	1	2	0	2	2	1	2	2	1	32.8	32.2	C	C	D
9	Harvill Av. / Oleander Av.	TS	1	2	0	1	2	1	1	1	0	1	1	0	6.5	4.6	A	A	D
10	I-215 SB Ramps / Harley Knox Bl.	TS	0	0	0	0	1	1	0	2	d	1	2	0	37.0	26.8	D	C	D
11	I-215 NB Ramps / Harley Knox Bl.	TS	0	1	1	0	0	0	1	2	0	0	2	d	13.6	22.2	B	C	D

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right; d = Defacto Right Turn Lane

[2] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[3] CSS = Cross-street Stop; TS = Traffic Signal

[4] Volume-to-capacity ratio is greater than 1.00; Intersection unstable; Level of Service "F".

Table 3-2

Peak Hour Freeway Off-Ramp Queuing Summary for Existing (2015) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	95th Percentile Queue (Feet)[2]		Acceptable?[1]	
			AM Peak Hour	PM Peak Hour	AM	PM
I-215 SB Off-Ramp / Harley Knox Bl.	SBL/T	1,330	383	339	Yes	Yes
	SBR	270	44	60	Yes	Yes
I-215 NB Off-Ramp / Harley Knox Bl.	NBL/T	1,120	13	22	Yes	Yes
	NBR	265	47	52	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] Maximum queue length for the approach reported.

3.10 BASIC FREEWAY SEGMENT ANALYSIS

Existing mainline directional volumes for the weekday AM and PM peak hours are provided on Exhibit 3-11. As shown on Table 3-3, the basic freeway segments analyzed for this study were found to operate at an acceptable LOS (i.e., LOS C or better) during the peak hours. Existing basic freeway segment analysis worksheets are provided in Appendix 3.5.

3.11 FREEWAY MERGE/DIVERGE ANALYSIS

Ramp merge and diverge operations were also evaluated for Existing conditions and the results of this analysis are presented in Table 3-4. As shown in Table 3-4, the freeway ramp merge and diverge areas currently operate at LOS C or better. Existing freeway ramp junction operations analysis worksheets are provided in Appendix 3.6.

EXHIBIT 3-11: EXISTING (2015) FREEWAY MAINLINE VOLUMES (ACTUAL VEHICLES)

Table 3-3

Basic Freeway Segment Analysis for Existing (2015) Conditions

Freeway	Direction	Mainline Segment	Lanes[1]	Volume		Truck %	Truck %	Density[2]		LOS	
				AM	PM	AM	PM	AM	PM	AM	PM
I-215 Freeway	SB	North of Harley Knox Boulevard	3	2,544	3,855	4%	4%	13.4	20.5	B	C
		South of Harley Knox Boulevard	3	2,186	3,445	2%	3%	11.4	18.1	B	C
	NB	North of Harley Knox Boulevard	3	4,092	3,247	4%	4%	22.0	17.1	C	B
		South of Harley Knox Boulevard	3	3,721	2,779	3%	3%	19.6	14.6	C	B

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

Table 3-4

Freeway Ramp Junction Merge/Diverge Analysis
for Existing (2015) Conditions

Freeway	Direction	Ramp or Segment	Lanes on Freeway[1]	AM Peak Hour		PM Peak Hour	
				Density[2]	LOS	Density[2]	LOS
I-215 Freeway	SB	Off-Ramp at Harley Knox Boulevard	3	20.2	C	27.5	C
		On-Ramp at Harley Knox Boulevard	3	15.1	B	21.5	C
	NB	On-Ramp at Harley Knox Boulevard	3	25.8	C	21.9	C
		Off-Ramp at Harley Knox Boulevard	3	25.1	C	20.0	B

[1] Number of lanes are in the specified direction and is based on existing conditions

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

4 PROJECTED FUTURE TRAFFIC

This section presents the traffic volumes estimated to be generated by the Project, as well as the Project's trip assignment onto the study area roadway network. The Project is proposed to consist of a total of 1,259,050 square feet (sf) of high-cube warehouse use/distribution center within two buildings. Building D located on the southeast corner of Decker Road and Oleander Avenue is proposed to consist of 703,040 sf of high-cube warehouse/distribution center use and Building E, located on the southwest corner of Decker Road and Oleander Avenue, is proposed to consist of 556,010 sf of high-cube warehouse/distribution center use. The Project is anticipated to be constructed and occupied by Year 2017.

The Project is proposed to have access on Oleander Avenue via Driveways 1 through 6. All Project access points are assumed to allow full-access. Driveways 1 and 4 are proposed for truck access only, Driveways 2 and 5 are proposed for passenger car access only, and Driveways 3 and 6 are proposed to allow access for both trucks and passenger cars. Regional access to the project site is provided via the I-215 Freeway at Harley Knox Boulevard interchange.

4.1 PROJECT TRIP GENERATION

Trip generation represents the amount of traffic which is both attracted to and produced by a development. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to and produced by the specific land uses being proposed for a given development. The ITE Trip Generation manual is a nationally recognized source for estimating site specific trip generation. ITE recently released an updated edition of the Trip Generation manual (9th Edition) in 2012. (3) The Trip Generation manual is based on more than 4,800 trip generation studies submitted to ITE by public agencies, consulting firms, universities/colleges, developers, associations and local sections/districts/student chapters of ITE.

High-cube warehouse/distribution centers (ITE Land Use Code 152) are a unique land use type within the larger, more generalized industrial land use category. ITE's most recent edition of the *Trip Generation* manual (ITE 9th Edition), published in 2012, defines "high-cube warehouses" as *"…used for storage of materials, goods and merchandise prior to their distribution to retail outlets, distribution centers or other warehouses. These facilities are typically characterized by ceiling heights of at least 24 feet with small employment counts due to a high level of mechanization."* The average square footage for the sites surveyed for high-cube warehouse/distribution center (Land Use 152) use is above 500,000 square feet. The number of sites observed in the compilation of this data ranges from 57-70 sites of which more than 20 sites exceed 1,000,000 square feet in gross floor area. The weighted average daily trip generation rate for high-cube warehouse (Land Use 152) use is 1.68 trips per thousand square feet (TSF).

The ITE *Trip Generation* manual includes data regarding the types of vehicles that are generated (passenger cars and trucks), but provides no guidance on vehicle mix (different sizes of trucks). While trucks, as a percentage of total traffic, has been based on the ITE *Trip Generation* manual,

data regarding the vehicle mix has been obtained from a separate report; the South Coast Air Quality Management District's (SCAQMD) recent Warehouse Truck Trip Study. (10) (11) The SCAQMD is currently recommending the use of the ITE Trip Generation manual in conjunction with their truck mix by axle-type to better quantify trip rates associated with local warehouse and distribution projects, as truck emission represent more than 90 percent of air quality impacts from these projects. This recommended procedure has been utilized for the purposes of this analysis in effort to be consistent with other technical studies prepared for the Project.

Trip generation rates used to estimate Project traffic are shown in Table 4-1. A summary of the Project's trip generation based on PCE is shown in Table 4-2 while the trip generation based on actual vehicles is shown on Table 4-3 (for comparative purposes). For purposes of this analysis, ITE land use code 152 (High-Cube Warehousing) has been used to derive site specific trip generation estimates. In order to accurately reflect the impact that heavy trucks would have on the street system, Project trips have been further broken down between passenger cars and trucks for each of the peak hours and weekday daily trip generation. As noted on Table 4-1, refinements to the raw trip generation estimates have been made to provide a more detailed breakdown of trips between passenger cars and trucks. The percentage of trucks has been determined from the table shown on page 267 of the ITE *Trip Generation* manual. As shown on page 267, the truck trip generation rate for weekday daily traffic is 0.64 or 38.1% of the total traffic. Similarly, the truck trip generation rate for the weekday AM peak hour is 0.03 (27.3% of the total traffic) and 0.04 (or 33.3% of the total traffic) for the weekday PM peak hour.

Trip generation for heavy trucks was further broken down by truck type (or axle type). The total truck percentage is comprised of 3 different truck types: 2-axle, 3-axle, and 4+-axle trucks. For the purposes of this analysis, the percentage of trucks, by axle type, were obtained from the South Coast Air Quality Management District's (SCAQMD) interim recommended truck mix. The SCAQMD has recently performed surveys of existing facilities and compiled the data to provide interim guidance on the mix of heavy trucks for these types of high-cube warehousing/distribution facilities. Based on this interim guidance from the SCAQMD, the following truck fleet mix was utilized for the purposes of estimating the truck trip generation for the site: 22.0% of the total trucks as 2-axle trucks, 17.7% of the total trucks as 3-axle trucks, and 60.3% of the total trucks as 4+-axle trucks. Lastly, PCE factors were applied to the trip generation rates for heavy trucks (large 2-axles, 3-axles, 4+-axles). As directed by the County of Riverside and consistent with standard traffic engineering practice in Southern California, PCE factors have been utilized due to the expected heavy truck component for the proposed Project uses. PCEs allow the typical "real-world" mix of vehicle types to be represented as a single, standardized unit, such as the passenger car, to be used for the purposes of capacity and level of service analyses. These PCE factors are consistent with the values recommended by the San Bernardino County CMP and are accepted factors in the County of Riverside. (9) Although the County of Riverside has a recommended PCE factor of 2.0, the San Bernardino County CMP PCE factors have been utilized in an effort to conduct a more conservative analysis.

As shown on Table 4-2, the proposed Project is anticipated to generate a net total of 3,319 PCE trip-ends per day with 195 net PCE AM peak hour trips and 226 net PCE PM peak hour trips.

Table 4-1

Project Trip Generation Rates

Land Use[1]	Units[2]	ITE LU Code	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Actual Vehicle Trip Generation Rates									
High-Cube Warehouse/Distribution Center[3]	TSF	152	0.076	0.034	0.110	0.037	0.083	0.120	1.680
Passenger Cars			0.055	0.025	0.080	0.025	0.055	0.080	1.040
2-Axle Trucks			0.005	0.002	0.007	0.003	0.006	0.009	0.141
3-Axle Trucks			0.004	0.002	0.005	0.002	0.005	0.007	0.113
4-Axle+ Trucks			0.012	0.006	0.018	0.007	0.017	0.024	0.386
Passenger Car Equivalent (PCE) Trip Generation Rates									
High-Cube Warehouse/Distribution Center[3,4]	TSF	152	0.076	0.034	0.110	0.037	0.083	0.120	1.680
Passenger Cars			0.055	0.025	0.080	0.025	0.055	0.080	1.040
2-Axle Trucks (PCE = 1.5)			0.007	0.003	0.010	0.004	0.009	0.013	0.211
3-Axle Trucks (PCE = 2.0)			0.007	0.003	0.011	0.004	0.010	0.014	0.226
4-Axle+ Trucks (PCE = 3.0)			0.037	0.017	0.054	0.022	0.050	0.072	1.158

[1] Trip Generation Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, Ninth Edition (2012).

[2] TSF = thousand square feet

[3] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.
AM peak hour = 72.7% passenger cars, 6.01% 2-Axle trucks, 4.83% 3-Axle trucks, 16.46% 4-Axle trucks
PM peak hour = 66.7% passenger cars, 7.33% 2-Axle trucks, 5.89% 3-Axle trucks, 20.08% 4-Axle trucks
ADT = 61.9% passenger cars, 8.38% 2-Axle trucks, 6.74% 3-Axle trucks, 22.98% 4-Axle trucks

[4] PCE rates are per SANBAG.

Table 4-2

Project Trip Generation Summary (in PCE)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Building D	703.040	TSF							
Passenger Cars:			39	17	56	17	39	56	731
Truck Trips:									
2-axle:			*5*	*2*	*7*	*3*	*6*	*9*	*148*
3-axle:			*5*	*2*	*7*	*3*	*7*	*10*	*159*
4+-axle:			*26*	*12*	*38*	*16*	*35*	*51*	*814*
- Net Truck Trips (PCE) [2]			*36*	*16*	*53*	*22*	*48*	*70*	*1,122*
BUILDING D TOTAL NET TRIPS (PCE) [3]			***75***	***34***	***109***	***39***	***87***	***126***	***1,853***
Building E	556.010	TSF							
Passenger Cars:			31	14	44	14	31	45	578
Truck Trips:									
2-axle:			*4*	*2*	*6*	*2*	*5*	*7*	*117*
3-axle:			*4*	*2*	*6*	*2*	*5*	*8*	*126*
4+-axle:			*21*	*9*	*30*	*12*	*28*	*40*	*644*
- Net Truck Trips (PCE) [2]			*29*	*13*	*42*	*17*	*38*	*55*	*887*
BUILDING E TOTAL NET TRIPS (PCE) [3]			***59***	***27***	***86***	***31***	***69***	***100***	***1,466***
TOTAL (PCE):			**135**	**60**	**195**	**70**	**156**	**226**	**3,319**

[1] TSF = thousand square feet

[2] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.

[3] TOTAL NET TRIPS (PCE) = Passenger Cars + Net Truck Trips (PCE).

Table 4-3

Project Trip Generation Summary (Actual Vehicles)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Building D	703.040	TSF							
Passenger Cars:			39	17	56	17	39	56	731
Truck Trips:									
2-axle:			*3*	*1*	*5*	*2*	*4*	*6*	*99*
3-axle:			*3*	*1*	*4*	*2*	*3*	*5*	*80*
4+-axle:			*9*	*4*	*13*	*5*	*12*	*17*	*271*
- Net Truck Trips (Actual Trucks) [2]			*15*	*7*	*21*	*9*	*19*	*28*	*450*
BUILDING D TOTAL NET TRIPS (Actual Vehicles) [3]			***53***	***24***	***77***	***26***	***58***	***84***	***1,181***
Building E	556.010	TSF							
Passenger Cars:			31	14	44	14	31	45	578
Truck Trips:									
2-axle:			*3*	*1*	*4*	*2*	*3*	*5*	*78*
3-axle:			*2*	*1*	*3*	*1*	*3*	*4*	*63*
4+-axle:			*7*	*3*	*10*	*4*	*9*	*13*	*215*
- Net Truck Trips (Actual Trucks) [2]			*12*	*5*	*17*	*7*	*15*	*22*	*356*
BUILDING E TOTAL NET TRIPS (Actual Vehicles) [3]			***42***	***19***	***61***	***21***	***46***	***67***	***934***
TOTAL (ACTUAL):			**96**	**43**	**138**	**47**	**104**	**151**	**2,115**

[1] TSF = thousand square feet

[2] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.

[3] TOTAL NET TRIPS (Actual Vehicles) = Passenger Cars + Net Truck Trips (Actual Trucks).

4.2 PROJECT TRIP DISTRIBUTION

Trip distribution is the process of identifying the probable destinations, directions or traffic routes that will be utilized by Project traffic. The potential interaction between the planned land uses and surrounding regional access routes are considered, to identify the route where the Project traffic would distribute.

The Project trip distribution was developed based on anticipated travel patterns to and from the Project site for both passenger cars and truck traffic. The truck trip distribution patterns have been developed based on the anticipated travel patterns for the high-cube warehousing trucks. The Project trip distribution patterns for both passenger cars and trucks were developed based on an understanding of existing travel patterns in the area, the geographical location of the site, and the site's proximity to the regional arterial and state highway system.

The Project passenger car trip distribution patterns is graphically depicted on Exhibit 4-1 and the Project truck trip distribution patterns is graphically depicted on Exhibit 4-2.

4.3 MODAL SPLIT

The traffic reducing potential of public transit, walking or bicycling have not been considered in this TIA. Essentially, the traffic projections are "conservative" in that these alternative travel modes might be able to reduce the forecasted traffic volumes (employee trips only).

4.4 PROJECT TRIP ASSIGNMENT

The assignment of traffic from the Project area to the adjoining roadway system is based upon the Project trip generation, trip distribution, and the arterial highway and local street system improvements that would be in place by the time of initial occupancy of the Project. Based on the identified Project traffic generation and trip distribution patterns, Project ADT and peak hour intersection turning movement volumes are shown on Exhibit 4-3.

4.5 BACKGROUND TRAFFIC

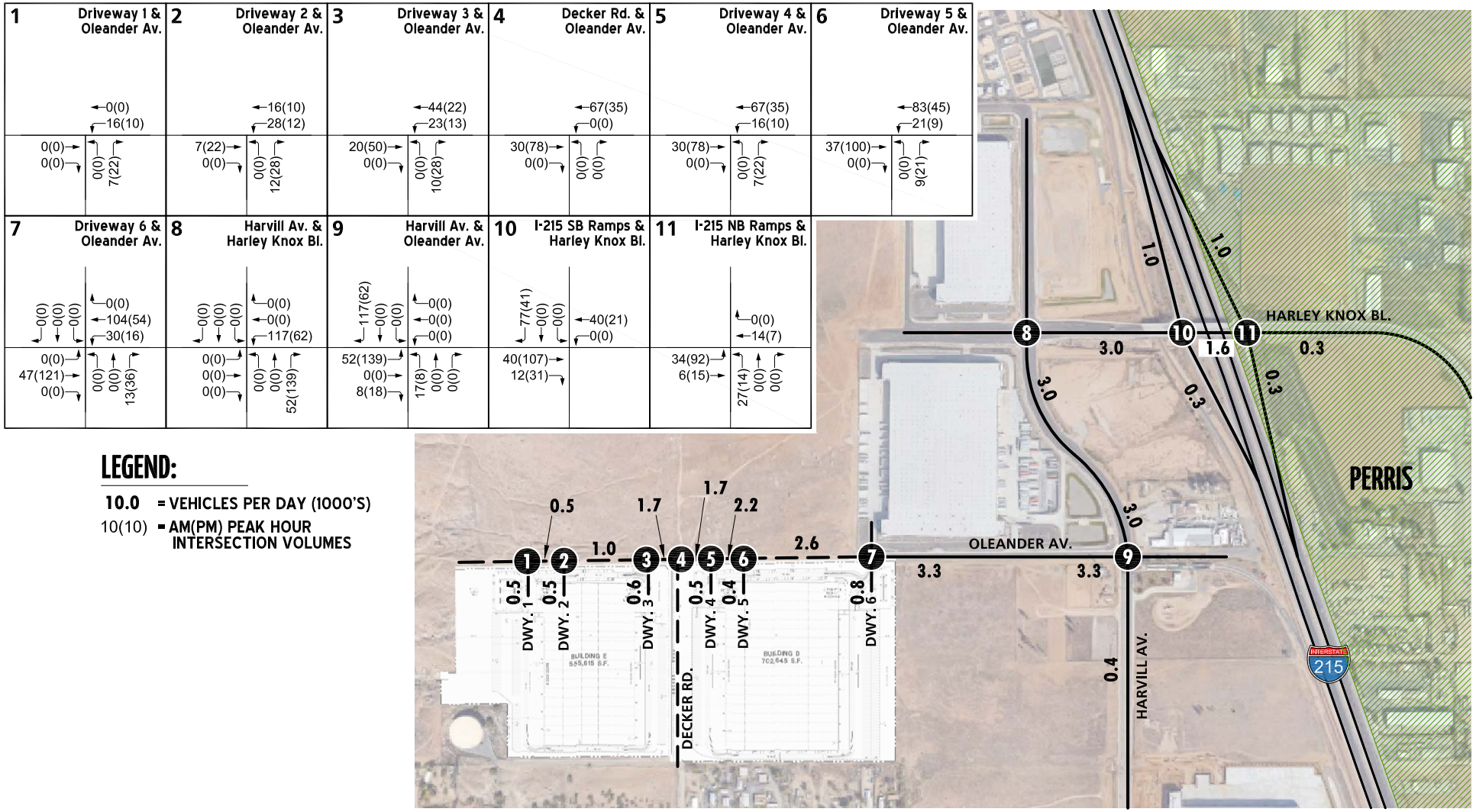
Future year traffic forecasts have been based upon background (ambient) growth at 2% per year for 2017 traffic conditions. The ambient growth factor is intended to approximate regional traffic growth. This ambient growth rate is added to existing traffic volumes to account for area-wide growth not reflected by cumulative development projects. Ambient growth has been added to daily and peak hour traffic volumes on surrounding roadways, in addition to traffic generated by the development of future projects that have been approved but not yet built and/or for which development applications have been filed and are under consideration by governing agencies.

EXHIBIT 4-1: PROJECT (PASSENGER CARS) TRIP DISTRIBUTION

EXHIBIT 4-2: PROJECT (TRUCKS) TRIP DISTRIBUTION

URBAN CROSSROADS

EXHIBIT 4-3: PROJECT ONLY TRAFFIC VOLUMES



The currently adopted SCAG 2012 RTP (April 2012) growth forecasts for the unincorporated areas of the County of Riverside identifies projected growth in population of 349,100 in 2008 to 710,600 in 2035, or a 103.5 percent increase over the 27 year period. (5) The change in population equates to roughly a 2.67 percent growth rate compounded annually. Similarly, growth over the same 27 year period in households is projected to increase by 119.0 percent, or 2.95 percent annual growth rate. Finally, growth in employment over the same 27 year period is projected to increase by 198.8 percent, or a 4.14 percent annual growth rate.

Based on a comparison of Existing traffic volumes to the Horizon Year (2035) forecasts, the average growth rate is estimated at approximately 6.50 percent compounded annually between Existing and Horizon Year (2035) traffic conditions. The annual growth rate at each individual intersection is not lower than 5.20 percent compounded annually to as high as 9.27 percent compounded annually over the same time period. Therefore, the annual growth rate utilized for the purposes of this analysis would appear to conservatively approximate the anticipated regional growth in traffic volumes in the County of Riverside for both EAPC and Horizon Year (2035) traffic conditions, especially when considered along with the addition of project-related traffic. As such, the growth in traffic volumes assumed in this traffic impact analysis would tend to overstate as opposed to understate the potential impacts to traffic and circulation.

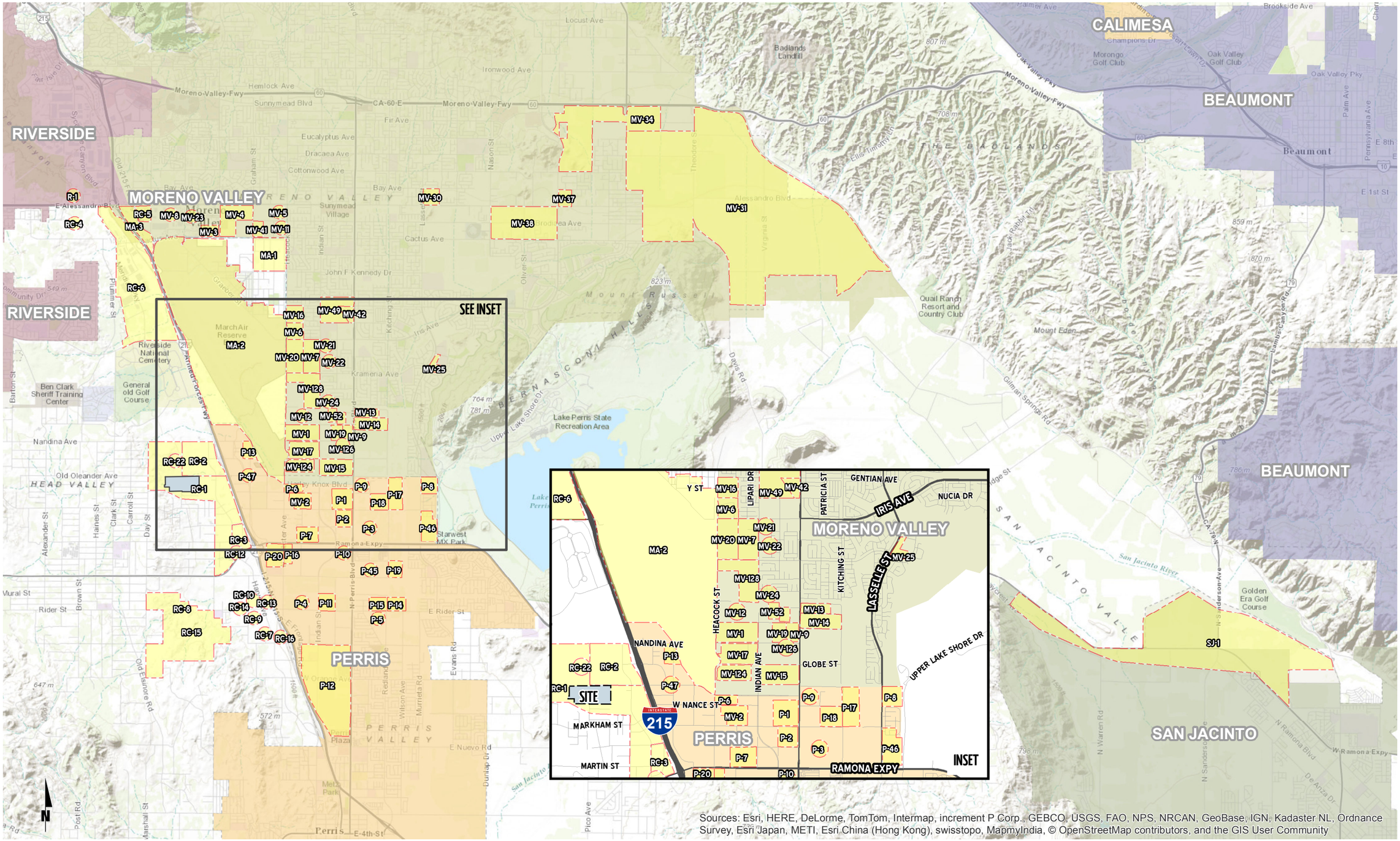
4.6 CUMULATIVE DEVELOPMENT TRAFFIC

California Environmental Quality Act (CEQA) guidelines require that other reasonably foreseeable development projects which are either approved or being processed concurrently in the study area also be included as part of a cumulative analysis scenario. A cumulative project list was developed for the purposes of this analysis through consultation with planning and engineering staff from the County of Riverside, the cumulative project list includes known and foreseeable projects that are anticipated to contribute traffic to the study area intersections. The cumulative projects provided by the County of Riverside are provided in Appendix 4.1.

Where applicable, cumulative projects anticipated to contribute measurable traffic (i.e. 50 or more peak hour trips) to study area intersections have been manually added to the study area network to generate EAPC forecasts. In other words, this list of cumulative development projects has been reviewed to determine which projects would likely contribute measurable traffic through the study area intersections (e.g., those cumulative projects in close proximity to the proposed Project). For the purposes of this analysis, the cumulative projects that were determined to affect one or more of the study area intersections are shown on Exhibit 4-4 and listed on Table 4-4.

Although it is unlikely that these cumulative projects would be fully built and occupied by Year 2017, they have been included in an effort to conduct a conservative analysis and overstate and opposed to understate potential traffic impacts.

EXHIBIT 4-4: CUMULATIVE DEVELOPMENT PROJECTS LOCATION MAP



09347 - pcd1.mxd

This Page Intentionally Left Blank

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
COUNTY OF RIVERSIDE				
RC-1	SP 341; PP 21552 (Majestic Freeway Business Center)	High-Cube Warehouse	6100.715	TSF
RC-2	PP 20699 (Oleander Business Park)	Warehousing	1206.710	TSF
RC-3	Ramona Metrolink Station	Light Rail Transit Station	300	SP
RC-4	PP 22925 (Amstar/Kaliber Development)	Office (258.102 TSF)	258.102	TSF
		Warehousing	409.312	TSF
		General Light Industrial	42.222	TSF
		Retail	10.000	TSF
RC-5	Alessandro Metrolink Station	Light Rail Transit Station	300	SP
RC-6	Meridian Business Park North	Industrial Park	5985.000	TSF
RC-7	PP 18908	General Light Industrial	133.000	TSF
RC-8	Tract 33869	SFDR	39.000	DU
RC-9	PP 16976	General Light Industrial	85.000	TSF
RC-10	PP 21144	Industrial Park	190.802	TSF
RC-12	CUP03315	Gas Station w/ Market	17	VFP
		Fast Food w/o Drive Thru	5.600	TSF
		High-Turnover Restaurant	6.500	TSF
RC-13	PP23342	Industrial Park	180.600	TSF
RC-14	TR30592	SFDR	131	DU
RC-15	Rider Street Quarry	Quarry	2500.0	AC
RC-16	PP 20711	Manufacturing	20.0	AC
	Yocum Baldwin	Warehousing	46.8	AC
RC-22	Blanding Assemblage	High-Cube Warehouse	707.880	TSF
CITY OF MORENO VALLEY				
MV-1	PA 06-0152 & PA 06-0153 (First Park Nandina I & II)	High-Cube Warehouse	1182.918	TSF
MV-2	Integra Pacific Industrial Facility	High-Cube Warehouse	880.000	TSF
MV-3	PA 08-0072 (Overton Moore Properties)	High-Cube Warehouse	520.000	TSF
MV-4	Harbor Freight Expansion	High-Cube Warehouse	1279.910	TSF
MV-5	PA 04-0063 (Centerpointe Buildings 8 and 9)	General Light Industrial	361.384	TSF
MV-6	PA 07-0035; PA 07-0039 (Moreno Valley Industrial Park)	General Light Industrial	204.657	TSF
		High-Cube Warehouse	409.920	TSF
MV-7	PA 07-0079 (Indian Business Park)	High-Cube Warehouse	1560.046	TSF
MV-8	PA 08-0047-0052 (Komar Cactus Plaza)[3]	Hotel	110	RMS
		Fast Food w/Drive Thru	8.000	TSF
		Commercial	42.400	TSF
MV-9	First Inland Logistics Center	High-Cube Warehouse	400.130	TSF
MV-11	PA 08-0093 (Centerpointe Business Park II)	General Light Industrial	99.988	TSF
MV-12	PA 06-0021; PA 06-0022; PA 06-0048; PA 06-0049 (Komar Investments)	Warehousing	2057.400	TSF
MV-13	PA 06-0017 (Ivan Devries)	Industrial Park	569.200	TSF
MV-14	Modular Logistics (Dorado Property)	High-Cube Warehouse	1109.378	TSF
MV-15	PA 09-0004 (Vogel)	High-Cube Warehouse	1616.133	TSF
MV-16	TM 34748	SFDR	135	DU
MV-17	First Nandina Logistics Center	High-Cube Warehouse	1450.000	TSF
MV-19	First Park Nandina III	High-Cube Warehouse	691.960	TSF
	Moreno Valley Commerce Park	High-Cube Warehouse	354.321	TSF
MV-20	March Business Center	General Light Industrial	16.732	TSF
		Warehousing	87.429	TSF
		High-Cube Warehouse	1380.246	TSF
MV-21	TM 33810	SFDR	16	DU
MV-22	TM 34151	SFDR	37	DU
MV-23	373K Industrial Facility	High-Cube Warehouse	373.030	TSF
MV-24	TM 32716	SFDR	57	DU
MV-25	TM 32917	Condo/Townhomes	227	DU

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
MV-30	PA 08-0079-0081 (Winco Foods)	Discount Supermarket	95.440	TSF
		Specialty Retail	14.800	TSF
MV-31	Moreno Beach Marketplace (Lowe's)	Commercial Retail	175.000	TSF
	Auto Mall Specific Plan (Planning Area C)	Commercial Retail	304.500	TSF
	Westridge	High-Cube Warehouse	937.260	TSF
	ProLogis	High-Cube Warehouse	1916.190	TSF
		Warehousing	328.448	TSF
	World Logistics Center	High-Cube Warehouse	41400.000	TSF
		Warehousing	200.000	TSF
		Gas Station w/ Market	12	VFP
		Existing SFDR	7	DU
MV-34	a Westridge Commerce Center	High-Cube Warehouse	937.260	TSF
	b P06-158 (Gascon)	Commercial Retail	116.360	TSF
	c Auto Mall Specific Plan (PAC)	Commercial Retail	304.500	TSF
	d ProLogis	Warehousing	367.000	TSF
		High-Cube Warehouse	1901.000	TSF
	e TR 35823 (Stowe Passco)	SFDR	261	DU
		Apartments	216	DU
MV-37	Lowe's (Moreno Beach Marketplace)	Home Improvement Store	175.000	TSF
MV-38	a Convenience Store/ Fueling Station	Gas Station w/ Market	30.750	TSF
	b Senior Assisted Living	Assisted Living Units	139	DU
	c TR 31590 (Winchester Associates)	SFDR	96	DU
	d TR 32548 (Gabel, Cook & Associates)	SFDR	107	DU
	e 26th Corp. & Granite Capitol	SFDR	32	DU
	f TR 32218 (Whitney)	SFDR	63	DU
	g Moreno Marketplace	Commercial Retail	93.788	TSF
	h Medical Plaza	Medical Offices	311.633	TSF
MV-40	Moreno Valley Industrial Center (Industrial Area SP)	General Light Industrial	354.810	TSF
MV-41	Centerpointe Business Park	General Light Industrial	356.000	TSF
MV-42	Moreno Valley Shopping Center	Free Standing Discount Store	189.520	TSF
		Gas Station w/ Market / Car Wash	16	VFP
MV-49	TR 22180 / Young Homes	Residential	140	DU
MV-52	San Michele Industrial Center (Industrial Area SP)	General Light Industrial	865.960	TSF
MV-124	PA 06-0014 (Pierce Hardy Limited Partnership)	Lumbar Yard	67.000	TSF
MV-126	Moval Assemblage	High-Cube Warehouse	456.337	TSF
MV-128	Moreno Valley Logistics Center	High-Cube Warehouse	1351.770	TSF
		General Light Industrial	385.748	TSF
MARCH JOINT POWERS AUTHORITY				
MA-1	March Lifecare Campus Specific Plan[4]	Medical Offices	190.000	TSF
		Commercial Retail	210.000	TSF
		Research & Education	200.000	TSF
		Hospital	50	Beds
		Institutional Residential	660	Beds
MA-2	Airport Master Plan	Airport Use	559.000	TSF
MA-3	Freeway Business Center (March JPA)	High-Cube Warehouse	710	TSF
CITY OF RIVERSIDE				
R-1	P07-1028 (Alessandro Business Park)	General Light Industrial	662.018	TSF
	Alessandro and Gorgonio	Fast Food w/Drive Thru	4.050	TSF
	2100 Alessandro Boulevard	Vocational School	11.505	TSF
CITY OF PERRIS				
P-1	P 05-0113 (IDI)	High-Cube Warehouse	1750.000	TSF
P-2	P 05-0192 (Oakmont I)	High-Cube Warehouse	697.600	TSF
P-3	P 05-0477	High-Cube Warehouse	462.692	TSF
P-4	Rados Distribution Center	High-Cube Warehouse	1200.000	TSF

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
P-5	Investment Development Services (IDS) II	High-Cube Warehouse	350.000	TSF
P-6	P 07-09-0018	Warehousing	170.000	TSF
P-7	P 07-07-0029 (Oakmont II)	High-Cube Warehouse	1600.000	TSF
P-8	TR 32707	SFDR	137	DU
P-9	TR 34716	SFDR	318	DU
P-10	P 05-0493 (Ridge I)	High-Cube Warehouse	700.000	TSF
P-11	Ridge II	High-Cube Warehouse	2000.000	TSF
P-12	Harvest Landing Specific Plan	SFDR	717	DU
		Condo/Townhomes	1,139	DU
		Sports Park	16.7	AC
		Business Park	1233.401	TSF
		Shopping Center	73.181	TSF
	Perris Marketplace	Shopping Center	450.000	TSF
P-13	P 06-0411 (Concrete Batch Plant)	Manufacturing	2.000	TSF
P-14	Jordan Distribution	High-Cube Warehouse	378.000	TSF
P-15	Aiere	High-Cube Warehouse	642.000	TSF
P-16	P 08-11-0005; P 08-11-0006 (Starcrest)	High-Cube Warehouse	454.088	TSF
P-17	Stratford Ranch Specific Plan	High-Cube Warehouse	1725.411	TSF
P-18	Stratford Ranch	High-Cube Warehouse	480.000	TSF
		General Light Industrial	120.000	TSF
P-19	P05-0493	Logistics	597.370	TSF
P-20	Starcrest, P011-0005; 08-11-0006	General Light Industrial	454.088	TSF
P-45	IDS 04-0464	High-Cube Warehouse	1686.760	TSF
P-46	TTM 32708 (50% Complete)	SFDR	238	DU
P-47	PM 34199	Gen. Light Industrial	46.500	TSF
	DPR 05-0387	Gen. Light Industrial	9.854	TSF
	DPR 05-0452	Warehousing	31.200	TSF
	TPM 34697	Gen. Light Industrial	47.400	TSF
	DPR 06-0396	Warehousing	159.823	TSF

[1] SFDR = Single Family Detached Residential ; MFDR = Multi-Family Detached Residential

[2] DU = Dwelling Units; TSF = Thousand Square Feet; SP = Spaces; VFP = Vehicle Fueling Positions; RMS = Rooms; AC = Acres; EMP = Employees

[3] Source: Cactus Avenue and Commerce Center Drive Commercial Center TIA, Urban Crossroads, Inc., December 9, 2008 (Revised).

[4] Source: March Lifecare Campus Specific Plan Traffic Impact Analysis, Mountain Pacific, Inc., May 2009 (Revised).

Any other cumulative projects that are not expected to contribute measurable traffic to study area intersections have not been included since the traffic would dissipate due to the distance from the Project site and study area intersections. Any additional traffic generated by other projects not on the cumulative projects list is accounted for through background ambient growth factors that have been applied to the peak hour volumes at study area intersections as discussed in Section 4.5 *Background Traffic*.

4.7 NEAR-TERM TRAFFIC FORECASTS

To provide a comprehensive assessment of potential transportation network deficiencies, two types of analyses, "buildup" and "buildout", were performed in support of this work effort. The "buildup" method was used to approximate the EAP traffic forecasts includes background traffic, and is intended to identify the significant impacts on both the existing and planned near-term circulation system. The "buildup" method was also utilized to approximate the EAPC traffic forecasts, and is intended to identify the cumulative impacts on both the existing and planned near-term circulation system. The EAPC traffic forecasts include background traffic, traffic generated by other cumulative development projects within the study area, and the traffic generated by the proposed Project. The "buildout" approach is used to forecast the Horizon Year Without and With Project conditions of the study area.

The "buildup" approach combines existing traffic counts with a background ambient growth factor to forecast the near-term 2017 traffic conditions. An ambient growth factor of 4.04% (2017) accounts for background (area-wide) traffic increases that occur over time, up to the year 2017 from the year 2015 (compounded two percent per year growth over a two year period). Traffic volumes generated by the Project are then added to assess the EAP and EAPC traffic conditions. The 2017 roadway network is similar to the existing conditions roadway network with the exception of future roadways and intersections proposed to be developed by the Project.

As noted previously, an analysis of the proposed Project at various development tiers has been assessed for the purposes of this traffic study. The near-term traffic analysis includes the following traffic conditions, with the various traffic components:

- EAP (2017)
    - Existing 2015 counts
    - Ambient growth traffic (4.04%)
    - Project traffic
- EAPC (2017)
    - Existing 2015 counts
    - Ambient growth traffic (4.04%)
    - Cumulative Development Project traffic
    - Project traffic

4.8 HORIZON YEAR (2035) VOLUME DEVELOPMENT

The Horizon Year (2035) With Project traffic conditions were derived from the Riverside County Transportation Analysis Model (RivTAM) using accepted procedures for model forecast refinement and smoothing. The traffic forecasts reflect the area-wide growth anticipated between Existing conditions and Horizon Year conditions.

In most instances the traffic model zone structure is not designed to provide accurate turning movements along arterial roadways unless refinement and reasonableness checking is performed. Therefore, the Horizon Year With Project peak hour forecasts were refined using the model derived long-range forecasts, along with existing peak hour traffic count data collected at each analysis location in April 2015. Future estimated peak hour traffic data was used for new intersections and intersections with an anticipated change in travel patterns to further refine the Horizon Year With Project peak hour forecasts.

The refined future peak hour approach and departure volumes obtained from the model output data are then entered into a spreadsheet program consistent with the National Cooperative Highway Research Program (NCHRP Report 255), along with initial estimates of turning movement proportions. A linear programming algorithm is used to calculate individual turning movements which match the known directional roadway segment forecast volumes computed in the previous step. This program computes a likely set of intersection turning movements from intersection approach counts and the initial turning proportions from each approach leg.

Typically, the model growth is prorated and is subsequently added to the existing (base validation) traffic volumes to represent Long Range traffic conditions. However, review of the resulting model growth indicates negative growth for several study area intersections. In an effort to conduct a conservative analysis, reductions to traffic forecasts from either Existing or EAPC traffic conditions were not assumed as part of this analysis. As such, in conjunction with the addition of cumulative projects that are not consistent with the General Plan, additional growth has also been applied on a movement-by-movement basis, where applicable, to estimate reasonable Horizon Year forecasts. Horizon Year turning volumes were compared to EAPC volumes in order to ensure a minimum growth as a part of the refinement process. The minimum growth includes any additional growth between EAPC and Horizon Year traffic conditions that is not accounted for by the traffic generated by cumulative development projects and ambient growth rates assumed between Existing (2015) and EAPC traffic conditions. Future estimated peak hour traffic data was used for new intersections and intersections with an anticipated change in travel patterns to further refine the Horizon Year peak hour forecasts.

The future Horizon Year without Project peak hour turning movements were then reviewed by Urban Crossroads for reasonableness, and in some cases, were adjusted to achieve flow conservation, reasonable growth, and reasonable diversion between parallel routes. Flow conservation checks ensure that traffic flow between two closely spaced intersections, such as two freeway ramp locations, is verified in order to make certain that vehicles leaving one intersection are entering the adjacent intersection and that there are no unexplained loss of vehicles. The result of this traffic forecasting procedure is a series of traffic volumes which are suitable for traffic operations analysis.

The truck competent of RivTAM has data that is unusually low. As such, in an effort to conduct a conservative analysis, the presence of trucks has been accounted for based on the manual volume adjustments made to demonstrate growth above EAPC traffic forecasts, which are presented and evaluated in PCE (see *Section 3.6 Existing (2015) Traffic Counts* for discussion on PCE). As such, the Horizon Year forecasts are also assumed to be in PCE for the purposes of this analysis.

Post-processing worksheets for Horizon Year Without Project traffic conditions are provided in Appendix 4.2.

5 E+P TRAFFIC CONDITIONS

This section discusses the traffic forecasts for Existing plus Project (E+P) conditions and the resulting intersection operations, traffic signal warrant, and freeway mainline operations analyses.

5.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for E+P conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for E+P conditions only (e.g., intersection and roadway improvements at the Project's frontage and driveways).

5.2 EXISTING PLUS PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus Project traffic. Exhibit 5-1 shows the ADT and peak hour intersection turning movement volumes, which can be expected for E+P traffic conditions.

5.3 INTERSECTION OPERATIONS ANALYSIS

E+P peak hour traffic operations have been evaluated, for each phase of development, for the study area intersections based on the analysis methodologies presented in Section 2 *Methodologies* of this TIA. The intersection analysis results are summarized in Table 5-1, which indicates that the study area intersections are anticipated to continue to operate at acceptable LOS under E+P traffic conditions, consistent with Existing traffic conditions. As such, the impact to study area intersections from the addition of Project traffic is anticipated to be less than significant.

A summary of the peak hour intersection LOS for E+P conditions are shown on Exhibit 5-2. The intersection operations analysis worksheets for E+P traffic conditions are included in Appendix 5.1 of this TIA.

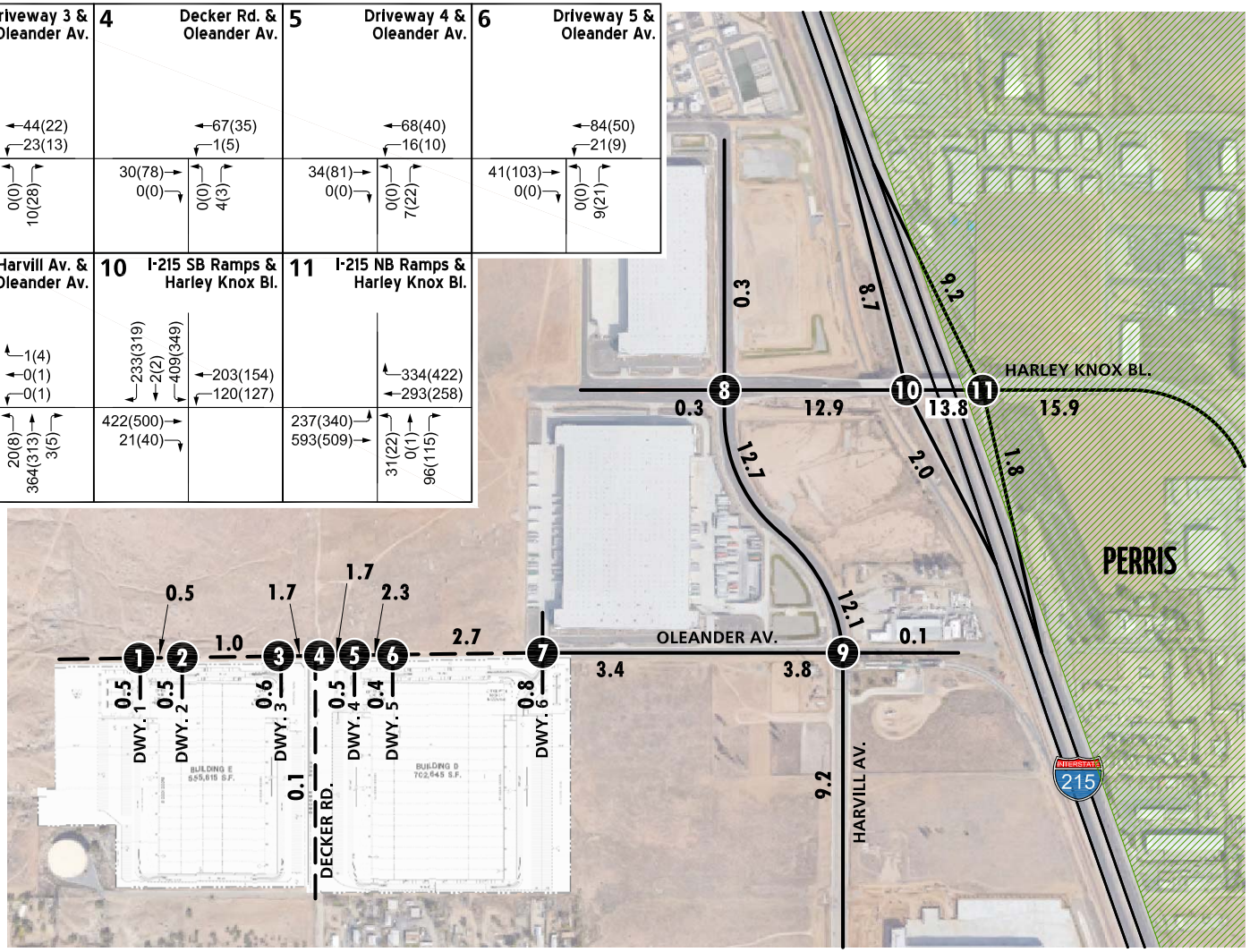
5.4 TRAFFIC SIGNAL WARRANTS ANALYSIS

There are no intersections anticipated to meet traffic signal warrants for E+P traffic conditions (see Appendix 5.2).

EXHIBIT 5-1: E+P TRAFFIC VOLUMES

1 Driveway 1 & Oleander Av.	2 Driveway 2 & Oleander Av.	3 Driveway 3 & Oleander Av.	4 Decker Rd. & Oleander Av.	5 Driveway 4 & Oleander Av.	6 Driveway 5 & Oleander Av.
←0(0) ←16(10)	←16(10) ←28(12)	←44(22) ←23(13)	←67(35) ←1(5)	←68(40) ←16(10)	←84(50) ←21(9)
0(0)→ 0(0)→ | 0(0) 7(22)	7(22)→ 0(0)→ | 0(0) 12(28)	20(50)→ 0(0)→ | 0(0) 10(28)	30(78)→ 0(0)→ | 0(0) 4(3)	34(81)→ 0(0)→ | 0(0) 7(22)	41(103)→ 0(0)→ | 0(0) 9(21)

7 Driveway 6 & Oleander Av.	8 Harvill Av. & Harley Knox Bl.	9 Harvill Av. & Oleander Av.	10 I-215 SB Ramps & Harley Knox Bl.	11 I-215 NB Ramps & Harley Knox Bl.
0(0) 0(0) 3(0) ←2(0) ←105(59) ←30(16)	0(0) 3(7) 8(9) ←16(6) ←9(14) ←411(452)	127(69) 284(396) 2(0) ←1(4) ←0(1) ←0(1)	233(319) 2(2) 409(349) ←203(154) ←120(127)	←334(422) ←293(258)
0(0)→ 51(124)→ 0(0)→ | 0(0) 0(0) 13(36)	0(0)→ 4(6)→ 3(6)→ | 1(1) 2(4) 431(526)	79(165)→ 0(0)→ 19(24)→ | 20(8) 364(313) 3(5)	422(500)→ 21(40)→	237(340)→ 593(509)→ | 31(22) 0(1) 96(115)



LEGEND:

10.0 = VEHICLES PER DAY (1000'S)

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

N

URBAN CROSSROADS

EXHIBIT 5-2: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR E+P CONDITIONS

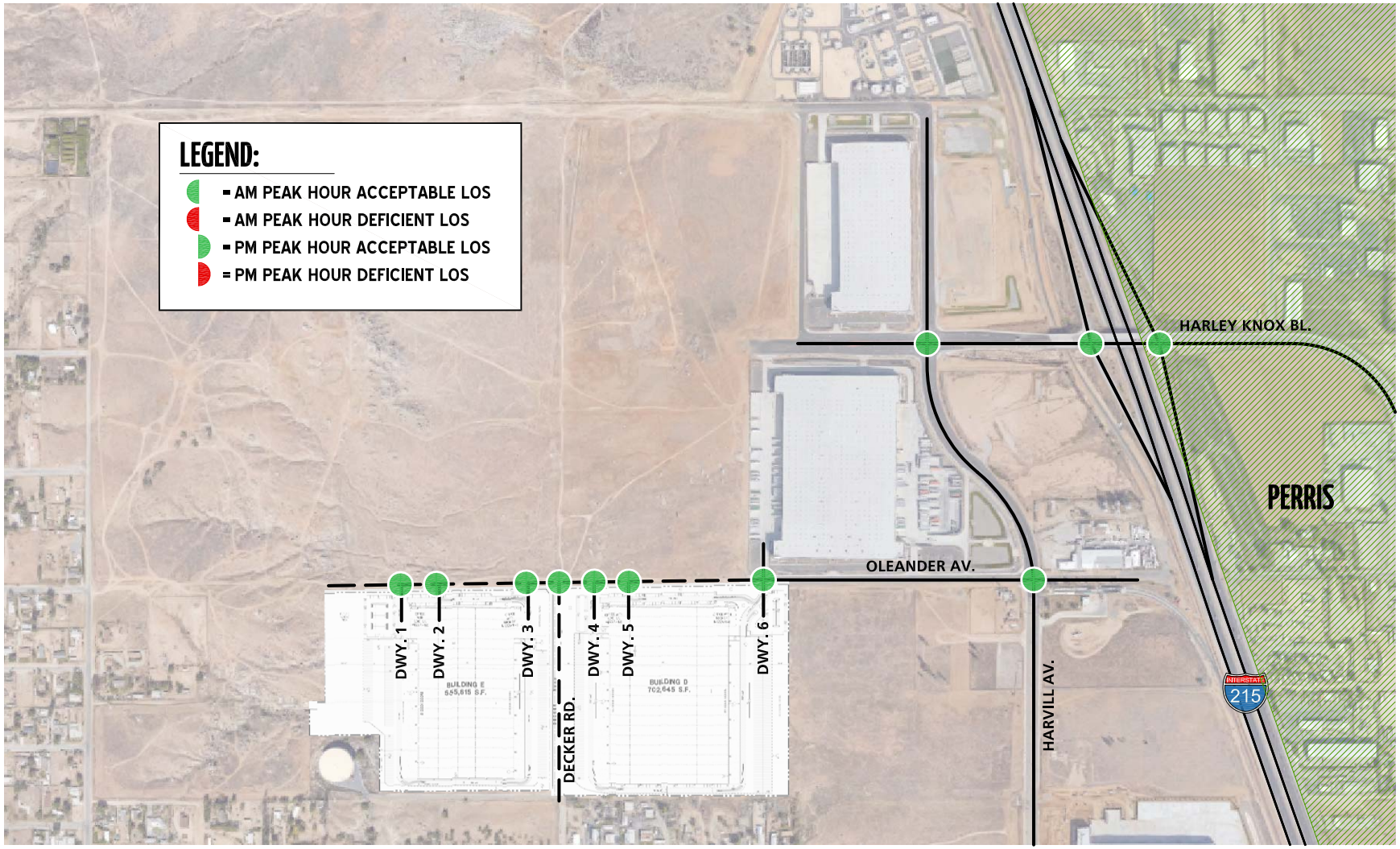


Table 5-1

Intersection Analysis for E+P Conditions

#	Intersection	Traffic Control[2]	Existing (2015)				Existing Plus Project				Acceptable LOS
			Delay[1] (secs.)		Level of Service		Delay[1] (secs.)		Level of Service		
			AM	PM	AM	PM	AM	PM	AM	PM	
1	Dwy. 1 / Oleander Av.	**CSS**	Future Intersection				0.0	0.0	A	A	C
2	Dwy. 2 / Oleander Av.	**CSS**	Future Intersection				8.4	8.5	A	A	C
3	Dwy. 3 / Oleander Av.	**CSS**	Future Intersection				8.4	8.6	A	A	C
4	Decker Rd. / Oleander Av.	**CSS**	Future Intersection				8.5	8.7	A	A	D
5	Dwy. 4 / Oleander Av.	**CSS**	Future Intersection				8.5	8.8	A	A	C
6	Dwy. 5 / Oleander Av.	**CSS**	Future Intersection				8.5	8.9	A	A	C
7	Dwy. 6 / Oleander Av.	CSS	8.9	0.0	A	A	10.2	9.5	B	A	C
8	Harvill Av. / Harley Knox Bl.	TS	32.8	32.2	C	C	33.5	34.8	C	C	D
9	Harvill Av. / Oleander Av.	TS	6.5	4.6	A	A	13.8	14.3	B	B	D
10	I-215 SB Ramps / Harley Knox Bl.	TS	37.0	26.8	D	C	37.1	28.4	D	C	D
11	I-215 NB Ramps / Harley Knox Bl.	TS	13.6	22.2	B	C	15.0	28.9	B	C	D

[1] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[2] CSS = Cross-street Stop; TS = Traffic Signal; **CSS** = Improvement

5.5 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the I-215 Freeway and Harley Knox Boulevard interchange to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 5-2 for E+P traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown on Table 5-2, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for E+P traffic conditions.

Worksheets for E+P traffic conditions off-ramp queuing analysis are provided in Appendix 5.3 for E+P traffic conditions.

5.6 BASIC FREEWAY SEGMENT ANALYSIS

E+P mainline directional volumes for the weekday AM and PM peak hours are provided on Exhibits 5-3. As shown on Table 5-3, the basic freeway segments analyzed for this study are anticipated to operate at an acceptable LOS (i.e., LOS C or better) during the peak hours, with the addition of Project traffic. E+P basic freeway segment analysis worksheets are provided in Appendix 5.4.

5.7 FREEWAY MERGE/DIVERGE ANALYSIS

Ramp merge and diverge operations were also evaluated for E+P traffic conditions and the results of this analysis are presented in Table 5-4. As shown in Table 5-4, the freeway ramp merge and diverge areas are anticipated to operate at LOS C or better. E+P freeway ramp junction operations analysis worksheets are provided in Appendix 5.5.

Table 5-2

Peak Hour Freeway Off-Ramp Queuing Summary for E+P Conditions

Intersection	Movement	Available Stacking Distance (Feet)	Existing (2015)				Existing plus Project			
			95th Percentile Queue (Feet)[2]		Acceptable? [1]		95th Percentile Queue (Feet)[2]		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Harley Knox Bl.	SBL/T	1,330	383	339	Yes	Yes	379	341	Yes	Yes
	SBR	270	44	60	Yes	Yes	52	64	Yes	Yes
I-215 NB Off-Ramp / Harley Knox Bl.	NBL/T	1,120	13	22	Yes	Yes	51	44	Yes	Yes
	NBR	265	47	52	Yes	Yes	47	53	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] Maximum queue length for the approach reported.

Table 5-3

Basic Freeway Segment Analysis for E+P Conditions

Freeway	Direction	Mainline Segment	Lanes[1]	Existing (2015)				Existing plus Project			
				Density[2]		LOS		Density[2]		LOS	
				AM	PM	AM	PM	AM	PM	AM	PM
I-215 Freeway	SB	North of Harley Knox Boulevard	3	13.4	20.5	B	C	13.8	20.8	B	C
		South of Harley Knox Boulevard	3	11.4	18.1	B	C	11.5	18.3	B	C
	NB	North of Harley Knox Boulevard	3	22.0	17.1	C	B	22.2	17.5	C	B
		South of Harley Knox Boulevard	3	19.6	14.6	C	B	19.9	14.6	C	B

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

Table 5-4

Freeway Ramp Junction Merge/Diverge Analysis for E+P Conditions

Freeway	Direction	Ramp or Segment	Lanes on Freeway[1]	Existing (2015)				Existing Plus Project			
				AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
				Density[2]	LOS	Density[2]	LOS	Density[2]	LOS	Density[2]	LOS
I-215 Freeway	SB	Off-Ramp at Harley Knox Boulevard	3	20.2	C	27.5	C	20.7	C	27.7	C
		On-Ramp at Harley Knox Boulevard	3	15.1	B	21.5	C	15.2	B	21.8	C
	NB	On-Ramp at Harley Knox Boulevard	3	25.8	C	21.9	C	26.0	C	22.4	C
		Off-Ramp at Harley Knox Boulevard	3	25.1	C	20.0	B	25.3	C	20.0	C

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

EXHIBIT 5-3: E+P FREEWAY MAINLINE VOLUMES (ACTUAL VEHICLES)

This Page Intentionally Left Blank

6 EAP (2017) TRAFFIC CONDITIONS

This section discusses the methods used to develop Existing plus Ambient Growth plus Project (EAP) (2017) traffic forecasts, and the resulting intersection operations, traffic signal warrant, and freeway mainline operations analyses.

6.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for EAP conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for EAP conditions only (e.g., intersection and roadway improvements along the Project's frontage and driveways).

6.2 EAP (2017) TRAFFIC VOLUME FORECASTS

To account for background traffic growth, an ambient growth from Existing conditions of 4.04% (2 percent per year over 2 years, compounded annually) is included for EAP traffic conditions. Cumulative development projects are not included as part of the EAP analysis. The weekday ADT and weekday AM and PM peak hour volumes which can be expected for EAP traffic conditions are shown on Exhibit 6-1.

6.3 INTERSECTION OPERATIONS ANALYSIS

LOS calculations were conducted for the study intersections to evaluate their operations under EAP conditions with roadway and intersection geometrics consistent with Section 6.1 *Roadway Improvements*. As shown in Table 6-1, the study area intersections are anticipated to operate at acceptable LOS under EAP traffic conditions, consistent with Existing traffic conditions. As such, the impact to study area intersections from the addition of Project traffic is anticipated to be less than significant.

A summary of the peak hour intersection LOS for EAP traffic conditions are shown on Exhibit 6-2. The intersection operations analysis worksheets for EAP traffic conditions are included in Appendix 6.1 of this TIA.

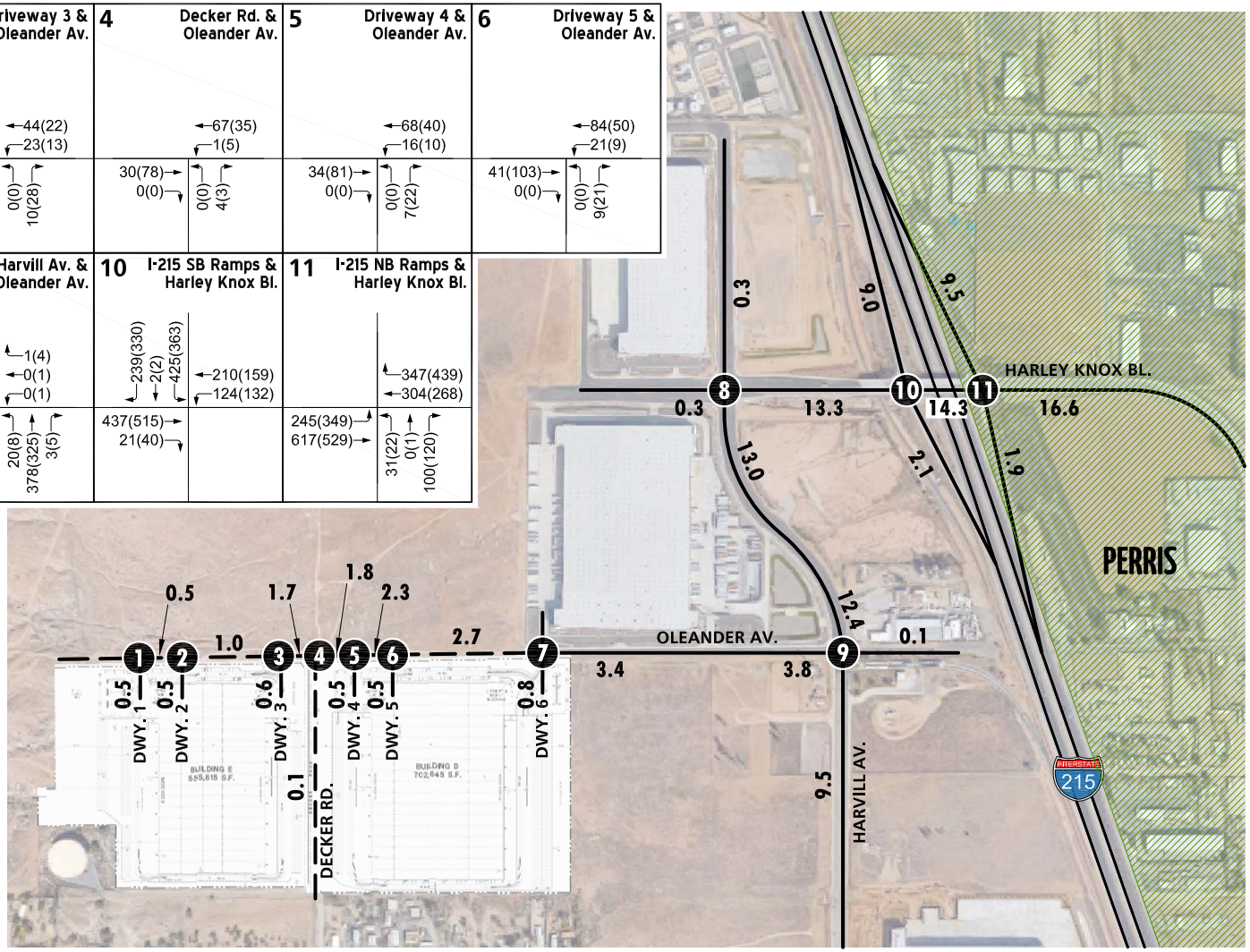
6.4 TRAFFIC SIGNAL WARRANTS ANALYSIS

No study area intersections are anticipated to meet traffic signal warrants for EAP traffic conditions (see Appendix 6.2).

EXHIBIT 6-1: EAP (2017) TRAFFIC VOLUMES

1 Driveway 1 & Oleander Av.	2 Driveway 2 & Oleander Av.	3 Driveway 3 & Oleander Av.	4 Decker Rd. & Oleander Av.	5 Driveway 4 & Oleander Av.	6 Driveway 5 & Oleander Av.
←0(0) ←16(10)	←16(10) ←28(12)	←44(22) ←23(13)	←67(35) ←1(5)	←68(40) ←16(10)	←84(50) ←21(9)
0(0)→ 0(0)→ 0(0) 7(22)←	7(22)→ 0(0)→ 0(0) 12(28)←	20(50)→ 0(0)→ 0(0) 10(28)←	30(78)→ 0(0)→ 0(0) 4(3)←	34(81)→ 0(0)→ 0(0) 7(22)←	41(103)→ 0(0)→ 0(0) 9(21)←

7 Driveway 6 & Oleander Av.	8 Harvill Av. & Harley Knox Bl.	9 Harvill Av. & Oleander Av.	10 I-215 SB Ramps & Harley Knox Bl.	11 I-215 NB Ramps & Harley Knox Bl.
0(0)→ 0(0)→ 3(0)→ ←2(0) ←105(59) ←30(16)	0(0)→ 3(7)→ 8(9)→ ←17(6) ←9(15) ←423(468)	127(69)→ 295(412)→ 2(0)→ ←1(4) ←0(1) ←0(1)	239(330)→ 2(2)→ 425(363)→ ←210(159) ←124(132)	←347(439) ←304(268)
0(0)→ 51(124)→ 0(0)→ 0(0) 0(0) 13(36)←	0(0)→ 4(6)→ 3(6)→ 1(1) 2(4) 446(541)←	80(166)→ 0(0)→ 19(24)→ 20(8) 378(325) 3(5)←	437(515)→ 21(40)→	245(349)→ 617(529)→ 31(22) 0(1) 100(120)←



LEGEND:

10.0 = VEHICLES PER DAY (1000'S)

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

N

URBAN CROSSROADS

EXHIBIT 6-2: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EAP (2017) CONDITIONS

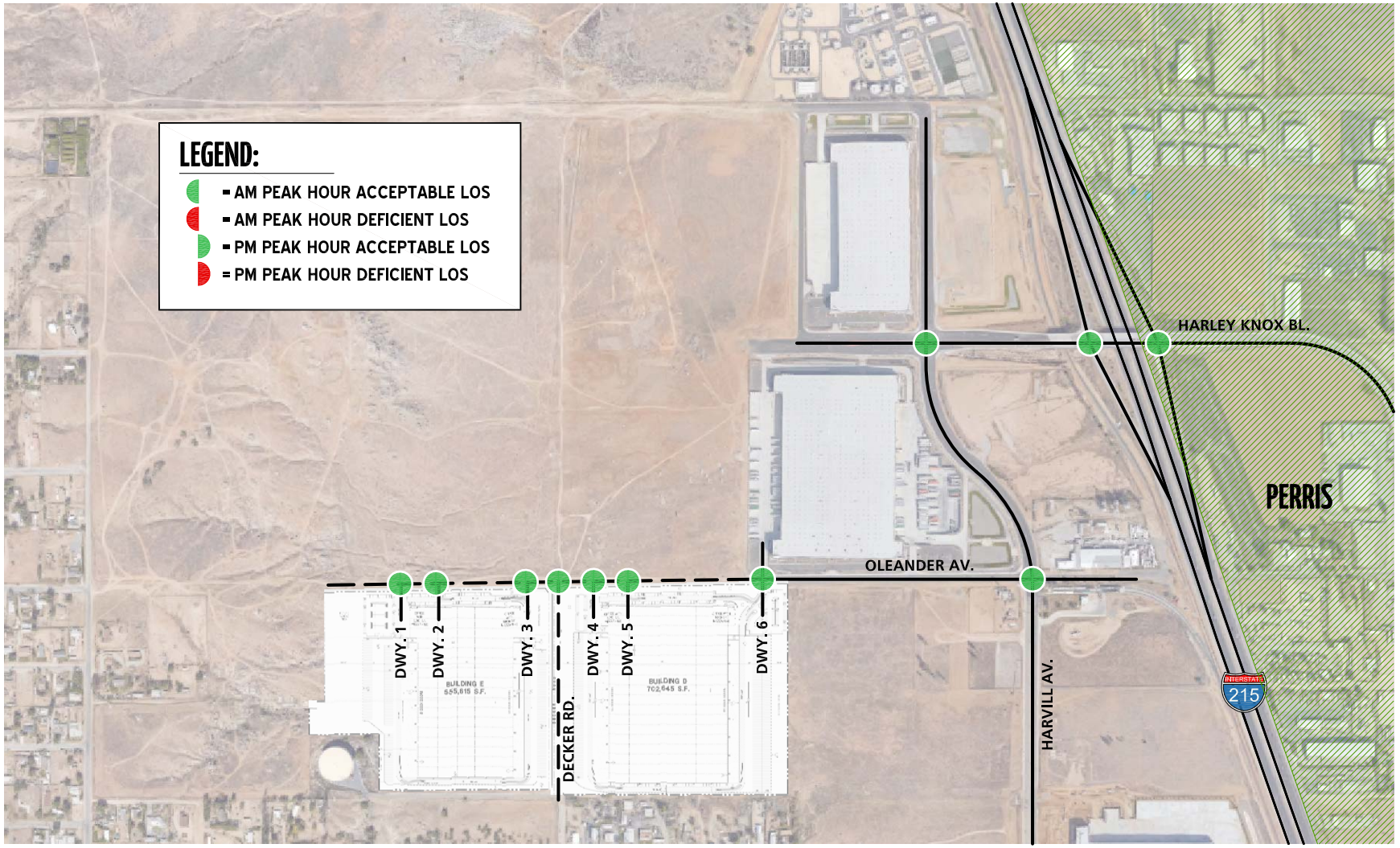


Table 6-1

Intersection Analysis for EAP (2017) Conditions

#	Intersection	Traffic Control[2]	Existing (2015)				EAP (2017)				Acceptable LOS
			Delay[1] (secs.)		Level of Service		Delay[1] (secs.)		Level of Service		
			AM	PM	AM	PM	AM	PM	AM	PM	
1	Dwy. 1 / Oleander Av.	**CSS**	Future Intersection				0.0	0.0	A	A	C
2	Dwy. 2 / Oleander Av.	**CSS**	Future Intersection				8.4	8.5	A	A	C
3	Dwy. 3 / Oleander Av.	**CSS**	Future Intersection				8.4	8.6	A	A	C
4	Decker Rd. / Oleander Av.	**CSS**	Future Intersection				8.5	8.7	A	A	D
5	Dwy. 4 / Oleander Av.	**CSS**	Future Intersection				8.5	8.8	A	A	C
6	Dwy. 5 / Oleander Av.	**CSS**	Future Intersection				8.5	8.9	A	A	C
7	Dwy. 6 / Oleander Av.	CSS	8.9	0.0	A	A	10.2	9.5	B	A	C
8	Harvill Av. / Harley Knox Bl.	TS	32.8	32.2	C	C	33.2	35.0	C	D	D
9	Harvill Av. / Oleander Av.	TS	6.5	4.6	A	A	13.8	14.2	B	B	D
10	I-215 SB Ramps / Harley Knox Bl.	TS	37.0	26.8	D	C	37.5	31.3	D	C	D
11	I-215 NB Ramps / Harley Knox Bl.	TS	13.6	22.2	B	C	15.1	29.5	B	C	D

[1] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[2] CSS = Cross-street Stop; TS = Traffic Signal; **CSS** = Improvement

6.5 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the I-215 Freeway and Harley Knox Boulevard interchange to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 6-2 for EAP traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown on Table 6-2, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for EAP traffic conditions.

Worksheets for EAP conditions off-ramp queuing analysis are provided in Appendix 6.3.

6.6 BASIC FREEWAY SEGMENT ANALYSIS

EAP mainline directional volumes for the weekday AM and PM peak hours are provided on Exhibit 6-3. As shown on Table 6-3, the freeway segments analyzed for this study are anticipated to operate at an acceptable LOS (i.e., LOS C or better) during the peak hours. EAP basic freeway segment analysis worksheets are provided in Appendix 6.4.

6.7 FREEWAY MERGE/DIVERGE ANALYSIS

Ramp merge and diverge operations were also evaluated for EAP conditions and the results of this analysis are presented in Table 6-4. As shown in Table 6-4, the freeway ramp merge and diverge areas are anticipated to operate at LOS D or better. EAP freeway ramp junction operations analysis worksheets are provided in Appendix 6.5.

Table 6-2

Peak Hour Freeway Off-Ramp Queuing Summary for EAP (2017) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	Existing (2015)				EAP (2017)			
			95th Percentile Queue (Feet)[2]		Acceptable? [1]		95th Percentile Queue (Feet)[2]		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Harley Knox Bl.	SBL/T	1,330	383	339	Yes	Yes	390	353	Yes	Yes
	SBR	270	44	60	Yes	Yes	51	63	Yes	Yes
I-215 NB Off-Ramp / Harley Knox Bl.	NBL/T	1,120	13	22	Yes	Yes	51	44	Yes	Yes
	NBR	265	47	52	Yes	Yes	49	54	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] Maximum queue length for the approach reported.

Table 6-3

Basic Freeway Segment Analysis for EAP (2017) Conditions

Freeway	Direction	Mainline Segment	Lanes[1]	Existing (2015)				EAP (2017)			
				Density[2]		LOS		Density[2]		LOS	
				AM	PM	AM	PM	AM	PM	AM	PM
I-215 Freeway	SB	North of Harley Knox Boulevard	3	13.4	20.5	B	C	14.3	21.7	B	C
		South of Harley Knox Boulevard	3	11.4	18.1	B	C	12.0	19.1	B	C
	NB	North of Harley Knox Boulevard	3	22.0	17.1	C	B	23.2	18.2	C	C
		South of Harley Knox Boulevard	3	19.6	14.6	C	B	20.7	15.2	C	B

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

Table 6-4

Freeway Ramp Junction Merge/Diverge Analysis for EAP (2017) Conditions

Freeway	Direction	Ramp or Segment	Lanes on Freeway[1]	Existing (2015)				EAP (2017)			
				AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
				Density[2]	LOS	Density[2]	LOS	Density[2]	LOS	Density[2]	LOS
I-215 Freeway	SB	Off-Ramp at Harley Knox Boulevard	3	20.2	C	27.5	C	21.3	C	28.6	D
		On-Ramp at Harley Knox Boulevard	3	15.1	B	21.5	C	15.7	B	22.5	C
	NB	On-Ramp at Harley Knox Boulevard	3	25.8	C	21.9	C	26.9	C	23.1	C
		Off-Ramp at Harley Knox Boulevard	3	25.1	C	20.0	B	26.1	C	20.7	C

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

EXHIBIT 6-3: EAP (2017) FREEWAY MAINLINE VOLUMES (ACTUAL VEHICLES)

This Page Intentionally Left Blank

7 EAPC (2017) TRAFFIC CONDITIONS

This section discusses the methods used to develop Existing plus Ambient Growth plus Project plus Cumulative (EAPC) (2017) traffic forecasts, and the resulting intersection operations, traffic signal warrant, and freeway mainline operations analyses.

7.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for EAPC (2017) conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for EAPC conditions only (e.g., intersection and roadway improvements along the Project's frontage and driveways).
- Driveways and those facilities assumed to be constructed by cumulative developments to provide site access are also assumed to be in place for EAPC conditions only (e.g., intersection and roadway improvements along the cumulative development's frontages and driveways).

7.2 EAPC (2017) TRAFFIC VOLUME FORECASTS

To account for background traffic, other known cumulative development projects in the study area were included in addition to 4.04% of ambient growth for EAPC traffic conditions in conjunction with traffic associated with the proposed Project. The weekday ADT and weekday AM and PM peak hour volumes which can be expected for EAPC (2017) traffic conditions are shown on Exhibit 7-1.

7.3 INTERSECTION OPERATIONS ANALYSIS

LOS calculations were conducted for the study intersections to evaluate their operations under EAPC conditions with roadway and intersection geometrics consistent with Section 7.1 *Roadway Improvements*. As shown in Table 7-1, the study area intersections are anticipated to operate at acceptable levels of service, with the exception of the following locations:

ID	Intersection Location
8	Harvill Avenue / Harley Knox Boulevard – LOS F AM and PM peak hours
10	I-215 Southbound Ramps / Harley Knox Boulevard – LOS F AM and PM peak hours
11	I-215 Northbound Ramps / Harley Knox Boulevard – LOS F PM peak hour only

A summary of the peak hour intersection LOS for EAPC conditions are shown on Exhibit 7-2. The intersection operations analysis worksheets for EAPC traffic conditions are included in Appendix 7.1 of this TIA. Measures to address near-term cumulative deficiencies for EAPC traffic conditions are discussed in Section 7.8 *EAPC Deficiencies and Recommended Improvements.*

EXHIBIT 7-1: EAPC (2017) TRAFFIC VOLUMES

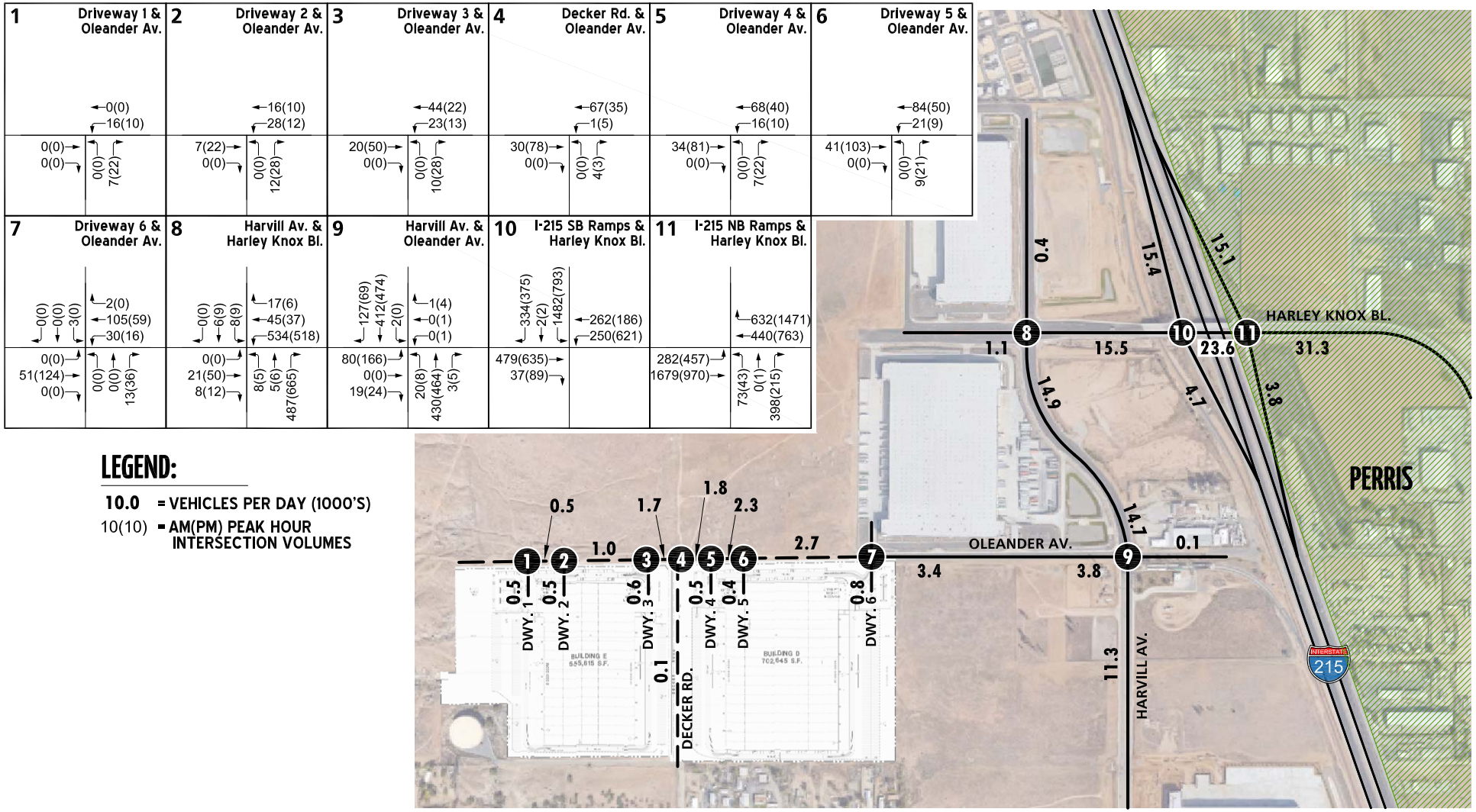


EXHIBIT 7-2: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EAPC (2017) CONDITIONS

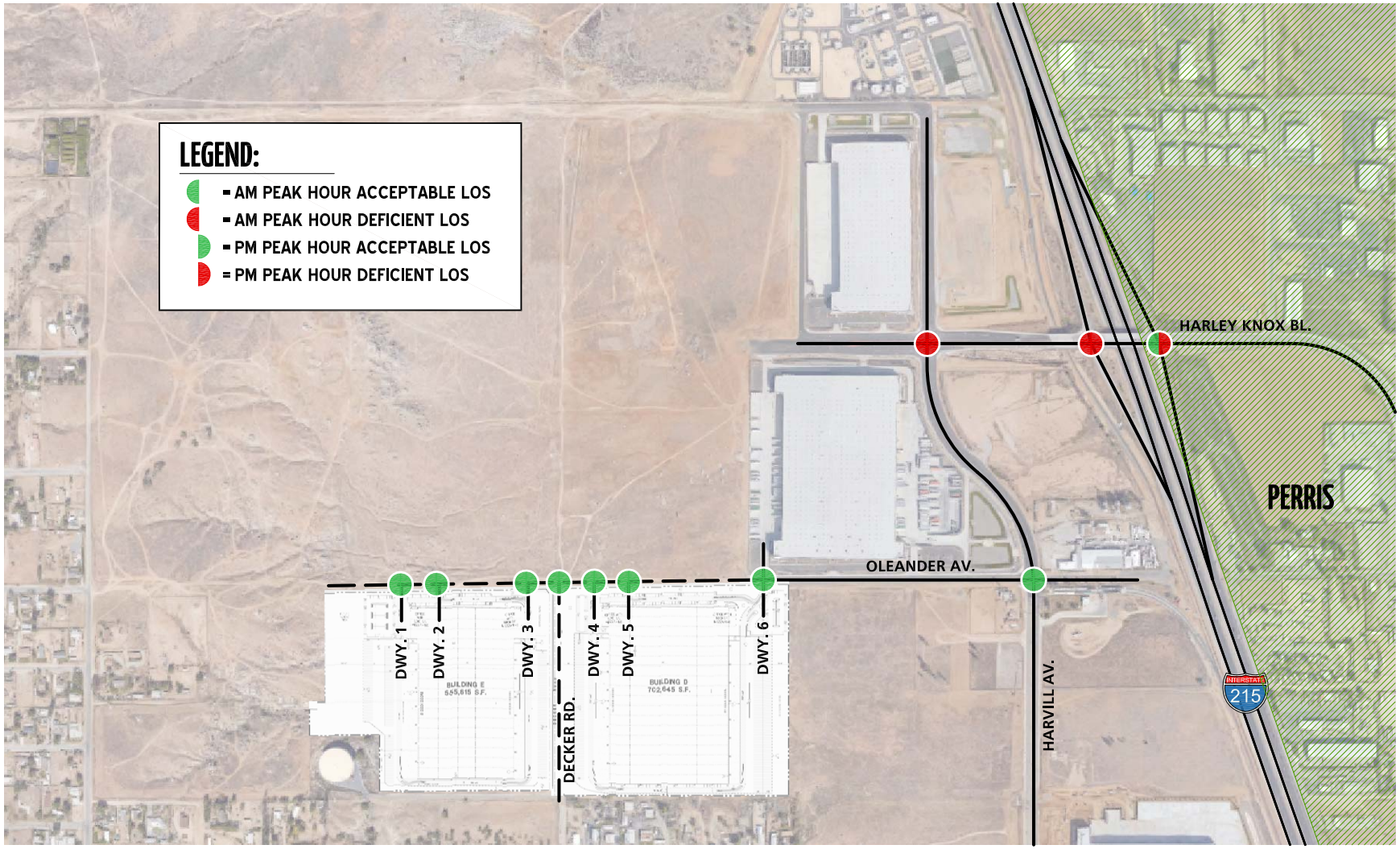


Table 7-1

Intersection Analysis for EAPC (2017) Conditions

#	Intersection	Traffic Control[2]	Existing (2015)				EAPC (2017)				Acceptable LOS
			Delay[2] (secs.)		Level of Service		Delay[2] (secs.)		Level of Service		
			AM	PM	AM	PM	AM	PM	AM	PM	
1	Dwy. 1 / Oleander Av.	**CSS**	Future Intersection				0.0	0.0	A	A	C
2	Dwy. 2 / Oleander Av.	**CSS**	Future Intersection				8.4	8.5	A	A	C
3	Dwy. 3 / Oleander Av.	**CSS**	Future Intersection				8.4	8.6	A	A	C
4	Decker Rd. / Oleander Av.	**CSS**	Future Intersection				8.5	8.7	A	A	D
5	Dwy. 4 / Oleander Av.	**CSS**	Future Intersection				8.5	8.8	A	A	C
6	Dwy. 5 / Oleander Av.	**CSS**	Future Intersection				8.5	8.9	A	A	C
7	Dwy. 6 / Oleander Av.	CSS	8.9	0.0	A	A	10.2	9.5	B	A	C
8	Harvill Av. / Harley Knox Bl.	TS	32.8	32.2	C	C	**104.4**	**183.7**	**F**	**F**	D
9	Harvill Av. / Oleander Av.	TS	6.5	4.6	A	A	10.1	13.1	B	B	D
10	I-215 SB Ramps / Harley Knox Bl.	TS	37.0	26.8	D	C	**168.2**	**107.3**	**F**	**F**	D
11	I-215 NB Ramps / Harley Knox Bl.	TS	13.6	22.2	B	C	36.8	**179.8**	D	**F**	D

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

[1] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[2] CSS = Cross-street Stop; TS = Traffic Signal; **CSS** = Improvement

7.4 TRAFFIC SIGNAL WARRANTS ANALYSIS

No study area intersections are anticipated to meet traffic signal warrants for EAPC traffic conditions (see Appendix 7.2).

7.5 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the I-215 Freeway and Harley Knox Boulevard interchange to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 7-2 for EAPC traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline.

As shown on Table 7-2, the following movement may potentially experience queuing issues during the weekday AM peak 95th percentile traffic flows for EAPC traffic conditions:

ID	Intersection Location
10	I-215 SB Ramps / Harley Knox Boulevard – Southbound shared left-through lane (AM peak hour only)

The 95th percentile queues for EAPC traffic conditions indicates potential queuing for the movement and peak hour identified above. As shown, the analysis indicates that potential queues would exceed the length of the off-ramp and could potentially spillback into the adjacent through lanes on the freeway mainline during the AM peak hour only. Worksheets for EAPC conditions off-ramp queuing analysis are provided in Appendix 7.3.

7.6 BASIC FREEWAY SEGMENT ANALYSIS

EAPC mainline directional volumes for the weekday AM and PM peak hours are provided on Exhibit 7-3. As shown on Table 7-3, the freeway segments analyzed for this study are anticipated to operate at an acceptable LOS (i.e., LOS D or better) during the peak hours. EAPC basic freeway segment analysis worksheets are provided in Appendix 7.4.

7.7 FREEWAY MERGE/DIVERGE ANALYSIS

Ramp merge and diverge operations were also evaluated for EAPC conditions and the results of this analysis are presented in Table 7-4. As shown in Table 7-4, the freeway ramp merge and diverge areas are anticipated to operate at LOS D or better. EAPC freeway ramp junction operations analysis worksheets are provided in Appendix 7.5.

Table 7-2

Peak Hour Freeway Off-Ramp Queuing Summary for EAPC (2017) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	Existing (2015)				EAPC (2017)			
			95th Percentile Queue (Feet)[2]		Acceptable? [1]		95th Percentile Queue (Feet)[2]		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Harley Knox Bl.	SBL/T	1,330	383	339	Yes	Yes	**1,910** [3]	1,014 [3]	**No**	Yes
	SBR	270	44	60	Yes	Yes	102	145	Yes	Yes
I-215 NB Off-Ramp / Harley Knox Bl.	NBL/T	1,120	13	22	Yes	Yes	52	73	Yes	Yes
	NBR	265	47	52	Yes	Yes	246 [3]	126	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] Maximum queue length for the approach reported.

[3] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

Table 7-3

Basic Freeway Segment Analysis for EAPC (2017) Conditions

Freeway	Direction	Mainline Segment	Lanes[1]	Existing (2015)				EAPC (2017)			
				Density[2]		LOS		Density[2]		LOS	
				AM	PM	AM	PM	AM	PM	AM	PM
I-215 Freeway	SB	North of Harley Knox Boulevard	3	13.4	20.5	B	C	20.9	30.7	C	D
		South of Harley Knox Boulevard	3	11.4	18.1	B	C	15.4	27.5	B	D
	NB	North of Harley Knox Boulevard	3	22.0	17.1	C	B	31.9	25.9	D	C
		South of Harley Knox Boulevard	3	19.6	14.6	C	B	28.7	18.8	D	C

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

Table 7-4

Freeway Ramp Junction Merge/Diverge Analysis for EAPC (2017) Conditions

Freeway	Direction	Ramp or Segment	Lanes on Freeway[1]	Existing (2015)				EAPC (2017)			
				AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
				Density[2]	LOS	Density[2]	LOS	Density[2]	LOS	Density[2]	LOS
I-215 Freeway	SB	Off-Ramp at Harley Knox Boulevard	3	20.2	C	27.5	C	29.2	D	34.7	D
		On-Ramp at Harley Knox Boulevard	3	15.1	B	21.5	C	19.3	B	30.0	D
	NB	On-Ramp at Harley Knox Boulevard	3	25.8	C	21.9	C	33.2	D	31.3	D
		Off-Ramp at Harley Knox Boulevard	3	25.1	C	20.0	B	32.0	D	24.5	C

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

EXHIBIT 7-3: EAPC (2017) FREEWAY MAINLINE VOLUMES (ACTUAL VEHICLES)

7.8 EAPC Deficiencies and Recommended Improvements

7.8.1 Recommended Improvements to Address Deficiencies at Intersections

Improvement strategies have been recommended at intersections that have been identified as deficient in an effort to reduce each location's peak hour delay and improve the associated LOS grade to an acceptable LOS (LOS D or better). The effectiveness of the recommended improvement strategies discussed below to address EAPC traffic deficiencies is presented in Table 7-5.

The applicant shall participate in the funding of off-site improvements, including traffic signals that are needed to serve cumulative traffic conditions through the payment of TUMF or County of Riverside DIF fees (if the improvements are included in the TUMF or DIF programs) or on a fair share basis (if the improvements are not included in the TUMF or DIF programs). These fees shall be collected by the County of Riverside, with the proceeds solely used as part of a funding mechanism aimed at ensuring that regional highways and arterial expansions keep pace with the projected population increases.

Worksheets for EAPC conditions, with improvements, HCM calculation worksheets are provided in Appendix 7.6.

7.8.2 Recommended Improvements to Address Off-Ramp Queues

With the implementation of the recommended intersection improvements shown on Table 7-5, which are necessary to reduce near-term cumulative impacts to less than significant levels, there are no potential queuing issues anticipated for EAPC traffic conditions (see Table 7-6). As such, no spill-back onto the I-215 Freeway Southbound mainline is anticipated. Worksheets for EAPC conditions, with improvements, queuing analysis is provided in Appendix 7.7.

Table 7-5

Intersection Analysis for EAPC (2017) Conditions With Improvements

#	Intersection	Traffic Control[3]	Intersection Approach Lanes[1]												Delay[2] (secs.)		Level of Service	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
8	Harvill Av. / Harley Knox Bl.																	
	- Without Improvements	TS	1	1	2	1	2	0	2	2	1	2	2	1	**104.4**	**183.7**	**F**	**F**
	- With Improvements	TS	1	1	**2>**	1	2	0	2	2	1	2	2	1	30.4	25.4	C	C
10	I-215 SB Ramps / Harley Knox Bl.																	
	- Without Improvements	TS	0	0	0	0	1	1	0	2	d	1	2	0	**168.2**	**107.3**	**F**	**F**
	- With Improvements	TS	0	0	0	**1**	1	**0**	0	2	d	**2**	2	0	36.8	45.7	D	D
11	I-215 NB Ramps / Harley Knox Bl.																	
	- Without Improvements	TS	0	1	1	0	0	0	1	2	0	0	2	d	36.8	**179.8**	D	**F**
	- With Improvements	TS	0	1	1	0	0	0	**2**	2	0	0	2	**1>>**	13.8	30.4	B	C

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right; > = Right-Turn Overlap Phasing; >> = Free Right Turn Lane; d = Defacto Right Turn Lane; **1** = Improvement

[2] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[3] TS = Traffic Signal

Table 7-6

Peak Hour Freeway Off-Ramp Queuing Summary for EAPC (2017) Conditions With Improvements

Intersection	Movement	Available Stacking Distance (Feet)	EAPC (2017) Without Improvements				EAPC (2017) With Improvements			
			95th Percentile Queue (Feet)[2]		Acceptable? [1]		95th Percentile Queue (Feet)[2]		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Harley Knox Bl.	SBL/T	1,330	**1,910** [3]	1,014 [3]	**No**	Yes	845 [3]	599	Yes	Yes
	SBR	270	102	145	Yes	Yes	708	445	Yes[4]	Yes[4]
I-215 NB Off-Ramp / Harley Knox Bl.	NBL/T	1,120	52	73	Yes	Yes	52	65	Yes	Yes
	NBR	265	246 [3]	126	Yes	Yes	246 [3]	140	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] Maximum queue length for the approach reported.

[3] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[4] Adjacent left turn lane has sufficient storage to accommodate any spillover from the southbound shared through-right turn lane without spilling back and affecting the I-215 Freeway mainline.

8 HORIZON YEAR (2035) TRAFFIC CONDITIONS

This section discusses the methods used to develop Horizon Year (2035) Without and With Project traffic forecasts, and the resulting intersection operations, traffic signal warrant, and freeway mainline operations analyses.

8.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for Horizon Year conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for Horizon Year conditions only (e.g., intersection and roadway improvements along the Project's frontage and driveways).
- Driveways and those facilities assumed to be constructed by cumulative developments to provide site access are also assumed to be in place for Horizon Year conditions only (e.g., intersection and roadway improvements along the cumulative development's frontages and driveways).
- The extension of Decker Road to the north of Oleander Avenue.
- Other parallel facilities, that although not evaluated for the purposes of this analysis, are anticipated to be in place for Horizon Year traffic conditions and would affect the travel patterns within the study area (e.g., Nandina Avenue, Markham Street, Day Street, etc.).

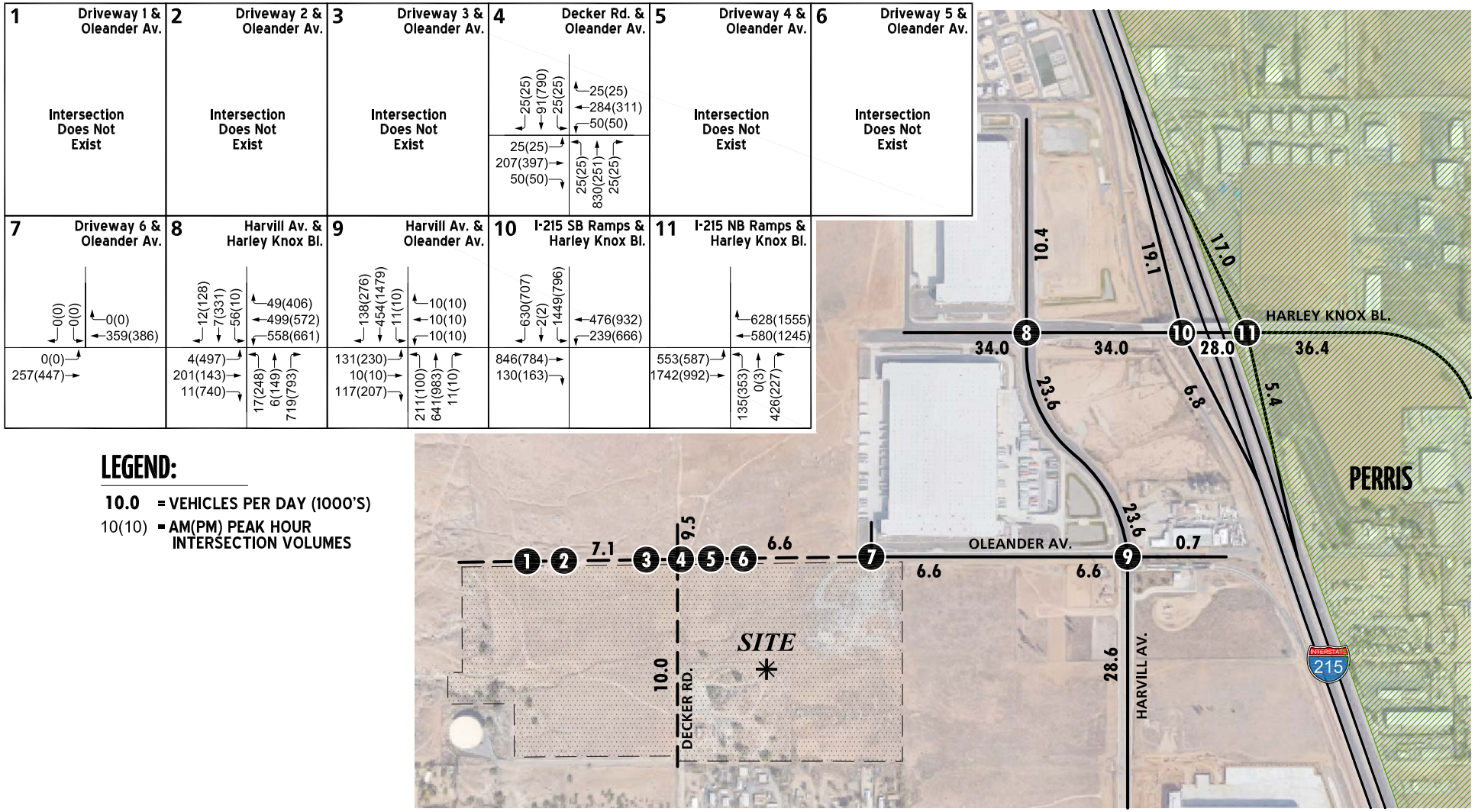
8.2 HORIZON YEAR (2035) WITHOUT PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes the refined post-processed volumes obtained from the RivTAM. For additional information on the development of the Horizon Year Without Project traffic forecasts, see Section 4.8 *Horizon Year (2035) Volume Development* of this TIA. The weekday ADT and weekday AM and PM peak hour volumes which can be expected for Horizon Year Without Project traffic conditions are shown on Exhibit 8-1.

8.3 HORIZON YEAR (2035) WITH PROJECT TRAFFIC VOLUME FORECASTS

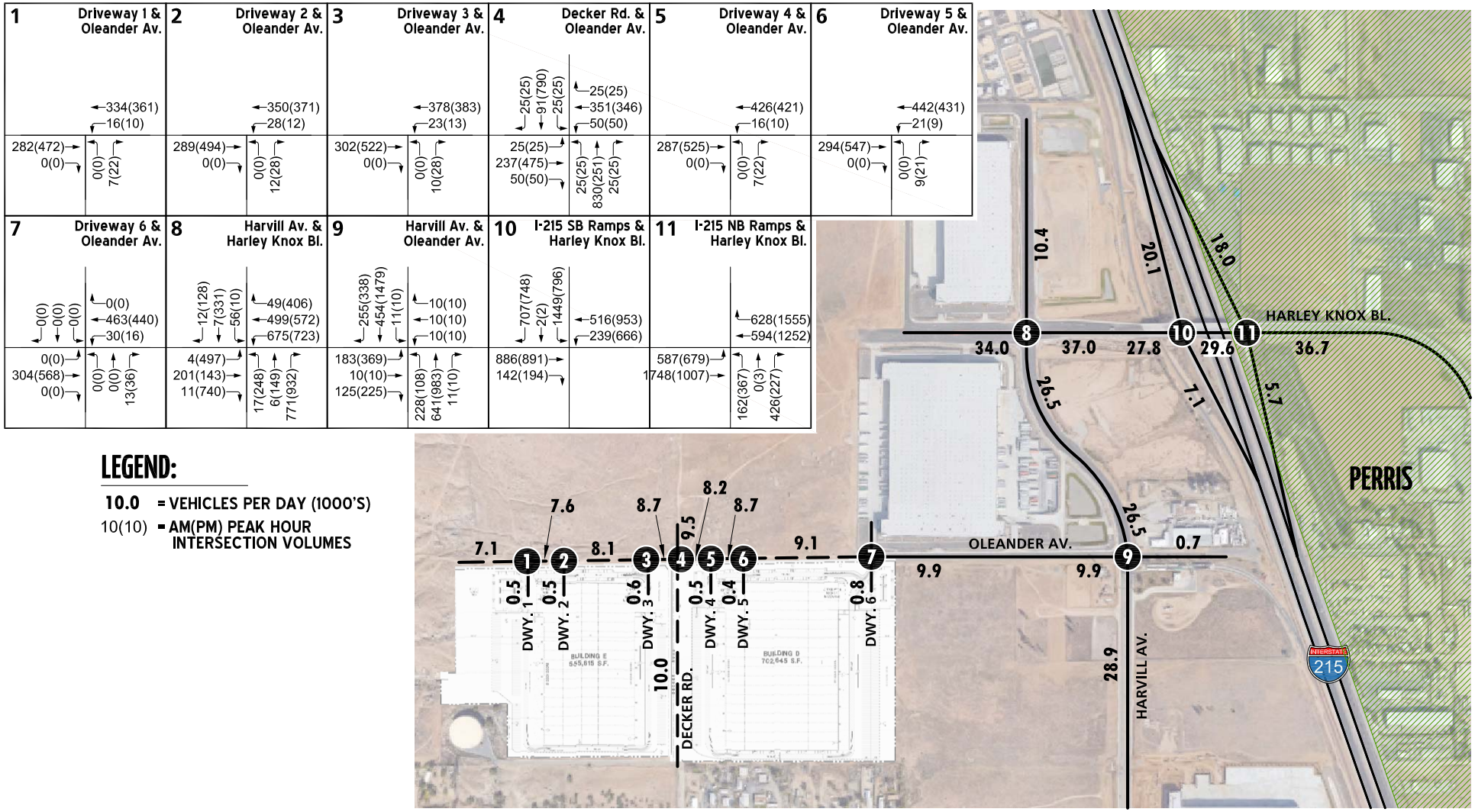
This scenario includes the refined post-processed volumes obtained from the RivTAM, plus Project traffic. The weekday ADT and weekday AM and PM peak hour volumes which can be expected for Horizon Year With Project traffic conditions are shown on Exhibit 8-2.

EXHIBIT 8-1: HORIZON YEAR (2035) WITHOUT PROJECT TRAFFIC VOLUMES



URBAN CROSSROADS

EXHIBIT 8-2: HORIZON YEAR (2035) WITH PROJECT TRAFFIC VOLUMES



8.4 INTERSECTION OPERATIONS ANALYSIS

8.4.1 HORIZON YEAR WITHOUT PROJECT TRAFFIC CONDITIONS

LOS calculations were conducted for the study intersections to evaluate their operations under Horizon Year Without Project conditions with roadway and intersection geometrics consistent with Section 8.1 *Roadway Improvements*. As shown in Table 8-1, the study area intersections are anticipated to operate at acceptable levels of service, with the exception of the following locations:

ID	Intersection Location
4	Decker Road / Oleander Avenue – LOS F AM and PM peak hours
8	Harvill Avenue / Harley Knox Boulevard – LOS F PM peak hour only
10	I-215 Southbound Ramps / Harley Knox Boulevard – LOS F AM and PM peak hours
11	I-215 Northbound Ramps / Harley Knox Boulevard – LOS E AM peak hour; LOS F PM peak hour

A summary of the peak hour intersection LOS for Horizon Year Without Project conditions are shown on Exhibit 8-3. The intersection operations analysis worksheets for Horizon Year Without Project traffic conditions are included in Appendix 8.1 of this TIA.

8.4.2 HORIZON YEAR WITH PROJECT TRAFFIC CONDITIONS

As shown on Table 8-1 and illustrated on Exhibit 8-4, there are no additional study area intersections anticipated to experience unacceptable LOS (LOS E or worse) with the addition of Project traffic during one or more peak hours in addition to those previously identified under Horizon Year Without Project conditions. However, the Project's contribution to the deficient intersections identified above are significant cumulative impacts as the Project is anticipated to contribute 50 or more peak hour trips. The intersection operations analysis worksheets for Horiozn Year With Project traffic conditions are included in Appendix 8.2 of this TIA. Measures to address long range deficiencies for Long Range traffic conditions are discussed in Section 8.9 *Horiozn Year Deficiencies and Recommended Improvements.*

8.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

The following study area intersection is anticipated to warrant a traffic signal for Horizon Year Without Project traffic conditions (see Appendix 8.3):

ID	Intersection Location
4	Decker Road / Oleander Avenue

There are no additional intersections anticipated to warrant a traffic signal under Horizon Year With Project traffic conditions, in addition to those identified under Horizon Year Without Project conditions (see Appendix 8.4).

Table 8-1

Intersection Analysis for Horizon Year (2035) Conditions

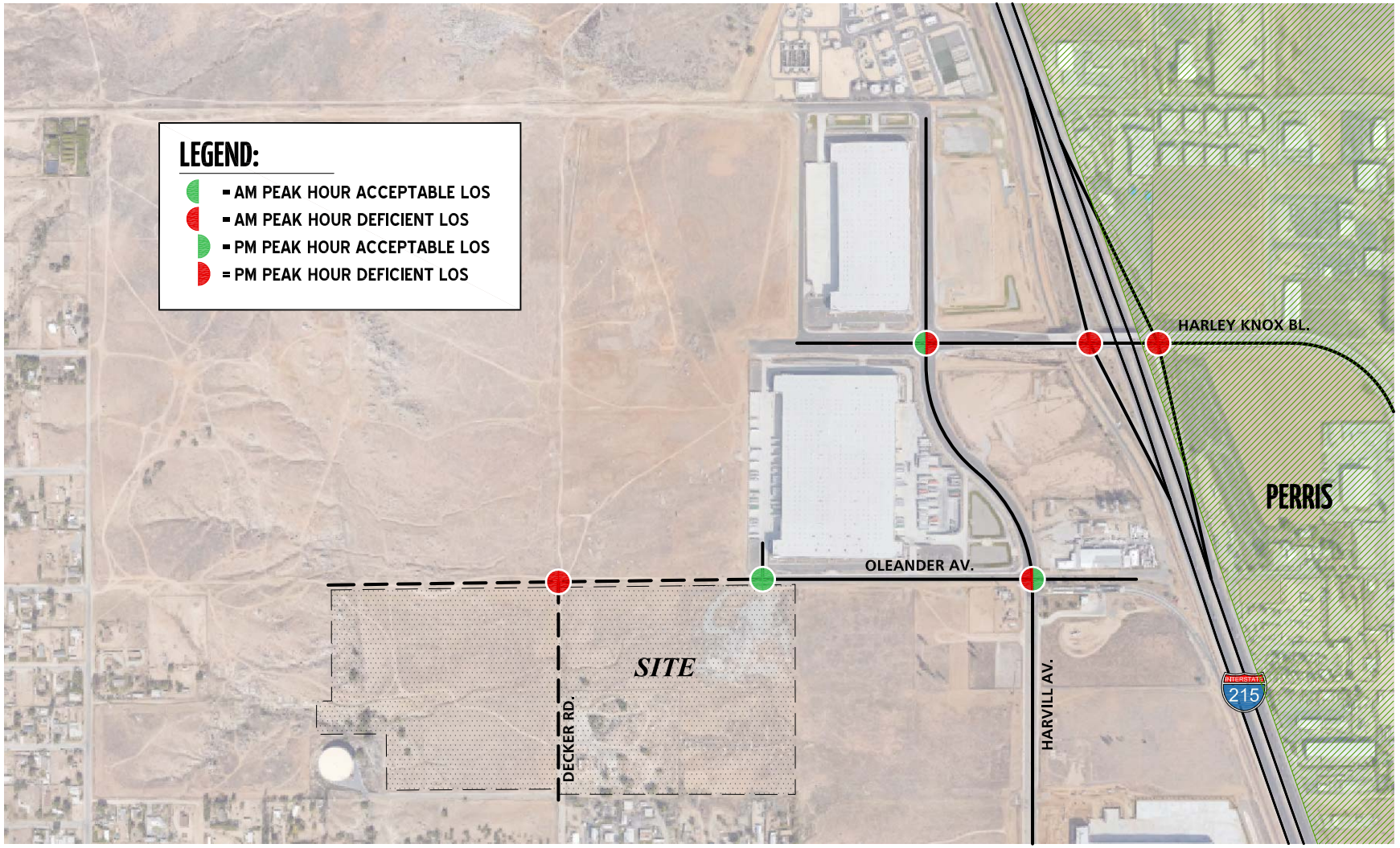
#	Intersection	Traffic Control[3]	2035 Without Project				2035 With Project				Acceptable LOS
			Delay[2] (secs.)		Level of Service		Delay[2] (secs.)		Level of Service		
			AM	PM	AM	PM	AM	PM	AM	PM	
1	Dwy. 1 / Oleander Av.	**CSS**	Future Intersection				9.9	11.7	A	B	C
2	Dwy. 2 / Oleander Av.	**CSS**	Future Intersection				10.0	12.0	B	B	C
3	Dwy. 3 / Oleander Av.	**CSS**	Future Intersection				10.1	12.2	B	B	C
4	Decker Rd. / Oleander Av.	**CSS**	**>100.0**	**>100.0**	**F**	**F**	**>100.0**	**>100.0**	**F**	**F**	D
5	Dwy. 4 / Oleander Av.	**CSS**	Future Intersection				10.0	12.2	B	B	C
6	Dwy. 5 / Oleander Av.	**CSS**	Future Intersection				10.0	12.4	B	B	C
7	Dwy. 6 / Oleander Av.	CSS	0.0	0.0	A	A	11.1	16.6	B	C	C
8	Harvill Av. / Harley Knox Bl.	TS	22.7	**177.4**	C	**F**	**113.6**	**181.9**	**F**	**F**	D
9	Harvill Av. / Oleander Av.	TS	24.9	25.9	C	C	29.8	41.4	C	D	D
10	I-215 SB Ramps / Harley Knox Bl.	TS	**140.0**	**119.4**	**F**	**F**	**156.4**	**139.1**	**F**	**F**	D
11	I-215 NB Ramps / Harley Knox Bl.	TS	**60.8**	**>200.0**	**E**	**F**	**67.5**	**>200.0**	**E**	**F**	D

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

[2] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

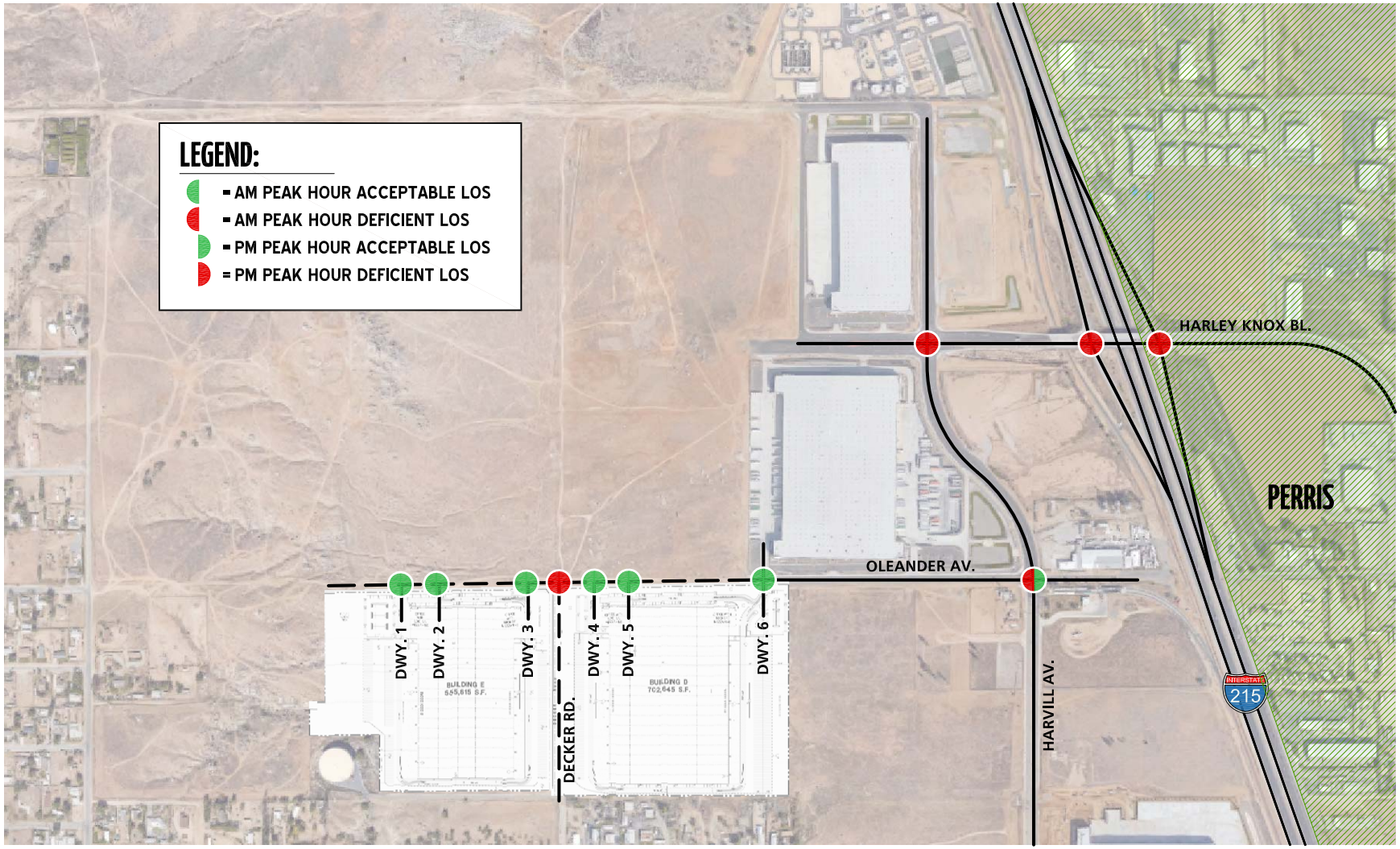
[3] CSS = Cross-street Stop; TS = Traffic Signal; **CSS** = Improvement

EXHIBIT 8-3: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS



URBAN CROSSROADS

EXHIBIT 8-4: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR HORIZON YEAR (2035) WITH PROJECT CONDITIONS



URBAN CROSSROADS

8.6 OFF-RAMP QUEUING ANALYSIS

8.6.1 HORIZON YEAR WITHOUT PROJECT TRAFFIC CONDITIONS

A queuing analysis was performed for the off-ramps at the I-215 Freeway and Harley Knox Boulevard interchange to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 8-2 for Horizon Year Without and With Project traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline.

As shown on Table 8-2, the following movements may potentially experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for Horizon Year Without Project traffic conditions:

ID	Intersection Location
10	I-215 SB Ramps / Harley Knox Boulevard – Southbound shared left-through lane (AM peak hour only)
11	I-215 NB Ramps / Harley Knox Boulevard – Southbound right turn lane (AM and PM peak hours)

The 95th percentile queues for Horizon Year Without Project traffic conditions indicates potential queuing for the movements and peak hours identified above. As shown, the analysis indicates that potential queues would exceed the length of the off-ramp and could potentially spillback into the adjacent through lanes on the freeway mainline during the AM and PM peak hours. Worksheets for Horizon Year Without Project conditions off-ramp queuing analysis are provided in Appendix 8.5.

8.6.2 HORIZON YEAR WITH PROJECT TRAFFIC CONDITIONS

As shown on Table 8-2, there are no additional off-ramps anticipated to experience queues that exceed the 95th percentile with the addition of Project traffic, in addition to those previously identified under Horizon Year Without Project conditions. However, the Project's contribution to the potential queuing issues at the locations identified above are significant cumulative impacts as the Project is anticipated to contribute 50 or more peak hour trips. Worksheets for Horiozn Year With Project conditions off-ramp queuing analysis are provided in Appendix 8.6.

8.7 BASIC FREEWAY SEGMENT ANALYSIS

8.7.1 HORIZON YEAR WITHOUT PROJECT TRAFFIC CONDITIONS

Horizon Year Without Project mainline directional volumes for the weekday AM and PM peak hours are provided on Exhibit 8-5. As shown on Table 8-3, all of the freeway segments analyzed for this study are anticipated to operate at an unacceptable LOS (i.e., LOS E or worse) during the peak hours. Horizon Year Without Project basic freeway segment analysis worksheets are provided in Appendix 8.7.

Table 8-2

Peak Hour Freeway Off-Ramp Queuing Summary for Horizon Year (2035) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	2035 Without Project				2035 With Project			
			95th Percentile Queue (Feet)[2]		Acceptable? [1]		95th Percentile Queue (Feet)[2]		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Harley Knox Bl.	SBL/T	1,330	**1,903** [3]	1,020 [3]	**No**	Yes	**1,903** [3]	1,020 [3]	**No**	Yes
	SBR	270	**361**	**771** [3]	**No**	**No**	**464**	**852** [3]	**No**	**No**
I-215 NB Off-Ramp / Harley Knox Bl.	NBL/T	1,120	151	640 [3]	Yes	Yes	146	668 [3]	Yes	Yes
	NBR	265	481 [3]	146	Yes[4]	Yes	414 [3]	150	Yes[4]	Yes

[*] **BOLD** = 95th percentile queue is anticipated to exceed available storage.

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] Maximum queue length for the approach reported.

[3] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[4] Adjacent through lane has sufficient storage to accommodate any spillover from the northbound right turn lane without spilling back and affecting the I-215 Freeway mainline.

Table 8-3

Basic Freeway Segment Analysis for Horizon Year (2035) Conditions

Freeway	Direction	Mainline Segment	Lanes[1]	2035 Without Project				2035 With Project			
				Density[2]		LOS		Density[2]		LOS	
				AM	PM	AM	PM	AM	PM	AM	PM
I-215 Freeway	SB	North of Harley Knox Boulevard	3	**53.5**	**51.5**	**F**	**F**	**54.5**	**52.0**	**F**	**F**
		South of Harley Knox Boulevard	3	29.7	**41.2**	D	**E**	29.8	**41.5**	D	**E**
	NB	North of Harley Knox Boulevard	3	**51.4**	**53.7**	**F**	**F**	**51.8**	**55.0**	**F**	**F**
		South of Harley Knox Boulevard	3	**41.5**	30.8	**E**	D	**41.8**	31.2	**E**	D

* **BOLD** = Unacceptable Level of Service

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

EXHIBIT 8-5: HORIZON YEAR (2035) WITHOUT PROJECT FREEWAY MAINLINE VOLUMES (ACTUAL VEHICLES)

8.7.2 HORIZON YEAR WITH PROJECT TRAFFIC CONDITIONS

Horizon Year With Project mainline directional volumes for the weekday AM and PM peak hours are provided on Exhibit 8-6. As shown on Table 8-3, there are no additional freeway segments anticipated to operate at an unacceptable LOS with the addition of Project traffic, in addition to those previously identified under Horizon Year Without Project conditions. However, the Project's contribution to the deficient basic freeway segments identified above are significant cumulative impacts as the Project is anticipated to contribute 50 or more peak hour trips. Worksheets for Horizon Year With Project conditions basic freeway segment analysis worksheets are provided in Appendix 8.8.

8.8 FREEWAY MERGE/DIVERGE ANALYSIS

8.8.1 HORIZON YEAR (2035) WITHOUT PROJECT TRAFFIC CONDITIONS

Ramp merge and diverge operations were also evaluated for Horizon Year Without Project conditions and the results of this analysis are presented in Table 8-4. As shown in Table 8-4, all of the study area freeway merge and diverge ramp junctions are anticipated to operate at deficient LOS (i.e., LOS E or worse). Horizon Year Without Project freeway ramp junction operations analysis worksheets are provided in Appendix 8.9.

8.8.2 HORIZON YEAR (2035) WITH PROJECT TRAFFIC CONDITIONS

As shown on Table 8-4, there are no additional freeway merge/diverge ramp junctions anticipated to operate at an unacceptable LOS with the addition of Project traffic, in addition to those previously identified under Horizon Year Without Project conditions. However, the Project's contribution to the deficient freeway merge/diverge ramp junctions identified previously are significant cumulative impacts as the Project is anticipated to contribute 50 or more peak hour trips. Worksheets for Horizon Year With Project conditions freeway ramp junction operations analysis worksheets are provided in Appendix 8.10.

8.9 HORIZON YEAR DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

8.9.1 RECOMMENDED IMPROVEMENTS TO ADDRESS DEFICIENCIES AT INTERSECTIONS

Improvement strategies have been recommended at intersections that have been identified as deficient in an effort to reduce each location's peak hour delay and improve the associated LOS grade to an acceptable LOS (LOS D or better). The effectiveness of the recommended improvement strategies discussed below to address Horizon Year traffic deficiencies is presented in Table 8-5.

The applicant shall participate in the funding of off-site improvements, including traffic signals that are needed to serve cumulative traffic conditions through the payment of TUMF and County of Riverside DIF fees (if the improvements are included in the TUMF or DIF programs) or on a fair share basis (if the improvements are not included in the TUMF or DIF programs). These fees shall be collected by the County of Riverside, with the proceeds solely used as part

EXHIBIT 8-6: HORIZON YEAR (2035) WITH PROJECT FREEWAY MAINLINE VOLUMES (ACTUAL VEHICLES)

Table 8-4

Freeway Ramp Junction Merge/Diverge Analysis
for Horizon Year (2035) Conditions

Freeway	Direction	Ramp or Segment	Lanes on Freeway[1]	2035 Without Project				2035 With Project			
				AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
				Density[2]	LOS	Density[2]	LOS	Density[2]	LOS	Density[2]	LOS
I-215 Freeway	SB	Off-Ramp at Harley Knox Boulevard	3	**45.7**	**F**	**44.7**	**F**	**46.2**	**F**	**45.0**	**F**
		On-Ramp at Harley Knox Boulevard	3	31.4	D	**38.0**	**E**	31.4	D	**38.2**	**E**
	NB	On-Ramp at Harley Knox Boulevard	3	**41.6**	**F**	**45.4**	**F**	**41.8**	**F**	**45.9**	**F**
		Off-Ramp at Harley Knox Boulevard	3	**38.1**	**E**	33.6	D	**38.3**	**E**	33.7	D

* **BOLD** = Unacceptable Level of Service

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

Table 8-5

Intersection Analysis for Horizon Year (2035) Conditions With Improvements

#	Intersection	Traffic Control[3]	Intersection Approach Lanes[1]												Delay[2] (secs.)		Level of Service	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
4	Decker Rd. / Oleander Av.																	
	- Without Project	**TS**	0	**1**	0	0	**1**	0	**1**	**1**	0	**1**	**1**	0	26.3	35.6	C	D
	- With Project	**TS**	0	**1**	0	0	**1**	0	**1**	**1**	0	**1**	**1**	0	31.1	48.4	C	D
8	Harvill Av. / Harley Knox Bl.																	
	- Without Project	TS	1	1	**2>**	1	2	0	2	2	**1>**	2	2	1	22.0	45.0	C	D
	- With Project	TS	1	1	**2>**	1	2	0	2	2	**1>**	2	2	1	28.8	50.8	C	D
10	I-215 SB Ramps / Harley Knox Bl.																	
	- Without Project	TS	0	0	0	**2**	1	**0**	0	2	d	**2**	2	0	32.5	42.6	C	D
	- With Project	TS	0	0	0	**2**	1	**0**	0	2	d	**2**	2	0	34.7	43.8	C	D
11	I-215 NB Ramps / Harley Knox Bl.																	
	- Without Project	TS	0	1	1	0	0	0	**2**	2	0	0	2	**1>>**	17.6	28.2	B	C
	- With Project	TS	0	1	1	0	0	0	**2**	2	0	0	2	**1>>**	21.7	38.6	C	D

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right; > = Right-Turn Overlap Phasing; >> = Free Right Turn Lane; d= Defacto Right Turn Lane; **1** = Improvement

[2] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[3] TS = Traffic Signal

of a funding mechanism aimed at ensuring that regional highways and arterial expansions keep pace with the projected population increases. There are no other applicable pre-existing funding programs for the study area aside from TUMF and DIF.

Worksheets for Horizon Year Without and With Project conditions, with improvements, HCM calculation worksheets are provided in Appendix 8.11 and Appendix 8.12.

8.9.2 RECOMMENDED IMPROVEMENTS TO ADDRESS OFF-RAMP QUEUES

The 95th percentile queues for Horizon Year Without and With Project traffic conditions, with improvements, are shown on Table 8-6. Table 8-6 indicates there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for Horizon Year traffic conditions, with the improvements identified previously in Table 8-5. Worksheets for Horizon Year Without and With Project conditions off-ramp queuing analysis, with improvements, are provided in Appendix 8.13 and Appendix 8.14.

8.9.3 RECOMMENDED IMPROVEMENTS TO ADDRESS DEFICIENCIES ON FREEWAY FACILITIES

The Project Study Report/Project Development Support in Riverside County on I-215 and SR-60 between Nuevo Road (I-215) & I-215/SR-60 Junction and Box Springs Road (I-215) & Day Street (SR-60) (prepared by Caltrans in April 2008), also known as the I-215 North Project, includes the construction of an high-occupancy vehicle lane in each direction of the I-215 Freeway between Nuevo Road and Box Springs Road within the existing median. Based on information provided on the Project website, these improvements are longer range as priority has been given to the I-215 South and I-215 Central projects. (12)

Caltrans typically assumes a reduction of fourteen (14) percent to the I-215 Freeway mainline through volumes in this region to account for vehicles utilizing the carpool (high-occupancy vehicle) lanes. Although the reduction to I-215 Freeway mainline volumes has been applied to account for the proposed carpool lanes, the analysis is performed assuming the same number of mixed-flow lanes and on and off-ramp configurations as existing baseline conditions.

As shown on Table 8-7, all of the freeway mainline segments are anticipated to operate at an acceptable LOS with the construction of a carpool lane in both directions of travel (i.e., LOS D or better), with the exception of the following:

ID	Freeway Mainline Segments
1	I-215 Freeway – Southbound, North of Harley Knox Boulevard – LOS E AM and PM peak hours
3	I-215 Freeway – Northbound, North of Harley Knox Boulevard – LOS E AM and PM peak hours

Similarly, Table 8-8 shows that the I-215 Freeway ramp junctions are anticipated to operate at an acceptable LOS with the improvements discussed above (i.e., LOS D or better), with the exception of the following freeway ramp junctions:

ID	Freeway Merge/Diverge Ramp Junctions
1	I-215 Freeway – Southbound, Off-Ramp at Harley Knox Boulevard – LOS F AM peak hour; LOS E PM peak hour
3	I-215 Freeway – Northbound, On-Ramp at Harley Knox Boulevard – LOS E AM and PM peak hours

Table 8-6

Peak Hour Freeway Off-Ramp Queuing Summary for Horizon Year (2035) Conditions With Improvements

Intersection	Movement	Available Stacking Distance (Feet)	2035 Without Project With Improvements				2035 With Project With Improvements			
			95th Percentile Queue (Feet)[2]		Acceptable?[1]		95th Percentile Queue (Feet)[2]		Acceptable?[1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Harley Knox Bl.	SBL/T	1,330	511	317	Yes	Yes	608	317	Yes	Yes
	SBR	270	363	775 [3]	Yes[4]	Yes[4]	504	857 [3]	Yes[4]	Yes[4]
I-215 NB Off-Ramp / Harley Knox Bl.	NBL/T	1,120	151	449 [3]	Yes	Yes	134	476 [3]	Yes	Yes
	NBR	265	481 [3]	162	Yes[5]	Yes	321 [3]	166	Yes[5]	Yes

[*] **BOLD** = 95th percentile queue is anticipated to exceed available storage.

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] Maximum queue length for the approach reported.

[3] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[4] Adjacent left turn lane has sufficient storage to accommodate any spillover from the southbound shared through-right turn lane without spilling back and affecting the I-215 Freeway mainline.

[5] Adjacent through lane has sufficient storage to accommodate any spillover from the northbound right turn lane without spilling back and affecting the I-215 Freeway mainline.

Table 8-7

Basic Freeway Segment Analysis for Horizon Year (2035) Conditions With Improvements

Freeway	Direction	Mainline Segment	Lanes[1]	2035 Without Project				2035 With Project			
				Density[2]		LOS		Density[2]		LOS	
				AM	PM	AM	PM	AM	PM	AM	PM
I-215 Freeway	SB	North of Harley Knox Boulevard	3	**38.1**	**37.4**	**E**	**E**	**39.0**	**37.7**	**E**	**E**
		South of Harley Knox Boulevard	3	22.8	30.9	C	D	22.9	31.1	C	D
	NB	North of Harley Knox Boulevard	3	**37.4**	**38.6**	**E**	**E**	**37.6**	**39.2**	**E**	**E**
		South of Harley Knox Boulevard	3	31.2	23.6	D	C	31.3	23.7	D	C

* **BOLD** = Unacceptable Level of Service

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

Table 8-8

Freeway Ramp Junction Merge/Diverge Analysis
for Horizon Year (2035) Conditions With Improvements

Freeway	Direction	Ramp or Segment	Lanes on Freeway[1]	2035 Without Project				2035 With Project			
				AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
				Density[2]	LOS	Density[2]	LOS	Density[2]	LOS	Density[2]	LOS
I-215 Freeway	SB	Off-Ramp at Harley Knox Boulevard	3	**40.9**	**F**	**39.0**	**E**	**41.4**	**F**	**39.2**	**E**
		On-Ramp at Harley Knox Boulevard	3	26.6	C	33.6	D	26.6	C	33.8	D
	NB	On-Ramp at Harley Knox Boulevard	3	**37.3**	**E**	**40.9**	**E**	**37.4**	**E**	**41.4**	**E**
		Off-Ramp at Harley Knox Boulevard	3	33.8	D	29.2	D	33.9	D	29.3	D

* **BOLD** = Unacceptable Level of Service

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

Worksheets for Horizon Year Without and With Project conditions freeway mainline level of service analysis, with improvements, are provided in Appendix 8.15 and Appendix 8.16. Horizon Year Without and With Project freeway ramp junction level of service analysis worksheets, with improvements, are provided in Appendix 8.17 and Appendix 8.18.

9 REFERENCES

1. **Riverside County Transportation Department.** *Traffic Impact Analysis Preparation Guide.* County of Riverside : s.n., April 2008.
2. **California Department of Transportation.** *Guide for the Preparation of Traffic Impact Studies.* December 2002.
3. **Institute of Transportation Engineers.** *Trip Generation.* 9th Edition. 2012.
4. **Riverside County Transportation Commission.** *2011 Riverside County Congestion Management Program.* County of Riverside : RCTC, December 14, 2011.
5. **Southern California Association of Governments.** *2012 Regional Transportation Plan.* April 2012.
6. **Transportation Research Board.** *Highway Capacity Manual (HCM).* s.l. : National Academy of Sciences, 2000.
7. **Federal Highway Administration.** Manual on Uniform Traffic Control Devices (MUTCD). [book auth.] California Department of Transportation. *California Manual on Uniform Traffic Control Devices (CAMUTCD).* 2014.
8. **California Department of Transportation.** *Freeway Performance Measurement (PeMS).* [Online] [Cited: January 7, 2014.] http://pems.dot.ca.gov/.
9. **San Bernardino Associated Governments.** *Congestion Management Program for County of San Bernardino.* County of San Bernardino : s.n., Updated December 2007.
10. **South Coast Air Quality Managment District.** *Warehouse Truck Trip Study.* [Powerpoint Presentation] July 17, 2014.
11. **South Coast Air Quality Managment District (SCAQMD).** *Warehouse Truck Trip Study Data Results and Usage.* June 2014.
12. **Riverside County Transportation Commission (RCTC).** RCTC: I-215 North Project. *RCTC.* [Online] [Cited: May 22, 2015.] http://www.rctc.org/projects/interstate-215/i-215-north-project.

This Page Intentionally Left Blank

10 CERTIFICATION

The contents of this traffic impact analysis represent an accurate depiction of the traffic environment and impacts associated with the proposed Knox Business Park development. The information contained in this traffic impact analysis is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 336-5978.

ARIC EVATT, PTP
President
URBAN CROSSROADS, INC.
41 Corporate Park, Suite 300
Irvine, CA 92606
(949) 336-5978
aevatt@urbanxroads.com

EDUCATION

Bachelor of Science - Finance, Real Estate, and Law
California Polytechnic State University, Pomona • 1992

PROFESSIONAL REGISTRATIONS

PTP – Professional Transportation Planner • 2008 – Present

PROFESSIONAL AFFILIATIONS

ITE – Institute of Transportation Engineers

CHARLENE SO, PE
Senior Transportation Engineer
URBAN CROSSROADS, INC.
41 Corporate Park, Suite 300
Irvine, CA 92606
(949) 336-5982
cso@urbanxroads.com

EDUCATION

Bachelor of Science – Civil Engineering
University of California, Irvine • 2004

PROFESSIONAL REGISTRATIONS

TE – Professional Traffic Engineer, TR 2414 • 2006 – Present

PROFESSIONAL AFFILIATIONS

ITE – Institute of Transportation Engineers

This page intentionally left blank

APPENDIX 1.1:

APPROVED TRAFFIC STUDY SCOPING AGREEMENT

This Page Intentionally Left Blank

URBAN CROSSROADS

41 Corporate Park | Suite 300 | Irvine, CA 92606 | (949) 660-1994
www.urbanXroads.com

April 6, 2015

Mr. Kevin Tsang
COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT
4080 Lemon Street, 8th Floor
Riverside, CA 92501

SUBJECT: TRAFFIC IMPACT ANALYSIS SCOPING AGREEMENT FOR THE KNOX LOGISTICS CENTER PHASE II

Dear Mr. Kevin Tsang:

The firm of Urban Crossroads, Inc. is pleased to submit this scoping letter regarding the traffic impact analysis for the proposed Knox Logistics Center Phase II ("Project"), which is generally located east and west of Decker Road and south of Oleander Avenue in unincorporated County of Riverside. It is our understanding that the Project is to consist of up to 1,234,160 square feet (sf) of high-cube warehouse/distribution center divided over two buildings: Building D (692,990 SF) and Building E (541,170 SF).

A site plan for the proposed Project is shown on Exhibit 1. Exhibit 2 depicts the location of the proposed Project in relation to the existing roadway network and the study area intersections. It is anticipated that the Project would be developed within a single phase. The Project's opening year is anticipated to be 2017 (i.e., fully built and occupied). Access to the Project site will be provided via the following five driveways:

- Driveway 1 to Oleander Avenue is a full access driveway for trucks only.
- Driveway 2 to Oleander Avenue is a full access driveway for passenger cars only.
- Driveway 3 to Oleander Avenue is a full access driveway for both trucks and passenger cars.
- Driveway 4 to Oleander Avenue is a full access driveway for trucks only.
- Driveway 5 to Oleander Avenue is a full access driveway for both trucks and passenger cars.

TRIP GENERATION

Trip generation represents the amount of traffic that is attracted and produced by a development, and is based upon the specific land uses planned for a given project. Trip generation rates for the Project are shown in Table 1. The trip generation summary illustrating daily and peak hour trip generation estimates for the proposed Project by buildings are shown on Table 2 in passenger car equivalent (PCE) and on Table 3 for actual vehicles.

The trip generation rates used for this analysis are based upon information collected by the Institute of Transportation Engineers (ITE) as provided in their *Trip Generation* manual, 9th Edition, 2012. For

purposes of this analysis, ITE land use code 152 (High-Cube Warehousing) has been used to derive site specific trip generation estimates. As noted on Table 1, refinements to the raw trip generation estimates have been made to provide a more detailed breakdown of trips by vehicle mix. Total vehicle mix percentages were also obtained from the ITE *Trip Generation* manual in conjunction with the South Coast Air Quality Management District's (SCAQMD) recommended truck mix, by axle type. Finally, PCE factors were applied to the trip generation rates for heavy trucks (large 2-axles, 3-axles, 4+-axles). PCEs allow the typical "real-world" mix of vehicle types to be represented as a single, standardized unit, such as the passenger car, to be used for the purposes of capacity and level of service analyses. The PCE factors are consistent with the recommended PCE factors in Appendix "C" of the San Bernardino County Congestion Management Program (CMP), 2005 Update. Trip generation rates with PCE factors are also shown on Table 1.

As shown on Table 2, the proposed Project is anticipated to generate a net total of 3,253 PCE trip-ends per day with 191 PCE AM peak hour trips and 222 PCE PM peak hour trips. In comparison, as shown on Table 3, the proposed Project is anticipated to generate a net total of 2,073 actual trip-ends per day with 136 actual AM peak hour trips and 148 actual PM peak hour trips.

TRIP DISTRIBUTION

The Project trip distribution and assignment process represents the directional orientation of traffic to and from the Project site. The trip distribution pattern of passenger cars is heavily influenced by the geographical location of the site, the location of surrounding uses, and the proximity to the regional freeway system. The trip distribution pattern for truck traffic is also influenced by the local truck routes approved by the County of Riverside, the City of Perris, and the California Department of Transportation (Caltrans). Given these differences, separate trip distributions were generated for both passenger cars and truck trips.

The Project passenger car trip distribution pattern is graphically depicted on Exhibit 3. The Project truck trip distribution pattern is graphically depicted on Exhibit 4.

ANALYSIS SCENARIOS

Consistent with the County's TIA guidelines, intersection analysis will be provided for the following analysis scenarios:

- Existing (2015) Conditions
- Existing plus Project Conditions
- Existing plus Ambient Growth plus Project (E+A+P) Conditions
- Existing plus Ambient Growth plus Project Plus Cumulative (E+A+P+C) Conditions

- Horizon Year (2035) without Project Conditions
- Horizon Year (2035) with Project Conditions

All study area intersections will be analyzed using the SYNCHRO (Version 8.0) software using the HCM 2010 methodology.

In addition, the traffic impact analysis will include Basic Freeway Segment, Ramp Junction (Merge/Diverge), and off-ramp queuing analyses consistent with Caltrans requirements.

SPECIAL ISSUES

The following special issues will be addressed in the traffic study:

- Truck turning templates will be used to address how Project truck traffic (e.g., large trucks such as a WB-67) would enter and exit the Project site.
- Provide a queuing analysis for the Project driveways and site adjacent signalized intersections to determine necessary storage lengths.

OPEN ITEMS - CUMULATIVE DEVELOPMENT PROJECTS

Exhibit 5 illustrates a cumulative development location map. A summary of the cumulative development projects are shown on Table 4. It is requested that the County provide land use and intensity information for any additional cumulative development projects.

CONCLUSION

Urban Crossroads, Inc. is pleased to submit this letter documenting the Project trip generation, trip distribution, and the recommended intersection analysis locations for the Knox Logistics Center Phase II Traffic Impact Study. We will continue to move forward towards completing the traffic study after receiving jurisdiction approval or comments finalizing the study area.

If you have any questions, please contact me directly at (949) 660-1994, extension 204.

Respectfully submitted,

URBAN CROSSROADS, INC.

Aric Evatt, PTP
Principal

Charlene So, PE
Senior Transportation Engineer

Attachments

EXHIBIT B

SCOPING AGREEMENT FOR TRAFFIC IMPACT STUDY

This letter acknowledges the Riverside County Transportation Department requirements for traffic impact analysis of the following project. The analysis must follow the Riverside County Transportation Department Traffic Study Guidelines dated April 2008.

Case No.
Related Cases-
SP No.
EIR No.
GPA No.
CZ No.
Project Name: Knox Logistics Center Phase II
Project Address: East and West of Decker Road, South of Oleander Avenue
Project Description: 1,234,160 square feet of high-cube warehouse/distribution center uses, divided over two buildings: Building D (692,990 SF) and Building E (541,170 SF).

	Consultant	Developer
Name:	Urban Crossroads Inc. - Aric Evatt	Trammell Crow Company
Address:	41 Corporate Park, Suite 300	3501 Jamboree Road, Suite 130
	Irvine, CA 92606	Newport Beach, CA 92660
Telephone:	(949) 660-1994 ext. 204	(949) 477-4719
Fax:	(949) 660-1911	(949) 477-9107

A. Trip Generation Source: ITE 9th Edition (2012) (See Table 1)

Current GP Land Use	Business Park		Proposed Land Use	High-Cube Warehousing	
Current Zoning	(R-R), (M-M), (I-P)		Proposed Zoning	Industrial Park (I-P)	

	Current Trip Generation			Proposed Trip Generation (PCE)		
	In	Out	Total	In	Out	Total
AM Trips	**0**	**0**	**0**	**132**	**59**	**191**
PM Trips	**0**	**0**	**0**	**69**	**153**	**222**

Internal Trip Allowance ☐ Yes ■ No (% Trip Discount)
Pass-By Trip Allowance ☐ Yes ■ No (% Trip Discount)

A passby trip discount of 25% is allowed for appropriate land uses. The passby trips at adjacent study area intersections and project driveways shall be indicated on a report figure.

B. Trip Geographic Distribution: (See attached Exhibits 3 & 4 for detailed assignment)

N **Varies** % S **Varies** % E **Varies** % W **Varies** %

C. Background Traffic

Project Build-out Year: 2017 Annual Ambient Growth Rate: 2 %
Phase Year(s) 2017

Other area Projects to be analyzed: County to provide list of cumulative projects
Model/Forecast Methodology: Riverside County Transportation Analysis Model (RivTAM)

D. Study Intersections: *(NOTE: Subject to revision after other projects, trip generation and distribution are determined, or comments form other agencies).* (See Exhibit 2)

1. Driveway 1 / Oleander Avenue
2. Driveway 2 / Oleander Avenue
3. Driveway 3 / Oleander Avenue
4. Decker Road / Oleander Avenue
5. Driveway 4 / Oleander Avenue
6. Driveway 5 / Oleander Avenue
7. Harvill Avenue / Harley Knox Boulevard
8. Harvill Avenue / Oleander Avenue
9. I-215 SB Ramps / Harley Knox Boulevard
10. I-215 NB Ramps / Harley Knox Boulevard
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.
23.
24.
25.
26.
27.
28.
29.
30.

E. Study Roadway Segments: *(NOTE: Subject to revision after other projects, trip generation and distribution are determined, or comments form other agencies).*

1. _____ 2. _____

F. Other Jurisdictional Impacts

Is this project within a City's Sphere of influence or one mile radius of City boundaries? ■ Yes ☐ No

If so, name of City jurisdiction: Perris

G. Site Plan (please attach reduced copy)

H. Specific issues to be addressed in the Study (in addition to the standard analysis described in the Guideline) (To be filled out by Transportation Department)
(NOTE: If the traffic study states that "a traffic signal is warranted" (or "a traffic signal appears to be warranted", or similar statement) at an existing unsignalized intersection under existing conditions, 8-hour approach traffic volume information must be submitted in addition to the peak hourly turning movement counts for that intersection.

truck turning template at Project driveways, turn pocket lengths at Project driveways

I. Existing Conditions
Traffic count data must be new or recent. Provide traffic count dates if using other than new counts.
Date of counts _____

***NOTE* Traffic Study Submittal Form and appropriate fee must be submitted with, or prior to submittal of this form. Transportation Department staff will not process the Scoping Agreement prior to receipt of the fee.**

Recommended by:

3/30/2015
Consultant's Representative — Date

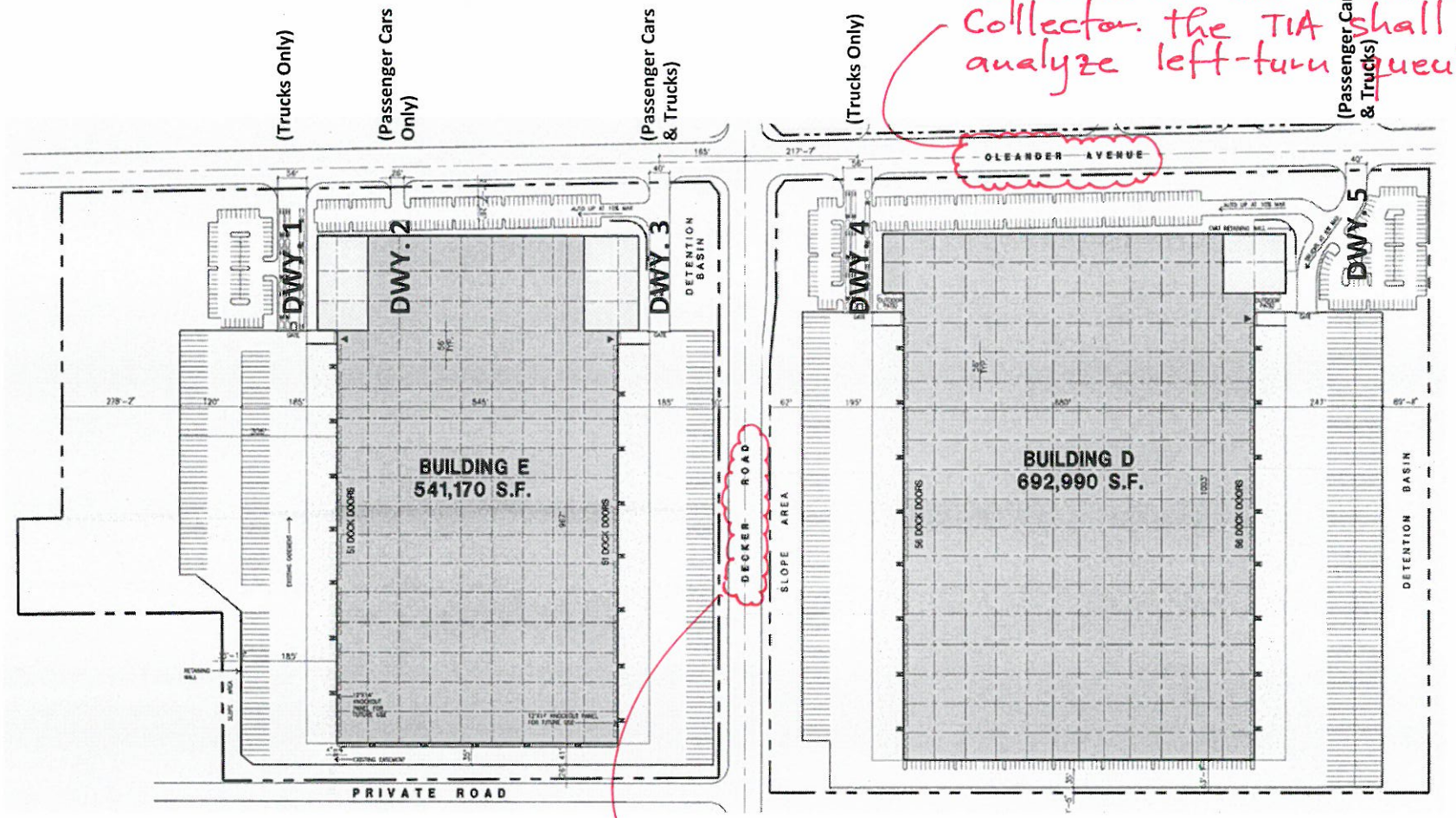
Approved Scoping Agreement:

04/09/2015
Riverside County Transportation Department — Date

Scoping Agreement Revised on _____

NOTE: If secondary access is required by Fire Dept. the TIA will need to be re-scoped.

EXHIBIT 1: PRELIMINARY SITE PLAN

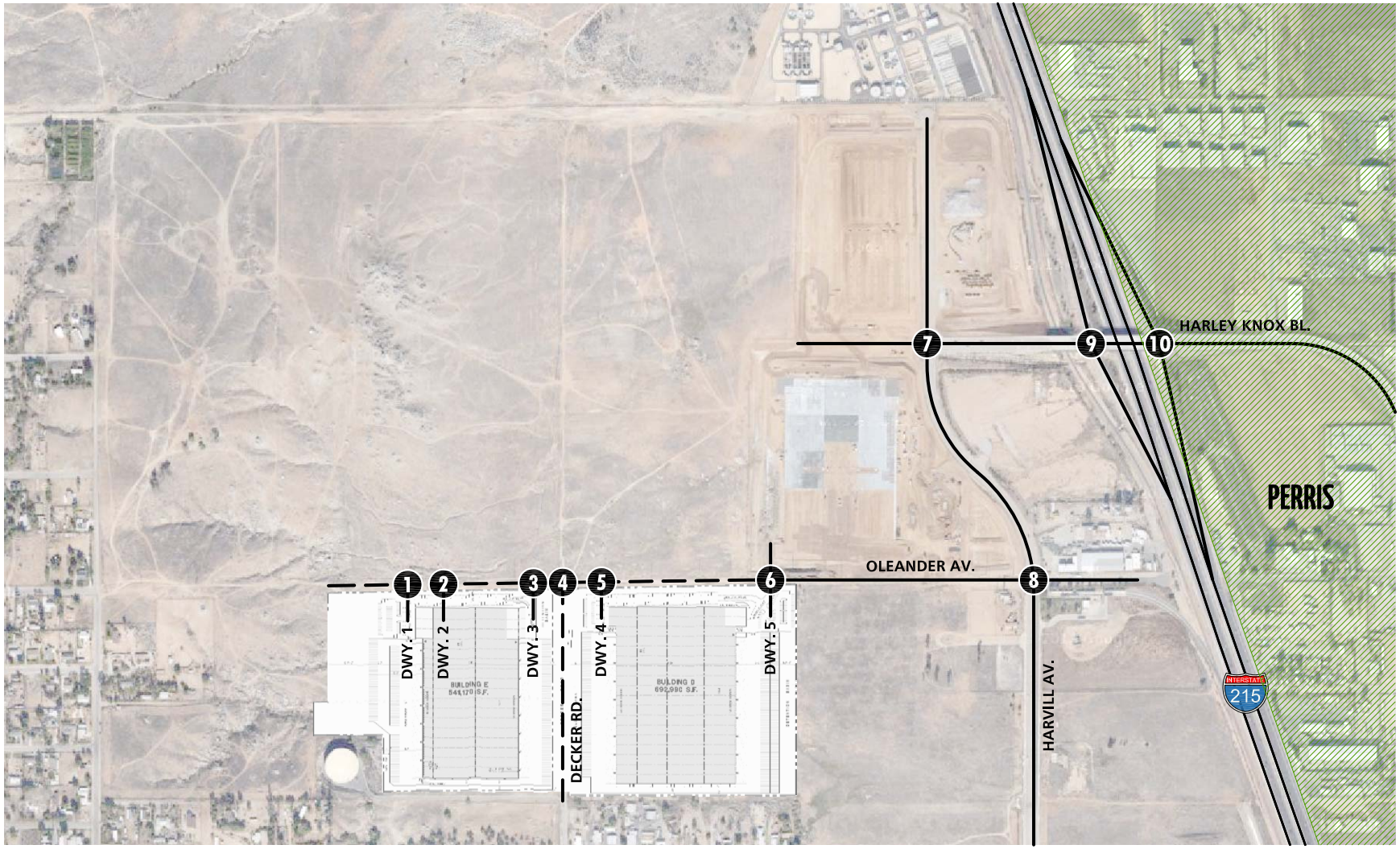


Oleander Ave. shall be improved as an Industrial Collector. the TIA shall analyze left-turn queuing.

Decker Road is designated as a Secondary Highway w/ a right-of-way requirement of 100'. Full-width improvements will be required.

N

EXHIBIT 2: LOCATION MAP



LEGEND:

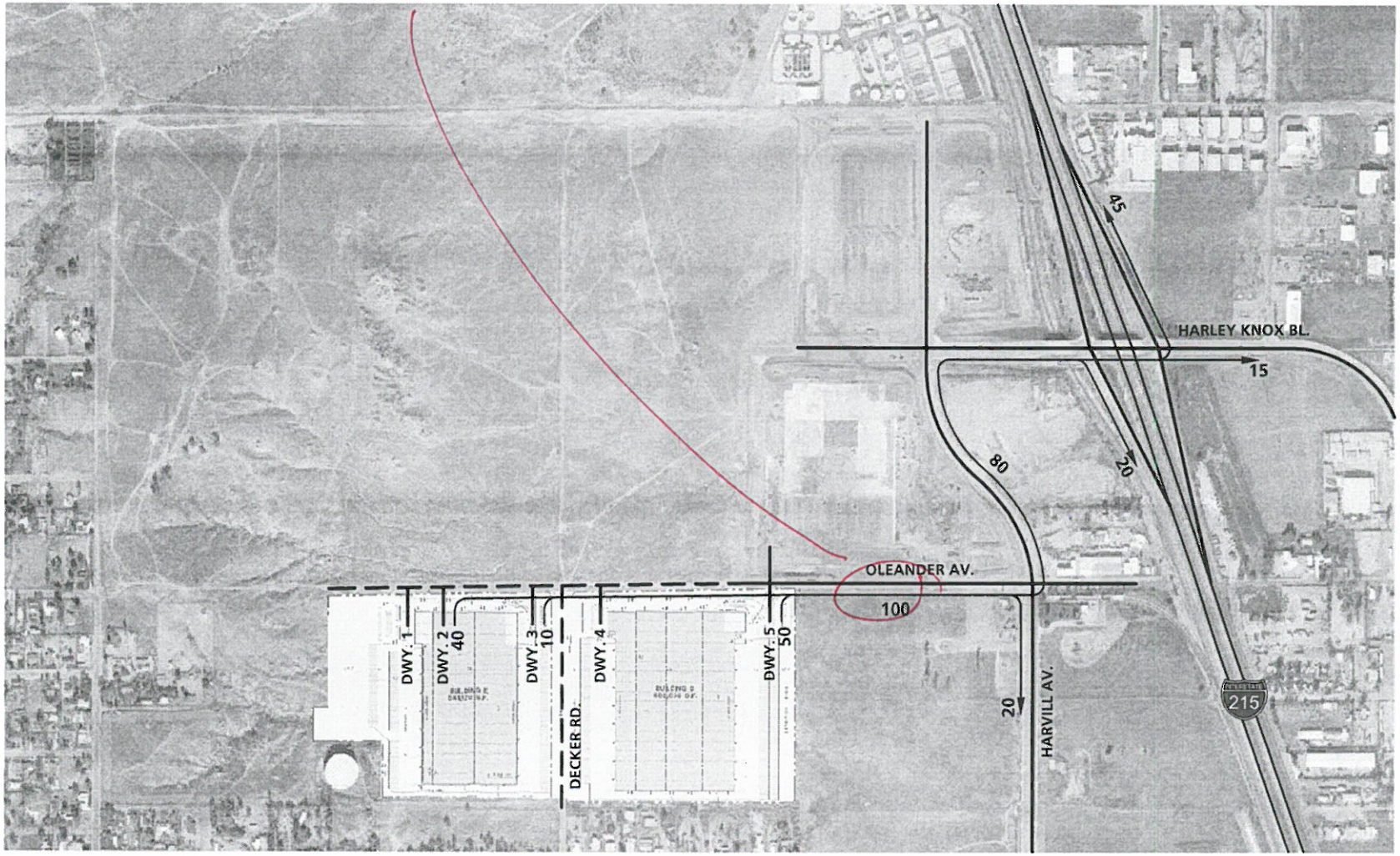
1 = INTERSECTION ANALYSIS LOCATION

N

URBAN CROSSROADS

Secondary access may be required by Fire Dept.

EXHIBIT 3: PROJECT (PASSENGER CARS) TRIP DISTRIBUTION

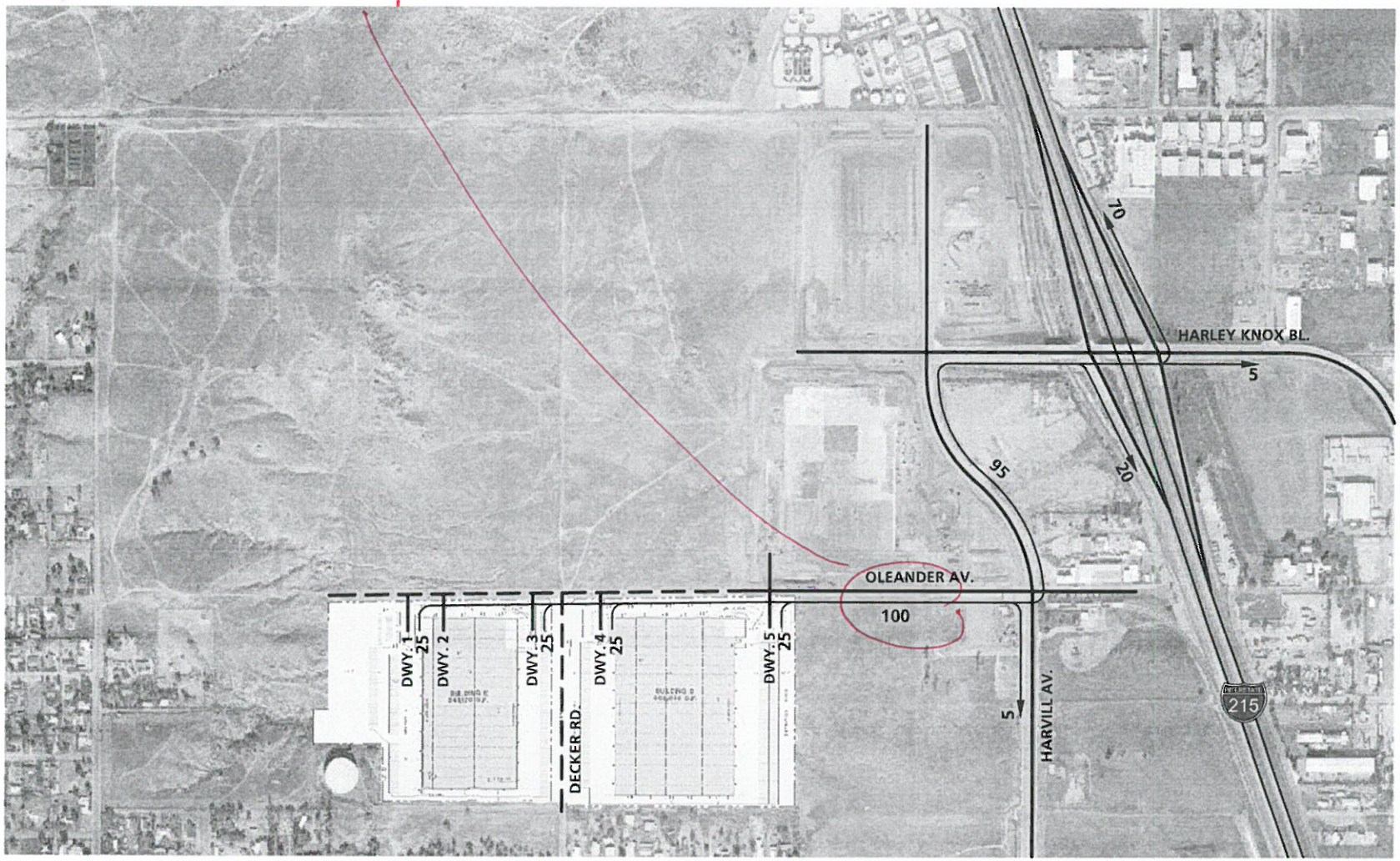


LEGEND:

10 = PERCENT TO/FROM PROJECT

Secondary Access may be required by Fire Dept.

EXHIBIT 4: PROJECT (TRUCKS) TRIP DISTRIBUTION



LEGEND:

10 = PERCENT TO/FROM PROJECT

N

EXHIBIT 5: CUMULATIVE DEVELOPMENT PROJECTS LOCATION MAP

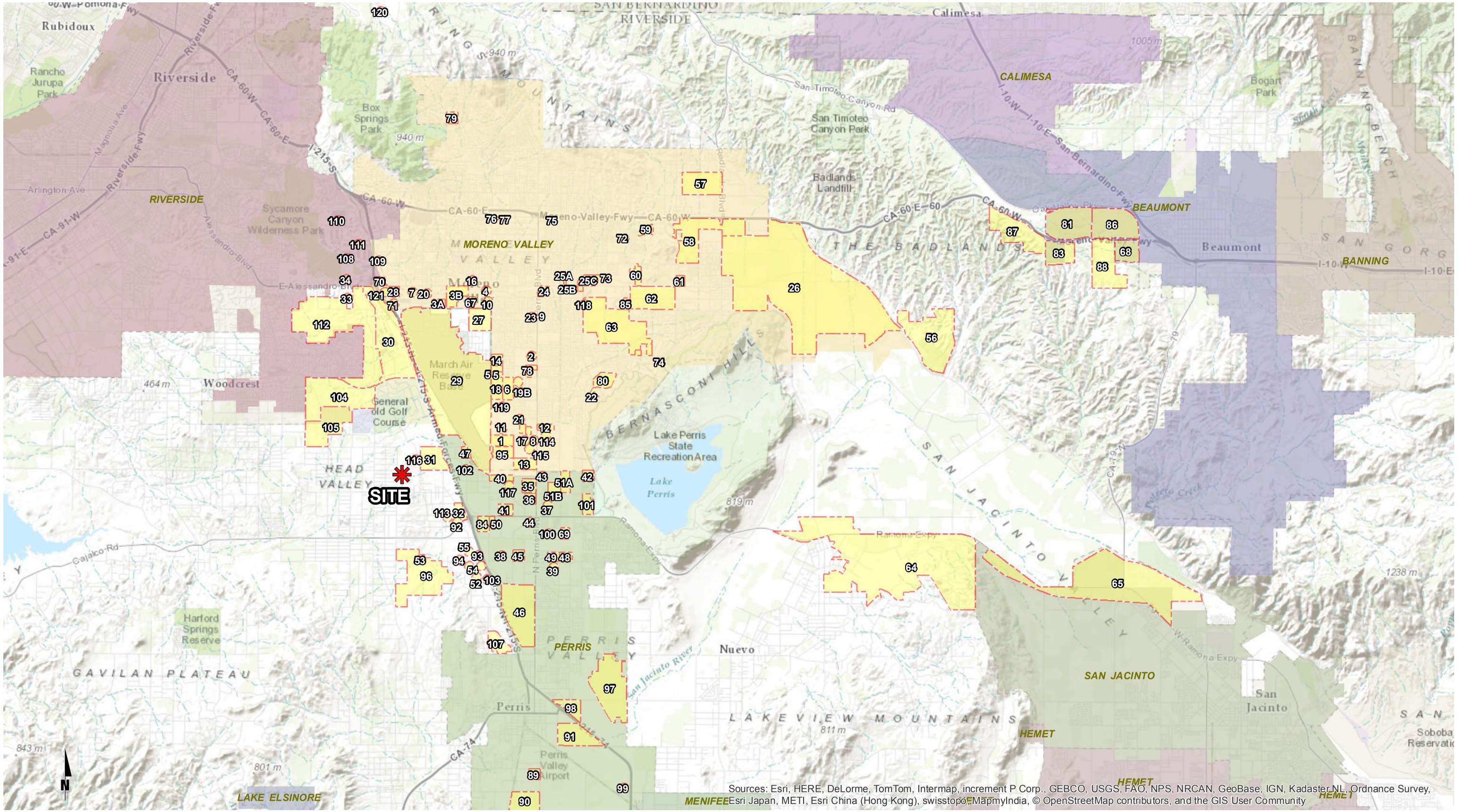


Table 1

Project Trip Generation Rates

Land Use[1]	Units[2]	ITE LU Code	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Actual Vehicle Trip Generation Rates									
High-Cube Warehouse/Distribution Center[3]	TSF	152	0.076	0.034	0.110	0.037	0.083	0.120	1.680
Passenger Cars			0.055	0.025	0.080	0.025	0.055	0.080	1.040
2-Axle Trucks			0.005	0.002	0.007	0.003	0.006	0.009	0.141
3-Axle Trucks			0.004	0.002	0.005	0.002	0.005	0.007	0.113
4-Axle+ Trucks			0.012	0.006	0.018	0.007	0.017	0.024	0.386
Passenger Car Equivalent (PCE) Trip Generation Rates									
High-Cube Warehouse/Distribution Center[3,4]	TSF	152	0.076	0.034	0.110	0.037	0.083	0.120	1.680
Passenger Cars			0.055	0.025	0.080	0.025	0.055	0.080	1.040
2-Axle Trucks (PCE = 1.5)			0.007	0.003	0.010	0.004	0.009	0.013	0.211
3-Axle Trucks (PCE = 2.0)			0.007	0.003	0.011	0.004	0.010	0.014	0.226
4-Axle+ Trucks (PCE = 3.0)			0.037	0.017	0.054	0.022	0.050	0.072	1.158

[1] Trip Generation Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, Ninth Edition (2012).

[2] TSF = thousand square feet

[3] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.
AM peak hour = 72.7% passenger cars, 6.01% 2-Axle trucks, 4.83% 3-Axle trucks, 16.46% 4-Axle trucks
PM peak hour = 66.7% passenger cars, 7.33% 2-Axle trucks, 5.89% 3-Axle trucks, 20.08% 4-Axle trucks
ADT = 61.9% passenger cars, 8.38% 2-Axle trucks, 6.74% 3-Axle trucks, 22.98% 4-Axle trucks

[4] PCE rates are per SANBAG.

Table 2

Project Trip Generation Summary (in PCE)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Building D	692.990	TSF							
Passenger Cars:			38	17	55	17	38	55	721
Truck Trips:									
2-axle:			*5*	*2*	*7*	*3*	*6*	*9*	*146*
3-axle:			*5*	*2*	*7*	*3*	*7*	*10*	*157*
4+-axle:			*26*	*12*	*38*	*16*	*35*	*50*	*803*
- Net Truck Trips (PCE) [2]			*36*	*16*	*52*	*21*	*48*	*69*	*1,106*
BUILDING D TOTAL NET TRIPS (PCE) [3]			***74***	***33***	***107***	***39***	***86***	***125***	***1,827***
Building E	541.170	TSF							
Passenger Cars:			30	13	43	13	30	43	563
Truck Trips:									
2-axle:			*4*	*2*	*5*	*2*	*5*	*7*	*114*
3-axle:			*4*	*2*	*6*	*2*	*5*	*8*	*123*
4+-axle:			*20*	*9*	*29*	*12*	*27*	*39*	*627*
- Net Truck Trips (PCE) [2]			*28*	*13*	*41*	*17*	*37*	*54*	*864*
BUILDING E TOTAL NET TRIPS (PCE) [3]			***58***	***26***	***84***	***30***	***67***	***97***	***1,426***
TOTAL (PCE):			**132**	**59**	**191**	**69**	**153**	**222**	**3,253**

[1] TSF = thousand square feet

[2] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.

[3] TOTAL NET TRIPS (PCE) = Passenger Cars + Net Truck Trips (PCE).

Table 3

Project Trip Generation Summary (Actual Vehicles)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Building D	692.990	TSF							
Passenger Cars:			38	17	55	17	38	55	721
Truck Trips:									
2-axle:			*3*	*1*	*5*	*2*	*4*	*6*	*98*
3-axle:			*3*	*1*	*4*	*2*	*3*	*5*	*78*
4+-axle:			*9*	*4*	*13*	*5*	*12*	*17*	*268*
- Net Truck Trips (Actual Trucks) [2]			*14*	*6*	*21*	*9*	*19*	*28*	*444*
BUILDING D TOTAL NET TRIPS (Actual Vehicles) [3]			***53***	***24***	***76***	***26***	***57***	***83***	***1,164***
Building E	541.170	TSF							
Passenger Cars:			30	13	43	13	30	43	563
Truck Trips:									
2-axle:			*2*	*1*	*4*	*1*	*3*	*5*	*76*
3-axle:			*2*	*1*	*3*	*1*	*3*	*4*	*61*
4+-axle:			*7*	*3*	*10*	*4*	*9*	*13*	*209*
- Net Truck Trips (Actual Trucks) [2]			*11*	*5*	*16*	*7*	*15*	*22*	*346*
BUILDING E TOTAL NET TRIPS (Actual Vehicles) [3]			***41***	***18***	***60***	***20***	***45***	***65***	***909***
TOTAL (ACTUAL):			**94**	**42**	**136**	**46**	**102**	**148**	**2,073**

[1] TSF = thousand square feet

[2] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.

[3] TOTAL NET TRIPS (Actual Vehicles) = Passenger Cars + Net Truck Trips (Actual Trucks).

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
1	PA 06-0152 & PA 06-0153 (First Park Nandina I & II)	High-Cube Warehouse	1,182.918	TSF
2	Moreno Valley Walmart	Free-Standing Discount Stor	189.520	TSF
		Gas Station	16	VFP
3A	PA 08-0072 (Overton Moore Properties)	High-Cube Warehouse	520.000	TSF
3B	Harbor Freight Expansion	High-Cube Warehouse	1,279.910	TSF
4	PA 04-0063 (Centerpointe Buildings 8 and 9)	General Light Industrial	361.384	TSF
5	PA 07-0035; PA 07-0039 (Moreno Valley Industrial Park)	General Light Industrial	204.657	TSF
		High-Cube Warehouse	409.920	TSF
6	PA 07-0079 (Indian Business Park)	High-Cube Warehouse	1,560.046	TSF
7	PA 08-0047-0052 (Komar Cactus Plaza)[3]	Hotel	110	RMS
		Fast Food w/Drive Thru	8.000	TSF
		Commercial	42.400	TSF
8	First Inland Logistics Center	High-Cube Warehouse	400.130	TSF
9	TM 33607	Condo/Townhomes	54	DU
10	PA 08-0093 (Centerpointe Business Park II)	General Light Industrial	99.988	TSF
11	PA 06-0021; PA 06-0022; PA 06-0048; PA 06-0049 (Komar	Warehousing	2,057.400	TSF
12	PA 06-0017 (Ivan Devries)	Industrial Park	569.200	TSF
13	PA 09-0004 (Vogel)	High-Cube Warehouse	1,616.133	TSF
14	TM 34748	SFDR	135	DU
15	TR 32548 (Gabel, Cook & Associates)	SFDR	107	DU
16	PA 09-0031	Gas Station	12	VFP
17	First Park Nandina III	High-Cube Warehouse	691.960	TSF
	Moreno Valley Commerce Park	High-Cube Warehouse	354.321	TSF
18	March Business Center	General Light Industrial	16.732	TSF
		Warehousing	87.429	TSF
		High-Cube Warehouse	1,380.246	TSF
19A	TM 33810	SFDR	16	DU
19B	TM 34151	SFDR	37	DU
20	373K Industrial Facility	High-Cube Warehouse	373.030	TSF
21	TM 32716	SFDR	57	DU
22	TM 32917	Condo/Townhomes	227	DU
23	TM 33417	Condo/Townhomes	10	DU
24	TM 34988	Condo/Townhomes	251	DU
25A	TM 34216	Condo/Townhomes	40	DU
25B	TM 34681	Condo/Townhomes	49	DU
25C	PA 08-0079-0081 (Winco Foods)	Discount Supermarket	95.440	TSF
		Specialty Retail	14.800	TSF

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
26	Moreno Beach Marketplace (Lowe's)	Commercial Retail	175.000	TSF
	Auto Mall Specific Plan (Planning Area C)	Commercial Retail	304.500	TSF
	Westridge	High-Cube Warehouse	937.260	TSF
	ProLogis	High-Cube Warehouse	1,916.190	TSF
		Warehousing	328.448	TSF
	World Logistics Center	High-Cube Warehouse	41,400.000	TSF
		Warehousing	200.000	TSF
		Gas Station w/ Market	12	VFP
		Existing SFDR	7	DU
27	March Lifecare Campus Specific Plan[4]	Medical Offices	190.000	TSF
		Commercial Retail	210.000	TSF
		Research & Education	200.000	TSF
		Hospital	50	Beds
		Institutional Residential	660	Beds
28	Alessandro Metrolink Station	Light Rail Transit Station	300	SP
29	Airport Master Plan	Airport Use	559.000	TSF
30	Meridian Business Park North	Industrial Park	5,985.000	TSF
31	PP 20699 (Oleander Business Park)	Warehousing	1,206.710	TSF
32	Ramona Metrolink Station	Light Rail Transit Station	300	SP
33	PP 22925 (Amstar/Kaliber Development)	Office (258.102 TSF)	258.102	TSF
		Warehousing	409.312	TSF
		General Light Industrial	42.222	TSF
		Retail	10.000	TSF
34	P07-1028 (Alessandro Business Park)	General Light Industrial	652.018	TSF
35	P 05-0113 (IDI)	High-Cube Warehouse	1,750.000	TSF
36	P 05-0192 (Oakmont I)	High-Cube Warehouse	697.600	TSF
37	P 05-0477	High-Cube Warehouse	462.692	TSF
38	Rados Distribution Center	High-Cube Warehouse	1,200.000	TSF
39	Investment Development Services (IDS) II	High-Cube Warehouse	350.000	TSF
40	P 07-09-0018	Warehousing	170.000	TSF
41	P 07-07-0029 (Oakmont II)	High-Cube Warehouse	1,600.000	TSF
42	TR 32707	SFDR	137	DU
43	TR 34716	SFDR	318	DU
44	P 05-0493 (Ridge I)	High-Cube Warehouse	700.000	TSF
45	Ridge II	High-Cube Warehouse	2,000.000	TSF

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
46	Harvest Landing Specific Plan	SFDR	717	DU
		Condo/Townhomes	1,139	DU
		Sports Park	16.700	AC
		Business Park	1,233.401	TSF
		Shopping Center	73.181	TSF
	Perris Marketplace	Shopping Center	450.000	TSF
47	P 06-0411 (Concrete Batch Plant)	Manufacturing	2.000	TSF
48	Jordan Distribution	High-Cube Warehouse	378.000	TSF
49	Aiere	High-Cube Warehouse	642.000	TSF
50	P 08-11-0005; P 08-11-0006 (Starcrest)	High-Cube Warehouse	454.088	TSF
51A	Stratford Ranch Specific Plan	High-Cube Warehouse	1,725.411	TSF
51B	Stratford Ranch Specific Plan	High-Cube Warehouse	480.000	TSF
		General Light Industrial	120.000	TSF
52	PP 18908	General Light Industrial	133.000	TSF
53	Tract 33869	SFDR	39.000	DU
54	PP 16976	General Light Industrial	85.000	TSF
55	PP 21144	Industrial Park	190.802	TSF
56	Quail Ranch Specific Plan	Private School (K-12)	300	STU
		Golf Course	18	Holes
		Hotel	500	RMS
		Specialty Retail	66.667	TSF
		General office	66.667	TSF
		Assisted Living	500	Beds
		Senior Living (Detached)	200	DU
		SFDR	600	DU
57	a TR 32460 (Sussex Capital)	SFDR	58	DU
	b TR 32459 (Sussex Capital)	SFDR	11	DU
	c TR 30411 (Pacific Communities)	SFDR	24	DU
	d TR 33962 (Pacific Scene Homes)	SFDR	31	DU
	e TR 30998 (Pacific Communities)	SFDR	47	DU
58	a Westridge Commerce Center	High-Cube Warehouse	937.260	TSF
	b P06-158 (Gascon)	Commercial Retail	116.360	TSF
	c Auto Mall Specific Plan (PAC)	Commercial Retail	304.500	TSF
	d ProLogis	Warehousing	367.000	TSF
		High-Cube Warehouse	1,901.000	TSF
	e TR 35823 (Stowe Passco)	SFDR	262	DU
		Apartments	216	DU
59	TR 36340	SFDR	275	DU

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
60	a TR 31771 (Sanchez)	SFDR	25	DU
	b TR 34397 (Winchester Associates)	SFDR	52	DU
	c TR 32645 (Winchester Associates)	SFDR	54	DU
61	Lowe's (Moreno Beach Marketplace)	Home Improvement Store	175.000	TSF
62	a Convenience Store/ Fueling Station	Gas Station w/ Market	30.750	TSF
	b Senior Assisted Living	Assisted Living Units	139	DU
	c TR 31590 (Winchester Associates)	SFDR	96	DU
	d TR 32548 (Gabel, Cook & Associates)	SFDR	107	DU
	e 26th Corp. & Granite Capitol	SFDR	32	DU
	f TR 32218 (Whitney)	SFDR	63	DU
	g Moreno Marketplace	Commercial Retail	93.788	TSF
	h Medical Plaza	Medical Offices	311.633	TSF
63	a Moreno Medical Campus	Medical Offices	80.000	TSF
	b Aqua Bella Specific Plan	SFDR	2,922	DU
	c TR 34329 (Granite Capitol)	SFDR	90	DU
	d Cresta Bella	General Office	30.000	TSF
64	a Villages of Lakeview	SFDR	860	DU
		Condo/Townhomes	1,920	DU
		Elementary School	1,200	STU
		Commercial Retail	100.000	TSF
		Soccer Complex	12	Fields
		City Park	8.900	AC
		County Park	8.100	AC
		Regional Park	107.100	AC
	b Motte Lakeview Ranch	SFDR	847	DU
		Condo/Townhomes	686	DU
		Apartments	467	DU
		Elementary School	650	STU
		Middle School	300	STU
		Commercial Retail	120.000	TSF
		Regional Park	177.000	AC
65	Gateway Area Specific Plan	Commercial Retail	255.000	AC
		General Office	510.000	AC
		Business Park	595.000	AC
		Residential	340.000	AC
66	Moreno Valley Industrial Center (Industrial Area SP)	General Light Industrial	354.810	TSF
67	Centerpointe Business Park	General Light Industrial	356.000	TSF
68	ProLogis/Rolling Hills Ranch Industrial	Heavy Industrial	2,565.684	TSF
69	P05-0493	Logistics	597.370	TSF
70	P07-1028, -0102; and P09-0416, -0418, -0419	General Light Industrial	652.018	TSF

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
71	Amstar/Kaliber Development, PP22925	General Light Industrial	42.222	TSF
		Heavy Industrial	409.312	TSF
		Commercial Retail	10.000	TSF
		General Office	258.102	TSF
72	TR 31305 / Richmond American	Residential	87	DU
73	TR 32505 / DR Horton	Residential	71	DU
74	TR 34329 / Granite Capitol	Residential	90	DU
75	TR 31814 / Moreno Valley Investors	Residential	60	DU
76	TR 33771 / Creative Design Associates	Residential	12	DU
77	TR 35663 / Kha	Residential	12	DU
78	TR 22180 / Young Homes	Residential	87	DU
79	TR 32515	Residential	161	DU
80	TR 32142	Residential	81	DU
81	Heartland	Residential	922	DU
82	San Michele Industrial Center (Industrial Area SP)	General Light Industrial	865.960	TSF
83	Hidden Canyon	General Light Industrial	2,890.000	TSF
84	Starcrest, P011-0005; 08-11-0006	General Light Industrial	454.088	TSF
85	Commercial Medical Plaza	Medical Offices	311.633	TSF
86	Mountain Bridge Regional Commercial Community	Commercial	1,853.251	TSF
87	Jack Rabbit Trail	Residential	2,000	DU
88	The Preserve / Legacy Highlands SP	Commercial	595.901	TSF
		Residential	3,412	DU
89	South Perris Industrial Phase 1	Logistics	787.700	TSF
90	South Perris Industrial Phase 2	Logistics	3,448.734	TSF
91	South Perris Industrial Phase 3	Logistics	3,166.857	TSF
92	CUP03315	Gas Station w/ Market	17	VFP
		Fast Food w/o Drive Thru	5.600	TSF
		High-Turnover Restaurant	6.500	TSF
93	PP23342	Industrial Park	180.600	TSF
94	TR30592	SFDR	131	DU
95	First Nandina Logistics Center	High-Cube Warehouse	1,450.000	TSF
96	Rider Street Quarry	Quarry	2,500.000	AC
97	Park West Specific Plan	SFDR	521.000	DU
		Elementary School	750.000	STU
		Neighborhood Park	5.000	AC
98	The Venue	Commercial Retail	642.627	TSF
	Retail on San Jacinto	Commercial Retail	217.800	TSF
	Retail on Redlands	Fast Food w/ Drive Thru	4.500	TSF
		Pharmacy w/ Drive Thru	14.000	TSF
		Specialty Retail	31.500	TSF

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
99	South Perris Metrolink Station	Light Rail Transit Station	680.000	SP
100	IDS 04-0464	High-Cube Warehouse	1,686.760	TSF
101	TTM 32708 (50% Complete)	SFDR	238.000	DU
102	PM 34199	Gen. Light Industrial	46.500	TSF
	DPR 05-0387	Gen. Light Industrial	9.854	TSF
	DPR 05-0452	Warehousing	31.200	TSF
	TPM 34697	Gen. Light Industrial	47.400	TSF
	DPR 06-0396	Warehousing	159.823	TSF
103	PP 20711	Manufacturing	20.000	AC
104	March Business Center - South Campus	Shopping Center	108.900	TSF
		Industrial Park	1,336.700	TSF
		Large Industrial Park	3,269.000	TSF
		General Office Building	140.600	TSF
		Manufacturing	215.600	TSF
		Warehousing	1,379.200	TSF
		Park	50.000	AC
		R&D	1,611.800	TSF
105	Ben Clark Training Facility	Students	5,045.000	STU
		Employees	354.000	EMP
106	PP 20103	Gen. Light Industrial	290.985	TSF
107	Nuevo Business Park	Gen. Light Industrial	357.156	TSF
		Warehousing	1,767.618	TSF
108	P06-0160	Gen. Light Industrial	316.224	TSF
109	P06-1408	Retail	75.300	TSF
110	Office, Magnon & Panattoni	Office	131.000	TSF
		Warehousing	1,400.000	TSF
		Warehousing	300.000	TSF
		Warehousing	216.000	TSF
111	P06-0591	Office	37.939	TSF
		Warehousing	782.188	TSF
		Manufacturing	168.294	TSF
112	Meridian (March Business Park SP)	Business Park	41,917.000	TSF
113	Majestic Freeway Business Center	High-Cube Warehouse	1,200.248	TSF
114	Modular Logistics Center	High-Cube Warehouse	1,109.378	TSF
115	Moval Assemblage	High-Cube Warehouse	456.337	TSF
116	Blanding Assemblage	High-Cube Warehouse	707.880	TSF
117	Integra Pacific	High-Cube Warehouse	864.000	TSF
118	Bella Vista Apartments	Apartments	220	DU
119	Moreno Valley Logistics	High-Cube Warehouse	1,351.770	TSF
		General Light Industrial	385.748	TSF

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
120	TTM 33410 Box Springs	SFDR	142	DU
121	March JPA Freeway Business Center	High-Cube Warehouse	709.083	TSF

[1] SFDR = Single Family Detached Residential; R&D = Retail & Development

[2] DU = Dwelling Units; TSF = Thousand Square Feet; SP = Spaces; VFP = Vehicle Fueling Positions; STU = Students EMP = Employees; RMS = Rooms

[3] Source: Cactus Avenue and Commerce Center Drive Commercial Center TIA, Urban Crossroads, Inc., December 9, 2008 (Revised).

[4] Source: March Lifecare Campus Specific Plan Traffic Impact Analysis, Mountain Pacific, Inc., May 2009 (Revised).

This Page Intentionally Left Blank

APPENDIX 3.1:

EXISTING TRAFFIC COUNTS – APRIL 2015

This Page Intentionally Left Blank

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

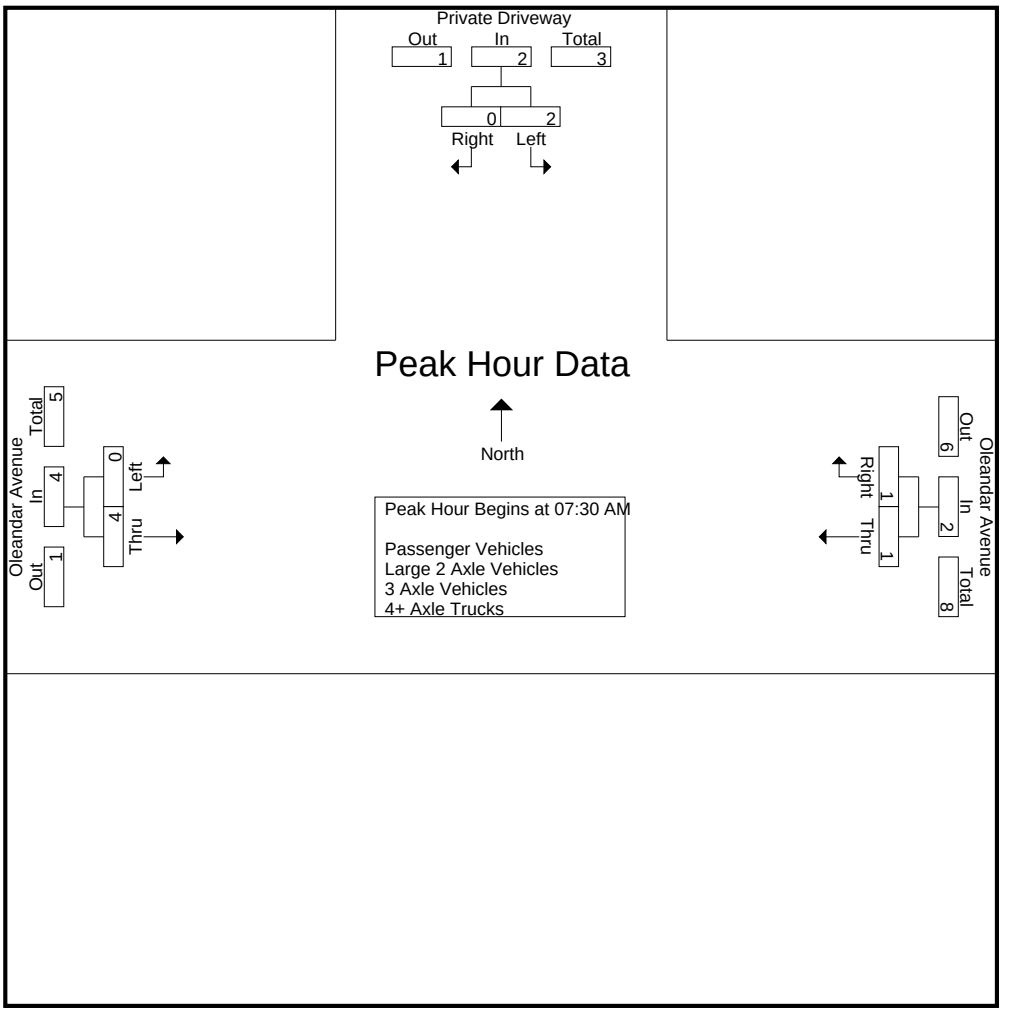
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	1	1	1
07:15 AM	0	0	0	0	1	1	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	1	1	1
07:45 AM	0	0	0	0	0	0	0	1	1	1
Total	0	0	0	0	1	1	0	3	3	4
08:00 AM	1	0	1	1	1	2	0	0	0	3
08:15 AM	1	0	1	0	0	0	0	2	2	3
08:30 AM	0	0	0	0	0	0	0	1	1	1
08:45 AM	0	0	0	0	0	0	0	1	1	1
Total	2	0	2	1	1	2	0	4	4	8
Grand Total	2	0	2	1	2	3	0	7	7	12
Apprch %	100	0		33.3	66.7		0	100		
Total %	16.7	0	16.7	8.3	16.7	25	0	58.3	58.3	
Passenger Vehicles	0	0	0	1	1	2	0	7	7	9
% Passenger Vehicles	0	0	0	100	50	66.7	0	100	100	75
Large 2 Axle Vehicles	2	0	2	0	1	1	0	0	0	3
% Large 2 Axle Vehicles	100	0	100	0	50	33.3	0	0	0	25
3 Axle Vehicles	0	0	0	0	0	0	0	0	0	0
% 3 Axle Vehicles	0	0	0	0	0	0	0	0	0	0
4+ Axle Trucks	0	0	0	0	0	0	0	0	0	0
% 4+ Axle Trucks	0	0	0	0	0	0	0	0	0	0

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	0	0	0	0	0	0	0	1	1	1
07:45 AM	0	0	0	0	0	0	0	1	1	1
08:00 AM	1	0	1	1	1	2	0	0	0	3
08:15 AM	1	0	1	0	0	0	0	2	2	3
Total Volume	2	0	2	1	1	2	0	4	4	8
% App. Total	100	0		50	50		0	100		
PHF	.500	.000	.500	.250	.250	.250	.000	.500	.500	.667

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM			07:15 AM			07:30 AM		
+0 mins.	0	0	0	0	1	1	0	1	1
+15 mins.	0	0	0	0	0	0	0	1	1
+30 mins.	1	0	1	0	0	0	0	0	0
+45 mins.	1	0	1	1	1	2	0	2	2
Total Volume	2	0	2	1	2	3	0	4	4
% App. Total	100	0		33.3	66.7		0	100	
PHF	.500	.000	.500	.250	.500	.375	.000	.500	.500

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

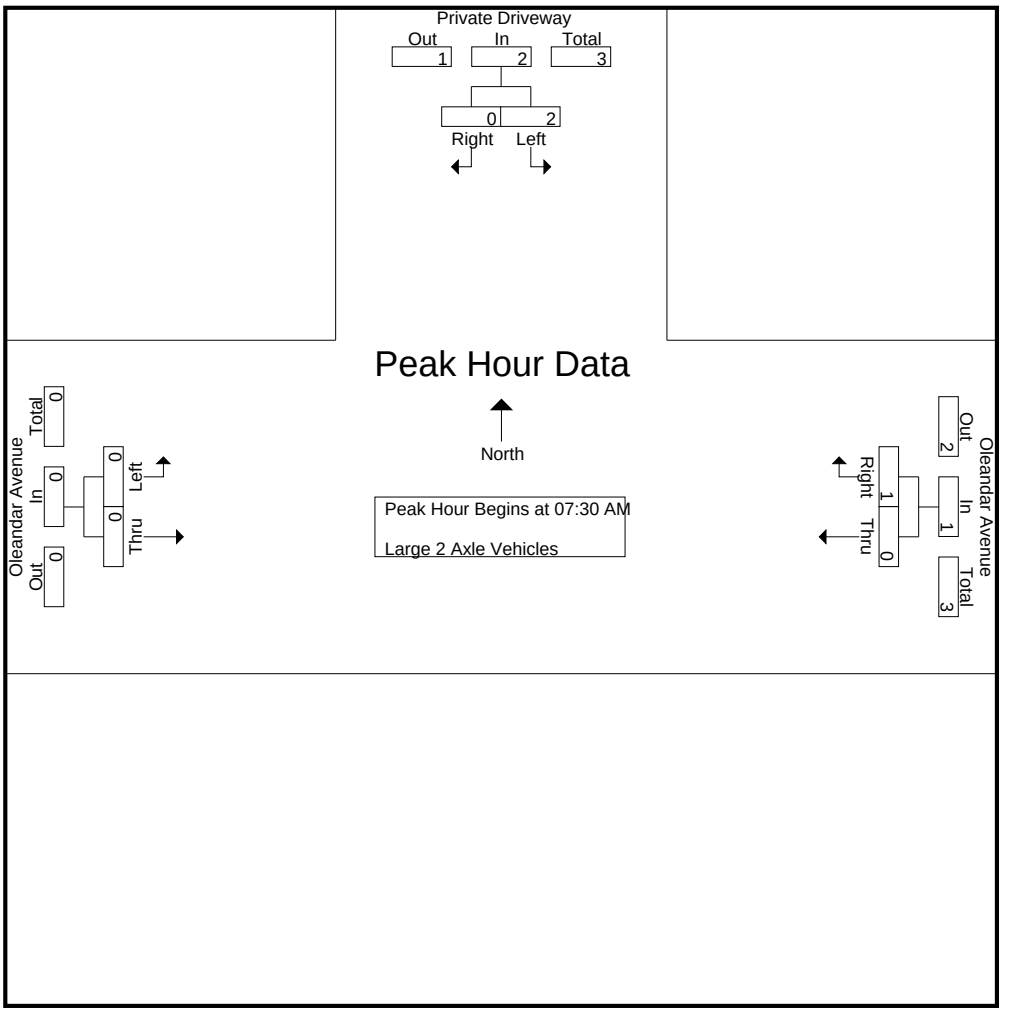
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
08:00 AM	1	0	1	0	1	1	0	0	0	2
08:15 AM	1	0	1	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	2	0	2	0	1	1	0	0	0	3
Grand Total	2	0	2	0	1	1	0	0	0	3
Apprch %	100	0		0	100		0	0		
Total %	66.7	0	66.7	0	33.3	33.3	0	0	0	

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
08:00 AM	1	0	1	0	1	1	0	0	0	2
08:15 AM	1	0	1	0	0	0	0	0	0	1
Total Volume	2	0	2	0	1	1	0	0	0	3
% App. Total	100	0		0	100		0	0		
PHF	.500	.000	.500	.000	.250	.250	.000	.000	.000	.375

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM			07:30 AM			07:30 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	1	0	1	0	1	1	0	0	0
+45 mins.	1	0	1	0	0	0	0	0	0
Total Volume	2	0	2	0	1	1	0	0	0
% App. Total	100	0		0	100		0	0	
PHF	.500	.000	.500	.000	.250	.250	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

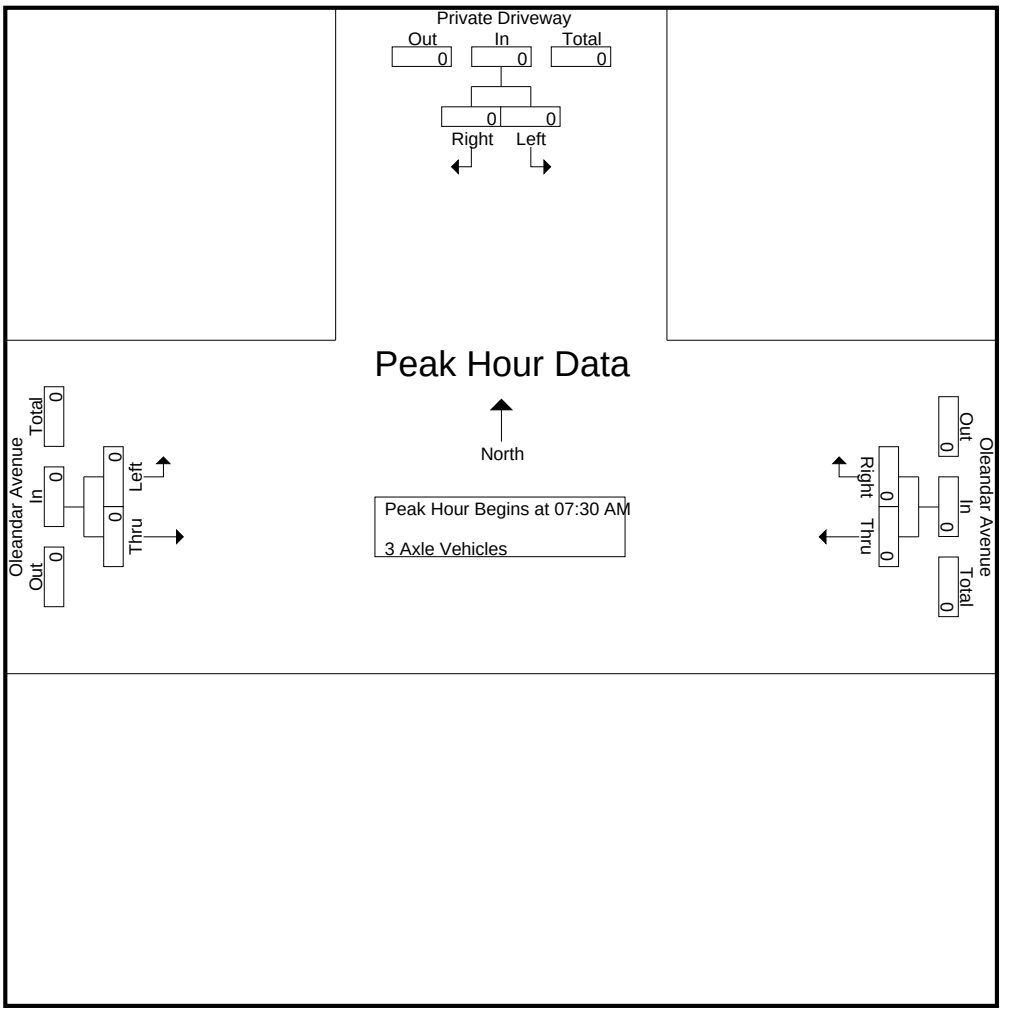
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0		0	0		0	0		
Total %										

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM			07:30 AM			07:30 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

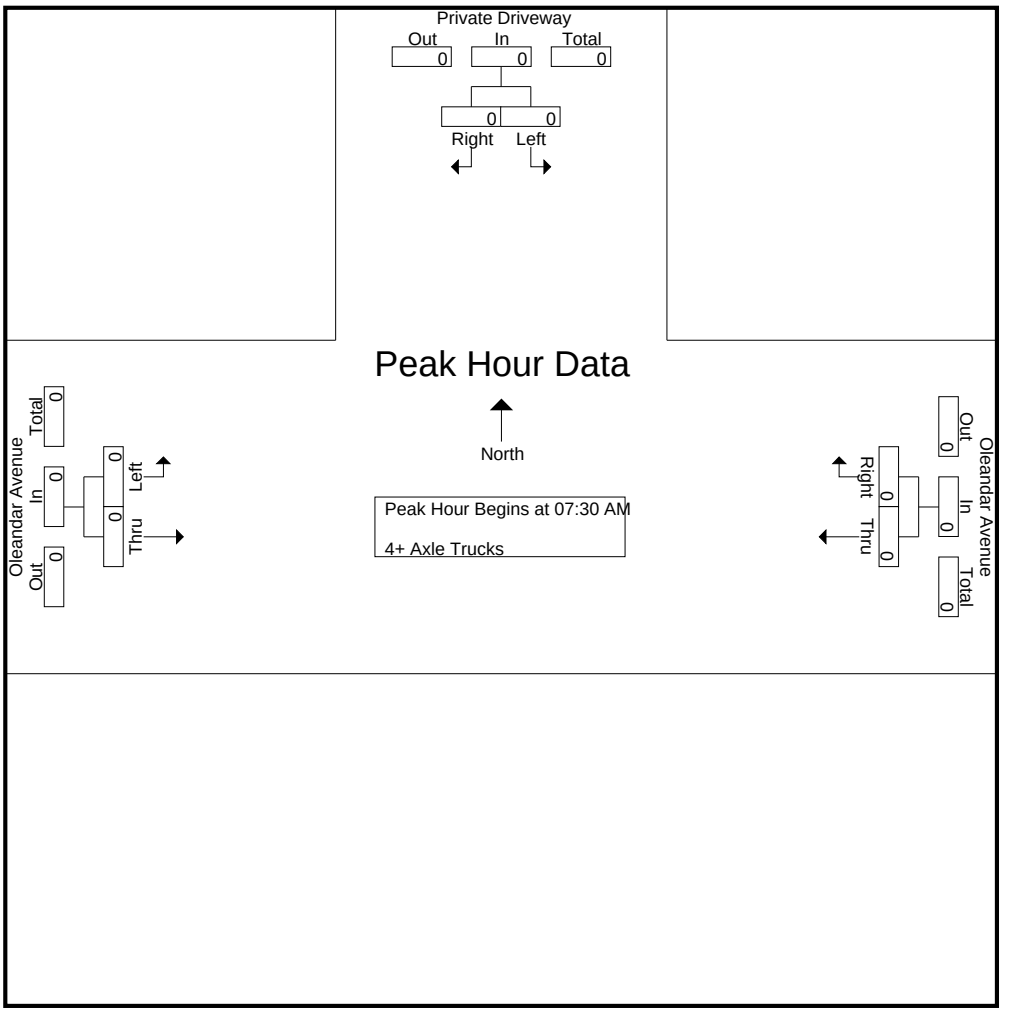
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0		0	0		0	0		
Total %										

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM			07:30 AM			07:30 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

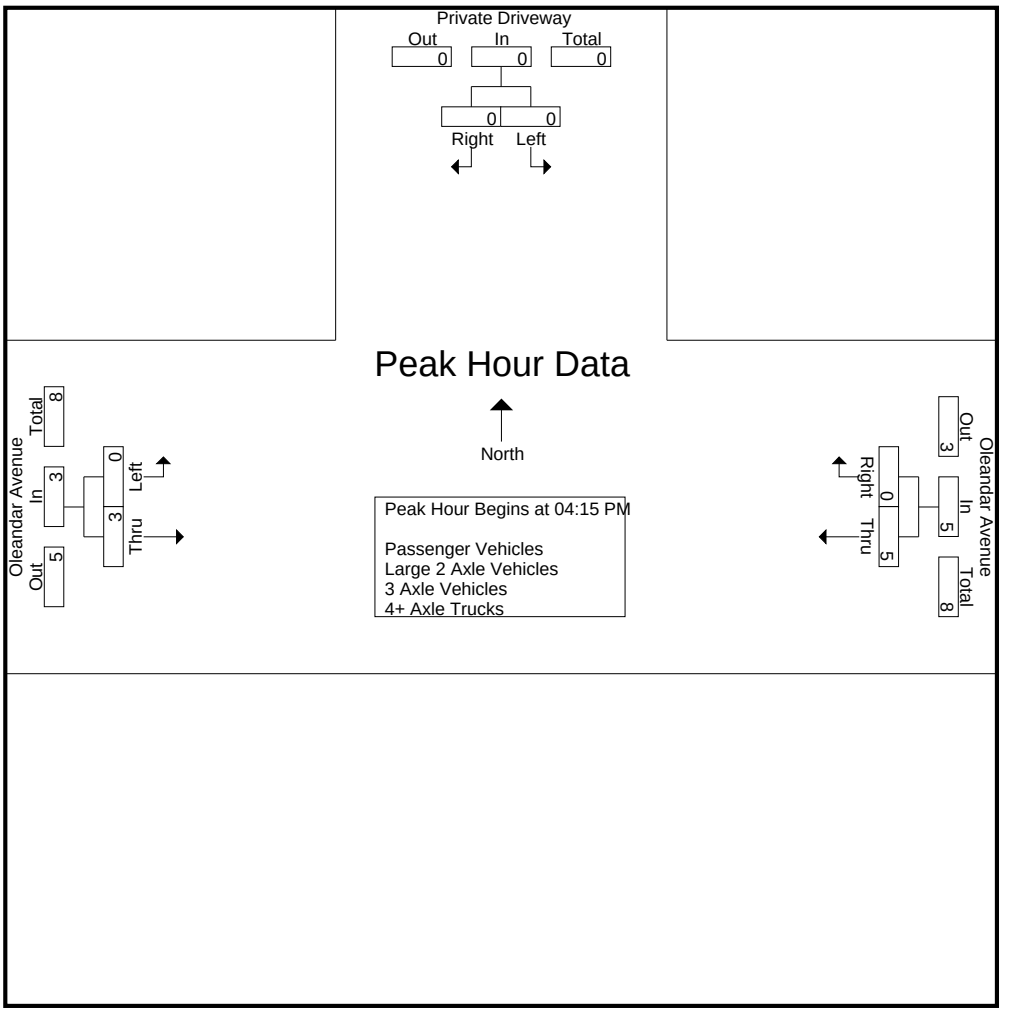
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	1	1	1
04:15 PM	0	0	0	1	0	1	0	0	0	1
04:30 PM	0	0	0	1	0	1	0	2	2	3
04:45 PM	0	0	0	2	0	2	0	0	0	2
Total	0	0	0	4	0	4	0	3	3	7
05:00 PM	0	0	0	1	0	1	0	1	1	2
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	2	0	2	0	0	0	2
05:45 PM	0	0	0	1	0	1	0	0	0	1
Total	0	0	0	4	0	4	0	1	1	5
Grand Total	0	0	0	8	0	8	0	4	4	12
Apprch %	0	0		100	0		0	100		
Total %	0	0	0	66.7	0	66.7	0	33.3	33.3	
Passenger Vehicles	0	0	0	8	0	8	0	4	4	12
% Passenger Vehicles	0	0	0	100	0	100	0	100	100	100
Large 2 Axle Vehicles	0	0	0	0	0	0	0	0	0	0
% Large 2 Axle Vehicles	0	0	0	0	0	0	0	0	0	0
3 Axle Vehicles	0	0	0	0	0	0	0	0	0	0
% 3 Axle Vehicles	0	0	0	0	0	0	0	0	0	0
4+ Axle Trucks	0	0	0	0	0	0	0	0	0	0
% 4+ Axle Trucks	0	0	0	0	0	0	0	0	0	0

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	0	0	0	1	0	1	0	0	0	1
04:30 PM	0	0	0	1	0	1	0	2	2	3
04:45 PM	0	0	0	2	0	2	0	0	0	2
05:00 PM	0	0	0	1	0	1	0	1	1	2
Total Volume	0	0	0	5	0	5	0	3	3	8
% App. Total	0	0		100	0		0	100		
PHF	.000	.000	.000	.625	.000	.625	.000	.375	.375	.667

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM			04:15 PM			04:00 PM		
+0 mins.	0	0	0	1	0	1	0	1	1
+15 mins.	0	0	0	1	0	1	0	0	0
+30 mins.	0	0	0	2	0	2	0	2	2
+45 mins.	0	0	0	1	0	1	0	0	0
Total Volume	0	0	0	5	0	5	0	3	3
% App. Total	0	0		100	0		0	100	
PHF	.000	.000	.000	.625	.000	.625	.000	.375	.375

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

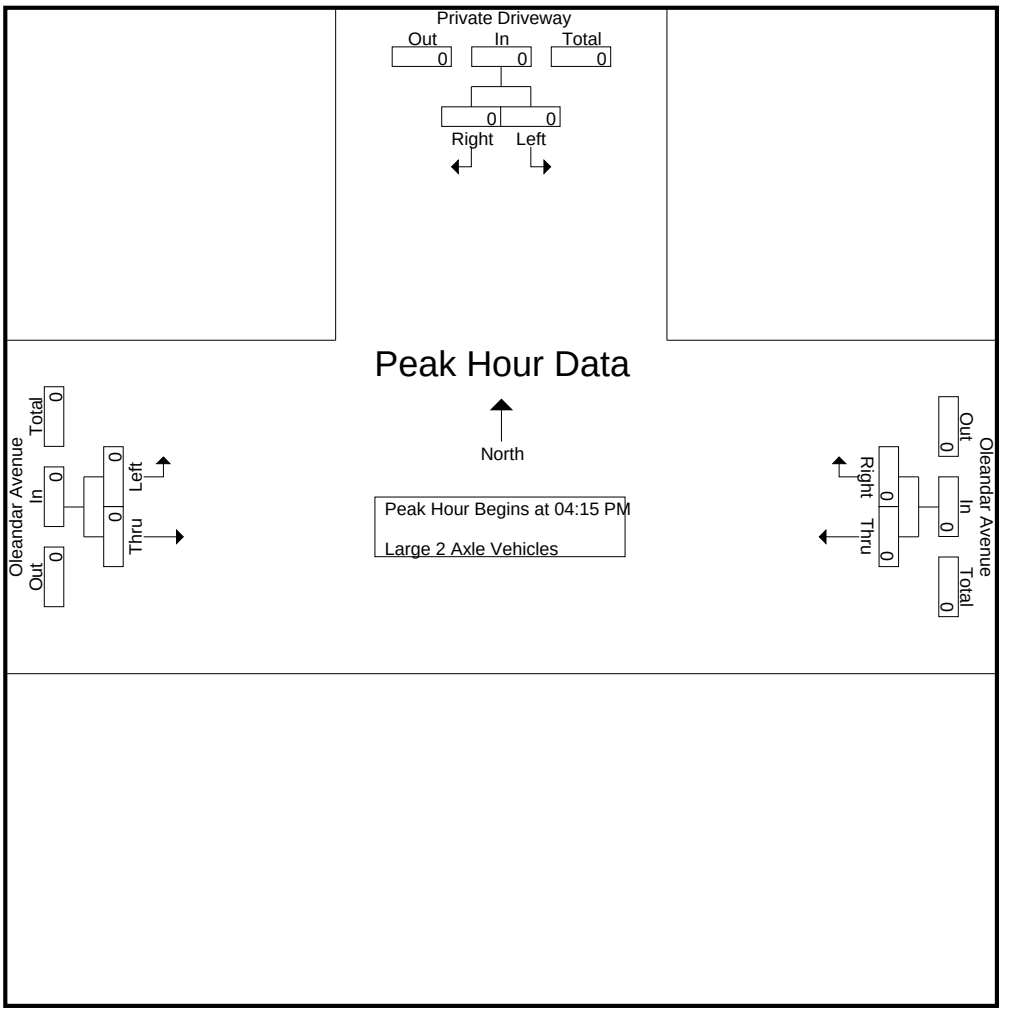
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0		0	0		0	0		
Total %										

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:15 PM			04:15 PM			04:15 PM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

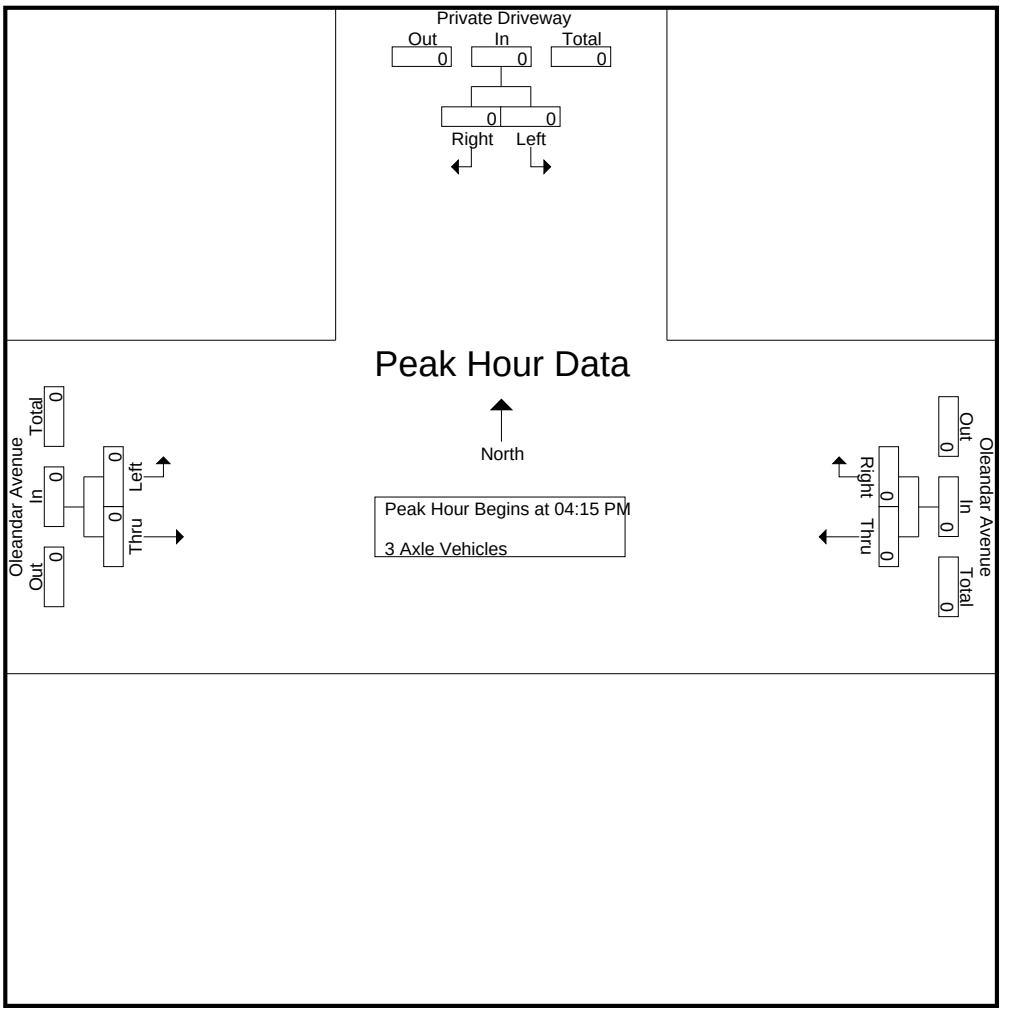
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0		0	0		0	0		
Total %										

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:15 PM			04:15 PM			04:15 PM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

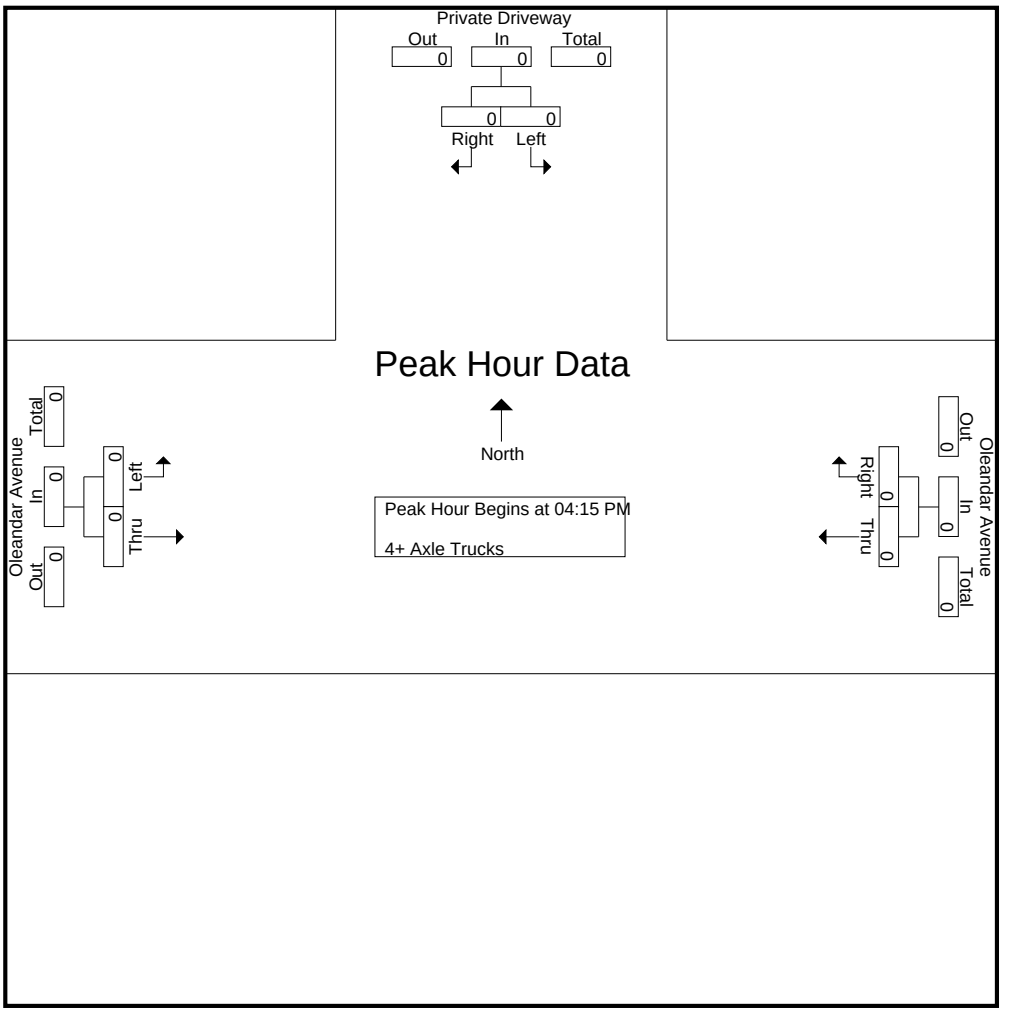
	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0		0	0		0	0		
Total %										

	Private Driveway Southbound			Oleandar Avenue Westbound			Oleandar Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue
Weather: Clear

File Name : CRVDWOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:15 PM			04:15 PM			04:15 PM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000

Location: County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue

Date: 4/14/2015
Weather: Clear

PEDESTRIANS

	North Leg Private Driveway	East Leg Oleander Avenue	South Leg Private Driveway	West Leg Oleander Avenue	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	2	0	0	0	2
7:45 AM	0	0	0	0	0
8:00 AM	1	0	0	0	1
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	3	0	0	0	3

	North Leg Private Driveway	East Leg Oleander Avenue	South Leg Private Driveway	West Leg Oleander Avenue	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

Location: County of Riverside
N/S: Private Driveway
E/W: Oleander Avenue

Date: 4/14/2015
Weather: Clear

BICYCLES

	North Leg Private Driveway	East Leg Oleander Avenue	South Leg Private Driveway	West Leg Oleander Avenue	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg Private Driveway	East Leg Oleander Avenue	South Leg Private Driveway	West Leg Oleander Avenue	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

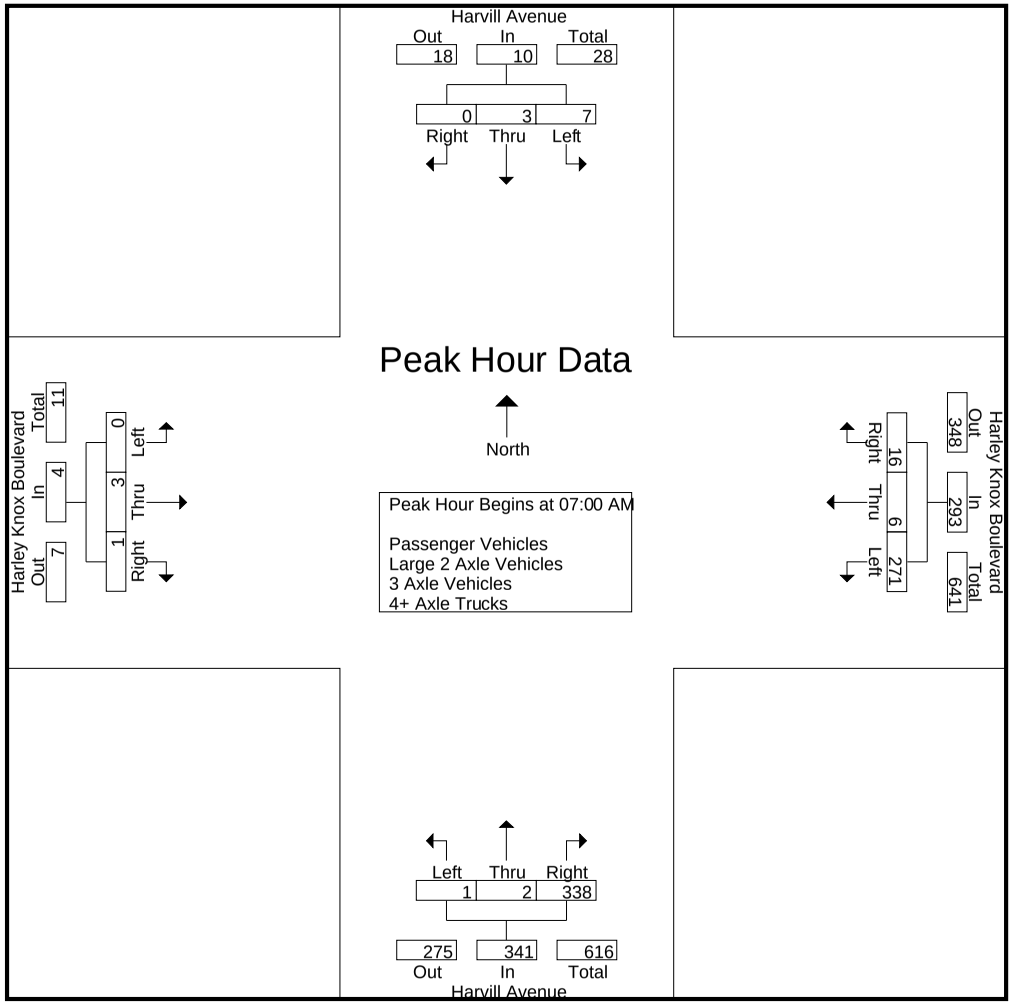
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	1	0	0	1	104	1	3	0	108	0	2	82	81	84	0	0	0	1	0	82	193
07:15 AM	2	1	0	0	3	76	0	3	0	79	0	0	75	68	75	0	0	0	0	0	68	157
07:30 AM	2	1	0	0	3	48	3	7	0	58	0	0	106	102	106	0	1	0	0	1	102	168
07:45 AM	3	0	0	0	3	43	2	3	0	48	1	0	75	62	76	0	2	1	1	3	63	130
Total	7	3	0	0	10	271	6	16	0	293	1	2	338	313	341	0	3	1	2	4	315	648
08:00 AM	0	1	0	0	1	22	1	3	0	26	0	0	44	39	44	0	1	0	0	1	39	72
08:15 AM	0	0	0	0	0	40	2	2	0	44	0	3	41	41	44	0	0	0	0	0	41	88
08:30 AM	1	0	0	0	1	33	1	3	1	37	1	0	48	43	49	0	0	0	0	0	44	87
08:45 AM	3	1	0	0	4	15	2	2	0	19	1	2	41	35	44	0	1	0	0	1	35	68
Total	4	2	0	0	6	110	6	10	1	126	2	5	174	158	181	0	2	0	0	2	159	315
Grand Total	11	5	0	0	16	381	12	26	1	419	3	7	512	471	522	0	5	1	2	6	474	963
Apprch %	68.8	31.2	0			90.9	2.9	6.2			0.6	1.3	98.1			0	83.3	16.7				
Total %	1.1	0.5	0		1.7	39.6	1.2	2.7		43.5	0.3	0.7	53.2		54.2	0	0.5	0.1		0.6	33	67
Passenger Vehicles	9	5	0		14	350	10	24		385	2	4	485		933	0	4	0		4	0	0
% Passenger Vehicles	81.8	100	0	0	87.5	91.9	83.3	92.3	100	91.7	66.7	57.1	94.7	93.8	94	0	80	0	0	50	0	0
Large 2 Axle Vehicles	2	0	0		2	7	1	1		9	1	3	5		24	0	1	0		2	0	0
% Large 2 Axle Vehicles	18.2	0	0	0	12.5	1.8	8.3	3.8	0	2.1	33.3	42.9	1	3.2	2.4	0	20	0	50	25	0	0
3 Axle Vehicles	0	0	0		0	4	0	0		4	0	0	4		6	0	0	0		0	0	0
% 3 Axle Vehicles	0	0	0	0	0	1	0	0	0	1	0	0	0.8	0.4	0.6	0	0	0	0	0	0	0
4+ Axle Trucks	0	0	0		0	20	1	1		22	0	0	18		30	0	0	1		2	0	0
% 4+ Axle Trucks	0	0	0	0	0	5.2	8.3	3.8	0	5.2	0	0	3.5	2.5	3	0	0	100	50	25	0	0

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	1	0	1	104	1	3	108	0	2	82	84	0	0	0	0	193
07:15 AM	2	1	0	3	76	0	3	79	0	0	75	75	0	0	0	0	157
07:30 AM	2	1	0	3	48	3	7	58	0	0	106	106	0	1	0	1	168
07:45 AM	3	0	0	3	43	2	3	48	1	0	75	76	0	2	1	3	130
Total Volume	7	3	0	10	271	6	16	293	1	2	338	341	0	3	1	4	648
% App. Total	70	30	0		92.5	2	5.5		0.3	0.6	99.1		0	75	25		
PHF	.583	.750	.000	.833	.651	.500	.571	.678	.250	.250	.797	.804	.000	.375	.250	.333	.839

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015

Groups Printed- Large 2 Axle Vehicles

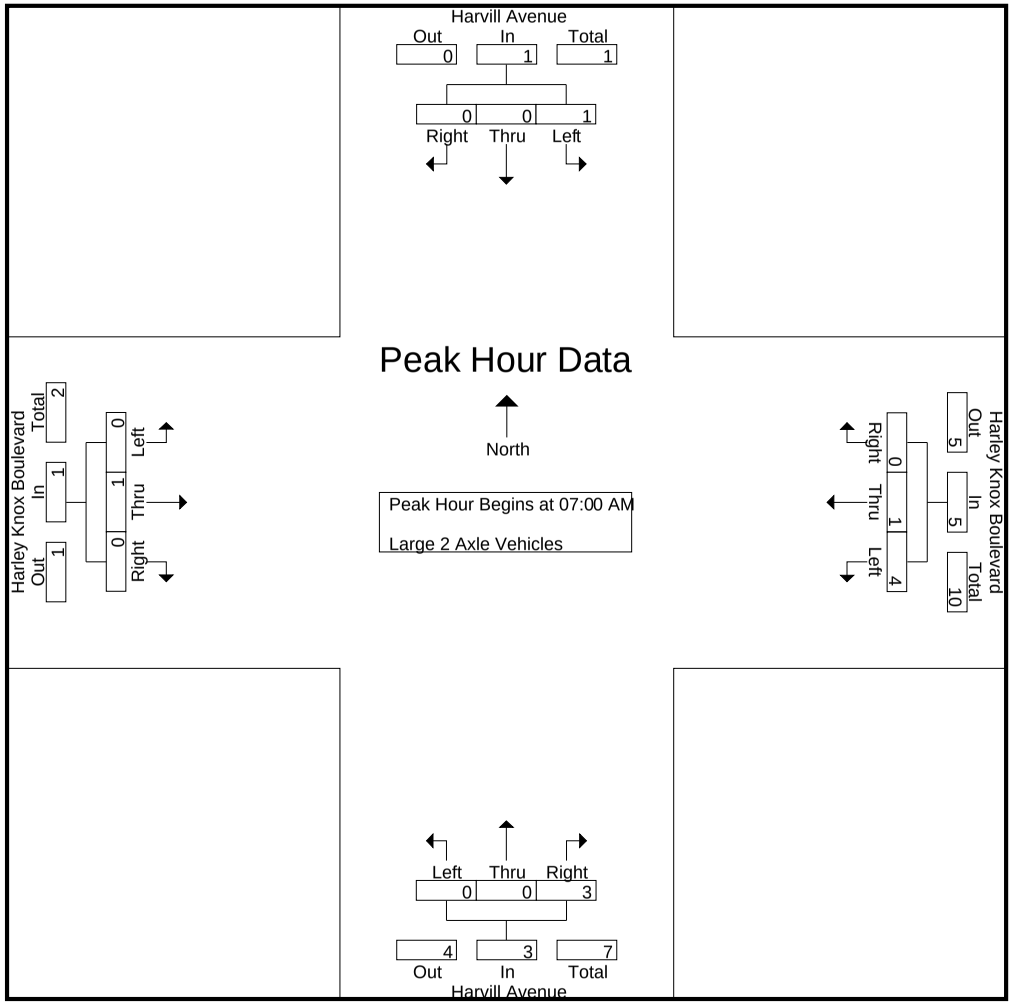
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	2	1	0	0	3	0	0	0	2	0	0	0	0	1	0	3	3
07:15 AM	1	0	0	0	1	0	0	0	0	0	0	0	2	3	2	0	0	0	0	0	3	3
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	2	1
07:45 AM	0	0	0	0	0	2	0	0	0	2	0	0	0	1	0	0	1	0	0	1	1	3
Total	1	0	0	0	1	4	1	0	0	5	0	0	3	8	3	0	1	0	1	1	9	10
08:00 AM	0	0	0	0	0	0	0	1	0	1	0	0	2	2	2	0	0	0	0	0	2	3
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	0	0	0	0	0	2	2
08:30 AM	0	0	0	0	0	1	0	0	0	1	1	0	0	1	1	0	0	0	0	0	1	2
08:45 AM	1	0	0	0	1	2	0	0	0	2	0	1	0	2	1	0	0	0	0	0	2	4
Total	1	0	0	0	1	3	0	1	0	4	1	3	2	7	6	0	0	0	0	0	7	11
Grand Total	2	0	0	0	2	7	1	1	0	9	1	3	5	15	9	0	1	0	1	1	16	21
Apprch %	100	0	0			77.8	11.1	11.1			11.1	33.3	55.6			0	100	0				
Total %	9.5	0	0		9.5	33.3	4.8	4.8		42.9	4.8	14.3	23.8		42.9	0	4.8	0		4.8	43.2	56.8

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	2	1	0	3	0	0	0	0	0	0	0	0	3
07:15 AM	1	0	0	1	0	0	0	0	0	0	2	2	0	0	0	0	3
07:30 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
07:45 AM	0	0	0	0	2	0	0	2	0	0	0	0	0	1	0	1	3
Total Volume	1	0	0	1	4	1	0	5	0	0	3	3	0	1	0	1	10
% App. Total	100	0	0		80	20	0		0	0	100		0	100	0		
PHF	.250	.000	.000	.250	.500	.250	.000	.417	.000	.000	.375	.375	.000	.250	.000	.250	.833

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015

Groups Printed- 3 Axle Vehicles

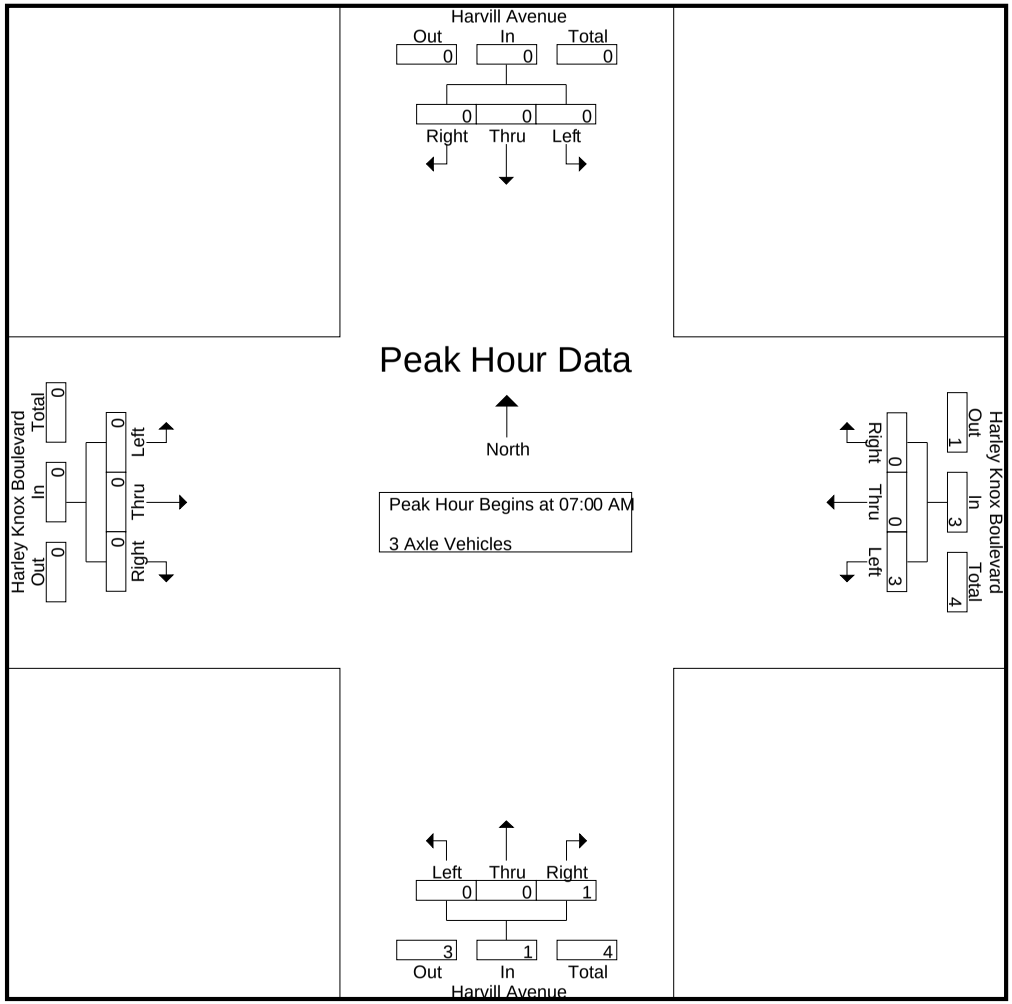
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	3	0	0	0	3	0	0	1	0	1	0	0	0	0	0	0	4
08:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	1	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1
Total	0	0	0	0	0	1	0	0	0	1	0	0	3	2	3	0	0	0	0	0	2	4
Grand Total	0	0	0	0	0	4	0	0	0	4	0	0	4	2	4	0	0	0	0	0	2	8
Apprch %	0	0	0			100	0	0			0	0	100			0	0	0				
Total %	0	0	0		0	50	0	0		50	0	0	50		50	0	0	0		0	20	80

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
07:30 AM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	3	0	0	3	0	0	1	1	0	0	0	0	4
% App. Total	0	0	0		100	0	0		0	0	100		0	0	0		
PHF	.000	.000	.000	.000	.750	.000	.000	.750	.000	.000	.250	.250	.000	.000	.000	.000	1.00

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

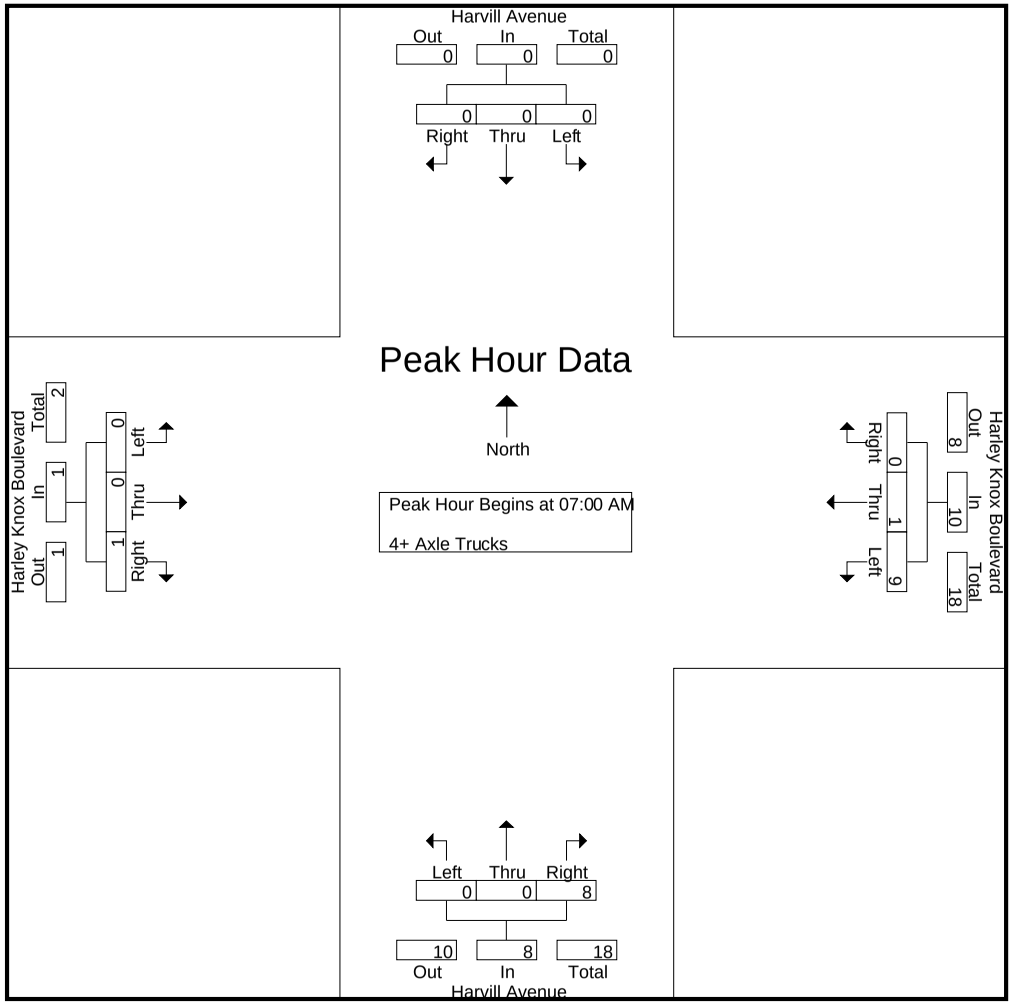
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
07:15 AM	0	0	0	0	0	4	0	0	0	4	0	0	2	2	2	0	0	0	0	0	2	6
07:30 AM	0	0	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	1	2
07:45 AM	0	0	0	0	0	2	1	0	0	3	0	0	5	2	5	0	0	1	1	1	3	9
Total	0	0	0	0	0	9	1	0	0	10	0	0	8	5	8	0	0	1	1	1	6	19
08:00 AM	0	0	0	0	0	2	0	0	0	2	0	0	1	1	1	0	0	0	0	0	1	3
08:15 AM	0	0	0	0	0	5	0	1	0	6	0	0	2	2	2	0	0	0	0	0	2	8
08:30 AM	0	0	0	0	0	3	0	0	0	3	0	0	5	3	5	0	0	0	0	0	3	8
08:45 AM	0	0	0	0	0	1	0	0	0	1	0	0	2	1	2	0	0	0	0	0	1	3
Total	0	0	0	0	0	11	0	1	0	12	0	0	10	7	10	0	0	0	0	0	7	22
Grand Total	0	0	0	0	0	20	1	1	0	22	0	0	18	12	18	0	0	1	1	1	13	41
Apprch %	0	0	0			90.9	4.5	4.5			0	0	100			0	0	100				
Total %	0	0	0		0	48.8	2.4	2.4		53.7	0	0	43.9		43.9	0	0	2.4		2.4	24.1	75.9

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	2
07:15 AM	0	0	0	0	4	0	0	4	0	0	2	2	0	0	0	0	6
07:30 AM	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	2
07:45 AM	0	0	0	0	2	1	0	3	0	0	5	5	0	0	1	1	9
Total Volume	0	0	0	0	9	1	0	10	0	0	8	8	0	0	1	1	19
% App. Total	0	0	0		90	10	0		0	0	100		0	0	100		
PHF	.000	.000	.000	.000	.563	.250	.000	.625	.000	.000	.400	.400	.000	.000	.250	.250	.528

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

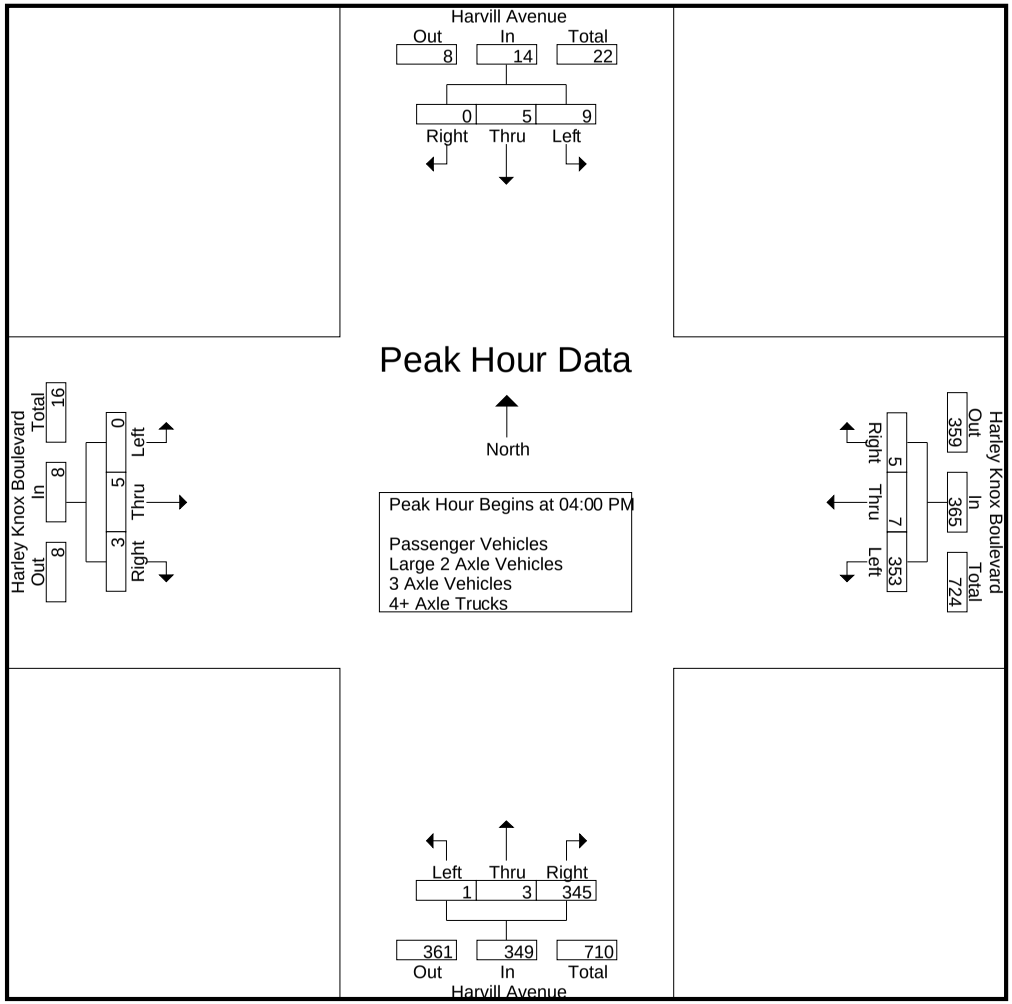
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	84	1	1	0	86	0	0	91	71	91	0	1	0	0	1	71	178
04:15 PM	3	2	0	0	5	76	4	0	0	80	0	1	90	62	91	0	3	2	2	5	64	181
04:30 PM	3	2	0	0	5	93	1	1	0	95	1	2	84	65	87	0	0	1	1	1	66	188
04:45 PM	3	1	0	0	4	100	1	3	0	104	0	0	80	78	80	0	1	0	0	1	78	189
Total	9	5	0	0	14	353	7	5	0	365	1	3	345	276	349	0	5	3	3	8	279	736
05:00 PM	1	0	0	0	1	93	0	2	0	95	0	0	73	68	73	0	0	0	0	0	68	169
05:15 PM	1	0	0	0	1	101	0	0	0	101	0	0	77	75	77	0	1	0	0	1	75	180
05:30 PM	3	0	1	1	4	65	1	1	0	67	0	2	83	60	85	0	1	0	0	1	61	157
05:45 PM	1	0	0	0	1	82	0	0	0	82	0	0	60	53	60	0	1	0	0	1	53	144
Total	6	0	1	1	7	341	1	3	0	345	0	2	293	256	295	0	3	0	0	3	257	650
Grand Total	15	5	1	1	21	694	8	8	0	710	1	5	638	532	644	0	8	3	3	11	536	1386
Apprch %	71.4	23.8	4.8			97.7	1.1	1.1			0.2	0.8	99.1			0	72.7	27.3				
Total %	1.1	0.4	0.1		1.5	50.1	0.6	0.6		51.2	0.1	0.4	46		46.5	0	0.6	0.2		0.8	27.9	72.1
Passenger Vehicles	15	3	1		20	640	3	7		650	1	4	594		1104	0	5	1		7	0	0
% Passenger Vehicles	100	60	100	100	90.9	92.2	37.5	87.5	0	91.5	100	80	93.1	94.9	93.9	0	62.5	33.3	33.3	50	0	0
Large 2 Axle Vehicles	0	1	0		1	17	2	0		19	0	0	7		12	0	2	0		2	0	0
% Large 2 Axle Vehicles	0	20	0	0	4.5	2.4	25	0	0	2.7	0	0	1.1	0.9	1	0	25	0	0	14.3	0	0
3 Axle Vehicles	0	1	0		1	5	1	1		7	0	1	15		27	0	0	1		2	0	0
% 3 Axle Vehicles	0	20	0	0	4.5	0.7	12.5	12.5	0	1	0	20	2.4	2.1	2.3	0	0	33.3	33.3	14.3	0	0
4+ Axle Trucks	0	0	0		0	32	2	0		34	0	0	22		33	0	1	1		3	0	0
% 4+ Axle Trucks	0	0	0	0	0	4.6	25	0	0	4.8	0	0	3.4	2.1	2.8	0	12.5	33.3	33.3	21.4	0	0

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	84	1	1	86	0	0	91	91	0	1	0	1	178
04:15 PM	3	2	0	5	76	4	0	80	0	1	90	91	0	3	2	5	181
04:30 PM	3	2	0	5	93	1	1	95	1	2	84	87	0	0	1	1	188
04:45 PM	3	1	0	4	100	1	3	104	0	0	80	80	0	1	0	1	189
Total Volume	9	5	0	14	353	7	5	365	1	3	345	349	0	5	3	8	736
% App. Total	64.3	35.7	0		96.7	1.9	1.4		0.3	0.9	98.9		0	62.5	37.5		
PHF	.750	.625	.000	.700	.883	.438	.417	.877	.250	.375	.948	.959	.000	.417	.375	.400	.974

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

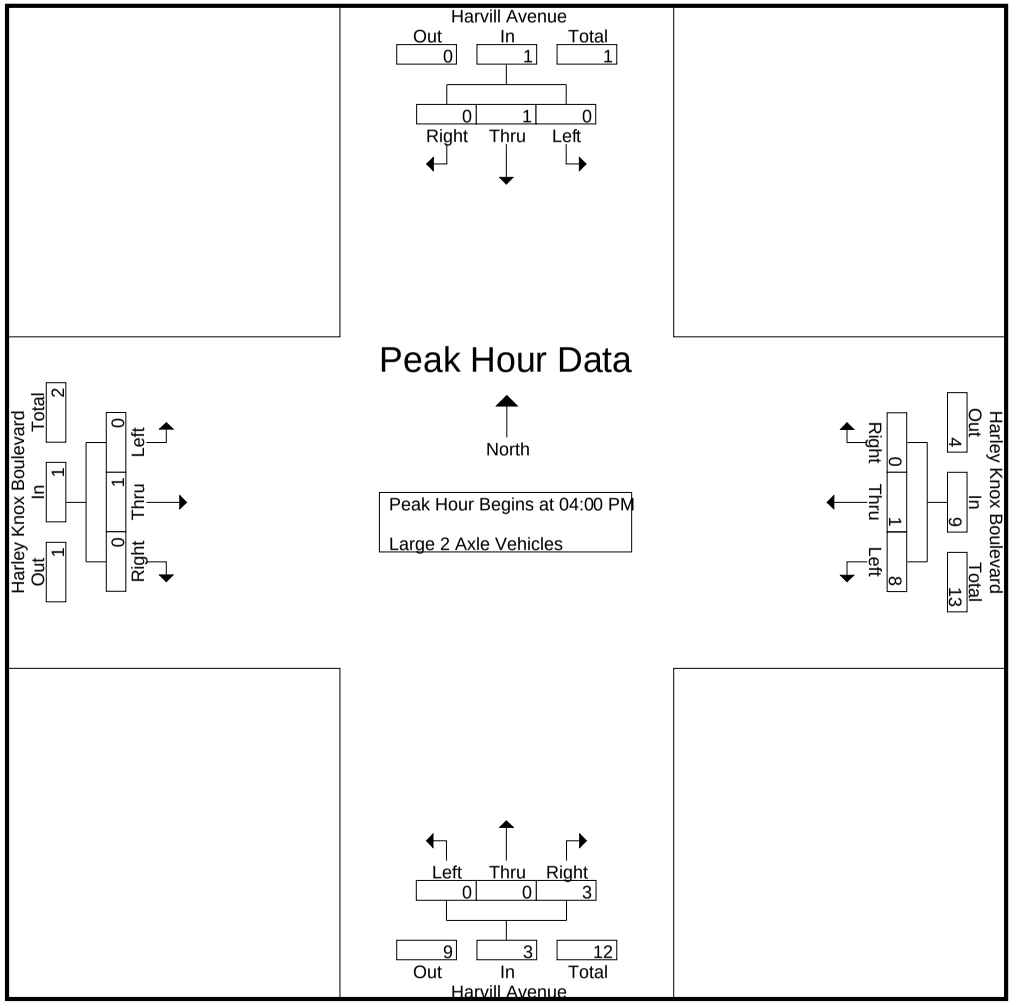
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	3	0	0	0	3	0	0	1	1	1	0	0	0	0	0	1	4
04:15 PM	0	0	0	0	0	2	0	0	0	2	0	0	1	0	1	0	0	0	0	0	0	3
04:30 PM	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	2
04:45 PM	0	1	0	0	1	2	1	0	0	3	0	0	0	0	0	0	1	0	0	1	0	5
Total	0	1	0	0	1	8	1	0	0	9	0	0	3	1	3	0	1	0	0	1	1	14
05:00 PM	0	0	0	0	0	3	0	0	0	3	0	0	1	1	1	0	0	0	0	0	1	4
05:15 PM	0	0	0	0	0	2	0	0	0	2	0	0	3	3	3	0	0	0	0	0	3	5
05:30 PM	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
05:45 PM	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	1	0	0	1	0	4
Total	0	0	0	0	0	9	1	0	0	10	0	0	4	4	4	0	1	0	0	1	4	15
Grand Total	0	1	0	0	1	17	2	0	0	19	0	0	7	5	7	0	2	0	0	2	5	29
Apprch %	0	100	0			89.5	10.5	0			0	0	100			0	100	0				
Total %	0	3.4	0		3.4	58.6	6.9	0		65.5	0	0	24.1		24.1	0	6.9	0		6.9	14.7	85.3

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	3	0	0	3	0	0	1	1	0	0	0	0	4
04:15 PM	0	0	0	0	2	0	0	2	0	0	1	1	0	0	0	0	3
04:30 PM	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	2
04:45 PM	0	1	0	1	2	1	0	3	0	0	0	0	0	1	0	1	5
Total Volume	0	1	0	1	8	1	0	9	0	0	3	3	0	1	0	1	14
% App. Total	0	100	0		88.9	11.1	0		0	0	100		0	100	0		
PHF	.000	.250	.000	.250	.667	.250	.000	.750	.000	.000	.750	.750	.000	.250	.000	.250	.700

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

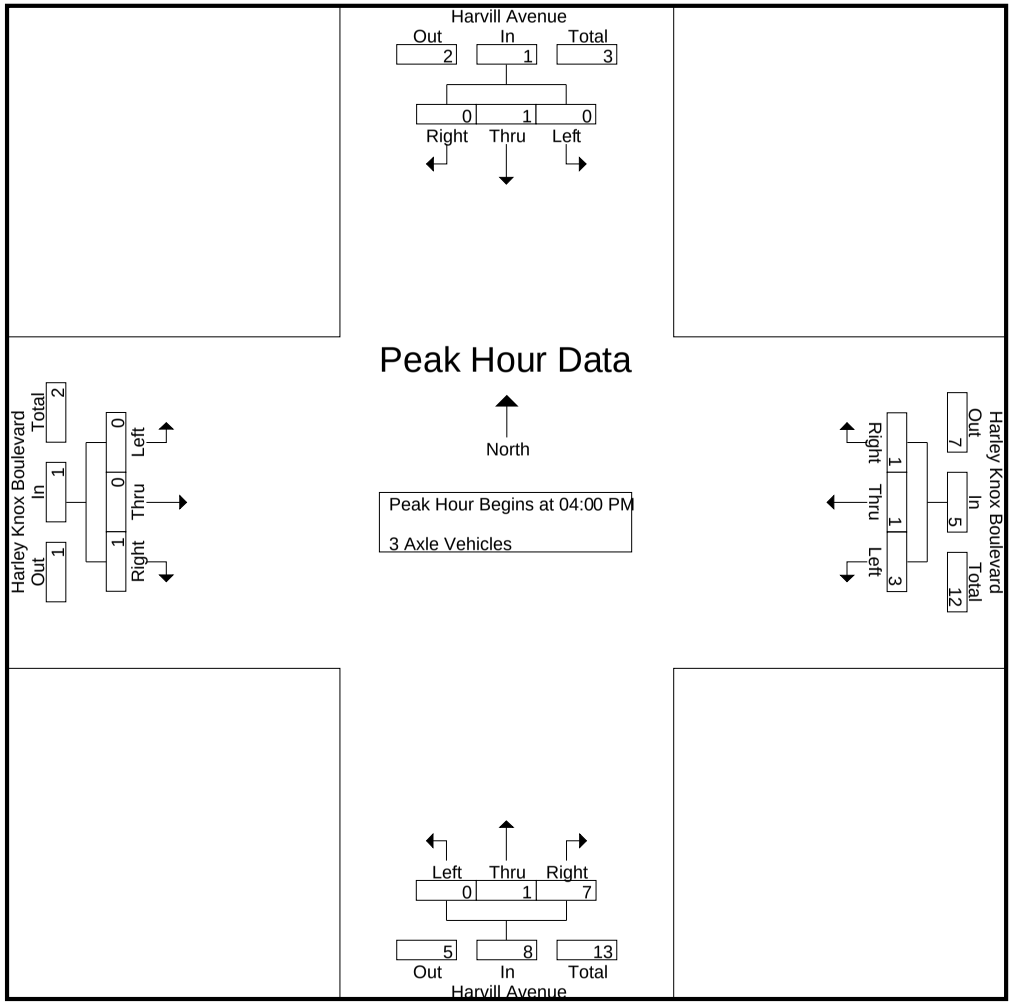
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	1	0	1	0	2	0	0	1	1	1	0	0	0	0	0	1	3
04:15 PM	0	1	0	0	1	0	1	0	0	1	0	1	1	0	2	0	0	1	1	1	1	5
04:30 PM	0	0	0	0	0	1	0	0	0	1	0	0	5	3	5	0	0	0	0	0	3	6
04:45 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	3	1	1	0	5	0	1	7	4	8	0	0	1	1	1	5	15
05:00 PM	0	0	0	0	0	2	0	0	0	2	0	0	2	2	2	0	0	0	0	0	2	4
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	0	0	0	0	0	3	3
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0	0	0	1	2
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1
Total	0	0	0	0	0	2	0	0	0	2	0	0	8	7	8	0	0	0	0	0	7	10
Grand Total	0	1	0	0	1	5	1	1	0	7	0	1	15	11	16	0	0	1	1	1	12	25
Apprch %	0	100	0			71.4	14.3	14.3			0	6.2	93.8			0	0	100				
Total %	0	4	0		4	20	4	4		28	0	4	60		64	0	0	4		4	32.4	67.6

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	1	0	1	2	0	0	1	1	0	0	0	0	3
04:15 PM	0	1	0	1	0	1	0	1	0	1	1	2	0	0	1	1	5
04:30 PM	0	0	0	0	1	0	0	1	0	0	5	5	0	0	0	0	6
04:45 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
Total Volume	0	1	0	1	3	1	1	5	0	1	7	8	0	0	1	1	15
% App. Total	0	100	0		60	20	20		0	12.5	87.5		0	0	100		
PHF	.000	.250	.000	.250	.750	.250	.250	.625	.000	.250	.350	.400	.000	.000	.250	.250	.625

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

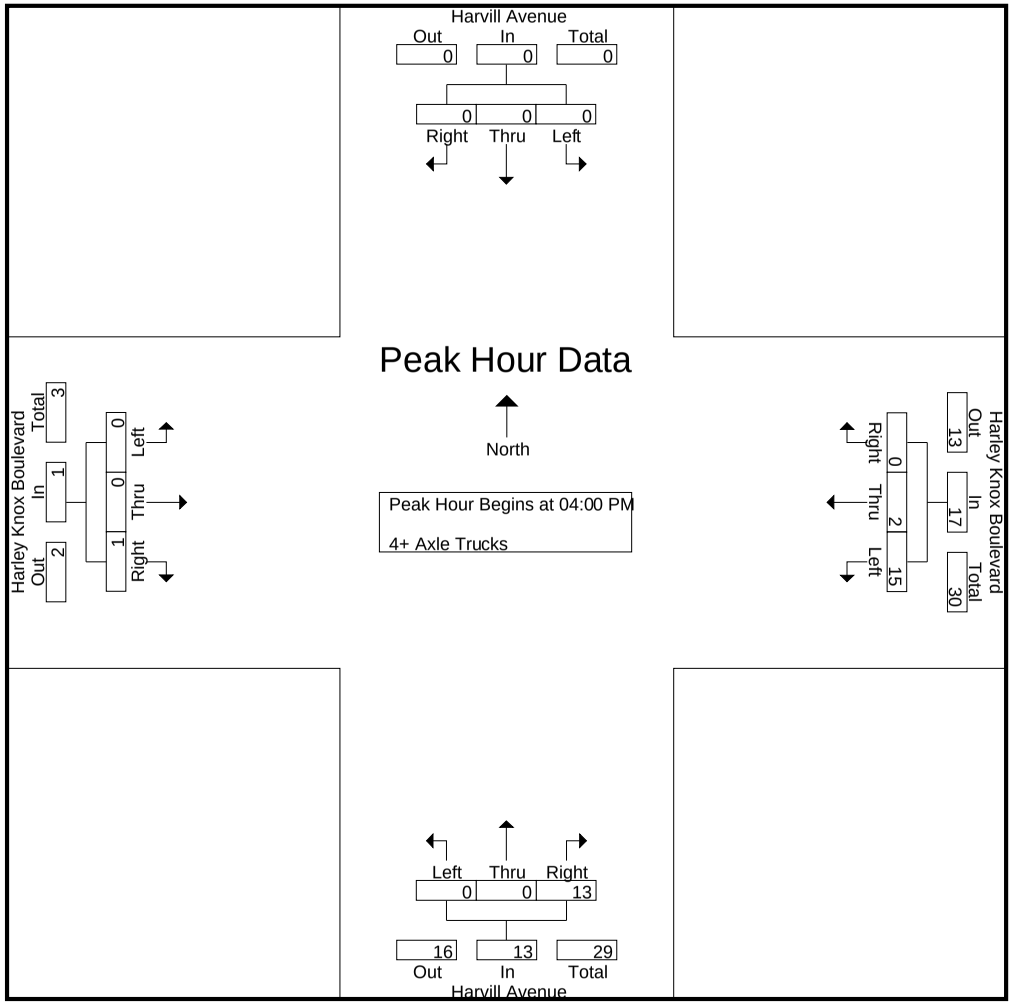
	Harvill Avenue Southbound					Harley Knox Boulevard Westbound					Harvill Avenue Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	2	1	0	0	3	0	0	6	2	6	0	0	0	0	0	2	9
04:15 PM	0	0	0	0	0	5	0	0	0	5	0	0	4	2	4	0	0	1	1	1	3	10
04:30 PM	0	0	0	0	0	5	1	0	0	6	0	0	3	2	3	0	0	0	0	0	2	9
04:45 PM	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	0	0	0	0	15	2	0	0	17	0	0	13	6	13	0	0	1	1	1	7	31
05:00 PM	0	0	0	0	0	5	0	0	0	5	0	0	3	1	3	0	0	0	0	0	1	8
05:15 PM	0	0	0	0	0	7	0	0	0	7	0	0	1	0	1	0	1	0	0	1	0	9
05:30 PM	0	0	0	0	0	2	0	0	0	2	0	0	3	3	3	0	0	0	0	0	3	5
05:45 PM	0	0	0	0	0	3	0	0	0	3	0	0	2	1	2	0	0	0	0	0	1	5
Total	0	0	0	0	0	17	0	0	0	17	0	0	9	5	9	0	1	0	0	1	5	27
Grand Total	0	0	0	0	0	32	2	0	0	34	0	0	22	11	22	0	1	1	1	2	12	58
Apprch %	0	0	0			94.1	5.9	0			0	0	100			0	50	50				
Total %	0	0	0		0	55.2	3.4	0		58.6	0	0	37.9		37.9	0	1.7	1.7		3.4	17.1	82.9

	Harvill Avenue Southbound				Harley Knox Boulevard Westbound				Harvill Avenue Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	2	1	0	3	0	0	6	6	0	0	0	0	9
04:15 PM	0	0	0	0	5	0	0	5	0	0	4	4	0	0	1	1	10
04:30 PM	0	0	0	0	5	1	0	6	0	0	3	3	0	0	0	0	9
04:45 PM	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	3
Total Volume	0	0	0	0	15	2	0	17	0	0	13	13	0	0	1	1	31
% App. Total	0	0	0		88.2	11.8	0		0	0	100		0	0	100		
PHF	.000	.000	.000	.000	.750	.500	.000	.708	.000	.000	.542	.542	.000	.000	.250	.250	.775

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Road
Weather: Clear

File Name : CRVHAHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Location: County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Boulevard

Date: 4/14/2015
Weather: Clear

PEDESTRIANS

	North Leg Harvill Avenue	East Leg Harley Knox Boulevard	South Leg Harvill Avenue	West Leg Harley Knox Boulevard	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	1	1
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	1	1

	North Leg Harvill Avenue	East Leg Harley Knox Boulevard	South Leg Harvill Avenue	West Leg Harley Knox Boulevard	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	1	0	0	1	2
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	1	0	0	1	2

Location: County of Riverside
N/S: Harvill Avenue
E/W: Harley Knox Boulevard

Date: 4/14/2015
Weather: Clear

BICYCLES

	North Leg Harvill Avenue	East Leg Harley Knox Boulevard	South Leg Harvill Avenue	West Leg Harley Knox Boulevard	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg Harvill Avenue	East Leg Harley Knox Boulevard	South Leg Harvill Avenue	West Leg Harley Knox Boulevard	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

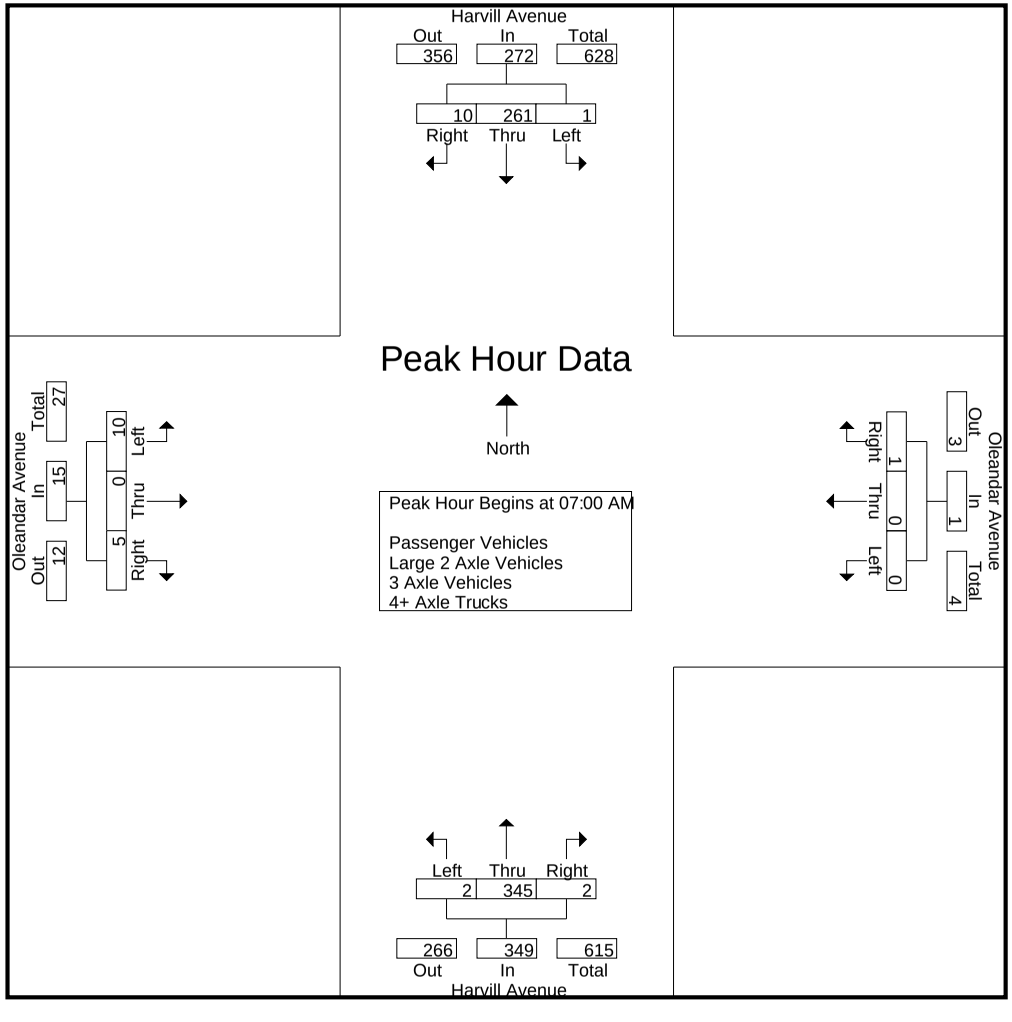
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	104	1	0	105	0	0	0	0	0	0	85	0	0	85	1	0	0	0	1	0	191
07:15 AM	0	68	4	0	72	0	0	0	0	0	1	77	0	0	78	1	0	1	0	2	0	152
07:30 AM	1	47	2	0	50	0	0	1	0	1	0	106	0	0	106	1	0	0	0	1	0	158
07:45 AM	0	42	3	0	45	0	0	0	0	0	1	77	2	0	80	7	0	4	1	11	1	136
Total	1	261	10	0	272	0	0	1	0	1	2	345	2	0	349	10	0	5	1	15	1	637
08:00 AM	3	18	1	0	22	0	0	0	0	0	3	41	0	0	44	2	0	2	0	4	0	70
08:15 AM	0	38	0	0	38	0	0	0	0	0	0	48	0	0	48	2	0	0	0	2	0	88
08:30 AM	3	27	0	0	30	0	0	5	2	5	0	47	0	0	47	4	0	0	0	4	2	86
08:45 AM	4	13	0	0	17	3	0	2	1	5	0	42	2	0	44	2	0	0	0	2	1	68
Total	10	96	1	0	107	3	0	7	3	10	3	178	2	0	183	10	0	2	0	12	3	312
Grand Total	11	357	11	0	379	3	0	8	3	11	5	523	4	0	532	20	0	7	1	27	4	949
Apprch %	2.9	94.2	2.9			27.3	0	72.7			0.9	98.3	0.8			74.1	0	25.9				
Total %	1.2	37.6	1.2		39.9	0.3	0	0.8		1.2	0.5	55.1	0.4		56.1	2.1	0	0.7		2.8	0.4	99.6
Passenger Vehicles	9	332	11		352	3	0	8		14	4	489	3		496	8	0	3		11	0	0
% Passenger Vehicles	81.8	93	100	0	92.9	100	0	100	100	100	80	93.5	75	0	93.2	40	0	42.9	0	39.3	0	0
Large 2 Axle Vehicles	2	8	0		10	0	0	0		0	1	21	1		23	3	0	1		4	0	0
% Large 2 Axle Vehicles	18.2	2.2	0	0	2.6	0	0	0	0	0	20	4	25	0	4.3	15	0	14.3	0	14.3	0	0
3 Axle Vehicles	0	4	0		4	0	0	0		0	0	3	0		3	0	0	0		0	0	0
% 3 Axle Vehicles	0	1.1	0	0	1.1	0	0	0	0	0	0	0.6	0	0	0.6	0	0	0	0	0	0	0
4+ Axle Trucks	0	13	0		13	0	0	0		0	0	10	0		10	9	0	3		13	0	0
% 4+ Axle Trucks	0	3.6	0	0	3.4	0	0	0	0	0	0	1.9	0	0	1.9	45	0	42.9	100	46.4	0	0

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	104	1	105	0	0	0	0	0	85	0	85	1	0	0	1	191
07:15 AM	0	68	4	72	0	0	0	0	1	77	0	78	1	0	1	2	152
07:30 AM	1	47	2	50	0	0	1	1	0	106	0	106	1	0	0	1	158
07:45 AM	0	42	3	45	0	0	0	0	1	77	2	80	7	0	4	11	136
Total Volume	1	261	10	272	0	0	1	1	2	345	2	349	10	0	5	15	637
% App. Total	0.4	96	3.7		0	0	100		0.6	98.9	0.6		66.7	0	33.3		
PHF	.250	.627	.625	.648	.000	.000	.250	.250	.500	.814	.250	.823	.357	.000	.313	.341	.834

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

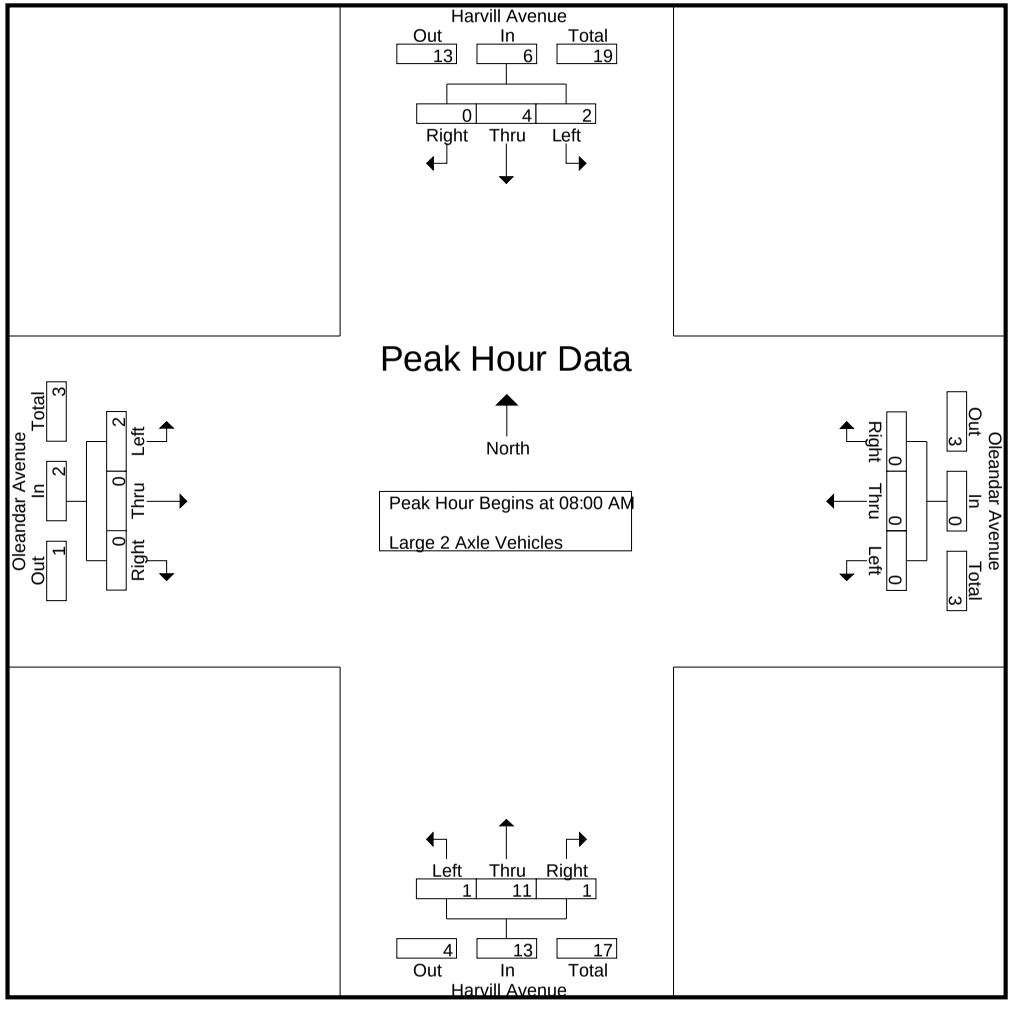
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	3
07:15 AM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	1	0	1	0	5
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	0	4
07:45 AM	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4
Total	0	4	0	0	4	0	0	0	0	0	0	10	0	0	10	1	0	1	0	2	0	16
08:00 AM	0	0	0	0	0	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	5
08:15 AM	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	0	5
08:30 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	3
08:45 AM	2	1	0	0	3	0	0	0	0	0	0	4	1	0	5	0	0	0	0	0	0	8
Total	2	4	0	0	6	0	0	0	0	0	1	11	1	0	13	2	0	0	0	2	0	21
Grand Total	2	8	0	0	10	0	0	0	0	0	1	21	1	0	23	3	0	1	0	4	0	37
Apprch %	20	80	0			0	0	0			4.3	91.3	4.3			75	0	25				
Total %	5.4	21.6	0		27	0	0	0		0	2.7	56.8	2.7		62.2	8.1	0	2.7		10.8	0	100

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	0	0	0	0	0	0	1	4	0	5	0	0	0	0	5
08:15 AM	0	2	0	2	0	0	0	0	0	2	0	2	1	0	0	1	5
08:30 AM	0	1	0	1	0	0	0	0	0	1	0	1	1	0	0	1	3
08:45 AM	2	1	0	3	0	0	0	0	0	4	1	5	0	0	0	0	8
Total Volume	2	4	0	6	0	0	0	0	1	11	1	13	2	0	0	2	21
% App. Total	33.3	66.7	0		0	0	0		7.7	84.6	7.7		100	0	0		
PHF	.250	.500	.000	.500	.000	.000	.000	.000	.250	.688	.250	.650	.500	.000	.000	.500	.656

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

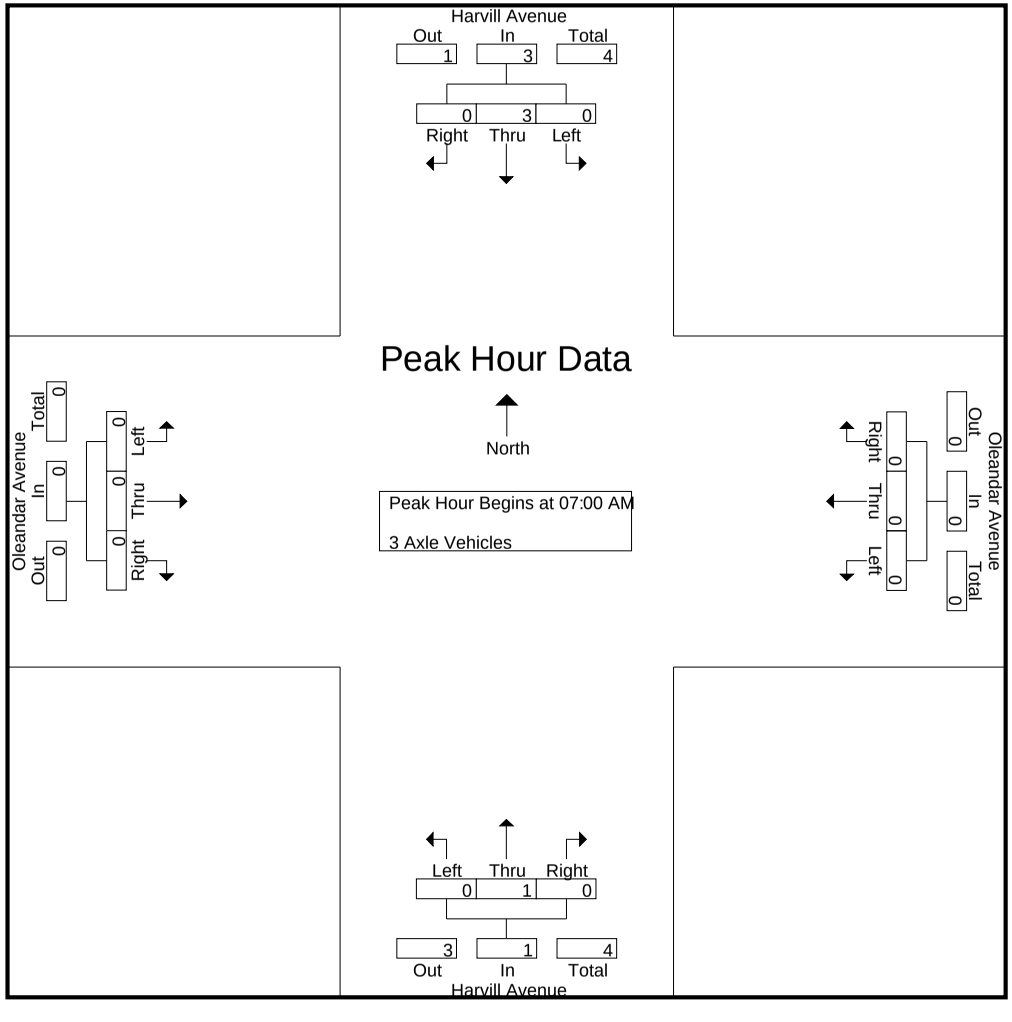
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
07:30 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4
08:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	3
Grand Total	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	7
Apprch %	0	100	0			0	0	0			0	100	0			0	0	0				
Total %	0	57.1	0		57.1	0	0	0		0	0	42.9	0		42.9	0	0	0		0	0	100

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
07:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	3	0	3	0	0	0	0	0	1	0	1	0	0	0	0	4
% App. Total	0	100	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.375	.000	.375	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.500

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

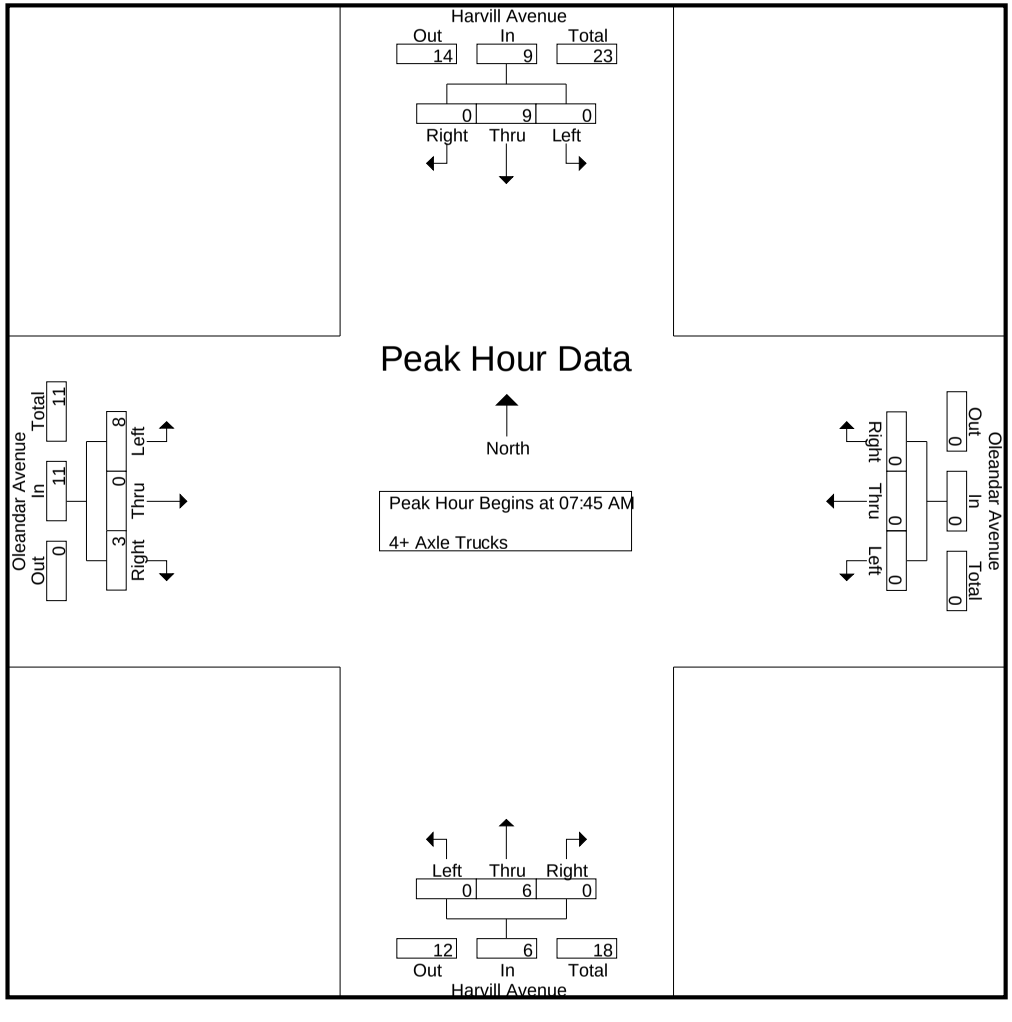
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
07:15 AM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3
07:30 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
07:45 AM	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	4	0	3	1	7	1	11
Total	0	6	0	0	6	0	0	0	0	0	0	4	0	0	4	4	0	3	1	7	1	17
08:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2	0	0	0	2	0	4
08:15 AM	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	5
08:30 AM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	2	0	0	0	2	0	6
08:45 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	3
Total	0	7	0	0	7	0	0	0	0	0	0	6	0	0	6	5	0	0	0	5	0	18
Grand Total	0	13	0	0	13	0	0	0	0	0	0	10	0	0	10	9	0	3	1	12	1	35
Apprch %	0	100	0			0	0	0			0	100	0			75	0	25				
Total %	0	37.1	0		37.1	0	0	0		0	0	28.6	0		28.6	25.7	0	8.6		34.3	2.8	97.2

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	3	0	3	0	0	0	0	0	1	0	1	4	0	3	7	11
08:00 AM	0	1	0	1	0	0	0	0	0	1	0	1	2	0	0	2	4
08:15 AM	0	4	0	4	0	0	0	0	0	1	0	1	0	0	0	0	5
08:30 AM	0	1	0	1	0	0	0	0	0	3	0	3	2	0	0	2	6
Total Volume	0	9	0	9	0	0	0	0	0	6	0	6	8	0	3	11	26
% App. Total	0	100	0		0	0	0		0	100	0		72.7	0	27.3		
PHF	.000	.563	.000	.563	.000	.000	.000	.000	.000	.500	.000	.500	.500	.000	.250	.393	.591

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

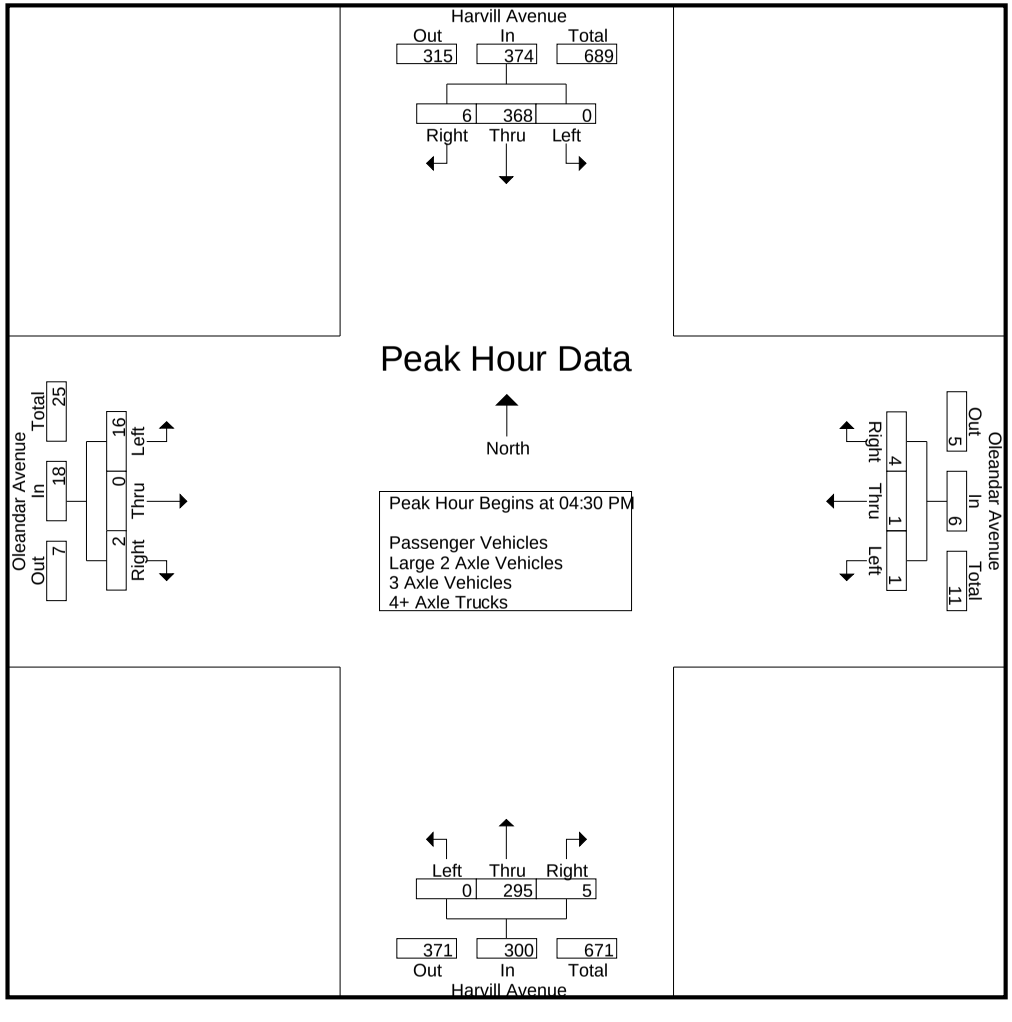
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	2	76	0	0	78	1	0	2	0	3	0	88	0	0	88	6	0	0	0	6	0	175
04:15 PM	0	75	1	0	76	2	0	2	1	4	0	77	2	0	79	7	0	1	1	8	2	167
04:30 PM	0	91	1	0	92	1	0	1	0	2	0	75	1	0	76	8	0	0	0	8	0	178
04:45 PM	0	94	2	0	96	0	0	0	0	0	0	78	0	0	78	2	0	0	0	2	0	176
Total	2	336	4	0	342	4	0	5	1	9	0	318	3	0	321	23	0	1	1	24	2	696
05:00 PM	0	86	1	0	87	0	1	0	0	1	0	68	1	0	69	4	0	0	0	4	0	161
05:15 PM	0	97	2	0	99	0	0	3	0	3	0	74	3	0	77	2	0	2	0	4	0	183
05:30 PM	0	63	3	1	66	0	0	0	0	0	1	83	0	0	84	4	0	1	0	5	1	155
05:45 PM	0	79	1	0	80	0	0	0	0	0	0	56	1	0	57	1	0	0	0	1	0	138
Total	0	325	7	1	332	0	1	3	0	4	1	281	5	0	287	11	0	3	0	14	1	637
Grand Total	2	661	11	1	674	4	1	8	1	13	1	599	8	0	608	34	0	4	1	38	3	1333
Apprch %	0.3	98.1	1.6			30.8	7.7	61.5			0.2	98.5	1.3			89.5	0	10.5				
Total %	0.2	49.6	0.8		50.6	0.3	0.1	0.6		1	0.1	44.9	0.6		45.6	2.6	0	0.3		2.9	0.2	99.8
Passenger Vehicles	2	619	9		631	3	1	7		12	1	570	8		579	16	0	1		18	0	0
% Passenger Vehicles	100	93.6	81.8	100	93.5	75	100	87.5	100	85.7	100	95.2	100	0	95.2	47.1	0	25	100	46.2	0	0
Large 2 Axle Vehicles	0	18	2		20	1	0	1		2	0	9	0		9	0	0	0		0	0	0
% Large 2 Axle Vehicles	0	2.7	18.2	0	3	25	0	12.5	0	14.3	0	1.5	0	0	1.5	0	0	0	0	0	0	0
3 Axle Vehicles	0	3	0		3	0	0	0		0	0	10	0		10	6	0	1		7	0	0
% 3 Axle Vehicles	0	0.5	0	0	0.4	0	0	0	0	0	0	1.7	0	0	1.6	17.6	0	25	0	17.9	0	0
4+ Axle Trucks	0	21	0		21	0	0	0		0	0	10	0		10	12	0	2		14	0	0
% 4+ Axle Trucks	0	3.2	0	0	3.1	0	0	0	0	0	0	1.7	0	0	1.6	35.3	0	50	0	35.9	0	0

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	91	1	92	1	0	1	2	0	75	1	76	8	0	0	8	178
04:45 PM	0	94	2	96	0	0	0	0	0	78	0	78	2	0	0	2	176
05:00 PM	0	86	1	87	0	1	0	1	0	68	1	69	4	0	0	4	161
05:15 PM	0	97	2	99	0	0	3	3	0	74	3	77	2	0	2	4	183
Total Volume	0	368	6	374	1	1	4	6	0	295	5	300	16	0	2	18	698
% App. Total	0	98.4	1.6		16.7	16.7	66.7		0	98.3	1.7		88.9	0	11.1		
PHF	.000	.948	.750	.944	.250	.250	.333	.500	.000	.946	.417	.962	.500	.000	.250	.563	.954

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

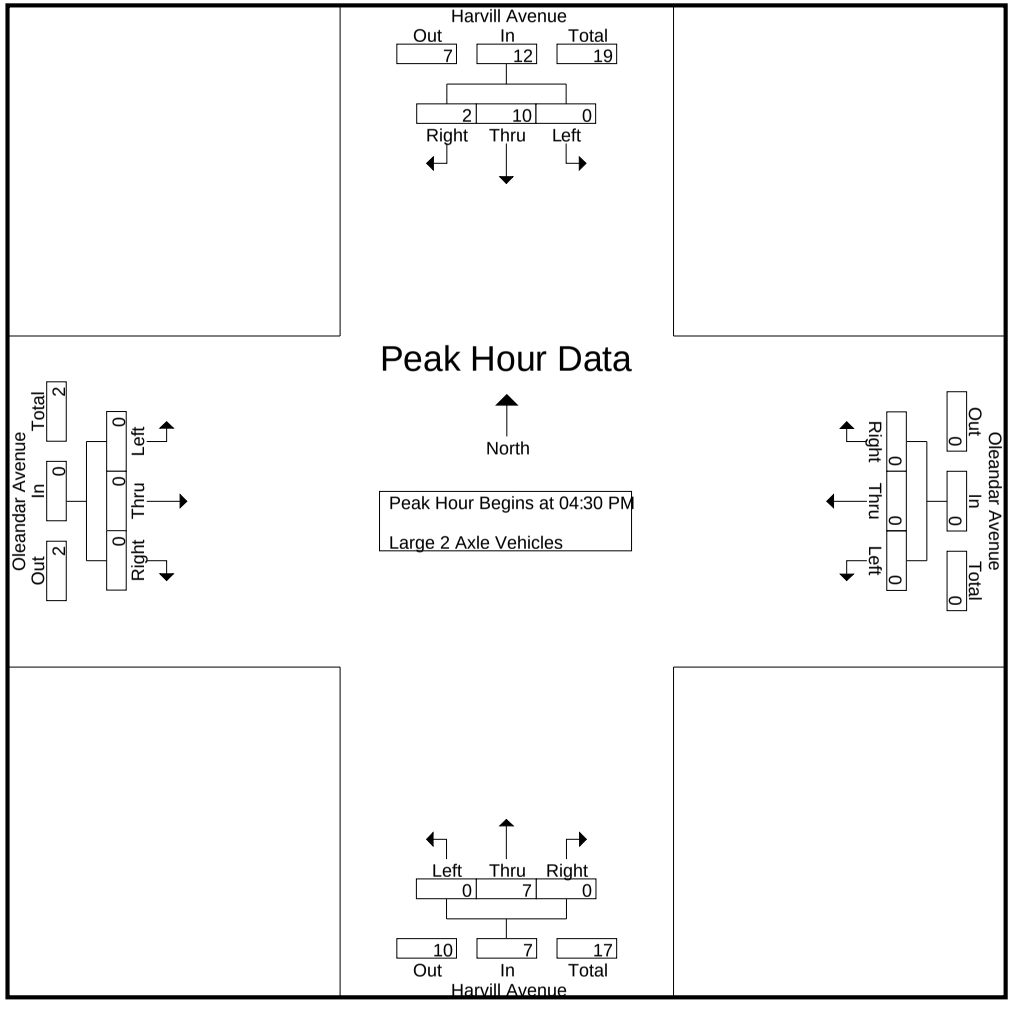
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4
04:15 PM	0	1	0	0	1	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
04:30 PM	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4
04:45 PM	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4
Total	0	7	1	0	8	1	0	1	0	2	0	5	0	0	5	0	0	0	0	0	0	15
05:00 PM	0	4	1	0	5	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	6
05:15 PM	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	5
05:30 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:45 PM	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	11	1	0	12	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	16
Grand Total	0	18	2	0	20	1	0	1	0	2	0	9	0	0	9	0	0	0	0	0	0	31
Apprch %	0	90	10			50	0	50			0	100	0			0	0	0				
Total %	0	58.1	6.5		64.5	3.2	0	3.2		6.5	0	29	0		29	0	0	0		0	0	100

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	1	1	2	0	0	0	0	0	2	0	2	0	0	0	0	4
04:45 PM	0	3	0	3	0	0	0	0	0	1	0	1	0	0	0	0	4
05:00 PM	0	4	1	5	0	0	0	0	0	1	0	1	0	0	0	0	6
05:15 PM	0	2	0	2	0	0	0	0	0	3	0	3	0	0	0	0	5
Total Volume	0	10	2	12	0	0	0	0	0	7	0	7	0	0	0	0	19
% App. Total	0	83.3	16.7		0	0	0		0	100	0		0	0	0		
PHF	.000	.625	.500	.600	.000	.000	.000	.000	.000	.583	.000	.583	.000	.000	.000	.000	.792

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

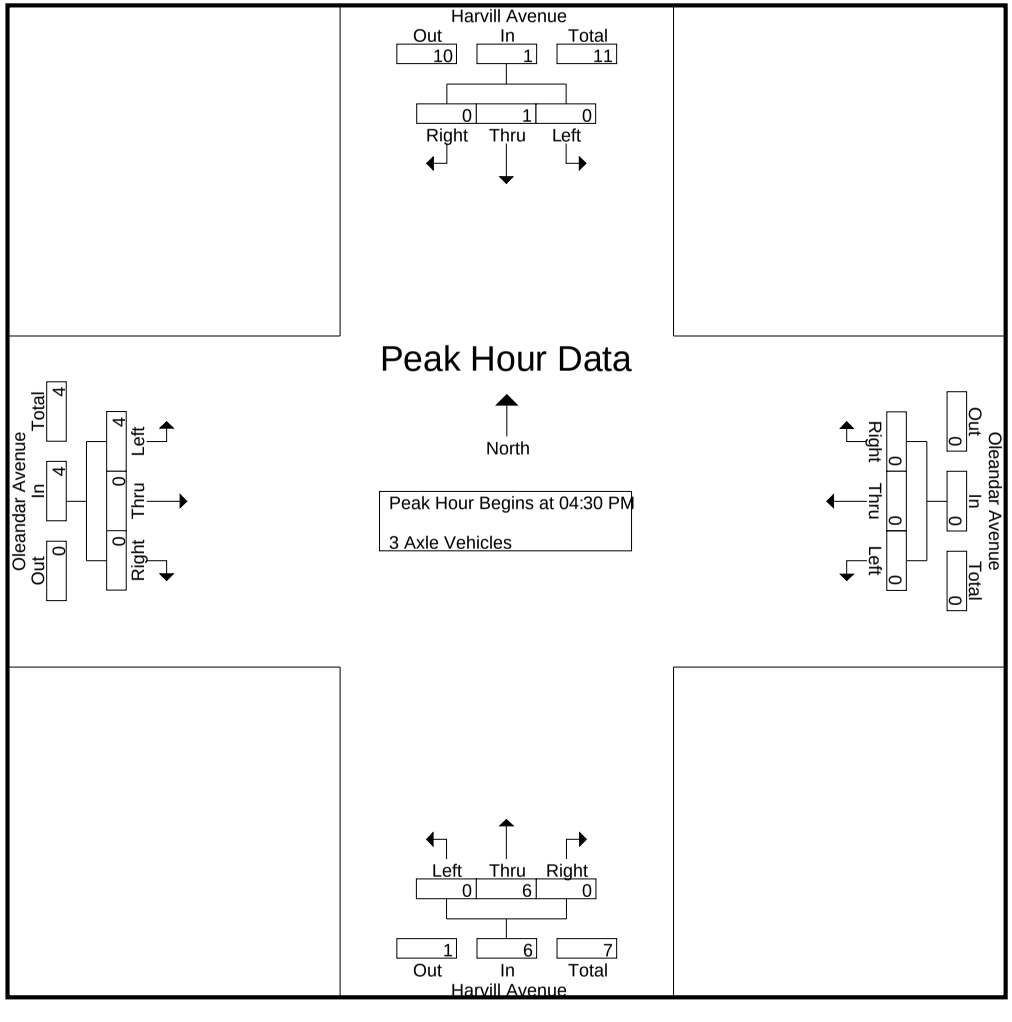
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
04:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	2	0	0	0	2	0	6
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	0	2	0	0	0	0	0	0	5	0	0	5	4	0	0	0	4	0	11
05:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	0	3
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	1	0	1	0	4
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	1	0	0	0	0	0	0	5	0	0	5	2	0	1	0	3	0	9
Grand Total	0	3	0	0	3	0	0	0	0	0	0	10	0	0	10	6	0	1	0	7	0	20
Apprch %	0	100	0			0	0	0			0	100	0			85.7	0	14.3				
Total %	0	15	0		15	0	0	0		0	0	50	0		50	30	0	5		35	0	100

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	0	0	0	0	4	0	4	2	0	0	2	6
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	2
05:15 PM	0	0	0	0	0	0	0	0	0	2	0	2	1	0	0	1	3
Total Volume	0	1	0	1	0	0	0	0	0	6	0	6	4	0	0	4	11
% App. Total	0	100	0		0	0	0		0	100	0		100	0	0		
PHF	.000	.250	.000	.250	.000	.000	.000	.000	.000	.375	.000	.375	.500	.000	.000	.500	.458

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

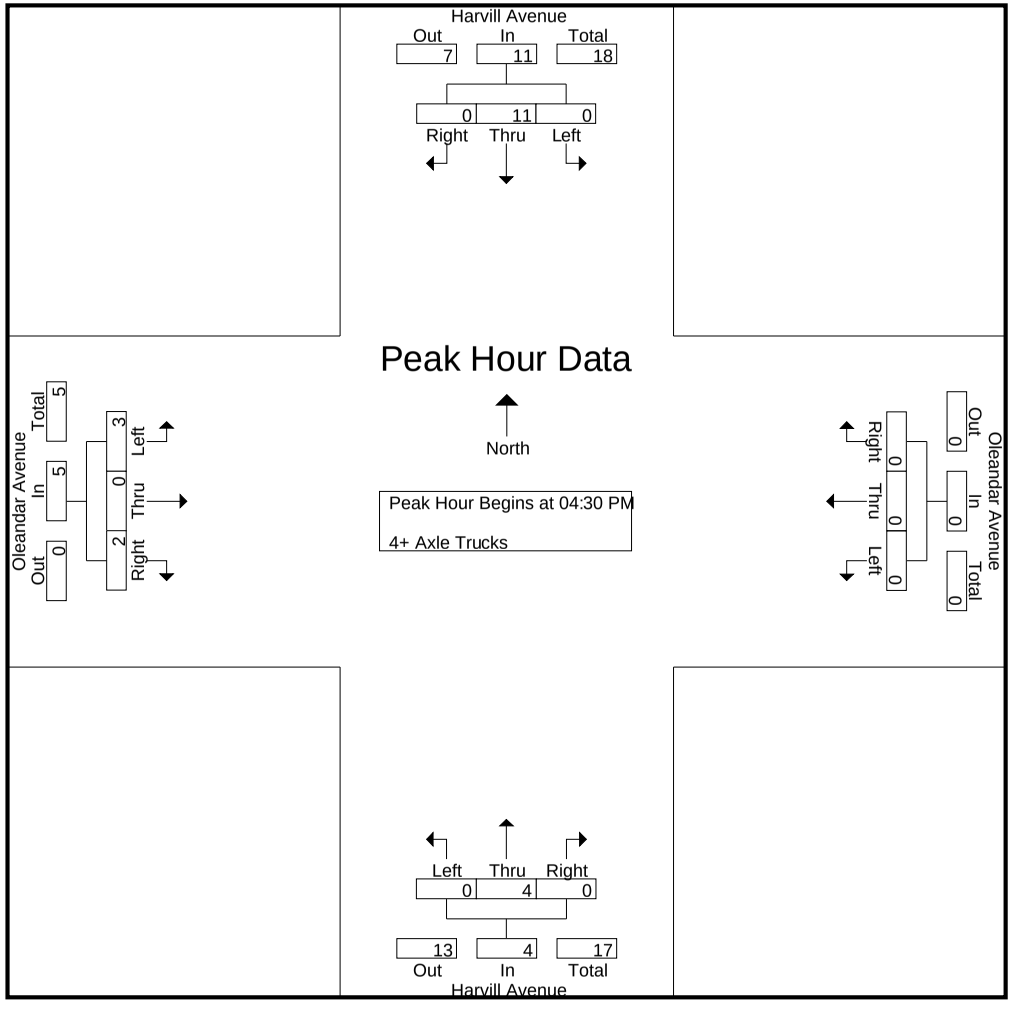
	Harvill Avenue Southbound					Oleandar Avenue Westbound					Harvill Avenue Northbound					Oleandar Avenue Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	4	0	0	0	4	0	7
04:15 PM	0	5	0	0	5	0	0	0	0	0	0	3	0	0	3	2	0	0	0	2	0	10
04:30 PM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	4
04:45 PM	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	12	0	0	12	0	0	0	0	0	0	5	0	0	5	7	0	0	0	7	0	24
05:00 PM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	2	0	0	0	2	0	5
05:15 PM	0	5	0	0	5	0	0	0	0	0	0	1	0	0	1	0	0	2	0	2	0	8
05:30 PM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	2	0	0	0	2	0	5
05:45 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	3
Total	0	9	0	0	9	0	0	0	0	0	0	5	0	0	5	5	0	2	0	7	0	21
Grand Total	0	21	0	0	21	0	0	0	0	0	0	10	0	0	10	12	0	2	0	14	0	45
Apprch %	0	100	0			0	0	0			0	100	0			85.7	0	14.3				
Total %	0	46.7	0		46.7	0	0	0		0	0	22.2	0		22.2	26.7	0	4.4		31.1	0	100

	Harvill Avenue Southbound				Oleandar Avenue Westbound				Harvill Avenue Northbound				Oleandar Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	2	0	2	0	0	0	0	0	1	0	1	1	0	0	1	4
04:45 PM	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
05:00 PM	0	1	0	1	0	0	0	0	0	2	0	2	2	0	0	2	5
05:15 PM	0	5	0	5	0	0	0	0	0	1	0	1	0	0	2	2	8
Total Volume	0	11	0	11	0	0	0	0	0	4	0	4	3	0	2	5	20
% App. Total	0	100	0		0	0	0		0	100	0		60	0	40		
PHF	.000	.550	.000	.550	.000	.000	.000	.000	.000	.500	.000	.500	.375	.000	.250	.625	.625

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue
Weather: Clear

File Name : CRVHAOLPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Location: County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue

Date: 4/14/2015
Weather: Clear

PEDESTRIANS

	North Leg Harvill Avenue	East Leg Oleander Avenue	South Leg Harvill Avenue	West Leg Oleander Avenue	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg Harvill Avenue	East Leg Oleander Avenue	South Leg Harvill Avenue	West Leg Oleander Avenue	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	1	1
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	1	1

Location: County of Riverside
N/S: Harvill Avenue
E/W: Oleander Avenue

Date: 4/14/2015
Weather: Clear

BICYCLES

	North Leg Harvill Avenue	East Leg Oleander Avenue	South Leg Harvill Avenue	West Leg Oleander Avenue	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	1	1
TOTAL VOLUMES:	0	0	0	1	1

	North Leg Harvill Avenue	East Leg Oleander Avenue	South Leg Harvill Avenue	West Leg Oleander Avenue	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

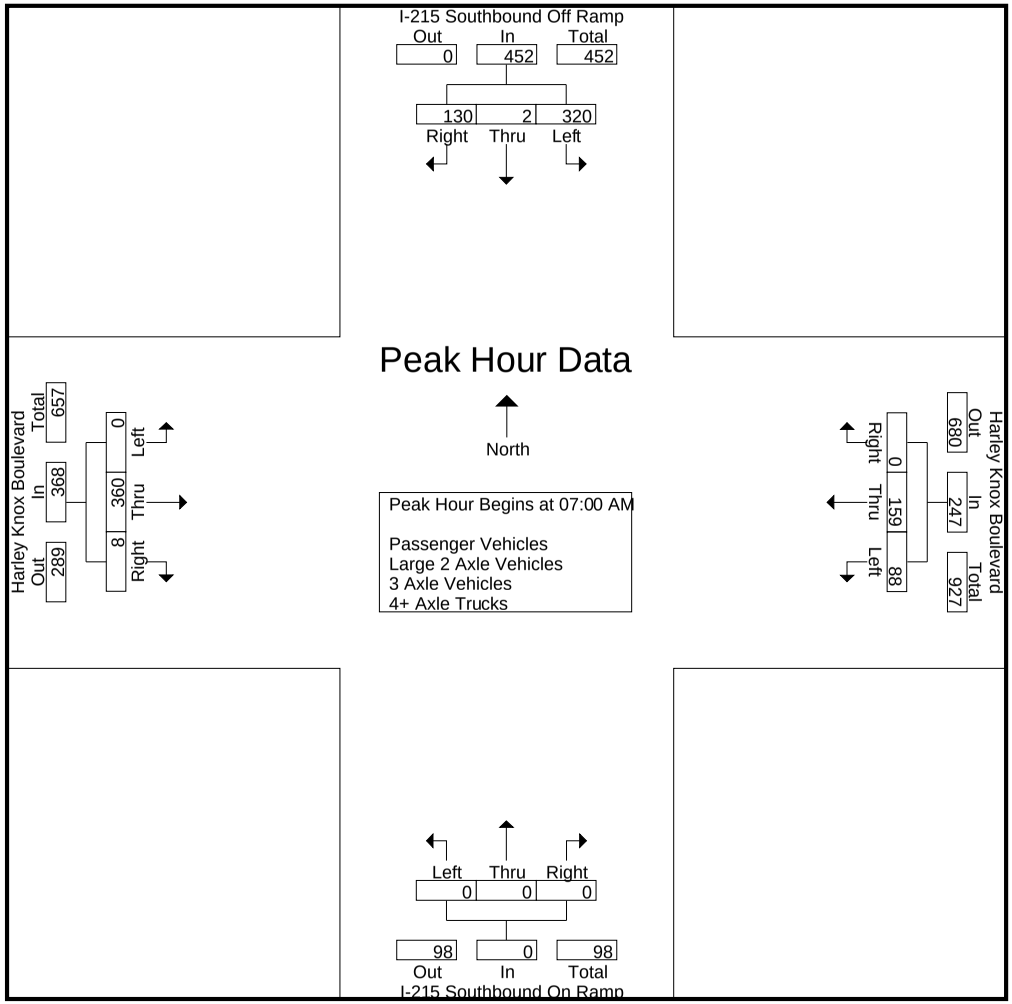
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	73	0	23	9	96	21	83	0	0	104	0	0	0	0	0	0	84	1	1	85	10	285
07:15 AM	79	0	35	18	114	23	44	0	0	67	0	0	0	0	0	0	80	0	0	80	18	261
07:30 AM	72	2	39	20	113	26	18	0	0	44	0	0	0	0	0	0	110	2	1	112	21	269
07:45 AM	96	0	33	13	129	18	14	0	0	32	0	0	0	0	0	0	86	5	3	91	16	252
Total	320	2	130	60	452	88	159	0	0	247	0	0	0	0	0	0	360	8	5	368	65	1067
08:00 AM	47	0	16	8	63	19	10	0	0	29	0	0	0	0	0	0	45	3	1	48	9	140
08:15 AM	56	0	26	7	82	17	17	0	0	34	0	0	0	0	0	0	40	1	0	41	7	157
08:30 AM	62	0	23	10	85	19	10	0	0	29	0	0	0	0	0	0	54	2	2	56	12	170
08:45 AM	61	0	11	3	72	20	10	0	0	30	0	0	0	0	0	0	43	3	1	46	4	148
Total	226	0	76	28	302	75	47	0	0	122	0	0	0	0	0	0	182	9	4	191	32	615
Grand Total	546	2	206	88	754	163	206	0	0	369	0	0	0	0	0	0	542	17	9	559	97	1682
Apprch %	72.4	0.3	27.3			44.2	55.8	0			0	0	0			0	97	3				
Total %	32.5	0.1	12.2		44.8	9.7	12.2	0		21.9	0	0	0		0	0	32.2	1		33.2	5.5	94.5
Passenger Vehicles	422	2	179		682	117	198	0		315	0	0	0		0	0	510	13		531	0	0
% Passenger Vehicles	77.3	100	86.9	89.8	81	71.8	96.1	0	0	85.4	0	0	0	0	0	0	94.1	76.5	88.9	93.5	0	0
Large 2 Axle Vehicles	34	0	4		40	16	4	0		20	0	0	0		0	0	12	1		14	0	0
% Large 2 Axle Vehicles	6.2	0	1.9	2.3	4.8	9.8	1.9	0	0	5.4	0	0	0	0	0	0	2.2	5.9	11.1	2.5	0	0
3 Axle Vehicles	32	0	3		37	11	1	0		12	0	0	0		0	0	4	0		4	0	0
% 3 Axle Vehicles	5.9	0	1.5	2.3	4.4	6.7	0.5	0	0	3.3	0	0	0	0	0	0	0.7	0	0	0.7	0	0
4+ Axle Trucks	58	0	20		83	19	3	0		22	0	0	0		0	0	16	3		19	0	0
% 4+ Axle Trucks	10.6	0	9.7	5.7	9.9	11.7	1.5	0	0	6	0	0	0	0	0	0	3	17.6	0	3.3	0	0

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	73	0	23	96	21	83	0	104	0	0	0	0	0	84	1	85	285
07:15 AM	79	0	35	114	23	44	0	67	0	0	0	0	0	80	0	80	261
07:30 AM	72	2	39	113	26	18	0	44	0	0	0	0	0	110	2	112	269
07:45 AM	96	0	33	129	18	14	0	32	0	0	0	0	0	86	5	91	252
Total Volume	320	2	130	452	88	159	0	247	0	0	0	0	0	360	8	368	1067
% App. Total	70.8	0.4	28.8		35.6	64.4	0		0	0	0		0	97.8	2.2		
PHF	.833	.250	.833	.876	.846	.479	.000	.594	.000	.000	.000	.000	.000	.818	.400	.821	.936

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

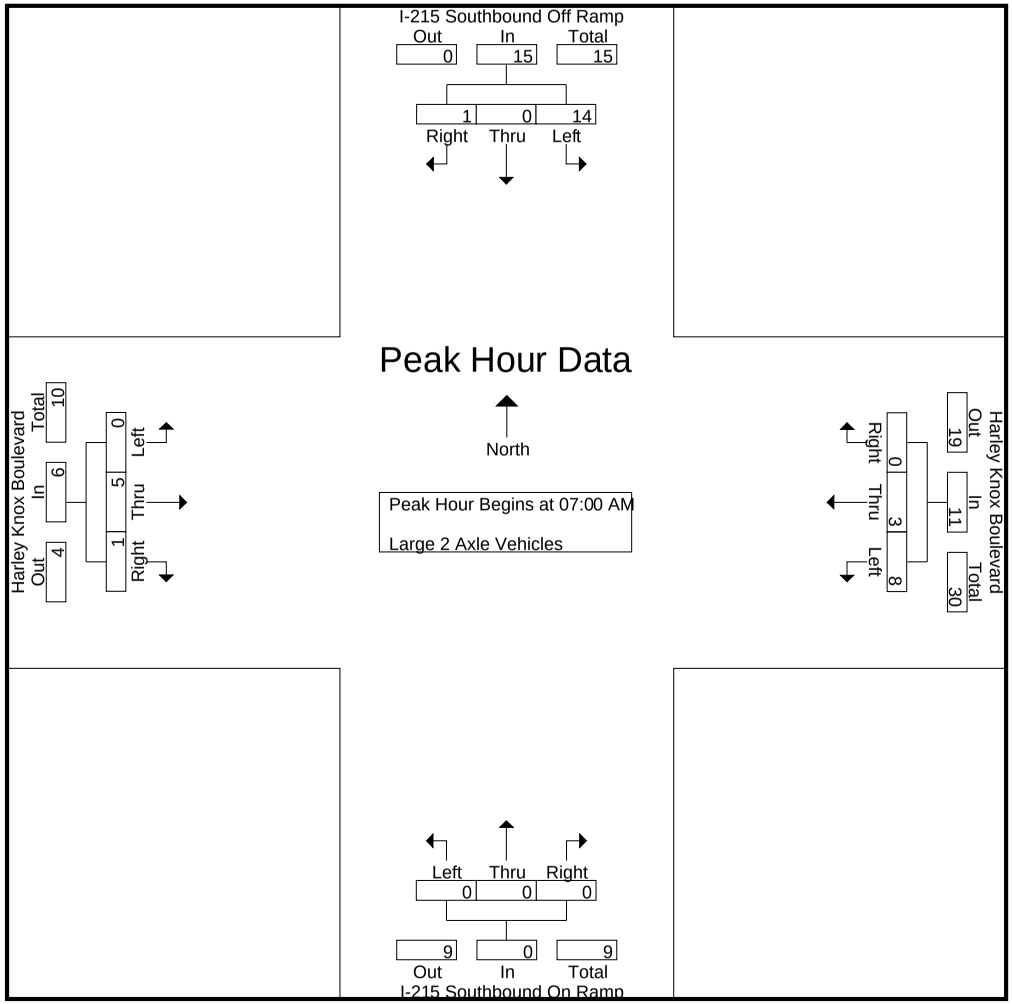
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	4	0	0	0	4	1	2	0	0	3	0	0	0	0	0	0	1	0	0	1	0	8
07:15 AM	4	0	0	0	4	1	0	0	0	1	0	0	0	0	0	0	2	0	0	2	0	7
07:30 AM	4	0	1	1	5	2	0	0	0	2	0	0	0	0	0	0	1	0	0	1	1	8
07:45 AM	2	0	0	0	2	4	1	0	0	5	0	0	0	0	0	0	1	1	1	2	1	9
Total	14	0	1	1	15	8	3	0	0	11	0	0	0	0	0	0	5	1	1	6	2	32
08:00 AM	5	0	1	0	6	4	0	0	0	4	0	0	0	0	0	0	3	0	0	3	0	13
08:15 AM	4	0	0	0	4	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	6
08:30 AM	4	0	0	0	4	2	0	0	0	2	0	0	0	0	0	0	1	0	0	1	0	7
08:45 AM	7	0	2	1	9	1	1	0	0	2	0	0	0	0	0	0	2	0	0	2	1	13
Total	20	0	3	1	23	8	1	0	0	9	0	0	0	0	0	0	7	0	0	7	1	39
Grand Total	34	0	4	2	38	16	4	0	0	20	0	0	0	0	0	0	12	1	1	13	3	71
Apprch %	89.5	0	10.5			80	20	0			0	0	0			0	92.3	7.7				
Total %	47.9	0	5.6		53.5	22.5	5.6	0		28.2	0	0	0		0	0	16.9	1.4		18.3	4.1	95.9

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	4	0	0	4	1	2	0	3	0	0	0	0	0	1	0	1	8
07:15 AM	4	0	0	4	1	0	0	1	0	0	0	0	0	2	0	2	7
07:30 AM	4	0	1	5	2	0	0	2	0	0	0	0	0	1	0	1	8
07:45 AM	2	0	0	2	4	1	0	5	0	0	0	0	0	1	1	2	9
Total Volume	14	0	1	15	8	3	0	11	0	0	0	0	0	5	1	6	32
% App. Total	93.3	0	6.7		72.7	27.3	0		0	0	0		0	83.3	16.7		
PHF	.875	.000	.250	.750	.500	.375	.000	.550	.000	.000	.000	.000	.000	.625	.250	.750	.889

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

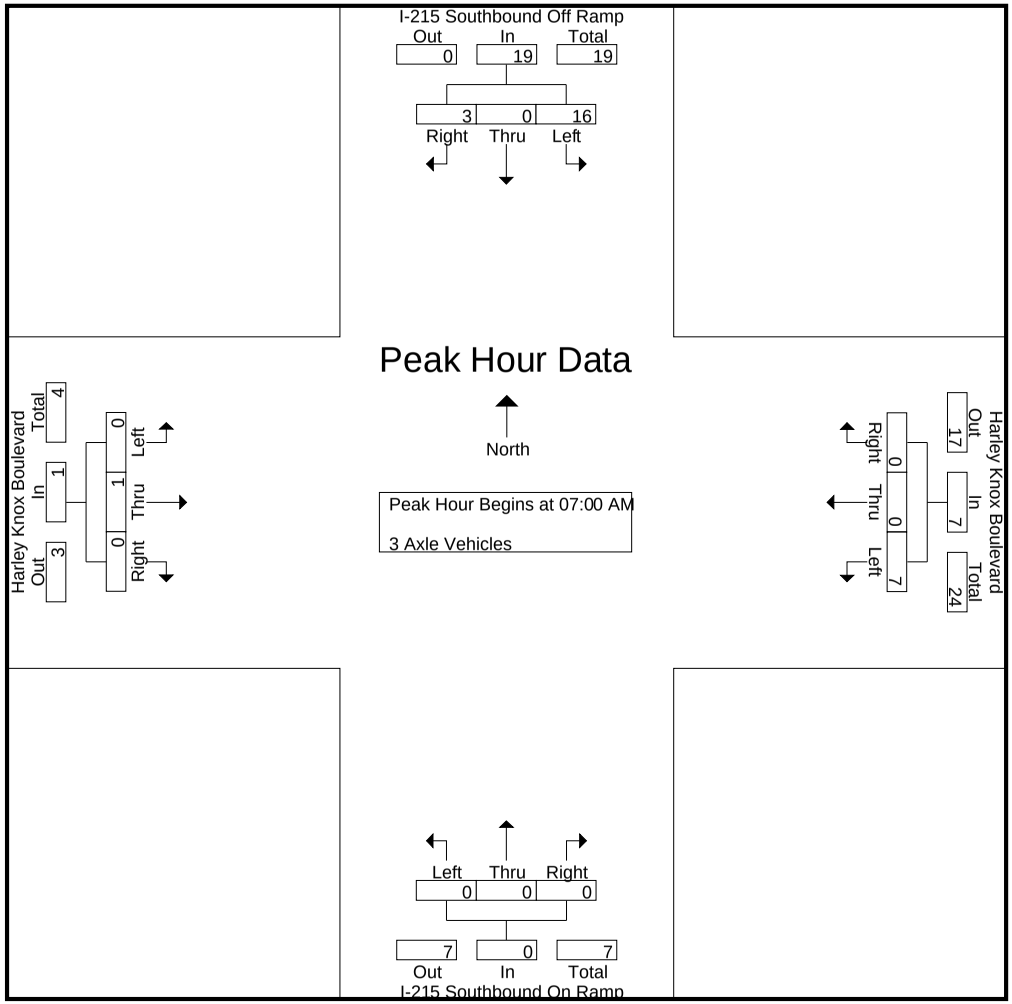
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	7	0	1	1	8	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1	11
07:15 AM	6	0	0	0	6	2	0	0	0	2	0	0	0	0	0	0	1	0	0	1	0	9
07:30 AM	2	0	1	1	3	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	4
07:45 AM	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
Total	16	0	3	2	19	7	0	0	0	7	0	0	0	0	0	0	1	0	0	1	2	27
08:00 AM	1	0	0	0	1	2	1	0	0	3	0	0	0	0	0	0	1	0	0	1	0	5
08:15 AM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	4
08:30 AM	2	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
08:45 AM	10	0	0	0	10	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	12
Total	16	0	0	0	16	4	1	0	0	5	0	0	0	0	0	0	3	0	0	3	0	24
Grand Total	32	0	3	2	35	11	1	0	0	12	0	0	0	0	0	0	4	0	0	4	2	51
Apprch %	91.4	0	8.6			91.7	8.3	0			0	0	0			0	100	0				
Total %	62.7	0	5.9		68.6	21.6	2	0		23.5	0	0	0		0	0	7.8	0		7.8	3.8	96.2

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	7	0	1	8	3	0	0	3	0	0	0	0	0	0	0	0	11
07:15 AM	6	0	0	6	2	0	0	2	0	0	0	0	0	1	0	1	9
07:30 AM	2	0	1	3	1	0	0	1	0	0	0	0	0	0	0	0	4
07:45 AM	1	0	1	2	1	0	0	1	0	0	0	0	0	0	0	0	3
Total Volume	16	0	3	19	7	0	0	7	0	0	0	0	0	1	0	1	27
% App. Total	84.2	0	15.8		100	0	0		0	0	0		0	100	0		
PHF	.571	.000	.750	.594	.583	.000	.000	.583	.000	.000	.000	.000	.000	.250	.000	.250	.614

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

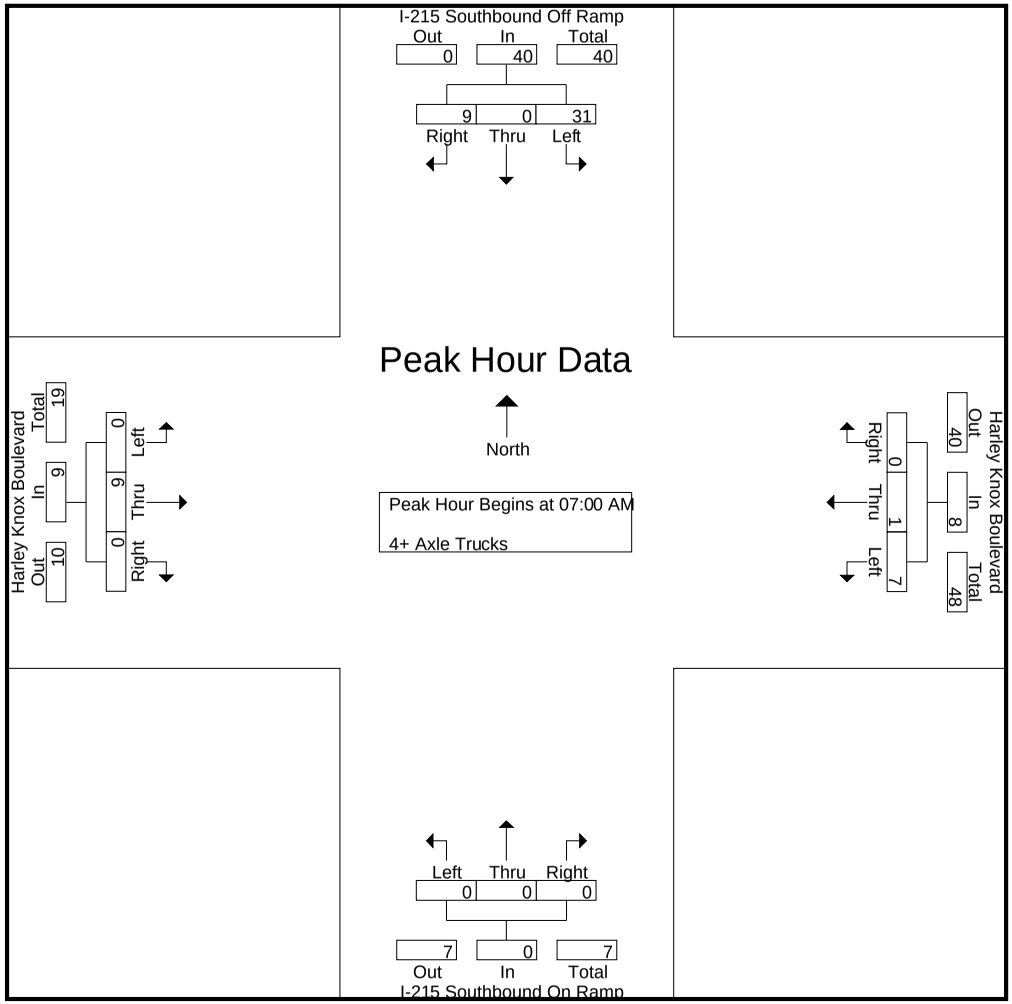
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	8	0	2	0	10	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	11
07:15 AM	10	0	4	0	14	2	0	0	0	2	0	0	0	0	0	0	3	0	0	3	0	19
07:30 AM	5	0	1	0	6	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	8
07:45 AM	8	0	2	1	10	2	1	0	0	3	0	0	0	0	0	0	6	0	0	6	1	19
Total	31	0	9	1	40	7	1	0	0	8	0	0	0	0	0	0	9	0	0	9	1	57
08:00 AM	4	0	2	1	6	3	0	0	0	3	0	0	0	0	0	0	0	1	0	1	1	10
08:15 AM	8	0	6	1	14	4	1	0	0	5	0	0	0	0	0	0	1	1	0	2	1	21
08:30 AM	8	0	2	2	10	3	1	0	0	4	0	0	0	0	0	0	6	0	0	6	2	20
08:45 AM	7	0	1	0	8	2	0	0	0	2	0	0	0	0	0	0	0	1	0	1	0	11
Total	27	0	11	4	38	12	2	0	0	14	0	0	0	0	0	0	7	3	0	10	4	62
Grand Total	58	0	20	5	78	19	3	0	0	22	0	0	0	0	0	0	16	3	0	19	5	119
Apprch %	74.4	0	25.6			86.4	13.6	0			0	0	0			0	84.2	15.8				
Total %	48.7	0	16.8		65.5	16	2.5	0		18.5	0	0	0		0	0	13.4	2.5		16	4	96

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	8	0	2	10	1	0	0	1	0	0	0	0	0	0	0	0	11
07:15 AM	10	0	4	14	2	0	0	2	0	0	0	0	0	3	0	3	19
07:30 AM	5	0	1	6	2	0	0	2	0	0	0	0	0	0	0	0	8
07:45 AM	8	0	2	10	2	1	0	3	0	0	0	0	0	6	0	6	19
Total Volume	31	0	9	40	7	1	0	8	0	0	0	0	0	9	0	9	57
% App. Total	77.5	0	22.5		87.5	12.5	0		0	0	0		0	100	0		
PHF	.775	.000	.563	.714	.875	.250	.000	.667	.000	.000	.000	.000	.000	.375	.000	.375	.750

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

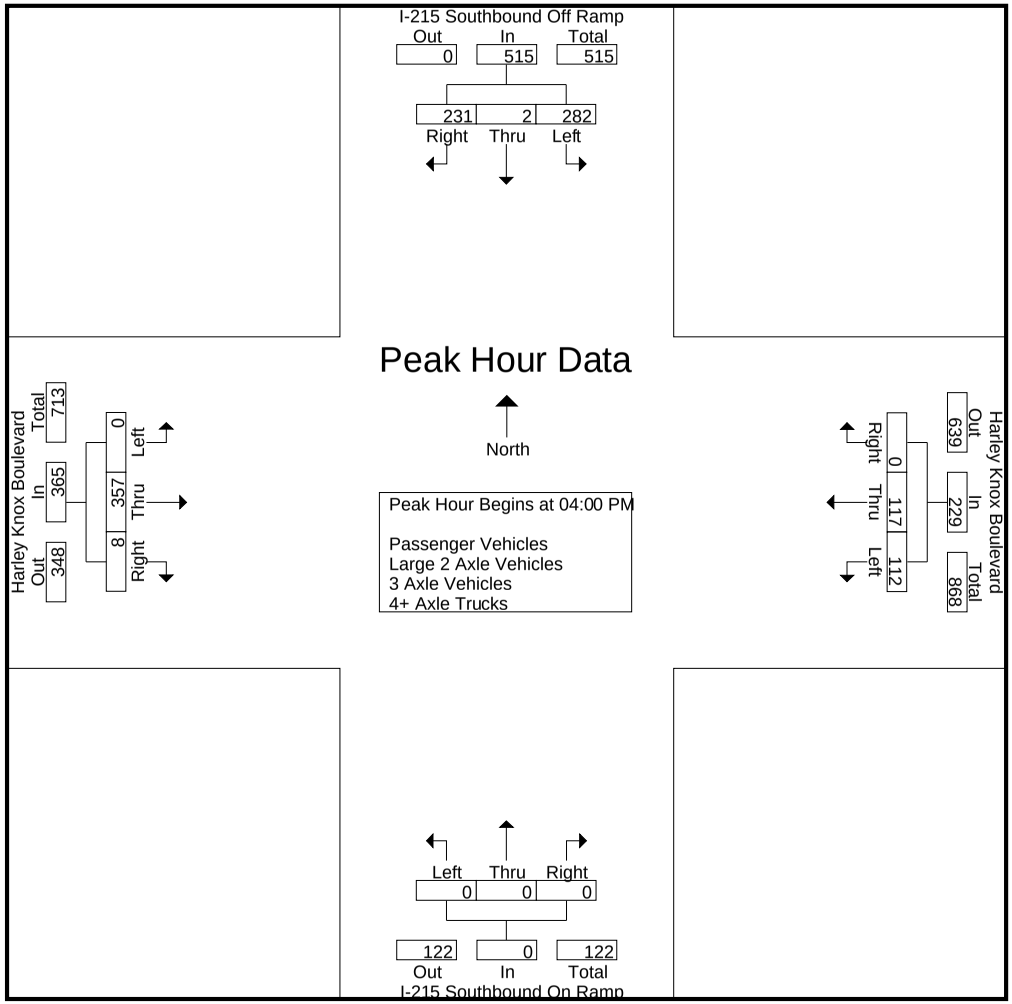
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	65	1	57	12	123	24	22	0	0	46	0	0	0	0	0	0	89	0	0	89	12	258
04:15 PM	79	0	53	17	132	31	21	0	0	52	0	0	0	0	0	0	86	3	0	89	17	273
04:30 PM	73	0	66	21	139	26	34	0	0	60	0	0	0	0	0	0	94	2	0	96	21	295
04:45 PM	65	1	55	22	121	31	40	0	0	71	0	0	0	0	0	0	88	3	0	91	22	283
Total	282	2	231	72	515	112	117	0	0	229	0	0	0	0	0	0	357	8	0	365	72	1109
05:00 PM	51	3	59	26	113	21	33	0	0	54	0	0	0	0	0	0	76	0	0	76	26	243
05:15 PM	53	0	72	18	125	18	28	0	0	46	0	0	0	0	0	0	75	1	0	76	18	247
05:30 PM	65	0	42	16	107	22	25	0	0	47	0	0	0	0	0	0	86	1	0	87	16	241
05:45 PM	63	2	54	14	119	9	27	0	0	36	0	0	0	0	0	0	60	1	0	61	14	216
Total	232	5	227	74	464	70	113	0	0	183	0	0	0	0	0	0	297	3	0	300	74	947
Grand Total	514	7	458	146	979	182	230	0	0	412	0	0	0	0	0	0	654	11	0	665	146	2056
Apprch %	52.5	0.7	46.8			44.2	55.8	0			0	0	0			0	98.3	1.7				
Total %	25	0.3	22.3		47.6	8.9	11.2	0		20	0	0	0		0	0	31.8	0.5		32.3	6.6	93.4
Passenger Vehicles	431	7	415		982	168	212	0		380	0	0	0		0	0	607	8		615	0	0
% Passenger Vehicles	83.9	100	90.6	88.4	87.3	92.3	92.2	0	0	92.2	0	0	0	0	0	0	92.8	72.7	0	92.5	0	0
Large 2 Axle Vehicles	20	0	16		42	3	5	0		8	0	0	0		0	0	10	2		12	0	0
% Large 2 Axle Vehicles	3.9	0	3.5	4.1	3.7	1.6	2.2	0	0	1.9	0	0	0	0	0	0	1.5	18.2	0	1.8	0	0
3 Axle Vehicles	12	0	2		16	4	6	0		10	0	0	0		0	0	15	0		15	0	0
% 3 Axle Vehicles	2.3	0	0.4	1.4	1.4	2.2	2.6	0	0	2.4	0	0	0	0	0	0	2.3	0	0	2.3	0	0
4+ Axle Trucks	51	0	25		85	7	7	0		14	0	0	0		0	0	22	1		23	0	0
% 4+ Axle Trucks	9.9	0	5.5	6.2	7.6	3.8	3	0	0	3.4	0	0	0	0	0	0	3.4	9.1	0	3.5	0	0

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	65	1	57	123	24	22	0	46	0	0	0	0	0	89	0	89	258
04:15 PM	79	0	53	132	31	21	0	52	0	0	0	0	0	86	3	89	273
04:30 PM	73	0	66	139	26	34	0	60	0	0	0	0	0	94	2	96	295
04:45 PM	65	1	55	121	31	40	0	71	0	0	0	0	0	88	3	91	283
Total Volume	282	2	231	515	112	117	0	229	0	0	0	0	0	357	8	365	1109
% App. Total	54.8	0.4	44.9		48.9	51.1	0		0	0	0		0	97.8	2.2		
PHF	.892	.500	.875	.926	.903	.731	.000	.806	.000	.000	.000	.000	.000	.949	.667	.951	.940

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

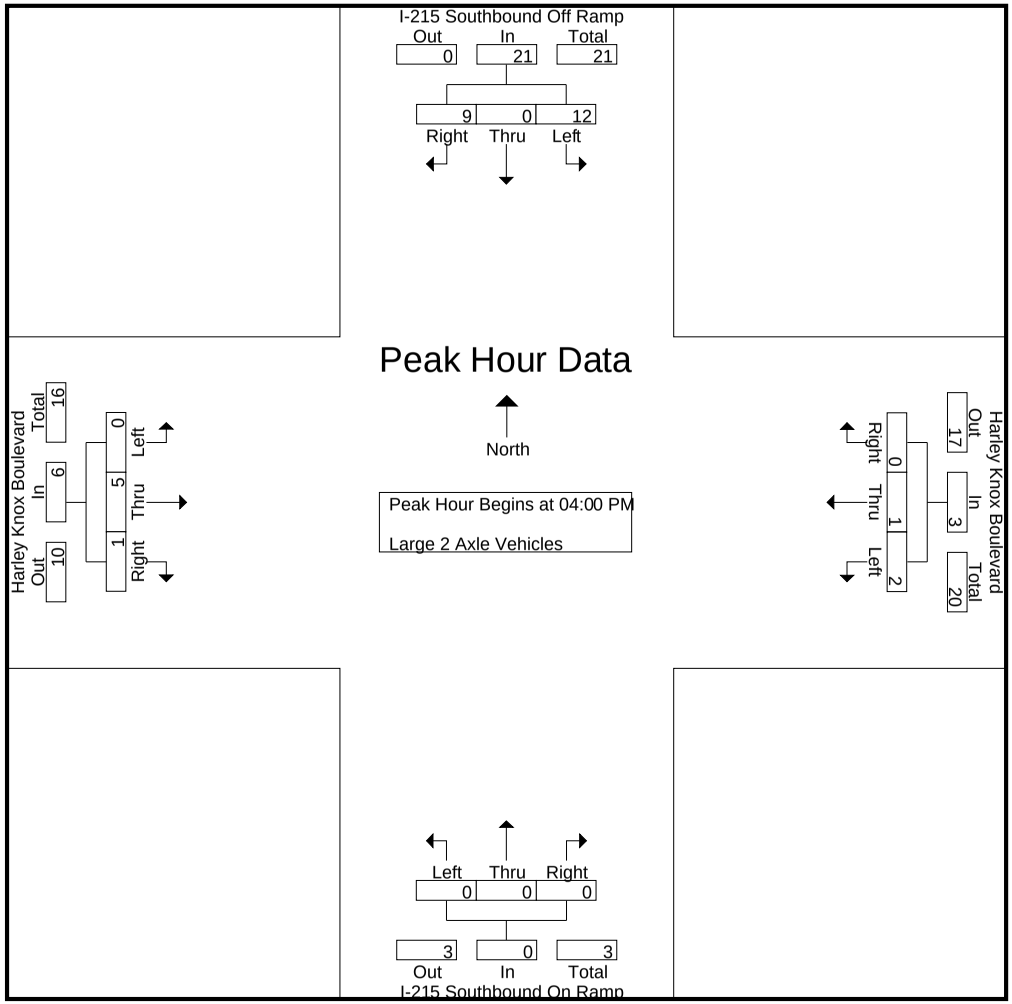
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	6	0	3	1	9	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	1	11
04:15 PM	3	0	1	1	4	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	5
04:30 PM	2	0	2	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
04:45 PM	1	0	3	1	4	1	1	0	0	2	0	0	0	0	0	0	3	1	0	4	1	10
Total	12	0	9	4	21	2	1	0	0	3	0	0	0	0	0	0	5	1	0	6	4	30
05:00 PM	2	0	2	0	4	1	1	0	0	2	0	0	0	0	0	0	2	0	0	2	0	8
05:15 PM	2	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	6
05:30 PM	3	0	2	1	5	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	1	8
05:45 PM	1	0	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	4
Total	8	0	7	2	15	1	4	0	0	5	0	0	0	0	0	0	5	1	0	6	2	26
Grand Total	20	0	16	6	36	3	5	0	0	8	0	0	0	0	0	0	10	2	0	12	6	56
Apprch %	55.6	0	44.4			37.5	62.5	0			0	0	0			0	83.3	16.7				
Total %	35.7	0	28.6		64.3	5.4	8.9	0		14.3	0	0	0		0	0	17.9	3.6		21.4	9.7	90.3

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	6	0	3	9	0	0	0	0	0	0	0	0	0	2	0	2	11
04:15 PM	3	0	1	4	1	0	0	1	0	0	0	0	0	0	0	0	5
04:30 PM	2	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	4
04:45 PM	1	0	3	4	1	1	0	2	0	0	0	0	0	3	1	4	10
Total Volume	12	0	9	21	2	1	0	3	0	0	0	0	0	5	1	6	30
% App. Total	57.1	0	42.9		66.7	33.3	0		0	0	0		0	83.3	16.7		
PHF	.500	.000	.750	.583	.500	.250	.000	.375	.000	.000	.000	.000	.000	.417	.250	.375	.682

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

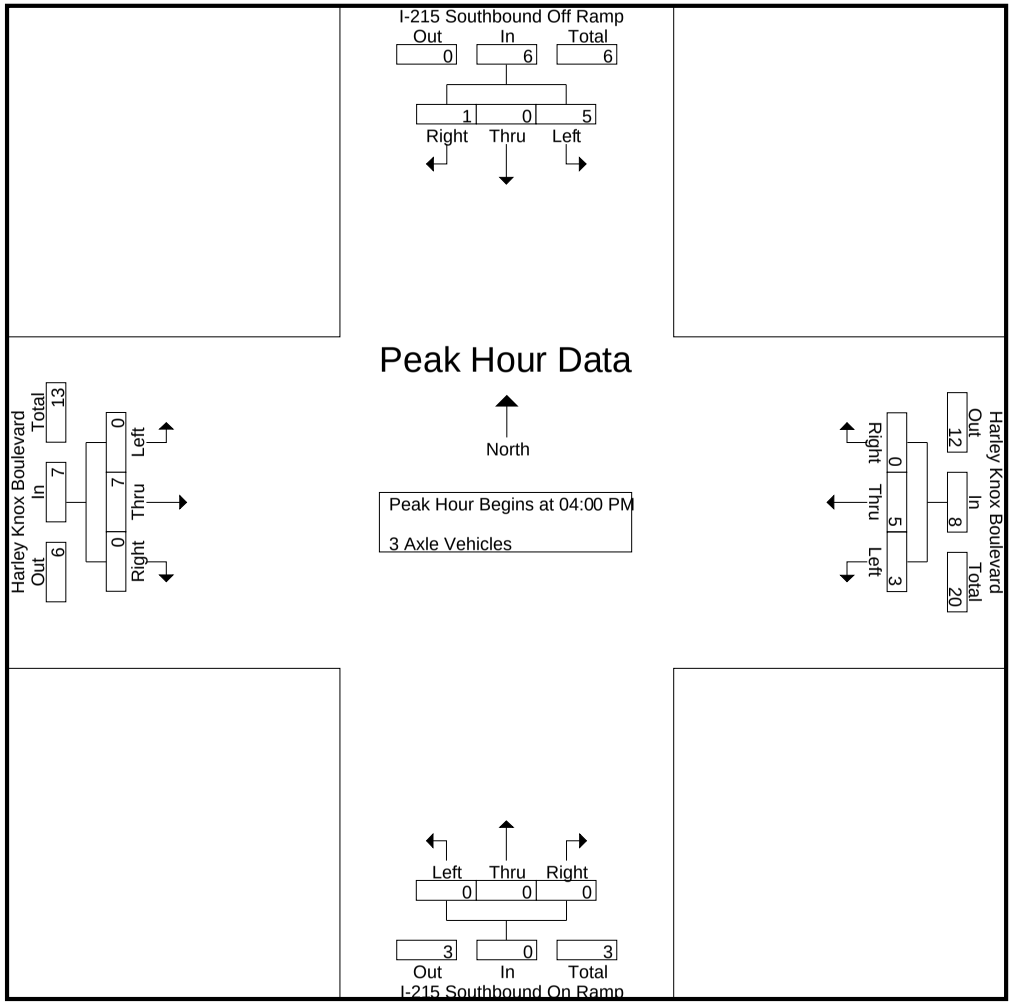
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	1	0	0	0	1	2	3	0	0	5	0	0	0	0	0	0	1	0	0	1	0	7
04:15 PM	3	0	0	0	3	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	5
04:30 PM	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	0	7
04:45 PM	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	2
Total	5	0	1	1	6	3	5	0	0	8	0	0	0	0	0	0	7	0	0	7	1	21
05:00 PM	1	0	1	1	2	1	1	0	0	2	0	0	0	0	0	0	2	0	0	2	1	6
05:15 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	5
05:30 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	4
05:45 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	3
Total	7	0	1	1	8	1	1	0	0	2	0	0	0	0	0	0	8	0	0	8	1	18
Grand Total	12	0	2	2	14	4	6	0	0	10	0	0	0	0	0	0	15	0	0	15	2	39
Apprch %	85.7	0	14.3			40	60	0			0	0	0			0	100	0				
Total %	30.8	0	5.1		35.9	10.3	15.4	0		25.6	0	0	0		0	0	38.5	0		38.5	4.9	95.1

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	1	0	0	1	2	3	0	5	0	0	0	0	0	1	0	1	7
04:15 PM	3	0	0	3	1	0	0	1	0	0	0	0	0	1	0	1	5
04:30 PM	1	0	0	1	0	2	0	2	0	0	0	0	0	4	0	4	7
04:45 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	2
Total Volume	5	0	1	6	3	5	0	8	0	0	0	0	0	7	0	7	21
% App. Total	83.3	0	16.7		37.5	62.5	0		0	0	0		0	100	0		
PHF	.417	.000	.250	.500	.375	.417	.000	.400	.000	.000	.000	.000	.000	.438	.000	.438	.750

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

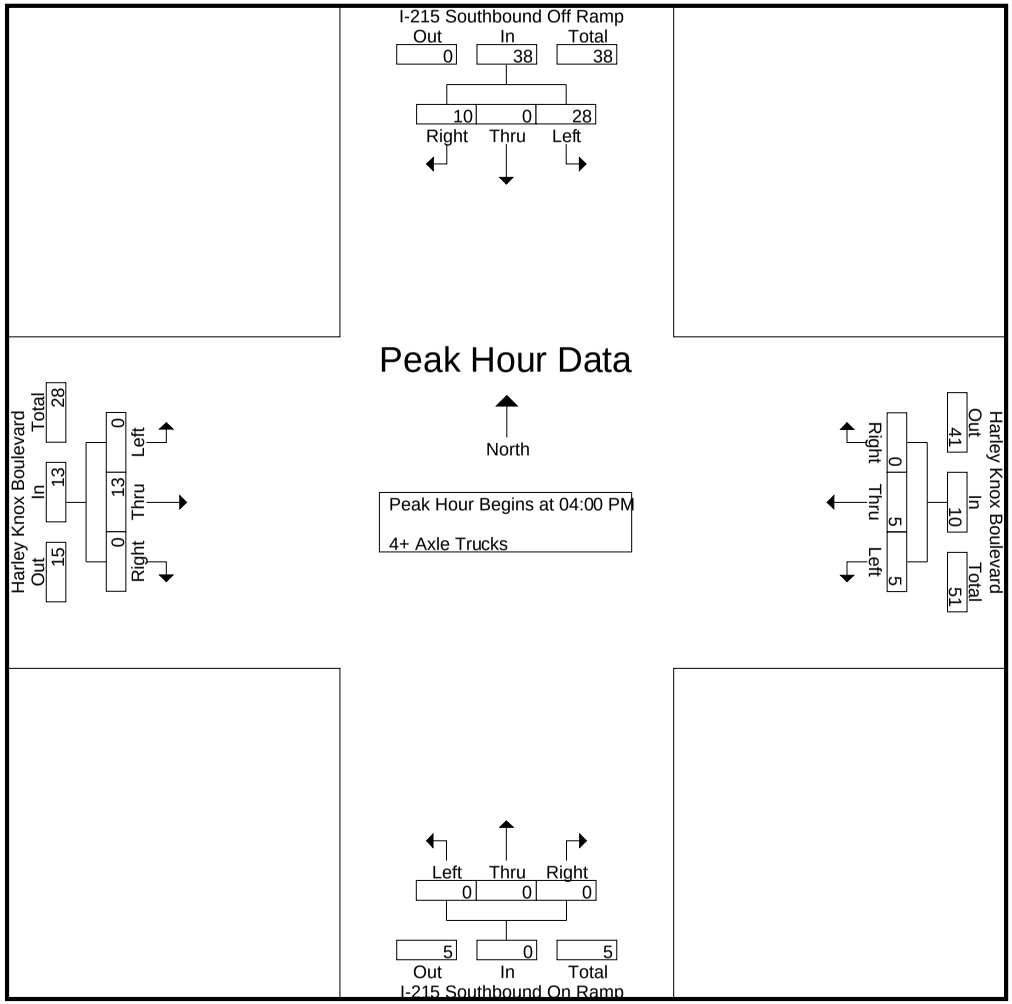
	I-215 Southbound Off Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Southbound On Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	6	0	2	0	8	4	1	0	0	5	0	0	0	0	0	0	5	0	0	5	0	18
04:15 PM	7	0	2	2	9	1	2	0	0	3	0	0	0	0	0	0	3	0	0	3	2	15
04:30 PM	7	0	4	1	11	0	1	0	0	1	0	0	0	0	0	0	5	0	0	5	1	17
04:45 PM	8	0	2	1	10	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	11
Total	28	0	10	4	38	5	5	0	0	10	0	0	0	0	0	0	13	0	0	13	4	61
05:00 PM	6	0	4	0	10	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	14
05:15 PM	6	0	6	3	12	1	1	0	0	2	0	0	0	0	0	0	1	1	0	2	3	16
05:30 PM	6	0	2	1	8	1	0	0	0	1	0	0	0	0	0	0	2	0	0	2	1	11
05:45 PM	5	0	3	1	8	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	1	11
Total	23	0	15	5	38	2	2	0	0	4	0	0	0	0	0	0	9	1	0	10	5	52
Grand Total	51	0	25	9	76	7	7	0	0	14	0	0	0	0	0	0	22	1	0	23	9	113
Apprch %	67.1	0	32.9			50	50	0			0	0	0			0	95.7	4.3				
Total %	45.1	0	22.1		67.3	6.2	6.2	0		12.4	0	0	0		0	0	19.5	0.9		20.4	7.4	92.6

	I-215 Southbound Off Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Southbound On Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	6	0	2	8	4	1	0	5	0	0	0	0	0	5	0	5	18
04:15 PM	7	0	2	9	1	2	0	3	0	0	0	0	0	3	0	3	15
04:30 PM	7	0	4	11	0	1	0	1	0	0	0	0	0	5	0	5	17
04:45 PM	8	0	2	10	0	1	0	1	0	0	0	0	0	0	0	0	11
Total Volume	28	0	10	38	5	5	0	10	0	0	0	0	0	13	0	13	61
% App. Total	73.7	0	26.3		50	50	0		0	0	0		0	100	0		
PHF	.875	.000	.625	.864	.313	.625	.000	.500	.000	.000	.000	.000	.000	.650	.000	.650	.847

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : CRV215SHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Location: County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Boulevard

Date: 4/14/2015
Weather: Clear

PEDESTRIANS

	North Leg I-215 Southbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Southbound Ramps	West Leg Harley Knox Boulevard	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg I-215 Southbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Southbound Ramps	West Leg Harley Knox Boulevard	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	1	0	0	0	1
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	1	0	0	0	1

Location: County of Riverside
N/S: I-215 Southbound Ramps
E/W: Harley Knox Boulevard

Date: 4/14/2015
Weather: Clear

BICYCLES

	North Leg I-215 Southbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Southbound Ramps	West Leg Harley Knox Boulevard	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg I-215 Southbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Southbound Ramps	West Leg Harley Knox Boulevard	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

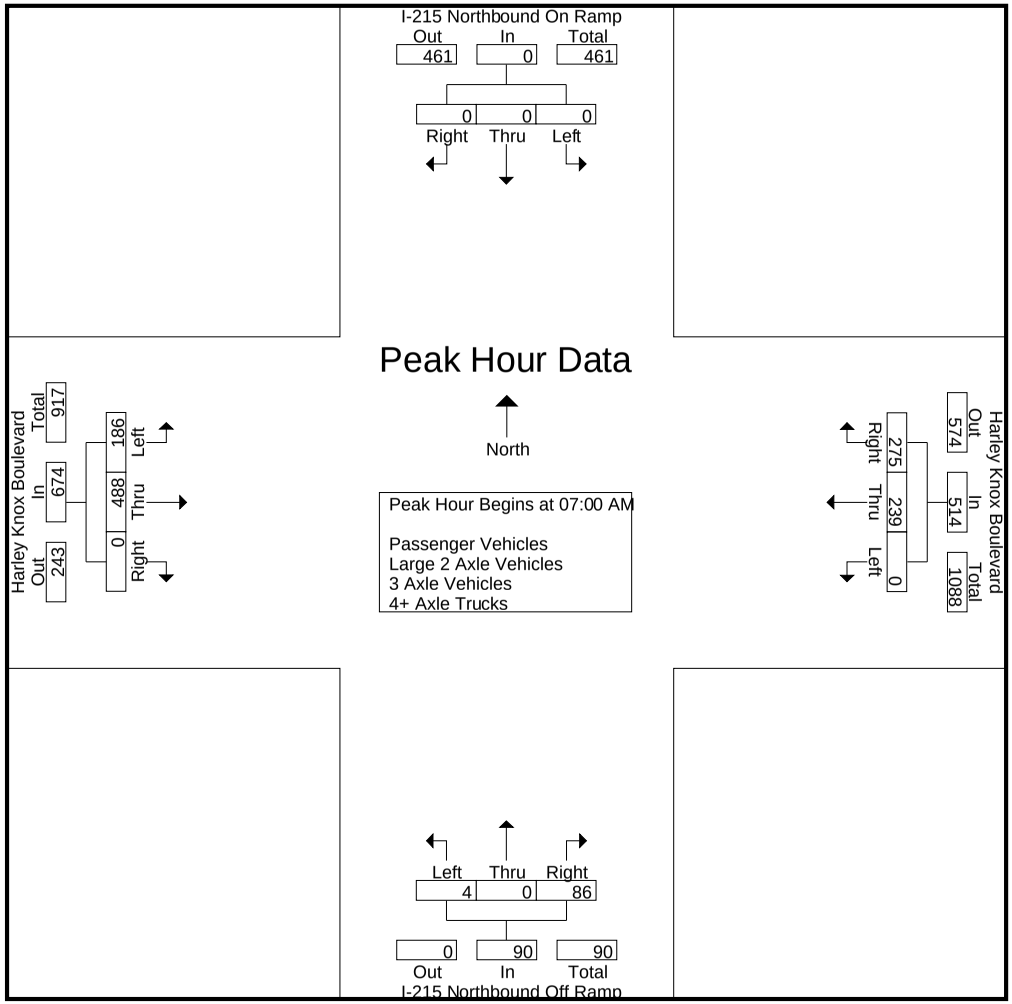
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	0	98	71	6	169	0	0	24	22	24	41	112	0	0	153	28	346
07:15 AM	0	0	0	0	0	0	67	71	7	138	0	0	14	14	14	39	119	0	0	158	21	310
07:30 AM	0	0	0	0	0	0	42	73	7	115	3	0	14	14	17	50	131	0	0	181	21	313
07:45 AM	0	0	0	0	0	0	32	60	12	92	1	0	34	29	35	56	126	0	0	182	41	309
Total	0	0	0	0	0	0	239	275	32	514	4	0	86	79	90	186	488	0	0	674	111	1278
08:00 AM	0	0	0	0	0	0	26	54	4	80	4	1	15	12	20	27	65	0	0	92	16	192
08:15 AM	0	0	0	0	0	0	30	49	6	79	4	0	10	10	14	31	62	0	0	93	16	186
08:30 AM	0	0	0	0	0	0	29	44	4	73	1	1	19	18	21	49	68	0	0	117	22	211
08:45 AM	0	0	0	0	0	0	25	37	2	62	4	3	22	20	29	29	73	0	0	102	22	193
Total	0	0	0	0	0	0	110	184	16	294	13	5	66	60	84	136	268	0	0	404	76	782
Grand Total	0	0	0	0	0	0	349	459	48	808	17	5	152	139	174	322	756	0	0	1078	187	2060
Apprch %	0	0	0			0	43.2	56.8			9.8	2.9	87.4			29.9	70.1	0				
Total %	0	0	0		0	0	16.9	22.3		39.2	0.8	0.2	7.4		8.4	15.6	36.7	0		52.3	8.3	91.7
Passenger Vehicles	0	0	0		0	0	294	352		682	14	5	133		273	298	621	0		919	0	0
% Passenger Vehicles	0	0	0	0	0	0	84.2	76.7	75	79.7	82.4	100	87.5	87.1	87.2	92.5	82.1	0	0	85.3	0	0
Large 2 Axle Vehicles	0	0	0		0	0	23	39		69	0	0	6		12	8	42	0		50	0	0
% Large 2 Axle Vehicles	0	0	0	0	0	0	6.6	8.5	14.6	8.1	0	0	3.9	4.3	3.8	2.5	5.6	0	0	4.6	0	0
3 Axle Vehicles	0	0	0		0	0	9	16		26	1	0	4		8	2	31	0		33	0	0
% 3 Axle Vehicles	0	0	0	0	0	0	2.6	3.5	2.1	3	5.9	0	2.6	2.2	2.6	0.6	4.1	0	0	3.1	0	0
4+ Axle Trucks	0	0	0		0	0	23	52		79	2	0	9		20	14	62	0		76	0	0
% 4+ Axle Trucks	0	0	0	0	0	0	6.6	11.3	8.3	9.2	11.8	0	5.9	6.5	6.4	4.3	8.2	0	0	7.1	0	0

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	0	98	71	169	0	0	24	24	41	112	0	153	346
07:15 AM	0	0	0	0	0	67	71	138	0	0	14	14	39	119	0	158	310
07:30 AM	0	0	0	0	0	42	73	115	3	0	14	17	50	131	0	181	313
07:45 AM	0	0	0	0	0	32	60	92	1	0	34	35	56	126	0	182	309
Total Volume	0	0	0	0	0	239	275	514	4	0	86	90	186	488	0	674	1278
% App. Total	0	0	0		0	46.5	53.5		4.4	0	95.6		27.6	72.4	0		
PHF	.000	.000	.000	.000	.000	.610	.942	.760	.333	.000	.632	.643	.830	.931	.000	.926	.923

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

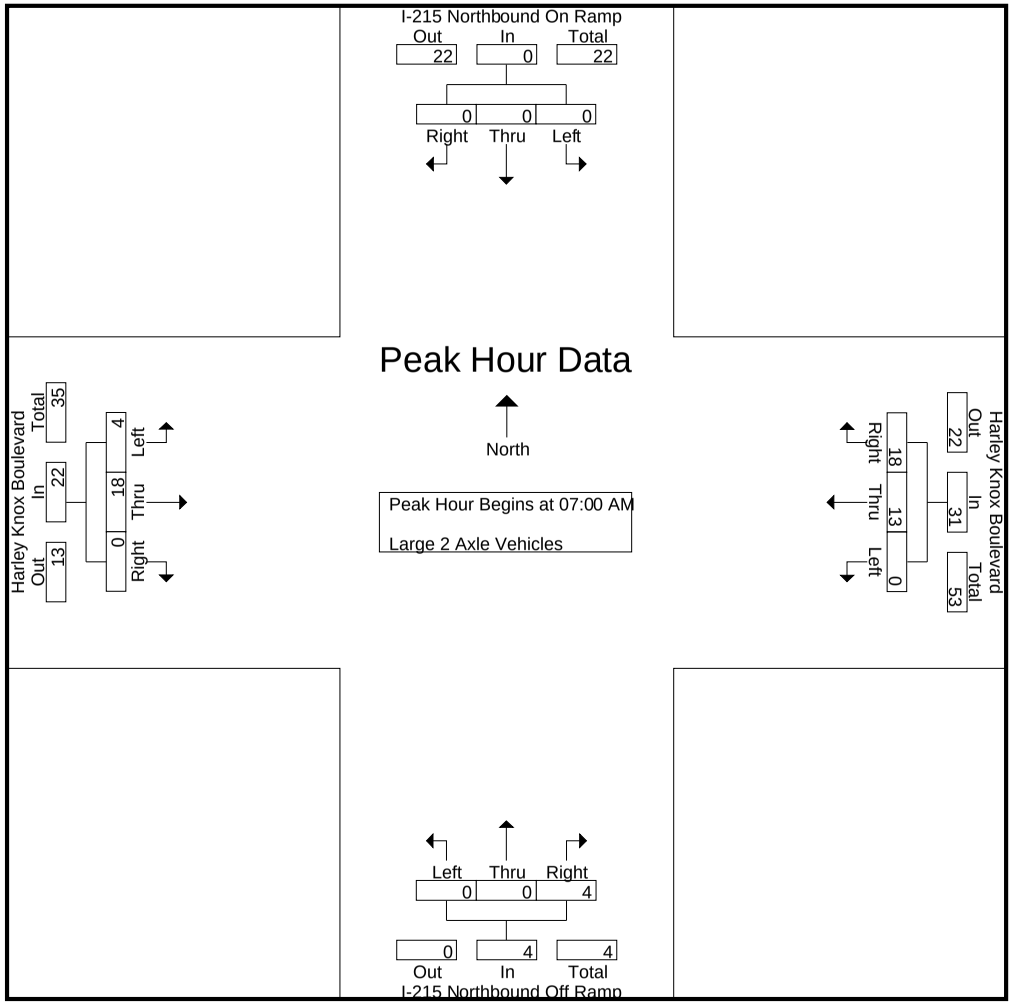
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	0	2	7	1	9	0	0	2	2	2	2	4	0	0	6	3	17
07:15 AM	0	0	0	0	0	0	2	2	1	4	0	0	2	2	2	2	3	0	0	5	3	11
07:30 AM	0	0	0	0	0	0	3	3	0	6	0	0	0	0	0	0	7	0	0	7	0	13
07:45 AM	0	0	0	0	0	0	6	6	2	12	0	0	0	0	0	0	4	0	0	4	2	16
Total	0	0	0	0	0	0	13	18	4	31	0	0	4	4	4	4	18	0	0	22	8	57
08:00 AM	0	0	0	0	0	0	6	3	0	9	0	0	1	1	1	2	5	0	0	7	1	17
08:15 AM	0	0	0	0	0	0	1	6	1	7	0	0	0	0	0	0	6	0	0	6	1	13
08:30 AM	0	0	0	0	0	0	2	4	1	6	0	0	0	0	0	1	4	0	0	5	1	11
08:45 AM	0	0	0	0	0	0	1	8	1	9	0	0	1	1	1	1	9	0	0	10	2	20
Total	0	0	0	0	0	0	10	21	3	31	0	0	2	2	2	4	24	0	0	28	5	61
Grand Total	0	0	0	0	0	0	23	39	7	62	0	0	6	6	6	8	42	0	0	50	13	118
Apprch %	0	0	0			0	37.1	62.9			0	0	100			16	84	0				
Total %	0	0	0		0	0	19.5	33.1		52.5	0	0	5.1		5.1	6.8	35.6	0		42.4	9.9	90.1

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	0	2	7	9	0	0	2	2	2	4	0	6	17
07:15 AM	0	0	0	0	0	2	2	4	0	0	2	2	2	3	0	5	11
07:30 AM	0	0	0	0	0	3	3	6	0	0	0	0	0	7	0	7	13
07:45 AM	0	0	0	0	0	6	6	12	0	0	0	0	0	4	0	4	16
Total Volume	0	0	0	0	0	13	18	31	0	0	4	4	4	18	0	22	57
% App. Total	0	0	0		0	41.9	58.1		0	0	100		18.2	81.8	0		
PHF	.000	.000	.000	.000	.000	.542	.643	.646	.000	.000	.500	.500	.500	.643	.000	.786	.838

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

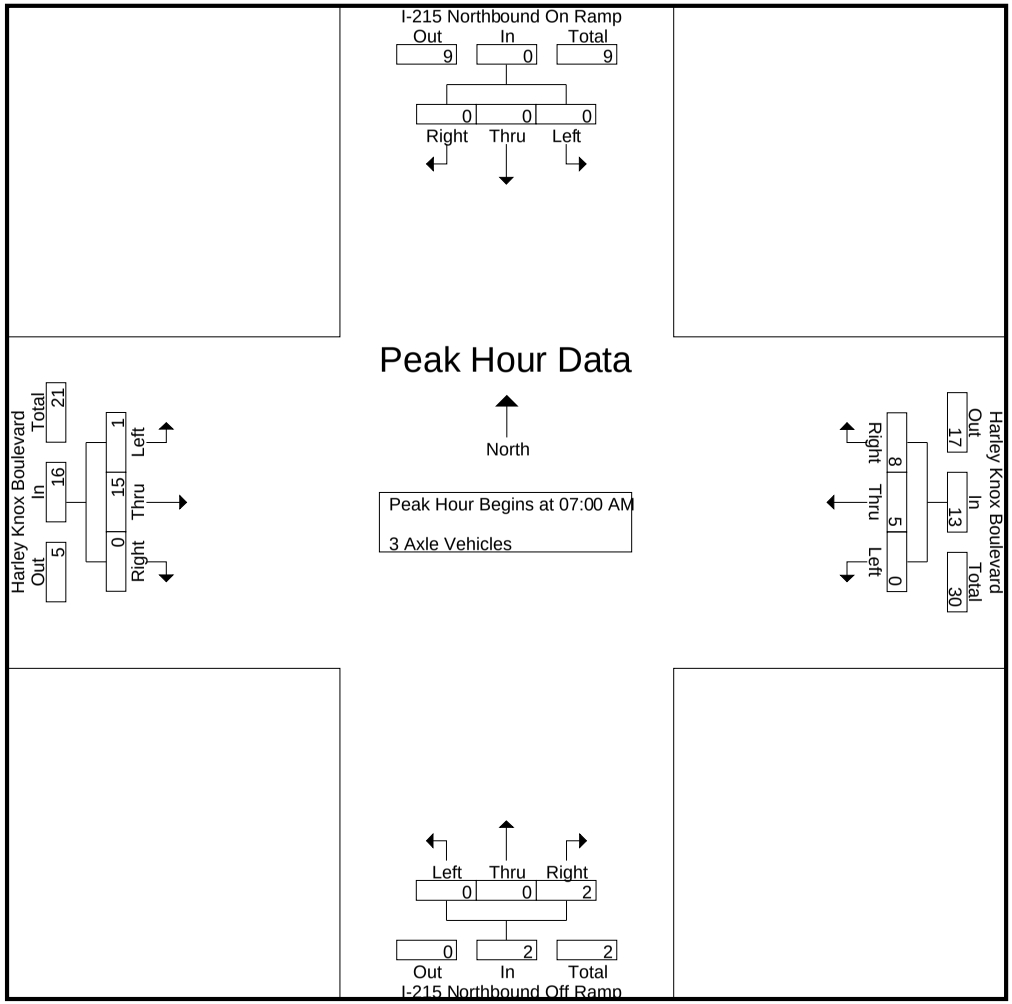
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	0	2	1	0	3	0	0	1	1	1	0	7	0	0	7	1	11
07:15 AM	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	1	5	0	0	6	0	8
07:30 AM	0	0	0	0	0	0	1	4	0	5	0	0	0	0	0	0	2	0	0	2	0	7
07:45 AM	0	0	0	0	0	0	1	2	0	3	0	0	1	0	1	0	1	0	0	1	0	5
Total	0	0	0	0	0	0	5	8	0	13	0	0	2	1	2	1	15	0	0	16	1	31
08:00 AM	0	0	0	0	0	0	2	2	0	4	0	0	0	0	0	1	1	0	0	2	0	6
08:15 AM	0	0	0	0	0	0	0	1	1	1	1	0	1	1	2	0	4	0	0	4	2	7
08:30 AM	0	0	0	0	0	0	1	4	0	5	0	0	0	0	0	0	1	0	0	1	0	6
08:45 AM	0	0	0	0	0	0	1	1	0	2	0	0	1	1	1	0	10	0	0	10	1	13
Total	0	0	0	0	0	0	4	8	1	12	1	0	2	2	3	1	16	0	0	17	3	32
Grand Total	0	0	0	0	0	0	9	16	1	25	1	0	4	3	5	2	31	0	0	33	4	63
Apprch %	0	0	0			0	36	64			20	0	80			6.1	93.9	0				
Total %	0	0	0		0	0	14.3	25.4		39.7	1.6	0	6.3		7.9	3.2	49.2	0		52.4	6	94

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	0	2	1	3	0	0	1	1	0	7	0	7	11
07:15 AM	0	0	0	0	0	1	1	2	0	0	0	0	1	5	0	6	8
07:30 AM	0	0	0	0	0	1	4	5	0	0	0	0	0	2	0	2	7
07:45 AM	0	0	0	0	0	1	2	3	0	0	1	1	0	1	0	1	5
Total Volume	0	0	0	0	0	5	8	13	0	0	2	2	1	15	0	16	31
% App. Total	0	0	0		0	38.5	61.5		0	0	100		6.2	93.8	0		
PHF	.000	.000	.000	.000	.000	.625	.500	.650	.000	.000	.500	.500	.250	.536	.000	.571	.705

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

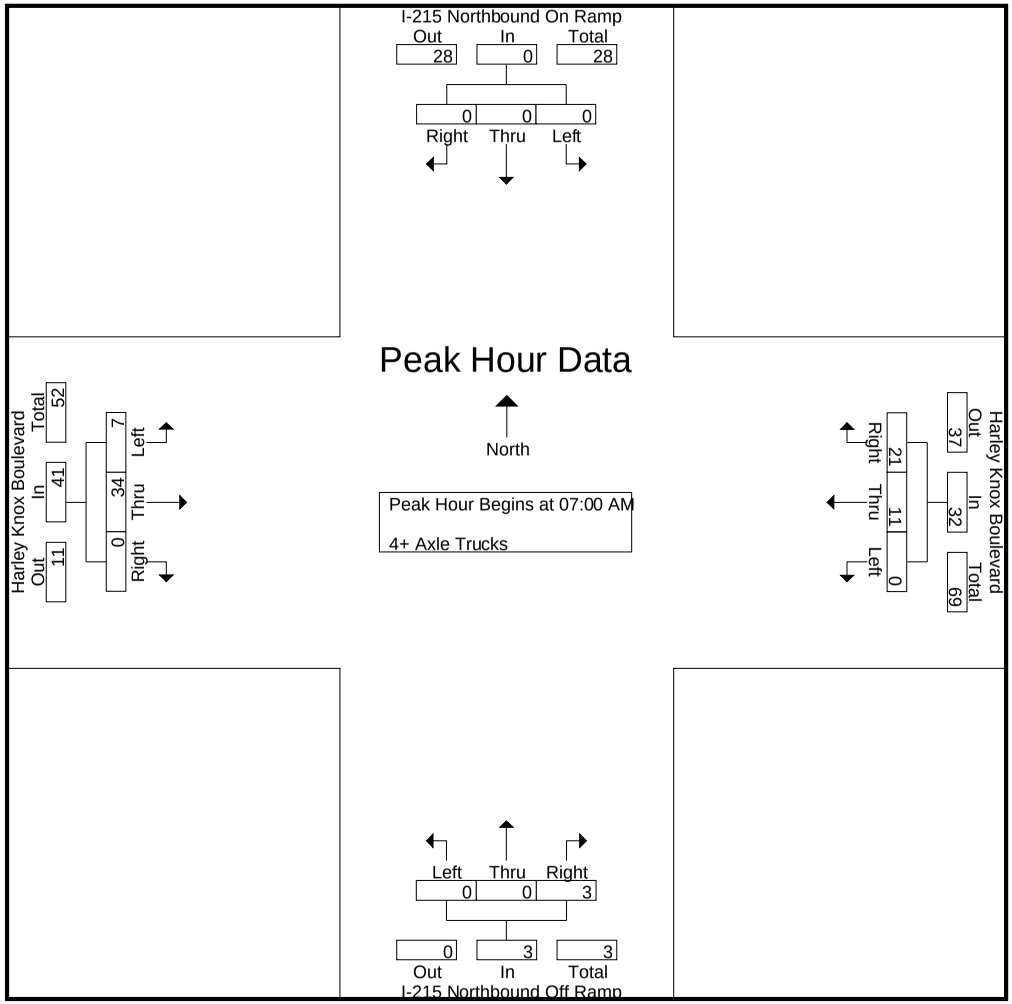
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
07:00 AM	0	0	0	0	0	0	2	6	0	8	0	0	0	0	0	0	9	0	0	9	0	17
07:15 AM	0	0	0	0	0	0	2	2	0	4	0	0	2	2	2	1	12	0	0	13	2	19
07:30 AM	0	0	0	0	0	0	3	7	1	10	0	0	0	0	0	0	5	0	0	5	1	15
07:45 AM	0	0	0	0	0	0	4	6	1	10	0	0	1	1	1	6	8	0	0	14	2	25
Total	0	0	0	0	0	0	11	21	2	32	0	0	3	3	3	7	34	0	0	41	5	76
08:00 AM	0	0	0	0	0	0	3	7	2	10	0	0	1	1	1	0	5	0	0	5	3	16
08:15 AM	0	0	0	0	0	0	4	6	0	10	1	0	0	0	1	1	8	0	0	9	0	20
08:30 AM	0	0	0	0	0	0	3	10	0	13	1	0	2	2	3	5	8	0	0	13	2	29
08:45 AM	0	0	0	0	0	0	2	8	0	10	0	0	3	3	3	1	7	0	0	8	3	21
Total	0	0	0	0	0	0	12	31	2	43	2	0	6	6	8	7	28	0	0	35	8	86
Grand Total	0	0	0	0	0	0	23	52	4	75	2	0	9	9	11	14	62	0	0	76	13	162
Apprch %	0	0	0			0	30.7	69.3			18.2	0	81.8			18.4	81.6	0				
Total %	0	0	0		0	0	14.2	32.1		46.3	1.2	0	5.6		6.8	8.6	38.3	0		46.9	7.4	92.6

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	0	2	6	8	0	0	0	0	0	9	0	9	17
07:15 AM	0	0	0	0	0	2	2	4	0	0	2	2	1	12	0	13	19
07:30 AM	0	0	0	0	0	3	7	10	0	0	0	0	0	5	0	5	15
07:45 AM	0	0	0	0	0	4	6	10	0	0	1	1	6	8	0	14	25
Total Volume	0	0	0	0	0	11	21	32	0	0	3	3	7	34	0	41	76
% App. Total	0	0	0		0	34.4	65.6		0	0	100		17.1	82.9	0		
PHF	.000	.000	.000	.000	.000	.688	.750	.800	.000	.000	.375	.375	.292	.708	.000	.732	.760

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKAM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

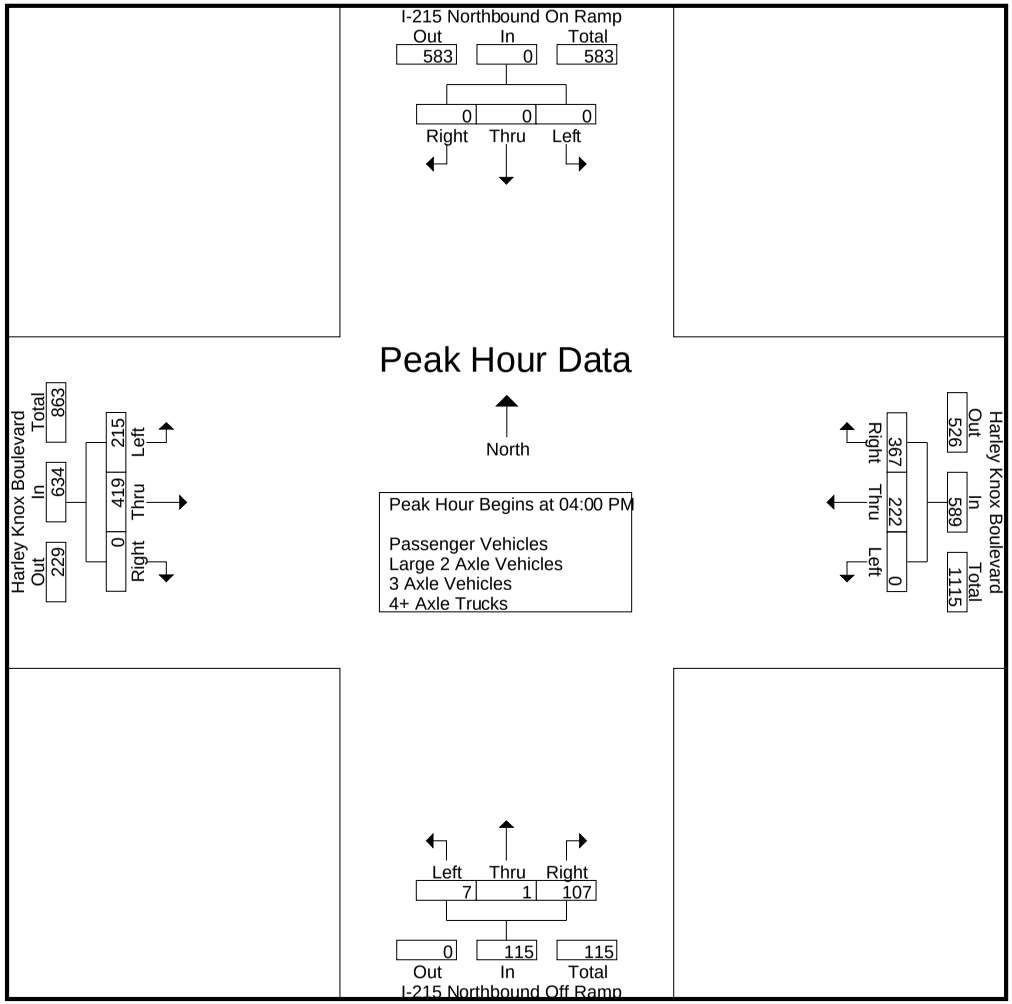
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	0	45	60	4	105	1	1	22	19	24	54	102	0	0	156	23	285
04:15 PM	0	0	0	0	0	0	49	81	5	130	4	0	18	18	22	53	114	0	0	167	23	319
04:30 PM	0	0	0	0	0	0	61	111	7	172	2	0	44	39	46	59	100	0	0	159	46	377
04:45 PM	0	0	0	0	0	0	67	115	6	182	0	0	23	21	23	49	103	0	0	152	27	357
Total	0	0	0	0	0	0	222	367	22	589	7	1	107	97	115	215	419	0	0	634	119	1338
05:00 PM	0	0	0	0	0	0	54	68	9	122	3	1	21	19	25	53	73	0	0	126	28	273
05:15 PM	0	0	0	0	0	0	41	51	7	92	2	0	16	15	18	47	84	0	0	131	22	241
05:30 PM	0	0	0	0	0	0	45	74	14	119	3	0	25	20	28	55	95	0	0	150	34	297
05:45 PM	0	0	0	0	0	0	34	52	4	86	1	1	21	21	23	43	79	0	0	122	25	231
Total	0	0	0	0	0	0	174	245	34	419	9	2	83	75	94	198	331	0	0	529	109	1042
Grand Total	0	0	0	0	0	0	396	612	56	1008	16	3	190	172	209	413	750	0	0	1163	228	2380
Apprch %	0	0	0			0	39.3	60.7			7.7	1.4	90.9			35.5	64.5	0				
Total %	0	0	0		0	0	16.6	25.7		42.4	0.7	0.1	8		8.8	17.4	31.5	0		48.9	8.7	91.3
Passenger Vehicles	0	0	0		0	0	368	539		959	13	2	174		349	387	660	0		1047	0	0
% Passenger Vehicles	0	0	0	0	0	0	92.9	88.1	92.9	90.1	81.2	66.7	91.6	93	91.6	93.7	88	0	0	90	0	0
Large 2 Axle Vehicles	0	0	0		0	0	5	19		25	1	0	4		9	5	13	0		18	0	0
% Large 2 Axle Vehicles	0	0	0	0	0	0	1.3	3.1	1.8	2.3	6.2	0	2.1	2.3	2.4	1.2	1.7	0	0	1.5	0	0
3 Axle Vehicles	0	0	0		0	0	10	11		23	1	0	10		18	5	22	0		27	0	0
% 3 Axle Vehicles	0	0	0	0	0	0	2.5	1.8	3.6	2.2	6.2	0	5.3	4.1	4.7	1.2	2.9	0	0	2.3	0	0
4+ Axle Trucks	0	0	0		0	0	13	43		57	1	1	2		5	16	55	0		71	0	0
% 4+ Axle Trucks	0	0	0	0	0	0	3.3	7	1.8	5.4	6.2	33.3	1.1	0.6	1.3	3.9	7.3	0	0	6.1	0	0

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	45	60	105	1	1	22	24	54	102	0	156	285
04:15 PM	0	0	0	0	0	49	81	130	4	0	18	22	53	114	0	167	319
04:30 PM	0	0	0	0	0	61	111	172	2	0	44	46	59	100	0	159	377
04:45 PM	0	0	0	0	0	67	115	182	0	0	23	23	49	103	0	152	357
Total Volume	0	0	0	0	0	222	367	589	7	1	107	115	215	419	0	634	1338
% App. Total	0	0	0		0	37.7	62.3		6.1	0.9	93		33.9	66.1	0		
PHF	.000	.000	.000	.000	.000	.828	.798	.809	.438	.250	.608	.625	.911	.919	.000	.949	.887

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- Large 2 Axle Vehicles

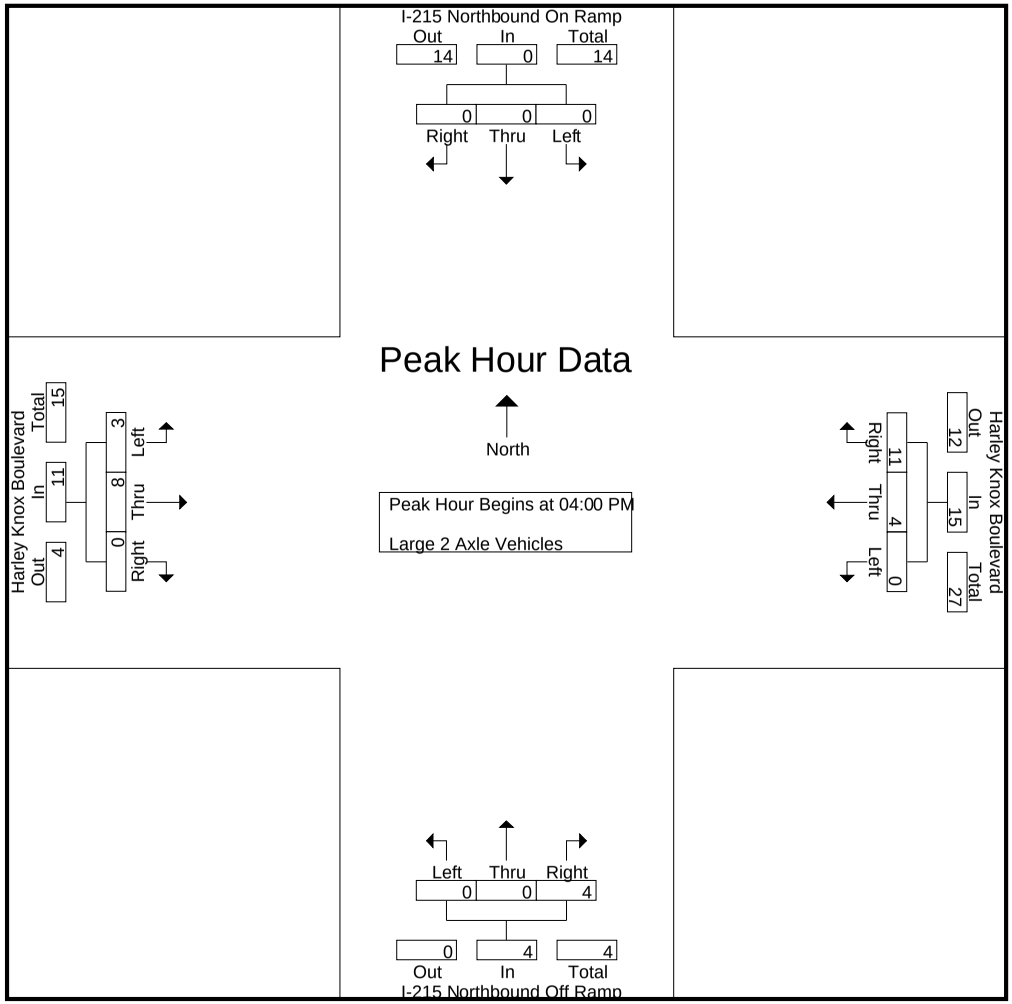
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	1	3	0	0	4	0	7
04:15 PM	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	1	3	0	0	4	0	6
04:30 PM	0	0	0	0	0	0	1	2	1	3	0	0	3	3	3	0	0	0	0	0	4	6
04:45 PM	0	0	0	0	0	0	2	5	0	7	0	0	1	1	1	1	2	0	0	3	1	11
Total	0	0	0	0	0	0	4	11	1	15	0	0	4	4	4	3	8	0	0	11	5	30
05:00 PM	0	0	0	0	0	0	1	2	0	3	0	0	0	0	0	0	1	0	0	1	0	4
05:15 PM	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	2	3	0	0	5	0	7
05:30 PM	0	0	0	0	0	0	0	2	0	2	1	0	0	0	1	0	0	0	0	0	0	3
05:45 PM	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	1	0	0	1	0	3
Total	0	0	0	0	0	0	1	8	0	9	1	0	0	0	1	2	5	0	0	7	0	17
Grand Total	0	0	0	0	0	0	5	19	1	24	1	0	4	4	5	5	13	0	0	18	5	47
Apprch %	0	0	0			0	20.8	79.2			20	0	80			27.8	72.2	0				
Total %	0	0	0		0	0	10.6	40.4		51.1	2.1	0	8.5		10.6	10.6	27.7	0		38.3	9.6	90.4

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	0	3	3	0	0	0	0	1	3	0	4	7
04:15 PM	0	0	0	0	0	1	1	2	0	0	0	0	1	3	0	4	6
04:30 PM	0	0	0	0	0	1	2	3	0	0	3	3	0	0	0	0	6
04:45 PM	0	0	0	0	0	2	5	7	0	0	1	1	1	2	0	3	11
Total Volume	0	0	0	0	0	4	11	15	0	0	4	4	3	8	0	11	30
% App. Total	0	0	0		0	26.7	73.3		0	0	100		27.3	72.7	0		
PHF	.000	.000	.000	.000	.000	.500	.550	.536	.000	.000	.333	.333	.750	.667	.000	.688	.682

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 3 Axle Vehicles

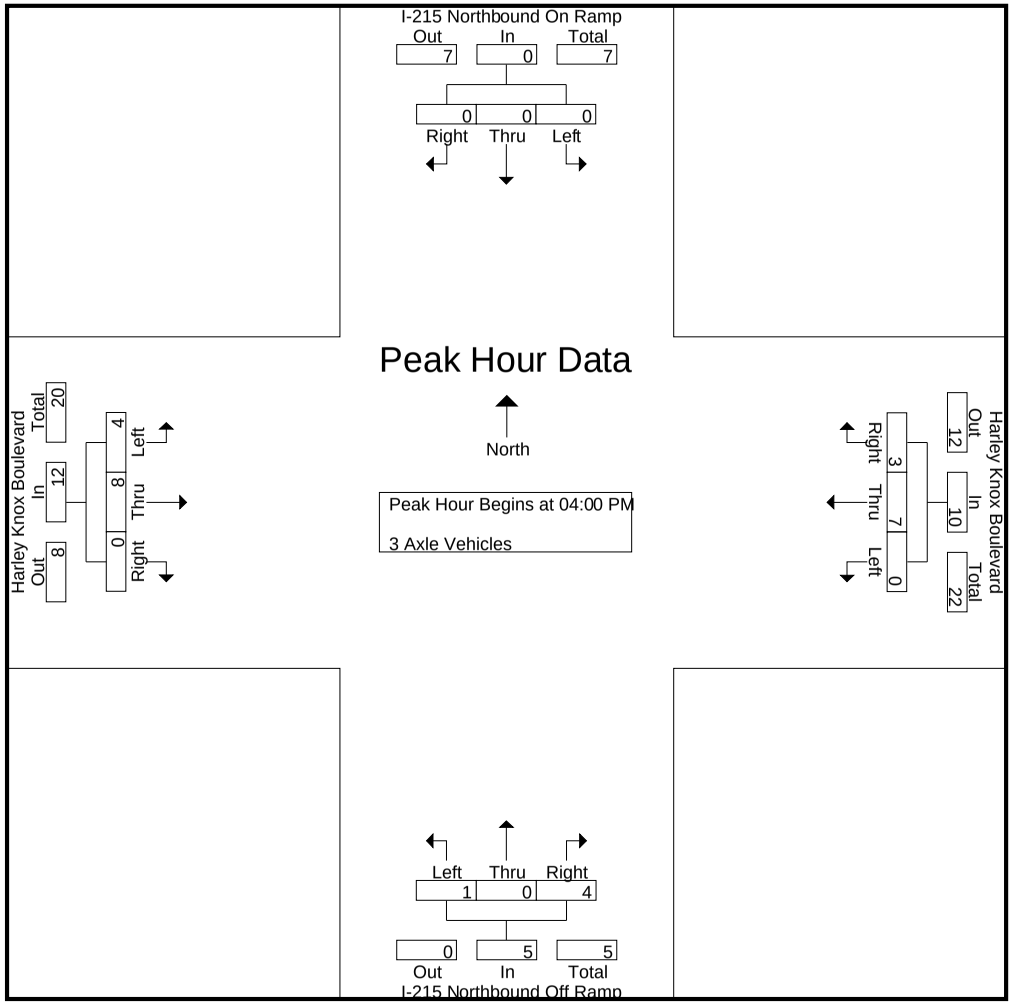
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	0	5	0	0	5	0	0	2	2	2	0	2	0	0	2	2	9
04:15 PM	0	0	0	0	0	0	1	2	1	3	0	0	0	0	0	1	3	0	0	4	1	7
04:30 PM	0	0	0	0	0	0	1	1	0	2	1	0	1	1	2	3	2	0	0	5	1	9
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	2
Total	0	0	0	0	0	0	7	3	1	10	1	0	4	3	5	4	8	0	0	12	4	27
05:00 PM	0	0	0	0	0	0	3	3	0	6	0	0	2	2	2	1	2	0	0	3	2	11
05:15 PM	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1	0	5	0	0	5	1	7
05:30 PM	0	0	0	0	0	0	0	3	1	3	0	0	3	1	3	0	4	0	0	4	2	10
05:45 PM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	3	0	0	3	0	4
Total	0	0	0	0	0	0	3	8	1	11	0	0	6	4	6	1	14	0	0	15	5	32
Grand Total	0	0	0	0	0	0	10	11	2	21	1	0	10	7	11	5	22	0	0	27	9	59
Apprch %	0	0	0			0	47.6	52.4			9.1	0	90.9			18.5	81.5	0				
Total %	0	0	0		0	0	16.9	18.6		35.6	1.7	0	16.9		18.6	8.5	37.3	0		45.8	13.2	86.8

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	5	0	5	0	0	2	2	0	2	0	2	9
04:15 PM	0	0	0	0	0	1	2	3	0	0	0	0	1	3	0	4	7
04:30 PM	0	0	0	0	0	1	1	2	1	0	1	2	3	2	0	5	9
04:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	2
Total Volume	0	0	0	0	0	7	3	10	1	0	4	5	4	8	0	12	27
% App. Total	0	0	0		0	70	30		20	0	80		33.3	66.7	0		
PHF	.000	.000	.000	.000	.000	.350	.375	.500	.250	.000	.500	.625	.333	.667	.000	.600	.750

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 1

Groups Printed- 4+ Axle Trucks

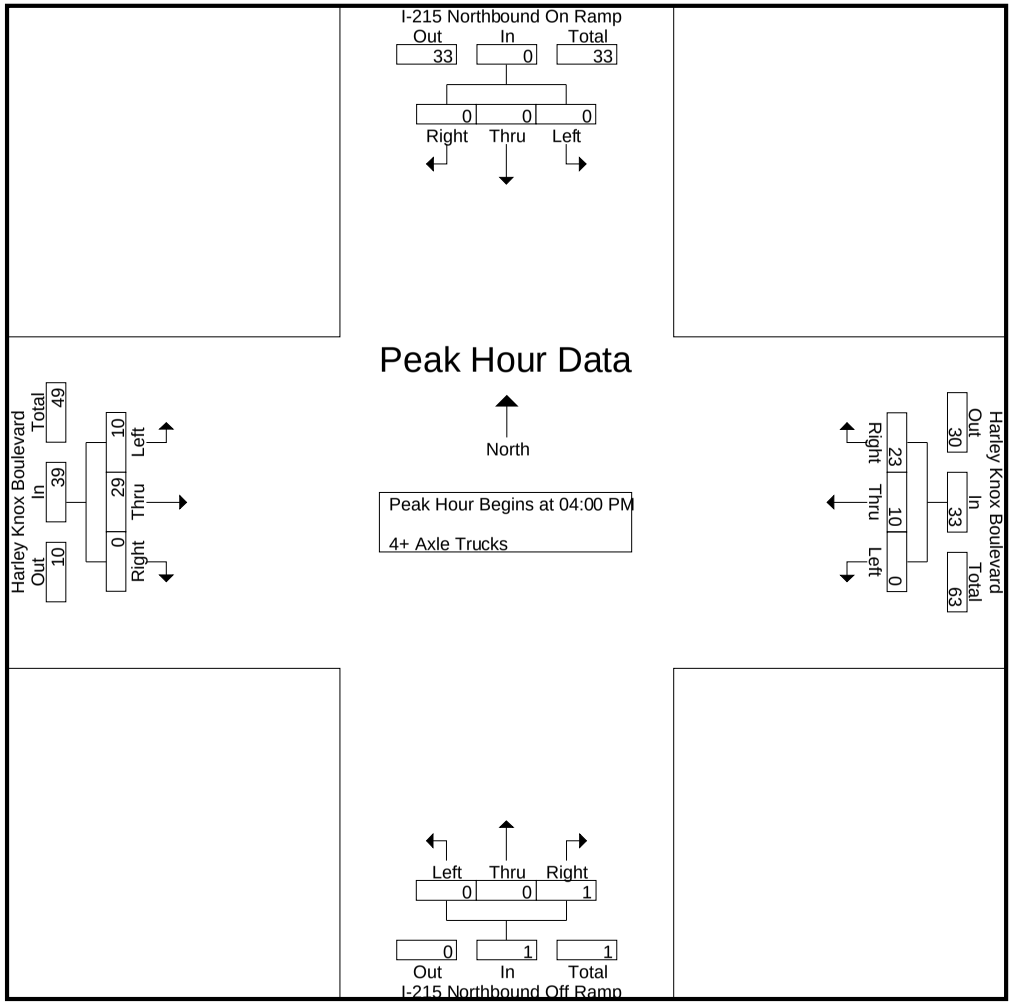
	I-215 Northbound On Ramp Southbound					Harley Knox Boulevard Westbound					I-215 Northbound Off Ramp Northbound					Harley Knox Boulevard Eastbound						
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Exclu. Total	Inclu. Total
04:00 PM	0	0	0	0	0	0	5	4	0	9	0	0	1	0	1	3	7	0	0	10	0	20
04:15 PM	0	0	0	0	0	0	3	8	1	11	0	0	0	0	0	3	7	0	0	10	1	21
04:30 PM	0	0	0	0	0	0	1	2	0	3	0	0	0	0	0	4	8	0	0	12	0	15
04:45 PM	0	0	0	0	0	0	1	9	0	10	0	0	0	0	0	0	7	0	0	7	0	17
Total	0	0	0	0	0	0	10	23	1	33	0	0	1	0	1	10	29	0	0	39	1	73
05:00 PM	0	0	0	0	0	0	1	5	0	6	1	1	0	0	2	1	8	0	0	9	0	17
05:15 PM	0	0	0	0	0	0	1	6	0	7	0	0	1	1	1	0	7	0	0	7	1	15
05:30 PM	0	0	0	0	0	0	1	4	0	5	0	0	0	0	0	2	6	0	0	8	0	13
05:45 PM	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	3	5	0	0	8	0	13
Total	0	0	0	0	0	0	3	20	0	23	1	1	1	1	3	6	26	0	0	32	1	58
Grand Total	0	0	0	0	0	0	13	43	1	56	1	1	2	1	4	16	55	0	0	71	2	131
Apprch %	0	0	0			0	23.2	76.8			25	25	50			22.5	77.5	0				
Total %	0	0	0		0	0	9.9	32.8		42.7	0.8	0.8	1.5		3.1	12.2	42	0		54.2	1.5	98.5

	I-215 Northbound On Ramp Southbound				Harley Knox Boulevard Westbound				I-215 Northbound Off Ramp Northbound				Harley Knox Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	5	4	9	0	0	1	1	3	7	0	10	20
04:15 PM	0	0	0	0	0	3	8	11	0	0	0	0	3	7	0	10	21
04:30 PM	0	0	0	0	0	1	2	3	0	0	0	0	4	8	0	12	15
04:45 PM	0	0	0	0	0	1	9	10	0	0	0	0	0	7	0	7	17
Total Volume	0	0	0	0	0	10	23	33	0	0	1	1	10	29	0	39	73
% App. Total	0	0	0		0	30.3	69.7		0	0	100		25.6	74.4	0		
PHF	.000	.000	.000	.000	.000	.500	.639	.750	.000	.000	.250	.250	.625	.906	.000	.813	.869

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Road
Weather: Clear

File Name : PER215NHKPM
Site Code : 05115195
Start Date : 4/14/2015
Page No : 2



Location: Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Boulevard

Date: 4/14/2015
Weather: Clear

PEDESTRIANS

	North Leg I-215 Northbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Northbound Ramps	West Leg Harley Knox Boulevard	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg I-215 Northbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Northbound Ramps	West Leg Harley Knox Boulevard	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	1	0	0	0	1
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	1	0	0	0	1

Location: Perris
N/S: I-215 Northbound Ramps
E/W: Harley Knox Boulevard

Date: 4/14/2015
Weather: Clear

BICYCLES

	North Leg I-215 Northbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Northbound Ramps	West Leg Harley Knox Boulevard	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg I-215 Northbound Ramps	East Leg Harley Knox Boulevard	South Leg I-215 Northbound Ramps	West Leg Harley Knox Boulevard	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

APPENDIX 3.2:

EXISTING (2015) CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	4	1	2	3	0
Conflicting Peds, #/hr	0	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	1	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	6	1	3	4	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	4	0	-	0	9	3
Stage 1	-	-	-	-	3	-
Stage 2	-	-	-	-	6	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1631	-	-	-	1017	1087
Stage 1	-	-	-	-	1025	-
Stage 2	-	-	-	-	1022	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1631	-	-	-	1017	1087
Mov Cap-2 Maneuver	-	-	-	-	931	-
Stage 1	-	-	-	-	1025	-
Stage 2	-	-	-	-	1022	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1631	-	-	-	931
HCM Lane V/C Ratio	-	-	-	-	0.005
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	3	294	9	16	1	2	379	8	3	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	5	2	350	11	19	1	2	78	10	4	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	304	1092	483	862	1678	742	2	562	956	21	1164	0
Arrive On Green	0.00	0.29	0.29	0.24	0.44	0.44	0.00	0.30	0.30	0.01	0.31	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1680	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	5	2	350	11	19	1	2	78	10	4	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1680	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.1	0.1	9.8	0.2	0.6	0.1	0.1	1.1	0.7	0.1	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.1	9.8	0.2	0.6	0.1	0.1	1.1	0.7	0.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	304	1093	483	862	1678	742	2	562	956	21	1164	0
V/C Ratio(X)	0.00	0.00	0.00	0.41	0.01	0.03	0.40	0.00	0.08	0.47	0.00	0.00
Avail Cap(c_a), veh/h	304	1093	483	862	1678	742	98	562	956	98	1164	0
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)	0.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	30.5	23.7	38.5	18.8	13.0	59.9	29.8	9.0	58.9	28.9	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	0.1	35.1	0.0	0.2	5.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	4.9	0.1	0.3	0.1	0.0	0.5	0.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	30.5	23.7	38.7	18.8	13.1	95.0	29.8	9.2	64.7	28.9	0.0
LnGrp LOS		C	C	D	B	B	F	C	A	E	C	
Approach Vol, veh/h		7			380			81			14	
Approach Delay, s/veh		28.6			36.8			10.7			54.5	
Approach LOS		C			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	33.1	40.0	4.7	42.3	14.6	58.5	5.9	41.0
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	23.5	34.5	6.5	35.5	5.0	53.0	6.5	35.5
Max Q Clear Time (g_c+I1), s	11.8	2.1	2.1	2.1	0.0	2.6	2.7	3.1
Green Ext Time (p_c), s	0.5	0.0	0.0	0.2	0.0	0.1	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	32.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	27	0	11	0	0	1	3	364	3	2	284	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	33	0	12	0	0	1	4	439	4	2	342	12
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	56	0	156	2	0	25	10	2739	25	5	2758	1172
Arrive On Green	0.03	0.00	0.10	0.00	0.00	0.02	0.01	0.73	0.73	0.00	0.73	0.73
Sat Flow, veh/h	1810	0	1615	1810	0	1615	1810	3760	34	1810	3800	1615
Grp Volume(v), veh/h	33	0	12	0	0	1	4	222	221	2	342	12
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1615	1810	1900	1894	1810	1900	1615
Q Serve(g_s), s	1.6	0.0	0.6	0.0	0.0	0.1	0.2	3.2	3.2	0.1	2.4	0.2
Cycle Q Clear(g_c), s	1.6	0.0	0.6	0.0	0.0	0.1	0.2	3.2	3.2	0.1	2.4	0.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	56	0	156	2	0	25	10	1384	1380	5	2758	1172
V/C Ratio(X)	0.58	0.00	0.08	0.00	0.00	0.04	0.42	0.16	0.16	0.41	0.12	0.01
Avail Cap(c_a), veh/h	113	0	574	101	0	563	101	1384	1380	101	2758	1172
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.0	0.0	37.0	0.0	0.0	43.7	44.6	3.8	3.8	44.8	3.7	3.4
Incr Delay (d2), s/veh	3.5	0.0	0.1	0.0	0.0	0.2	10.4	0.2	0.2	18.9	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.3	0.0	0.0	0.0	0.1	1.8	1.8	0.1	1.3	0.1
LnGrp Delay(d),s/veh	46.5	0.0	37.1	0.0	0.0	43.9	55.1	4.0	4.0	63.8	3.8	3.4
LnGrp LOS	D		D			D	E	A	A	E	A	A
Approach Vol, veh/h		45			1			447			356	
Approach Delay, s/veh		44.0			43.9			4.5			4.1	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	71.1	0.0	14.2	5.0	70.8	7.3	6.9
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	5.6	31.4
Max Q Clear Time (g_c+I1), s	2.1	5.2	0.0	2.6	2.2	4.4	3.6	2.1
Green Ext Time (p_c), s	0.0	2.6	0.0	0.0	0.0	2.6	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	6.5
HCM 2010 LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

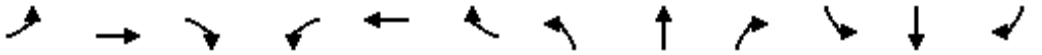
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	382	9	120	163	0	0	0	0	409	2	156
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	406	5	128	173	0				435	2	102
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	934	397	623	2417	0				491	2	440
Arrive On Green	0.00	0.08	0.08	0.69	1.00	0.00				0.27	0.27	0.27
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1802	8	1615
Grp Volume(v), veh/h	0	406	5	128	173	0				437	0	102
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	12.2	0.3	3.1	0.0	0.0				27.8	0.0	5.9
Cycle Q Clear(g_c), s	0.0	12.2	0.3	3.1	0.0	0.0				27.8	0.0	5.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	934	397	623	2417	0				493	0	440
V/C Ratio(X)	0.00	0.43	0.01	0.21	0.07	0.00				0.89	0.00	0.23
Avail Cap(c_a), veh/h	0	934	397	623	2417	0				822	0	733
HCM Platoon Ratio	1.00	0.33	0.33	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.98	0.98	0.99	0.99	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	47.2	41.7	12.7	0.0	0.0				41.9	0.0	33.9
Incr Delay (d2), s/veh	0.0	1.4	0.1	0.1	0.1	0.0				6.7	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.6	0.2	1.5	0.0	0.0				14.8	0.0	2.7
LnGrp Delay(d),s/veh	0.0	48.6	41.8	12.8	0.1	0.0				48.6	0.0	34.2
LnGrp LOS		D	D	B	A					D		C
Approach Vol, veh/h		411			301						539	
Approach Delay, s/veh		48.6			5.5						45.9	
Approach LOS		D			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	46.8	35.0		38.2		81.8		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	20.5	* 30		54.5		54.5		
Max Q Clear Time (g_c+I1), s	5.1	14.2		29.8		2.0		
Green Ext Time (p_c), s	0.7	1.4		2.9		0.8		

Intersection Summary	
HCM 2010 Ctrl Delay	37.0
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	203	587	0	0	279	334	4	0	96	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	221	638	0	0	303	328	4	0	18			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	247	2755	0	0	2126	904	347	0	310			
Arrive On Green	0.27	1.00	0.00	0.00	0.56	0.56	0.19	0.00	0.19			
Sat Flow, veh/h	1810	3800	0	0	3800	1615	1809	0	1615			
Grp Volume(v), veh/h	221	638	0	0	303	328	4	0	18			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	14.1	0.0	0.0	0.0	4.6	13.5	0.2	0.0	1.1			
Cycle Q Clear(g_c), s	14.1	0.0	0.0	0.0	4.6	13.5	0.2	0.0	1.1			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	247	2755	0	0	2126	904	347	0	310			
V/C Ratio(X)	0.90	0.23	0.00	0.00	0.14	0.36	0.01	0.00	0.06			
Avail Cap(c_a), veh/h	550	2755	0	0	2126	904	347	0	310			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.98	0.98	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	42.8	0.0	0.0	0.0	12.7	14.6	39.3	0.0	39.6			
Incr Delay (d2), s/veh	4.5	0.2	0.0	0.0	0.1	1.1	0.1	0.0	0.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	7.3	0.1	0.0	0.0	2.4	6.3	0.1	0.0	0.5			
LnGrp Delay(d),s/veh	47.3	0.2	0.0	0.0	12.8	15.7	39.4	0.0	40.0			
LnGrp LOS	D	A			B	B	D		D			
Approach Vol, veh/h		859			631			22				
Approach Delay, s/veh		12.3			14.3			39.9				
Approach LOS		B			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		92.0			19.9	72.1		28.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		87.0			36.5	47.0		23.0
Max Q Clear Time (g_c+I1), s		2.0			16.1	15.5		3.1
Green Ext Time (p_c), s		4.7			0.3	4.6		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	13.6
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	3	5	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	1	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	4	7	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	7	0	-	0	11	7
Stage 1	-	-	-	-	7	-
Stage 2	-	-	-	-	4	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1627	-	-	-	1014	1081
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	1024	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1627	-	-	-	1014	1081
Mov Cap-2 Maneuver	-	-	-	-	929	-
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	1024	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1627	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	6	6	390	14	6	1	4	387	9	7	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	6	3	402	14	6	1	4	114	9	7	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	297	1092	483	885	1710	755	2	552	939	20	1140	0
Arrive On Green	0.00	0.29	0.29	0.24	0.45	0.45	0.00	0.29	0.29	0.01	0.30	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1678	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	6	3	402	14	6	1	4	114	9	7	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1678	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.1	0.1	11.3	0.2	0.2	0.1	0.2	1.7	0.6	0.2	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.1	11.3	0.2	0.2	0.1	0.2	1.7	0.6	0.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	297	1093	483	885	1710	755	2	552	939	20	1140	0
V/C Ratio(X)	0.00	0.01	0.01	0.45	0.01	0.01	0.40	0.01	0.12	0.46	0.01	0.00
Avail Cap(c_a), veh/h	297	1093	483	885	1710	755	75	552	939	98	1140	0
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)	0.00	1.00	1.00	0.96	0.96	0.96	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	30.5	23.7	38.5	18.2	12.5	59.9	30.3	9.1	59.0	29.5	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	0.0	35.1	0.0	0.3	6.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.1	5.7	0.1	0.1	0.1	0.1	0.8	0.3	0.1	0.0
LnGrp Delay(d),s/veh	0.0	30.5	23.7	38.7	18.2	12.5	95.0	30.3	9.3	65.2	29.5	0.0
LnGrp LOS		C	C	D	B	B	F	C	A	E	C	
Approach Vol, veh/h		9			422			119			16	
Approach Delay, s/veh		28.2			37.6			10.7			49.5	
Approach LOS		C			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	33.8	40.0	4.7	41.5	14.3	59.5	5.8	40.4
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	24.5	34.5	5.0	36.0	5.0	54.0	6.5	34.5
Max Q Clear Time (g_c+I1), s	13.3	2.1	2.1	2.2	0.0	2.2	2.6	3.7
Green Ext Time (p_c), s	0.6	0.0	0.0	0.2	0.0	0.0	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	32.2
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	26	0	6	1	1	4	0	313	5	0	396	7
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	27	0	6	1	1	4	0	329	5	0	417	7
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	49	0	65	2	5	19	2	2935	45	2	2987	1269
Arrive On Green	0.03	0.00	0.04	0.00	0.01	0.01	0.00	0.79	0.79	0.00	0.79	0.79
Sat Flow, veh/h	1810	0	1615	1810	333	1332	1810	3733	57	1810	3800	1614
Grp Volume(v), veh/h	27	0	6	1	0	5	0	167	167	0	417	7
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1665	1810	1900	1890	1810	1900	1614
Q Serve(g_s), s	1.3	0.0	0.3	0.0	0.0	0.3	0.0	1.9	1.9	0.0	2.4	0.1
Cycle Q Clear(g_c), s	1.3	0.0	0.3	0.0	0.0	0.3	0.0	1.9	1.9	0.0	2.4	0.1
Prop In Lane	1.00		1.00	1.00		0.80	1.00		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	49	0	65	2	0	24	2	1494	1486	2	2987	1269
V/C Ratio(X)	0.55	0.00	0.09	0.40	0.00	0.21	0.00	0.11	0.11	0.00	0.14	0.01
Avail Cap(c_a), veh/h	107	0	574	101	0	586	101	1494	1486	101	2987	1269
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	43.2	0.0	41.6	44.9	0.0	43.8	0.0	2.3	2.3	0.0	2.3	2.1
Incr Delay (d2), s/veh	3.5	0.0	0.2	34.8	0.0	1.6	0.0	0.2	0.2	0.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.1	0.0	0.0	0.1	0.0	1.0	1.0	0.0	1.3	0.0
LnGrp Delay(d),s/veh	46.7	0.0	41.8	79.7	0.0	45.4	0.0	2.4	2.4	0.0	2.4	2.1
LnGrp LOS	D		D	E		D		A	A		A	A
Approach Vol, veh/h		33			6			334			424	
Approach Delay, s/veh		45.8			51.1			2.4			2.4	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	76.2	4.6	9.1	0.0	76.2	7.0	6.8
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	5.3	31.7
Max Q Clear Time (g_c+I1), s	0.0	3.9	2.0	2.3	0.0	4.4	3.3	2.3
Green Ext Time (p_c), s	0.0	2.6	0.0	0.0	0.0	2.6	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	4.6
HCM 2010 LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	393	9	127	133	0	0	0	0	349	2	278
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	418	10	135	141	0				371	2	219
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	2067	879	161	2547	0				429	2	384
Arrive On Green	0.00	1.00	1.00	0.18	1.00	0.00				0.24	0.24	0.24
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1800	10	1615
Grp Volume(v), veh/h	0	418	10	135	141	0				373	0	219
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	0.0	0.0	8.7	0.0	0.0				23.7	0.0	14.3
Cycle Q Clear(g_c), s	0.0	0.0	0.0	8.7	0.0	0.0				23.7	0.0	14.3
Prop In Lane	0.00		1.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	2067	879	161	2547	0				431	0	384
V/C Ratio(X)	0.00	0.20	0.01	0.84	0.06	0.00				0.87	0.00	0.57
Avail Cap(c_a), veh/h	0	2067	879	354	2547	0				747	0	666
HCM Platoon Ratio	1.00	2.00	2.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.99	0.99	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	48.5	0.0	0.0				43.9	0.0	40.3
Incr Delay (d2), s/veh	0.0	0.2	0.0	4.4	0.0	0.0				5.3	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	4.5	0.0	0.0				12.5	0.0	6.5
LnGrp Delay(d),s/veh	0.0	0.2	0.0	53.0	0.0	0.0				49.2	0.0	41.6
LnGrp LOS		A	A	D	A					D		D
Approach Vol, veh/h		428			276						592	
Approach Delay, s/veh		0.2			25.9						46.4	
Approach LOS		A			C						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.2	70.8		34.1		85.9		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	23.5	31.5		49.5		59.5		
Max Q Clear Time (g_c+I1), s	10.7	2.0		25.7		2.0		
Green Ext Time (p_c), s	0.1	2.2		2.8		2.2		

Intersection Summary	
HCM 2010 Ctrl Delay	26.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	248	494	0	0	251	422	8	1	115	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	279	555	0	0	282	449	9	1	21			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	311	2818	0	0	2055	873	286	32	283			
Arrive On Green	0.11	0.50	0.00	0.00	0.54	0.54	0.17	0.17	0.17			
Sat Flow, veh/h	1810	3800	0	0	3800	1614	1636	182	1615			
Grp Volume(v), veh/h	279	555	0	0	282	449	10	0	21			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1614	1818	0	1615			
Q Serve(g_s), s	18.3	9.8	0.0	0.0	4.4	21.2	0.5	0.0	1.3			
Cycle Q Clear(g_c), s	18.3	9.8	0.0	0.0	4.4	21.2	0.5	0.0	1.3			
Prop In Lane	1.00		0.00	0.00		1.00	0.90		1.00			
Lane Grp Cap(c), veh/h	311	2818	0	0	2055	873	318	0	283			
V/C Ratio(X)	0.90	0.20	0.00	0.00	0.14	0.51	0.03	0.00	0.07			
Avail Cap(c_a), veh/h	565	2818	0	0	2055	873	318	0	283			
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.98	0.98	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	52.1	10.3	0.0	0.0	13.7	17.5	41.1	0.0	41.4			
Incr Delay (d2), s/veh	3.7	0.2	0.0	0.0	0.1	2.2	0.2	0.0	0.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	9.5	5.2	0.0	0.0	2.4	9.9	0.3	0.0	0.6			
LnGrp Delay(d),s/veh	55.8	10.4	0.0	0.0	13.8	19.7	41.2	0.0	41.9			
LnGrp LOS	E	B			B	B	D		D			
Approach Vol, veh/h		834			731			31				
Approach Delay, s/veh		25.6			17.4			41.7				
Approach LOS		C			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		94.0			24.1	69.9		26.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		89.0			37.5	48.0		21.0
Max Q Clear Time (g_c+I1), s		11.8			20.3	23.2		3.3
Green Ext Time (p_c), s		4.4			0.3	4.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	22.2
HCM 2010 LOS	C

APPENDIX 3.3:

EXISTING (2015) CONDITIONS TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

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

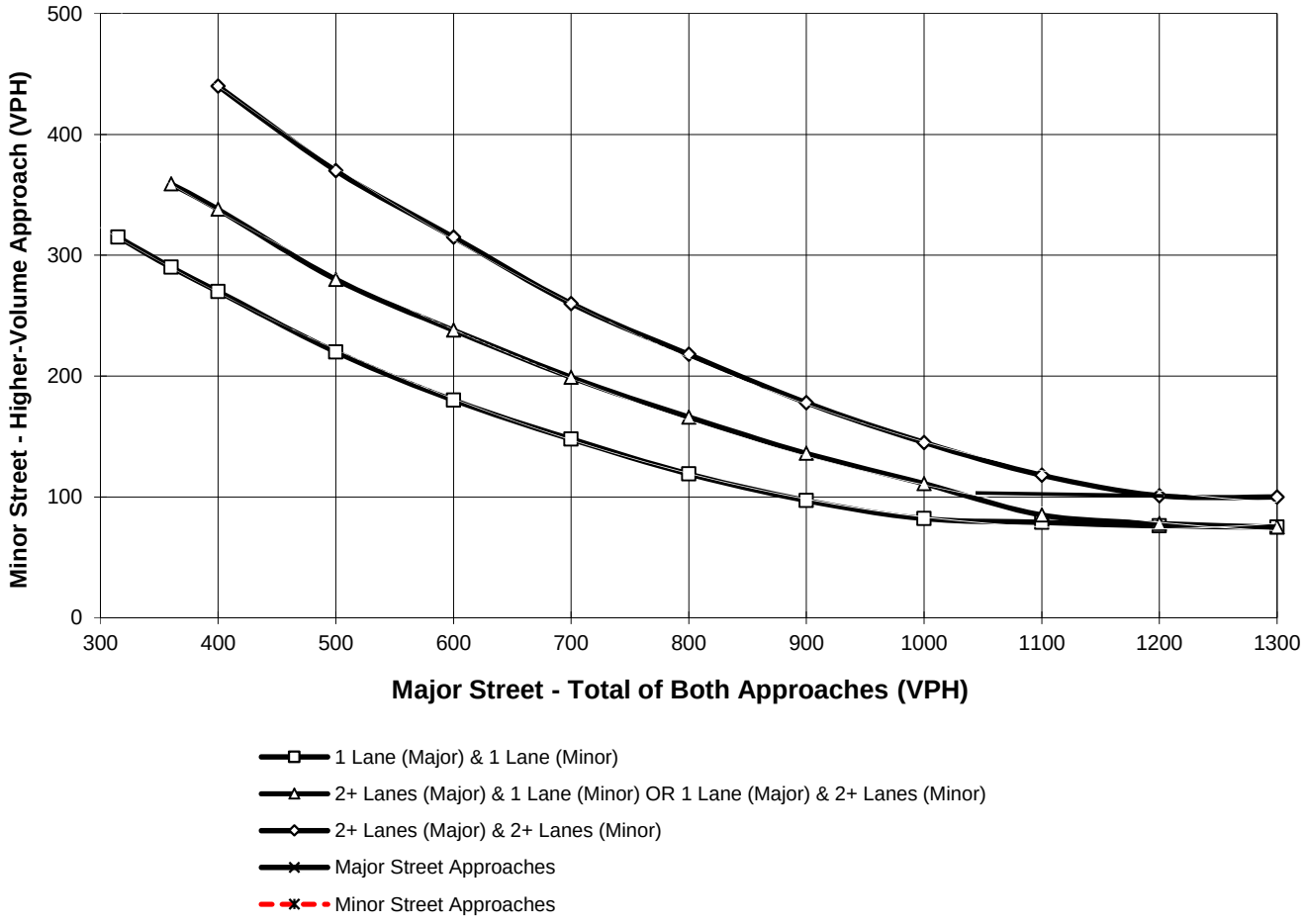
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **Existing (2015) Conditions - Weekday AM Peak Hour**

Major Street Name = **Oleander Avenue**
Total of Both Approaches (VPH) = **7**
Number of Approach Lanes Major Street = **2**

Minor Street Name = **Driveway 6**
High Volume Approach (VPH) = **3**
Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



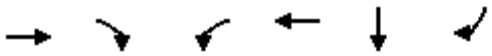
*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

This Page Intentionally Left Blank

APPENDIX 3.4:

EXISTING (2015) CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

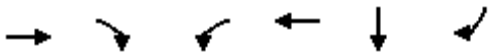


Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	406	10	128	173	437	166
v/c Ratio	0.26	0.01	0.40	0.07	0.79	0.25
Control Delay	23.4	0.0	34.1	10.2	49.8	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.4	0.0	34.1	10.2	49.8	4.8
Queue Length 50th (ft)	101	0	40	25	311	0
Queue Length 95th (ft)	126	0	64	43	383	44
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	1559	823	324	2351	862	953
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.01	0.40	0.07	0.51	0.17

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	221	638	303	363	4	104
v/c Ratio	0.76	0.23	0.15	0.30	0.01	0.23
Control Delay	39.2	6.0	14.7	2.4	39.5	9.1
Queue Delay	0.0	0.6	0.0	0.0	0.0	0.0
Total Delay	39.3	6.6	14.7	2.4	39.5	9.1
Queue Length 50th (ft)	158	71	56	0	3	0
Queue Length 95th (ft)	171	105	90	49	13	47
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	577	2755	2059	1195	364	448
Starvation Cap Reductn	9	1626	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.57	0.15	0.30	0.01	0.23

Intersection Summary



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	418	10	135	141	373	296
v/c Ratio	0.22	0.01	0.66	0.06	0.77	0.42
Control Delay	16.5	0.0	69.9	8.2	51.7	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.5	0.0	69.9	8.2	51.7	5.2
Queue Length 50th (ft)	86	0	111	17	270	0
Queue Length 95th (ft)	112	0	175	34	339	60
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	1931	997	372	2482	783	957
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.01	0.36	0.06	0.48	0.31

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	279	555	282	474	10	129
v/c Ratio	0.79	0.20	0.14	0.39	0.03	0.29
Control Delay	46.1	3.0	15.6	2.6	41.6	9.1
Queue Delay	0.2	0.3	0.0	0.0	0.0	0.0
Total Delay	46.3	3.3	15.6	2.6	41.6	9.1
Queue Length 50th (ft)	187	10	53	0	7	0
Queue Length 95th (ft)	79	52	86	53	22	52
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	593	2818	2004	1212	332	438
Starvation Cap Reductn	37	1620	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.46	0.14	0.39	0.03	0.29

Intersection Summary

APPENDIX 3.5:

EXISTING (2015) CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2544*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*940*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*13.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:04 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2186*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*2*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.990*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*800*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*11.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:05 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4092*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1512*	pc/h/ln
S	*68.9*	mph
D = v_p / S	*22.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:06 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3721*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1368*	pc/h/ln
S	*69.7*	mph
D = v_p / S	*19.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:07 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3855*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1425*	pc/h/ln
S	*69.4*	mph
D = v_p / S	*20.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:07 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3445*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1267*	pc/h/ln
S	*69.9*	mph
D = v_p / S	*18.1*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:08 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3247*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1200*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*17.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:08 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing (2015)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2779*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1022*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*14.6*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:09 AM

APPENDIX 3.6:

EXISTING (2015) CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	195
Freeway Volume, V_F	2544
Ramp Volume, V_R	456
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1420 ft

V_D = 98 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2544	0.92	Level	4	0	0.980	1.00	2821
Ramp	456	0.92	Level	17	0	0.922	1.00	538
UpStream								
DownStream	98	0.92	Level	28	0	0.877	1.00	121

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.665 using Equation (Exhibit 13-7)

V_{12} = 2056 pc/h

V_3 or V_{av34} 765 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2821	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2283	Exhibit 13-8	7200	No
V_R	538	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2056	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 20.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.346 (Exhibit 13-12)

S_R = 60.3 mph (Exhibit 13-12)

S_0 = 76.8 mph (Exhibit 13-12)

S = 64.0 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 9:59 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway/Ramp		Downstream Adj Ramp	
☑ Yes	☐ On	Freeway Number of Lanes, N	3	☐ Yes	☐ On
☐ No	☑ Off	Ramp Number of Lanes, N	1	☑ No	☐ Off
L_{up} =	1420 ft	Acceleration Lane Length, L_A	260	L_{down} =	ft
V_u =	456 veh/h	Deceleration Lane Length L_D		V_D =	veh/h
		Freeway Volume, V_F	2088		
		Ramp Volume, V_R	98		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2088	0.92	Level	1	0	0.995	1.00	2281
Ramp	98	0.92	Level	28	0	0.877	1.00	121
UpStream	456	0.92	Level	17	0	0.922	1.00	538
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 580.87 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 1334 pc/h

V_3 or V_{av34} 947 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1334 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2402	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1455	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.1 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.314 (Exibit 13-11)

S_R = 61.2 mph (Exhibit 13-11)

S_0 = 68.4 mph (Exhibit 13-11)

S = 63.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway/Ramp		Downstream Adj Ramp	
☑ Yes	☐ On	Freeway Number of Lanes, N	3	☐ Yes	☐ On
☐ No	☑ Off	Ramp Number of Lanes, N	1	☑ No	☐ Off
L_{up} =	1395 ft	Acceleration Lane Length, L_A	300	L_{down} =	ft
V_u =	90 veh/h	Deceleration Lane Length L_D		V_D =	veh/h
		Freeway Volume, V_F	3631		
		Ramp Volume, V_R	461		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3631	0.92	Level	3	0	0.985	1.00	4006
Ramp	461	0.92	Level	13	0	0.939	1.00	534
UpStream	90	0.92	Level	10	0	0.952	1.00	103
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1056.16 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 2347 pc/h

V_3 or V_{av34} = 1659 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2347 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4540	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2881	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 25.8 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.364 (Exibit 13-11)

S_R = 59.8 mph (Exhibit 13-11)

S_0 = 65.8 mph (Exhibit 13-11)

S = 61.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	3721
Ramp Volume, V_R	90
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off; L_{down} = 1395 ft; V_D = 461 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3721	0.92	Level	3	0	0.985	1.00	4105
Ramp	90	0.92	Level	10	0	0.952	1.00	103
UpStream								
DownStream	461	0.92	Level	13	0	0.939	1.00	534

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.653 using Equation (Exhibit 13-7)

V_{12} = 2715 pc/h

V_3 or V_{av34} 1390 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4105	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4002	Exhibit 13-8	7200	No
V_R	103	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2715	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 25.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.307 (Exhibit 13-12)

S_R = 61.4 mph (Exhibit 13-12)

S_0 = 75.3 mph (Exhibit 13-12)

S = 65.5 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:00 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	195	L_{down} =	1420 ft
V_u =	veh/h	Freeway Volume, V_F	3855	V_D =	122 veh/h
		Ramp Volume, V_R	532		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3855	0.92	Level	4	0	0.980	1.00	4274
Ramp	532	0.92	Level	13	0	0.939	1.00	616
UpStream								
DownStream	122	0.92	Level	10	0	0.952	1.00	139

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.625 using Equation (Exhibit 13-7)

V_{12} = 2902 pc/h

V_3 or V_{av34} 1372 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4274	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3658	Exhibit 13-8	7200	No
V_R	616	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2902	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 27.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.353 (Exhibit 13-12)

S_R = 60.1 mph (Exhibit 13-12)

S_0 = 75.3 mph (Exhibit 13-12)

S = 64.3 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:01 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 1420 ft
V_u = 532 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	260
Deceleration Lane Length L_D	
Freeway Volume, V_F	3323
Ramp Volume, V_R	122
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3323	0.92	Level	3	0	0.985	1.00	3666
Ramp	122	0.92	Level	10	0	0.952	1.00	139
UpStream	532	0.92	Level	13	0	0.939	1.00	616
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 881.11 (Equation 13-6 or 13-7)
P_{FM} = 0.585 using Equation (Exhibit 13-6)
V_{12} = 2144 pc/h
V_3 or V_{av34} = 1522 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
If Yes, V_{12a} = 2144 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3805	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2283	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 21.6 (pc/mi/ln)
LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.336 (Exibit 13-11)
S_R = 60.6 mph (Exhibit 13-11)
S_0 = 66.3 mph (Exhibit 13-11)
S = 62.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R = mph (Exhibit 13-12)
S_0 = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 1395 ft
V_u = 115 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	300
Deceleration Lane Length L_D	
Freeway Volume, V_F	2664
Ramp Volume, V_R	583
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2664	0.92	Level	2	0	0.990	1.00	2925
Ramp	583	0.92	Level	11	0	0.948	1.00	669
UpStream	115	0.92	Level	9	0	0.957	1.00	131
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 853.72 (Equation 13-6 or 13-7)
P_{FM} = 0.586 using Equation (Exhibit 13-6)
V_{12} = 1714 pc/h
V_3 or V_{av34} = 1211 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
If Yes, V_{12a} = 1714 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3594	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2383	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 21.9 (pc/mi/ln)
LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.336 (Exibit 13-11)
S_R = 60.6 mph (Exhibit 13-11)
S_0 = 67.4 mph (Exhibit 13-11)
S = 62.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R = mph (Exhibit 13-12)
S_0 = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing (2015)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	2779
Ramp Volume, V_R	115
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1395 ft
V_D = 583 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2779	0.92	Level	3	0	0.985	1.00	3066
Ramp	115	0.92	Level	9	0	0.957	1.00	131
UpStream								
DownStream	583	0.92	Level	11	0	0.948	1.00	669

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R = mph (Exhibit 13-11)
S_0 = mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.677 using Equation (Exhibit 13-7)
V_{12} = 2119 pc/h
V_3 or V_{av34} 947 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3066	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2935	Exhibit 13-8	7200	No
V_R	131	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2119	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 20.0 (pc/mi/ln)
LOS = B (Exhibit 13-2)

Speed Determination

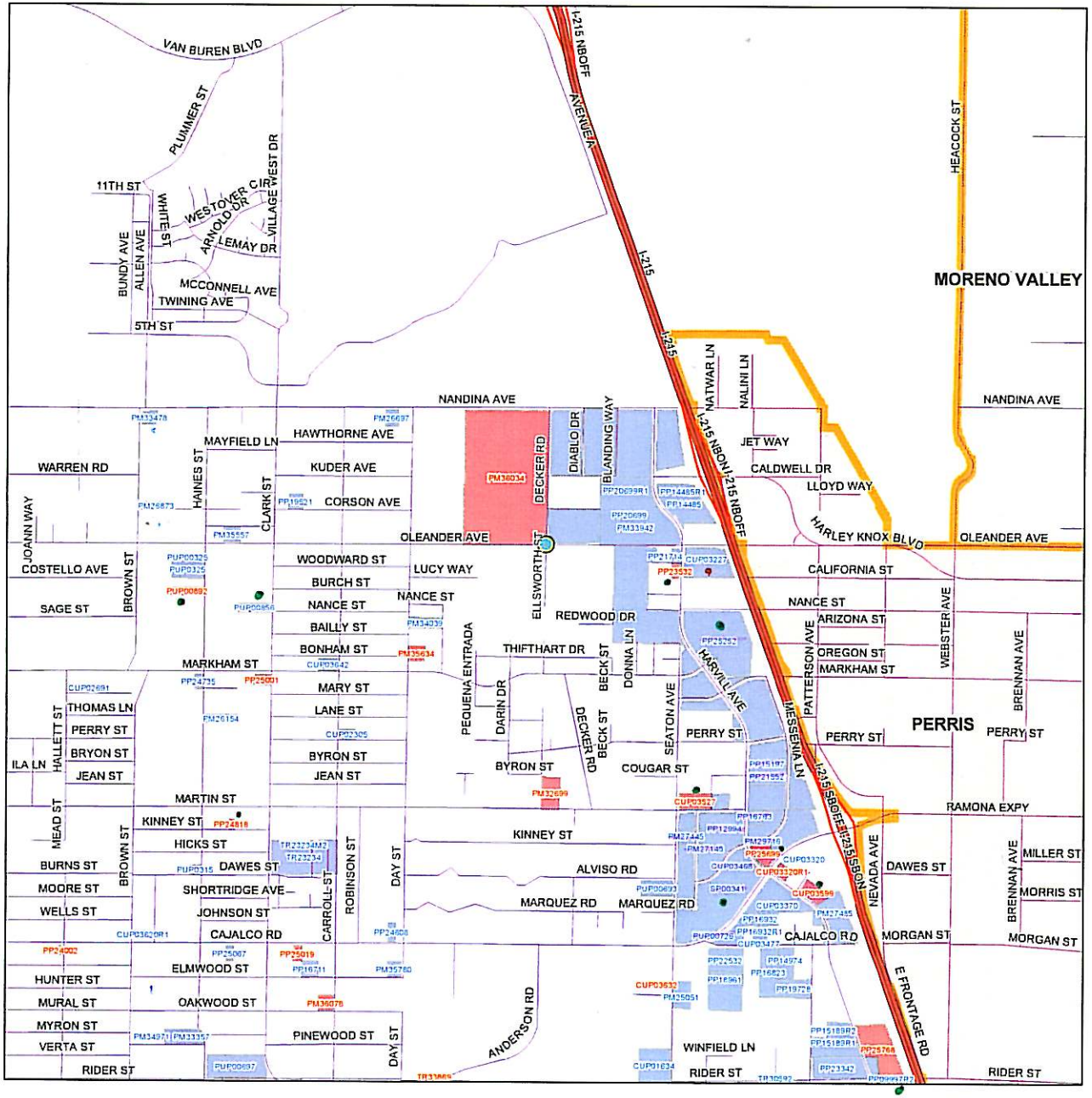
D_s = 0.310 (Exhibit 13-12)
S_R = 61.3 mph (Exhibit 13-12)
S_0 = 76.8 mph (Exhibit 13-12)
S = 65.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:03 AM

APPENDIX 4.1:

CUMULATIVE DEVELOPMENT PROJECTS

This Page Intentionally Left Blank



4.1-1

The County of Riverside assumes no warranty or legal responsibility for the information contained on this map. Data and information represented on this map is subject to updates, modifications and may not be complete or appropriate for all purposes. County GIS and other sources should be queried for the most current information. Do not copy or resell this map.

N

COUNTY LIST

Cities (Outline)
ACTIVE CASES
APPROVED CASES

0 1,000 2,000 4,000 Feet

Printed by ksang on 6/16/10

Active Cases as of 4/9/2015

CASE NAME	STATUS	APPLIED DATE	APPROVAL DATE	EXPIRED DATE
CASE DESCRIPTION				
CUP03320R1	DRT	20051221	0	20000000
ALLOW LIQUOR SALES USE WITHIN EXISTING GAS STATION				
CUP03527	DRT	20060915	0	20000000
8000 SF WAREHOUSE/OFFICE/CONCRETE MIXING SILO&STOR				
CUP03599	DRT	20080625	0	20000000
TO CONSTRUCT A THREE-STORY 52,798 SQ.FT. HOTEL WI				
CUP03632	DRT	20090915	0	20000000
COMMUNITY AUCTION AND SALES YARD				
PM32699	DRT	20060223	0	20000000
SCHED H DIVISION OF 5 ACRES INTO (2) PARCELS				
PM35634	DRT	20071221	0	0
DIVIDE 1.89 ACRES INTO 2 LOTS				
PM36034	DRT	20080612	0	20000000
SCHEDULE "E" DIVISION OF 100 ACRES INTO 16 LOTS				
PM36078	DRT	20090521	0	20000000
SUBDIVIDE 2.9 ACRES INTO TWO LOTS				
PP23532	DRT	20080617	0	20000000
GAS STATION AND MINI MARKET & RETAIL STORES				
PP24002	DRT	20090225	0	20000000
PROPOSED FEED STORE				
PP24818	DRT	20101227	0	20000000
1,860 SQ FT HOUSE CONVERT TO CHURCH				
PP25001	DRT	20110818	0	20000000
FEED AND GRAIN SALES				
PP25019	APPLIED	20110921	0	0
ADD SMOKE SHOP/RECYCL COLL FAC/PROPANE TANK TO EXI				
PP25699	DRT	20141107	0	20000000
PLOT PLAN TO CONSTRUCT TWO (2) DRIVE THRU RESTAURA				
PP25768	DRT	20150226	0	0
PP TO REMOVE AN EXISTING GRAIN STORAGE BINS AND TO				
PUP00892	BOS	20070713	0	20000000
ADULT RESIDENTIAL CARE FACILITY				
TR33869	APPLIED	20051005	0	0
SUBDIVIDE 50.2 AC (3 PARCELS) INTO 39 SFR LOTS				

Approved Cases as of 04/09/2015

CASE NAME	STATUS	APPLIED DATE	APPROVAL DATE	EXPIRED DATE
CASE DESCRIPTION				
CUP01634	APPROVED	02/01/2008	0	NA
PROPOSAL TO REPLACE RESIN PROCESSING SYSTEM				
CUP02305	APPROVED	01/28/2008	0	NA
CUP02691	EXPIRED	12/22/2000	19840904	09/04/1984
AUTOMOBILE DISMANTLER FACILITY				
CUP03227	APPROVED	04/01/1996	19960604	06/04/1998
RESINS MANUFACTURING FACILITY				
CUP03315	APPROVED	05/18/2000	20000725	NA
GAS STATN/CONV STORE/2 FAST FOOD/1 DINE IN RESTRNT				
CUP03320	APPROVED	08/15/2000	20010206	06/01/2030
CONVENIENCE STORE/FAST FOOD RESTAURANT/CAR WASH/			Existing	JITB/Circ.K/76 Gas w/CW.
CUP03370	APPROVED	04/03/2002	20030701	07/01/2006
TRUCK/GASSTATION COMM CTR SEVERAL BLDGS @ 32,000SF				
CUP03425	APPROVED	02/19/2004	20071114	11/14/2009
(4)CONCRETE TILT-UP BUILDINGS(TRUCKING OPERATIONS)				
CUP03468	APPROVED	09/15/2005	20080311	03/11/2010
PROPOSED GAS STATION,FASTFOOD,CARWASH, STORE				
CUP03477	APPROVED	11/14/2005	20080402	04/02/2010
CUP FOR EXISTING STRUCT FOR OFFICE SP/VEHICLE STOR				
CUP03620	APPROVED	03/30/2009	20120118	01/18/2014
GAS STATION/CONV STORE/RETAIL BUILDING				
CUP03620R1	APPROVED	10/23/2013	20141106	NA
ALLOW BEER&WINE SALES WITHIN GAS STATION/MARKET				
CUP03642	APPROVED	04/19/2010	20140128	NA
EXISTING USE AS CONVENIENT STORE W/PROPANE &ALCOHO				
PM25051	APPROVED	01/25/1990	19910514	05/14/1996
DIVIDE APPROX 4 ACRES INTO 4 PARCELS				
PM26154	APPROVED	07/17/1990	19920225	02/25/1998
SUBDIVIDE INTO 4 LOTS				
PM26697	APPROVED	05/02/1991	19970211	02/11/2000
SUBDIVIDE 2.12 ACRES INTO TWO PARCELS.				
PM26873	APPROVED	04/12/1991	19920707	07/07/1998
DIVIDE 2.50 ACRES INTO 4 PARCELS				
PM27140	APPROVED	09/25/1991	19920526	05/26/1998
3.99AC INTO TEN INDUSTRIAL PARCELS				
PM27445	APPROVED	03/25/1992	19930316	03/16/1999
DIVIDE APPROX 14 ACRES INTO 10 LOTS				
PM27485	APPROVED	04/21/1992	19930126	01/26/1999
SUBDIVIDE 26.73 ACRES INTO 10 INDUSTRIAL LOTS				
PM29716	APPROVED	05/18/2000	20000725	07/25/2004
SUBDIVIDE 4.45 ACRES INTO 4 COMMERCIAL PARCELS				
PM33357	APPROVED	10/18/2005	20080421	04/21/2015
SCHED H DIVISION OF 3 AC INTO 3 ONE AC PARCELS.				

CASE NAME	STATUS	APPLIED DATE	APPROVAL DATE	EXPIRED DATE
CASE DESCRIPTION				
PM33478	APPROVED	03/21/2006	20070730	07/30/2013
SCHED H DIVISION OF 2.35AC INTO TWO 1-AC PARCELS.				
PM33942	APPROVED	07/28/2005	20080625	06/25/2017
PM33942 PROPOSES A SCHEDULE E SUBDIVISION OF 68.85				
PM34039	APPROVED	10/03/2005	20061113	11/13/2014
SCHED H DIVISION OF 3 AC INTO 3 1-AC. MIN PARCELS				
PM34971	APPROVED	05/31/2007	20080616	06/16/2015
SCHED H DIVISION OF 2.29 AC INTO 2 SFR PARCELS.				
PM35557	APPROVED	08/13/2007	20080722	07/22/2015
Schedule H subdivision of 2.5ac into two parcels				
PM35780	APPROVED	09/20/2007	20080630	06/30/2015
SCHED H DIVISION OF 2.02 ACRES INTO TWO PARCELS.				
PP09997R1	APPROVED	02/19/1997	19970424	NA
REV.PP ADD 10,000 SQFT MAINT BLD. 2400 SQFT OFFICE				
PP09997R2	APPROVED	08/10/2000	20010502	NA
RVP FOR 12,800 SQ FT MAINT BLDG W/OUTDOOR STORAGE				
PP12994	APPROVED	09/25/1991	19920309	03/09/1994
PLOT PLAN FOR PLANNED INDUSTRIAL DEVELOPMENT FOR 8				
PP14485	APPROVED	12/19/1995	19960122	01/22/1999
CONSTRUCTION EQUIP AUCTION				
PP14485R1	APPROVED	08/20/2001	20021104	NA
HEAVY EQUIPMENT AUCTION YARD				
PP14974	APPROVED	04/25/1997	19970630	06/30/1999
STEEL BUILDING FABRICATION				
PP15189R1	APPROVED	02/28/2002	20020812	NA
CO-LOCATE ANT'S/EXPAND LEASE AREA-SEE DESCRIPTION				
PP15189R2	APPROVED	07/03/2007	20070809	NA
INSTALL 30KW EMERGENCY GENERATOR W/IN FACILITY Non-traffic				
PP15197	APPROVED	10/30/1997	19971201	12/01/1999
3 INDUSTRIAL BUILDINGS				
PP16711	APPROVED	09/01/2000	20011217	NA
150' UNMANNED TELECOMMUNICATION MONOPOLE Non-traffic				
PP16763	APPROVED	10/11/2000	20001212	12/12/2002
19500 SQ FT IND BUILDING (18,570 WAREHOUSE 930 OFF				
PP16823	APPROVED	11/17/2000	20010208	02/08/2006
TO CONSTRUCT A 22,000 SQ FT MANUFACTURING FACILITY				
PP16932	APPROVED	02/02/2001	20010423	NA
SHEET METAL MANUFACTURING, 12,000 SQ FT STEEL BLDG				
PP16932R1	APPROVED	10/17/2008	20110711	07/12/2013
ADD RECYCLING COLLECTION CENTER TO A 12,000 S.F. P				
PP18961	APPROVED	10/28/2003	20041215	NA
NATIONAL ARCHIVES & RECORDS ADMIN. WAREHOUSE FAC.				
PP19521	APPROVED	06/11/2004	20061113	11/13/2008
HAY AND FEED STORE				

CASE NAME	STATUS	APPLIED DATE	APPROVAL DATE	EXPIRED DATE
CASE DESCRIPTION				
PP19728	APPROVED	09/01/2004	20070227	02/27/2009
CONTRACTORS STORAGE YARD, VEHICLE MAINT AND ADMIN				
PP20699	APPROVED	07/28/2005	20080625	06/25/2012
PP20699 PROPOSES TO DEVELOP FIVE (5) INDUSTRIAL /				
PP20699R1	APPROVED	06/16/2011	20110816	08/16/2013
REDUCE FROM 5 INDUS BLDG TO 3/MODIFY DRAINAGE AND				
PP21552	APPROVED	03/21/2006	20061218	12/18/2008
PROSPD 6 LIGHT INDUS BLDGS; TOTAL OF 14 PARCELS.				
PP21714	APPROVED	05/04/2006	20070921	09/21/2009
UNMNND WRLSS COMM 65' MONOTREE BROADLEAF/OUTDOOR E				
PP22532	APPROVED	02/09/2007	20080107	01/07/2010
OFFICE AND MANUFACTURING FACILITY				
PP23342	APPROVED	03/20/2008	20080820	10/28/2013
MULTI USE INDUSTRIAL PARK WAREHOUSE BUILDINGS				
PP24608	APPROVED	06/17/2010	20140908	09/08/2016
FEED & GRAIN SALES W/6400 SF HAY BARN, 2880 SF STO				
PP24735	APPROVED	09/30/2010	20120326	03/26/2014
50' MONOPINE/12 PANNL ANTS/1 MICRO/6 EQUIP CABINTS				
PP25067	APPROVED	12/22/2011	20130603	06/03/2015
VERIZON 65 FT MONOEUCALYPTUS WIRELESS FACILITY/12			non-traffic	
PP25252	APPROVED	12/20/2012	20130205	NA
+ 399,150 SF WAREHOUSE/OFFICE BLDG FOR DISCOUNT TIRE				
PUP00325	APPROVED	12/26/2000	0	NA
?				
PUP00693	APPROVED	11/17/1989	19910108	01/08/1993
BUILD A CHURCH				
PUP00697	APPROVED	12/22/1989	19940816	08/15/1996
CHURCH FACILITY				
PUP00726	APPROVED	07/26/1991	19911015	10/15/1993
OFFICES AND DAY CARE CENTER				
PUP00765	APPROVED	03/31/1995	19950905	09/05/1997
PUBLIC USE PERMIT FOR 32-BED RESIDENTIAL CARE FACI				
PUP00856	APPROVED	07/19/2002	20030415	NA
+ DAY CARE CENTER				
PUP00856R1	APPROVED	06/11/2008	20090624	06/24/2011
RENEWTIME&EXPANSION OF EXISTING DAY CARE FACILITY				
PUP00856R2	APPROVED	01/09/2012	20121219	12/29/2014
ADD 2,596 SQ FT CARE TAKERS QUARTER,ADD 2,400SQ FT				
PUP0315	APPROVED	08/07/2000	19751031	11/01/1985
EXPANSION OF FAMILY CARE HOME				
? PUP0325	APPROVED	08/07/2000	0	NA
+ SP00341	APPROVED	04/21/2004	20051012	NA
FOR 6.2 MILLION SQ FT BUS PARK & LGT IND.				

Approved Cases as of 04/09/2015

CASE NAME	STATUS	APPLIED DATE	APPROVAL DATE	EXPIRED DATE
CASE DESCRIPTION				
TR23234	APPROVED	12/14/1987	19880607	06/07/2001
DIVIDE 44.55 ACRES INTO 170 SINGLE FAMILY RESIDENC				
TR23234M2	APPROVED	08/27/1996	19970429	06/07/2001
MC TO TR23234 TO RECONFIGURE STREETS AND LOTS				
TR30592	APPROVED	01/08/2003	20040225	02/25/2016
TO SUBDIVIDE 34 ACRES INTO 131 SFR LOTS				
TR30592M1	APPROVED	09/01/2005	20060208	02/25/2016
REMOVE TRANS COND. 50.TRANS.22 FOR ROW IMPROVEMNT				

non-traffic

Charlene Hwang So

From: Tsang, Kevin <KTSANG@rctlma.org>
Sent: Thursday, April 30, 2015 3:06 PM
To: Charlene Hwang So
Cc: CMS Administrator; Isidro Abreo
Subject: RE: 09347: Cumulative List

Please see below.

Thanks

From: Charlene Hwang So [mailto:cso@urbanxroads.com]
Sent: Thursday, April 23, 2015 1:43 PM
To: Tsang, Kevin
Cc: CMS Administrator; Isidro Abreo
Subject: 09347: Cumulative List
Importance: High

Hi Kevin,

Just trying to sort through the cumulative projects from the County that need to be added to our list. Could you please review and provide us with needed info or if projects should be removed? Thanks in advance!

Below is a list of projects we will be including because there was no expiration date, please let us know if there are projects that should be removed:

1. CUP03527 – 8,000 sf Warehouse: Keep
2. CUP03599 – 52,798 sf hotel: Keep
3. PP09997R2 – 12,800 sf maintenance building: You may remove, existing.
4. PP16932 – 12,000 sf manufacturing building: You may remove, existing.
5. PP24608 – 9,280 sf feed and grain sales: Keep
6. PP25252 – 399,150 sf warehouse: You may remove, existing.

The cumulative projects listed below did not have an expiration date and are missing information or we need to confirm information in order to be added:

1. CUP03632 – Auction/Sales yard (need sf/acreage): You may remove, existing.
2. PM32699 – Need land use and quantity: 2 SFDU
3. PM23532 – Gas Station/Convenience Store (need # of pumps or sf): You may remove, no activity for 5+ years.
4. PP24002 – Feed Store (need sf) : You may remove, no activity for 5+ years.
5. PP25001 – Feed and Grain Sales (need sf) : You may remove, no activity for 3+ years.
6. PP25699 – 2 drive-thru restaurants (need total sf): (2) 2,800 SF fast food w/ DT, 19,000 SF retail
7. PUP00892 – Adult Residential Care (need # of DUs or Beds and type of adult care facility) : You may remove, no activity for 5+ years.
8. PP14485R1 – Heavy Equipment Auction Yard (need sf or acreage): : You may remove, no activity for 5+ years.
9. PP18961 – National Archives Warehouse (need sf): You may remove, existing.
10. PUP00325 – need land use and quantity: You may remove, no activity for 5+ years.
11. PUP00856 – Day Care Center (need # of students): You may remove, existing.
12. TR30592 – 131 single family DUs: Keep

The following cumulative projects will not be included as they are low traffic generators (less than 50 peak hours trips):

1. PM35634 – 2 single family DUs: OK
2. PM36034 – 16 single family DUs: OK
3. PM36078 – 2 single family DUs: OK
4. PP24818 – Home conversion to 1,860 sf Church: OK
5. PP25019: You may remove, no activity for 4+ years.
6. PP25768: Keep, 52,450 SF manufacturing
7. TR33869 – 39 single family DUs: OK
8. CUP01634: You may remove, existing.
9. CUP03620R1: Keep, 8 VFP gas station w/ Conv. Store
10. CUP03642: You may remove, existing.
11. PM33357 – 2 single family DUs: OK
12. PM34971 – 2 single family DUs: OK
13. PM35780 – 2 single family DUs: OK
14. PP15189R1: You may remove, cell tower.

On a separate note, I wanted to follow up on your review of the scoping agreement for TTM No. 35570 (near Washington and Benton). Let me know if you have any questions.

Regards,

CHARLENE SO, P.E.
Senior Transportation Engineer

URBAN CROSSROADS

41 Corporate Park, Suite 300
Irvine, CA 92606
(949) 336-5982 Direct
(949) 861-0177 Cell
(949) 660-1994 Main
urbanxroads.com

APPENDIX 4.2:

POST PROCESSING WORKSHEETS

This Page Intentionally Left Blank

INPUT DATA

Project:	==========>		Knox Logistics	<===	Job #: 09347
Scenario:	==========>		Horizon Year Without Project	<===	Analyst: CHS
Existing Conditions Model Run ID:		==>	RivTAM-Existing Base Model	<===	Date: 4/23/15
Future Conditions Model Run ID:		==>	RivTAM GP	<===	

LOCATION: **Harvill Avenue / Harley Knox Boulevard**

AM PEAK HOUR	PM PEAK HOUR
EXISTING TURNING MOVEMENT VOLUMES: **2015** **5 3 9** < v > **5** ^ ^ **16** **5** > Total = 740 < **11** **4** v v **310** < ^ > **1 2 369**	EXISTING TURNING MOVEMENT VOLUMES: 2015 **9 418 5** < v > **33** ^ ^ **4** **5** > Total = 824 < **1** **8** v v **1** < ^ > **5 330 5**
EXISTING MODEL YEAR: **2008** **2 10** v ^ **38** < IN = 538 < **284** **66** > OUT = 538 > **235** v ^ **255 186**	EXISTING MODEL YEAR: 2008 **12 5** v ^ **72** < IN = 805 < **515** **55** > OUT = 805 > **264** v ^ **464 223**
FUTURE MODEL YEAR: **2035** **50 50** v ^ **2014** < IN = 3674 < **1649** **1098** > OUT = 3673 > **1466** v ^ **143 877**	FUTURE MODEL YEAR: 2035 **50 50** v ^ **1527** < IN = 4210 < **1679** **2179** > OUT = 4210 > **1796** v ^ **837 302**
EXISTING (COUNTED) ADTs BY LEG: 2015 **8,268** N **300** W **LEG** E **132** S **8,052**	EXISTING (COUNTED) ADTs BY LEG: 2015 8,268 N 300 W + E 132 S 8,052
REFINED FUTURE ADT'S BY LEG: 2035 **0** N **34,000** W **LEG** E **34,000** S **9,000**	REFINED FUTURE ADT'S BY LEG: 2035 0 N 34,000 W + E 34,000 S 9,000

U:\UcJobs_09100-09500_09300\09347\Post Processing\[08 Harvill_Harley Knox.xls]Input (1)

Project: Knox Logistics
Scenario: Horizon Year Without Project

Job #: 09347
Analyst: CHS
Date: 04/23/15

LOCATION: Harvill Avenue / Harley Knox Boulevard

EXISTING COUNTED INBOUND AND OUTBOUND VOLUME CALCULATION

AM

EXISTING COUNT YEAR: 2015

			17	23		
			v	^		
	17	< IN =	740	<	337	
	14	> OUT =	740	>	383	
			v	^		
			317	372		

GROWTH CALCULATION DECISION RULE
MIN = Minimum Count Growth Approach
ADD = Additive (Growth Increment) Approach
MUL = Multiplicative (Ratio) Approach

			ADD	ADD		
			v	^		
	MUL	<		<	ADD	
	MUL	>		>	ADD	
			v	^		
			MIN	ADD		

MINIMUM GROWTH %s 2008 TO 2035

			-100%	-100%		
			v	^		
	0%	<		<	0%	
	0%	>		>	0%	
			v	^		
			0%	0%		

REFINED GROWTH: 2008 TO 2035

			50	40		
			v	^		
	883	<		<	1370	
	216	>		>	1230	
			v	^		
			0	690		

PRORATED GROWTH: 2015 TO 2035
20 YEARS

			40	30		
			v	^		
	650	<		<	1010	
	160	>		>	910	
			v	^		
			0	510		

NEW PROJECTED VOLUMES: 2035

			60	53			
			v	^			
	707	< IN =	2460	<	1350		
	170	> OUT =	2460	>	1362		
			v	^	*		
			338	880			

PM

EXISTING COUNT YEAR: 2015

			432	367		
			v	^		
	15	< IN =	824	<	6	
	46	> OUT =	824	>	15	
			v	^		
			427	340		

MIN = Minimum Count Growth Approach
ADD = Additive (Growth Increment) Approach
MUL = Multiplicative (Ratio) Approach

			ADD	ADD		
			v	^		
	MUL	<		<	MUL	
	MUL	>		>	MUL	
			v	^		
			MUL	ADD		

			-100%	-100%		
			v	^		
	0%	<		<	0%	
	0%	>		>	0%	
			v	^		
			0%	0%		

ADJUSTED GROWTH: 2008 TO 2035

			40	50		
			v	^		
	305	<		<	14	
	1774	>		>	85	
			v	^		
			343	80		

PRORATED GROWTH: 2015 TO 2035
20 YEARS

			30	40		
			v	^		
	230	<		<	10	
	1310	>		>	60	
			v	^		
			250	60		

NEW PROJECTED VOLUMES: 2035

			460	647			
			v	^			
	394	< IN =	2240	<	20		
	1360	> OUT =	2240	>	126		
			v	^	*		
			1073	400			

* NOTE: Outbound future volume may be factored (increased) to match inbound if inbound is greater than outbound.

U:\UcJobs_09100-09500_09300\09347\Post Processing\[08 Harvill_Harley Knox.xls] Growth Summary (2)

Project:	Knox Logistics	Job #:	09347
Scenario:	Horizon Year Without Project	Analyst:	CHS
		Date:	04/23/15

LOCATION: Harvill Avenue / Harley Knox Boulevard
FORECAST YEAR: 2035

INDIVIDUAL TURN VOLUME GROWTH REVIEW

		AM PEAK HOUR INPUT DATA				PM PEAK HOUR INPUT DATA			
APPROACH	TURNING MOVEMENT	EXISTING COUNT	FUTURE VOLUME	DIFF-ERENCE	% CHANGE	EXISTING COUNT	FUTURE VOLUME	DIFF-ERENCE	% CHANGE
NORTH BOUND	Left	1	1	0	0%	5	248	243	4860%
	Through	2	0	-2	-100%	330	149	-181	-55%
	Right	369	1,101	732	198%	5	4	-1	-20%
	NB Total	372	1,102	730	196%	340	401	61	18%
SOUTH BOUND	Left	9	56	47	522%	5	1	-4	-80%
	Through	3	0	-3	-100%	418	331	-87	-21%
	Right	5	12	7	140%	9	128	119	1322%
	SB Total	17	68	51	300%	432	460	28	6%
EAST BOUND	Left	5	4	-1	-20%	33	497	464	1406%
	Through	5	205	200	4000%	5	122	117	2340%
	Right	4	1	-3	-75%	8	740	732	9150%
	EB Total	14	210	196	1400%	46	1,359	1,313	2854%
WEST BOUND	Left	310	337	27	9%	1	1	0	0%
	Through	11	694	683	6209%	1	18	17	1700%
	Right	16	49	33	206%	4	1	-3	-75%
	WB Total	337	1,080	743	220%	6	20	14	233%
TOTAL ENTERING VOLUME		740	2,460	1720	232%	824	2,240	1416	172%

FORECAST PEAK HOUR TO ADT COMPARISON

		VOLUMES		PERCENT OF ADT		
		AM	PM	AM	PM	ADT
North Leg	Inbound	68	460			
North Leg	Outbound	53	647			
North Leg	**TOTAL**	**121**	**1,107**	**#DIV/0!**	**#DIV/0!**	**-**
South Leg	Inbound	1,102	401			
South Leg	Outbound	338	1,072			
South Leg	**TOTAL**	**1,440**	**1,473**	**16%**	**16%**	**9,000**
East Leg	Inbound	1,080	20			
East Leg	Outbound	1,362	127			
East Leg	**TOTAL**	**2,442**	**147**	**7%**	**0%**	**34,000**
West Leg	Inbound	210	1,359			
West Leg	Outbound	707	394			
West Leg	**TOTAL**	**917**	**1,753**	**3%**	**5%**	**34,000**
OVERALL TOTAL		***4,920***	***4,480***	**6%**	***6%***	***77,000***

U:\UcJobs_09100-09500_09300\09347\Post Processing\[08 Harvill_Harley Knox.xls]Output (3)

INPUT DATA

Project:	==========>		Knox Logistics	<===	Job #: 09347
Scenario:	==========>		Horizon Year Without Project	<===	Analyst: CHS
Existing Conditions Model Run ID:		==>	Existing RivTAM	<===	Date: 4/23/2015
Future Conditions Model Run ID:		==>	RivTAM	<===	

LOCATION: **I-215 Southbound Ramps / Harley Knox Boulevard**

AM PEAK HOUR

EXISTING TURNING MOVEMENT VOLUMES:

2015

			165	**2**	**466**			
		<	v	>				
0	^				^	**0**		
397	>				<	**167**		
10	v				v	**135**		
		<	^	>				
			0	**0**	**0**			

FUTURE MODEL YEAR:

2035

				598	**0**			
				v	^			
1094	<		IN =	2158	<	**496**		
1064	>		OUT =	2158	>	**878**		
				v	^			
				186	**0**			

EXISTING (COUNTED) ADTs BY LEG:

2015

				6,180				
				N				
8,556		W		**LEG**	E	**10,416**		
				S				
				1,464				

REFINED FUTURE ADT'S BY LEG:

2035

				8,700				
				N				
24,800		W		**LEG**	E	**13,900**		
				S				
				2,300				

PM PEAK HOUR

EXISTING TURNING MOVEMENT VOLUMES:

2015

			394	**2**	**277**			
		<	v	>				
0	^				^	**0**		
418	>				<	**144**		
10	v				v	**136**		
		<	^	>				
			0	**0**	**0**			

FUTURE MODEL YEAR:

2035

				717	**0**			
				v	^			
1597	<		IN =	2744	<	**880**		
1147	>		OUT =	2444	>	**645**		
				v	^			
				202	**0**			

EXISTING (COUNTED) ADTs BY LEG:

2015

				6,180				
				N				
8,556		W		+	E	10,416		
				S				
				1,464				

REFINED FUTURE ADT'S BY LEG:

2035

				8,700				
				N				
24,800		W		+	E	13,900		
				S				
				2,300				

U:\UcJobs_09100-09500_09300\09347\Post Processing\[10 I-215 SB_Harley Knox.xlsx]Input (1)

Project: Knox Logistics
Scenario: Horizon Year Without Project

Job #: 09347
Analyst: CHS
Date: 4/23/2015

LOCATION: I-215 Southbound Ramps / Harley Knox Boulevard

EXISTING COUNTED INBOUND AND OUTBOUND VOLUME CALCULATION

AM

EXISTING COUNT YEAR: 2015

633 0
v ^
332 < IN = 1342 < 302
407 > OUT = 1342 > 863
v ^
147 0

GROWTH CALCULATION DECISION RULE
MIN = Minimum Count Growth Approach
ADD = Additive (Growth Increment) Approach
MUL = Multiplicative (Ratio) Approach

MIN MUL
v ^
MUL < < MUL
MUL > > MUL
v ^
MUL MUL

MINIMUM GROWTH %s 2015 TO 2035

0% 0%
v ^
0% < < 0%
0% > > 0%
v ^
0% 0%

REFINED GROWTH: 2015 TO 2035

0 0
v ^
758 < < 198
653 > > 17
v ^
43 0

PRORATED GROWTH: 2015 TO 2035
20 YEARS

0 0
v ^
760 < < 200
650 > > 20
v ^
40 0

NEW PROJECTED VOLUMES: 2035

630 0
v ^
1105 < IN = 2190 < 500
1060 > OUT = 2190 > 892
v ^ *
193 0

PM

EXISTING COUNT YEAR: 2015

673 0
v ^
538 < IN = 1381 < 280
428 > OUT = 1381 > 695
v ^
148 0

GROWTH CALCULATION DECISION RULE
MIN = Minimum Count Growth Approach
ADD = Additive (Growth Increment) Approach
MUL = Multiplicative (Ratio) Approach

MUL MUL
v ^
MUL < < MUL
MUL > > MIN
v ^
MUL MUL

0% 0%
v ^
0% < < 0%
0% > > 0%
v ^
0% 0%

ADJUSTED GROWTH: 2015 TO 2035

47 0
v ^
1062 < < 600
722 > > 0
v ^
52 0

PRORATED GROWTH: 2015 TO 2035
20 YEARS

50 0
v ^
1060 < < 600
720 > > 0
v ^
50 0

NEW PROJECTED VOLUMES: 2035

720 0
v ^
1760 < IN = 2750 < 880
1150 > OUT = 2750 > 770
v ^ *
220 0

* NOTE: Outbound future volume may be factored (increased) to match inbound if inbound is greater than outbound.

U:\UcJobs_09100-09500_09300\09347\Post Processing\[10 I-215 SB_Harley Knox.xlsx] Growth Summary (2)

Project:	Knox Logistics	Job #:	09347
Scenario:	Horizon Year Without Project	Analyst:	CHS
		Date:	4/23/2015

LOCATION: I-215 Southbound Ramps / Harley Knox Boulevard
FORECAST YEAR: 2035

INDIVIDUAL TURN VOLUME GROWTH REVIEW

		AM PEAK HOUR INPUT DATA				PM PEAK HOUR INPUT DATA			
APPROACH	TURNING MOVEMENT	EXISTING COUNT	FUTURE VOLUME	DIFF-ERENCE	% CHANGE	EXISTING COUNT	FUTURE VOLUME	DIFF-ERENCE	% CHANGE
NORTH BOUND	Left	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	Through	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	Right	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	NB Total	0	0	0	#DIV/0!	0	0	0	#DIV/0!
SOUTH BOUND	Left	466	46	-420	-90%	277	6	-271	-98%
	Through	2	1	-1	-50%	2	0	-2	-100%
	Right	165	630	465	282%	394	828	434	110%
	SB Total	633	677	44	7%	673	834	161	24%
EAST BOUND	Left	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	Through	397	846	449	113%	418	764	346	83%
	Right	10	130	120	1200%	10	150	140	1400%
	EB Total	407	976	569	140%	428	914	486	114%
WEST BOUND	Left	135	61	-74	-55%	136	70	-66	-49%
	Through	167	476	309	185%	144	932	788	547%
	Right	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	WB Total	302	537	235	78%	280	1,002	722	258%
TOTAL ENTERING VOLUME		1,342	2,190	848	63%	1,381	2,750	1369	99%

FORECAST PEAK HOUR TO ADT COMPARISON

		VOLUMES		PERCENT OF ADT		
		AM	PM	AM	PM	ADT
North Leg	Inbound	677	834			
North Leg	Outbound	0	0			
North Leg	**TOTAL**	**677**	**834**	**8%**	**10%**	**8,700**
South Leg	Inbound	0	0			
South Leg	Outbound	192	220			
South Leg	**TOTAL**	**192**	**220**	**8%**	**10%**	**2,300**
East Leg	Inbound	537	1,002			
East Leg	Outbound	892	770			
East Leg	**TOTAL**	**1,429**	**1,772**	**10%**	**13%**	**13,900**
West Leg	Inbound	976	914			
West Leg	Outbound	1,106	1,760			
West Leg	**TOTAL**	**2,082**	**2,674**	**8%**	**11%**	**24,800**
OVERALL TOTAL		***4,380***	***5,500***	**9%**	***11%***	***49,700***

U:\UcJobs_09100-09500_09300\09347\Post Processing\[10 I-215 SB_Harley Knox.xlsx]Output (3)

Project:	==========>		Knox Logistics	<===	Job #: 09347
Scenario:	==========>		Horizon Year Without Project	<===	Analyst: CHS
Existing Conditions Model Run ID:		==>	Existing RivTAM	<===	Date: 4/23/2015
Future Conditions Model Run ID:		==>	RivTAM	<===	

LOCATION: **I-215 Northbound Ramps / Harley Knox Boulevard**

AM PEAK HOUR

EXISTING TURNING MOVEMENT VOLUMES:

2015

			0		**0**		**0**	
		<		v		>		
	215	^				^		**381**
	647	>				<		**302**
	0	v				v		**0**
		<		^		>		
			4		**0**		**105**	

FUTURE MODEL YEAR:

2035

					0		**667**	
				v		^		
	496	<	IN =		1822	<		**621**
	878	>	OUT =		1822	>		**659**
				v		^		
					0		**323**	

EXISTING (COUNTED) ADTs BY LEG:

2015

					6,996			
					N			
	10,356		W	**LEG**	E		**13,380**	
				S				
					1,380			

REFINED FUTURE ADT'S BY LEG:

2035

					7,400			
					N			
	13,900		W	**LEG**	E		**16,200**	
				S				
					3,400			

PM PEAK HOUR

EXISTING TURNING MOVEMENT VOLUMES:

2015

			0		**0**		**0**	
		<		v		>		
	258	^				^		**459**
	534	>				<		**272**
	0	v				v		**0**
		<		^		>		
			9		**1**		**124**	

FUTURE MODEL YEAR:

2035

					0		**636**	
				v		^		
	880	<	IN =		2233	<		**931**
	945	>	OUT =		2233	>		**717**
				v		^		
					0		**357**	

EXISTING (COUNTED) ADTs BY LEG:

2015

					6,996			
					N			
	10,356		W	+	E		13,380	
				S				
					1,380			

REFINED FUTURE ADT'S BY LEG:

2035

					7,400			
					N			
	13,900		W	+	E		16,200	
				S				
					3,400			

U:\UcJobs_09100-09500_09300\09347\Post Processing\[11 I-215 NB_Harley Knox.xlsx]Input (1)

Project: Knox Logistics
Scenario: Horizon Year Without Project

Job #: 09347
Analyst: CHS
Date: 4/23/2015

LOCATION: I-215 Northbound Ramps / Harley Knox Boulevard

EXISTING COUNTED INBOUND AND OUTBOUND VOLUME CALCULATION

AM

EXISTING COUNT YEAR: 2015

0 596
v ^
306 < IN = 1654 < 683
862 > OUT = 1654 > 752
v ^
0 109

GROWTH CALCULATION DECISION RULE
MIN = Minimum Count Growth Approach
ADD = Additive (Growth Increment) Approach
MUL = Multiplicative (Ratio) Approach

MUL MUL
v ^
MUL < < MIN
MUL > > MIN
v ^
MUL MUL

MINIMUM GROWTH %s 2015 TO 2035

0% 0%
v ^
0% < < 0%
0% > > 0%
v ^
0% 0%

REFINED GROWTH: 2015 TO 2035

0 74
v ^
194 < < 0
18 > > 0
v ^
0 211

PRORATED GROWTH: 2015 TO 2035
20 YEARS

0 70
v ^
190 < < 0
20 > > 0
v ^
0 210

NEW PROJECTED VOLUMES: 2035

0 670
v ^
500 < IN = 1880 < 680
880 > OUT = 1920 > 750
v ^ *
0 320

PM

EXISTING COUNT YEAR: 2015

0 718
v ^
281 < IN = 1657 < 731
792 > OUT = 1657 > 658
v ^
0 134

MIN = Minimum Count Growth Approach
ADD = Additive (Growth Increment) Approach
MUL = Multiplicative (Ratio) Approach

MUL MIN
v ^
MUL < < MUL
MUL > > MUL
v ^
MUL MUL

0% 0%
v ^
0% < < 0%
0% > > 0%
v ^
0% 0%

ADJUSTED GROWTH: 2015 TO 2035

0 0
v ^
599 < < 199
158 > > 62
v ^
0 226

PRORATED GROWTH: 2015 TO 2035
20 YEARS

0 0
v ^
600 < < 200
160 > > 60
v ^
0 230

NEW PROJECTED VOLUMES: 2035

0 720
v ^
880 < IN = 2240 < 930
950 > OUT = 2320 > 720
v ^ *
0 360

* NOTE: Outbound future volume may be factored (increased) to match inbound if inbound is greater than outbound.

U:\UcJobs_09100-09500_09300\09347\Post Processing\[11 I-215 NB_Harley Knox.xlsx] Growth Summary (2)

Project:	Knox Logistics	Job #:	09347
Scenario:	Horizon Year Without Project	Analyst:	CHS
		Date:	4/23/2015

LOCATION: I-215 Northbound Ramps / Harley Knox Boulevard
FORECAST YEAR: 2035

INDIVIDUAL TURN VOLUME GROWTH REVIEW

		AM PEAK HOUR INPUT DATA				PM PEAK HOUR INPUT DATA			
APPROACH	TURNING MOVEMENT	EXISTING COUNT	FUTURE VOLUME	DIFF-ERENCE	% CHANGE	EXISTING COUNT	FUTURE VOLUME	DIFF-ERENCE	% CHANGE
NORTH BOUND	Left	4	57	53	1325%	9	153	144	1600%
	Through	0	0	0	#DIV/0!	1	3	2	200%
	Right	105	268	163	155%	124	216	92	74%
	NB Total	109	325	216	198%	134	372	238	178%
SOUTH BOUND	Left	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	Through	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	Right	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	SB Total	0	0	0	#DIV/0!	0	0	0	#DIV/0!
EAST BOUND	Left	215	412	197	92%	258	473	215	83%
	Through	647	482	-165	-26%	534	504	-30	-6%
	Right	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	EB Total	862	894	32	4%	792	977	185	23%
WEST BOUND	Left	0	0	0	#DIV/0!	0	0	0	#DIV/0!
	Through	302	443	141	47%	272	727	455	167%
	Right	381	258	-123	-32%	459	244	-215	-47%
	WB Total	683	701	18	3%	731	971	240	33%
TOTAL ENTERING VOLUME		1,654	1,920	266	16%	1,657	2,320	663	40%

FORECAST PEAK HOUR TO ADT COMPARISON

		VOLUMES		PERCENT OF ADT		
		AM	PM	AM	PM	ADT
North Leg	Inbound	0	0			
North Leg	Outbound	670	720			
North Leg	**TOTAL**	**670**	**720**	**9%**	**10%**	**7,400**
South Leg	Inbound	325	372			
South Leg	Outbound	0	0			
South Leg	**TOTAL**	**325**	**372**	**10%**	**11%**	**3,400**
East Leg	Inbound	701	971			
East Leg	Outbound	750	720			
East Leg	**TOTAL**	**1,451**	**1,691**	**9%**	**10%**	**16,200**
West Leg	Inbound	894	977			
West Leg	Outbound	500	880			
West Leg	**TOTAL**	**1,394**	**1,857**	**10%**	**13%**	**13,900**
OVERALL TOTAL		***3,840***	***4,640***	**9%**	***11%***	***40,900***

U:\UcJobs_09100-09500_09300\09347\Post Processing\[11 I-215 NB_Harley Knox.xlsx]Output (3)

This Page Intentionally Left Blank

APPENDIX 5.1:

E+P CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	16	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	0	17	0	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	35	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	35	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	-	-	983	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	993	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	983	-
Mov Cap-2 Maneuver	-	-	-	-	942	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	993	-

Approach	EB	WB	NB
HCM Control Delay, s	0		
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	-	-	-
HCM Lane LOS	-	-	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	7	0	28	16	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	0	30	17	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	8	0	86	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	78	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1625	-	920	1080
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	950	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1625	-	903	1080
Mov Cap-2 Maneuver	-	-	-	-	883	-
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	932	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.6	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1080	-	-	1625	-
HCM Lane V/C Ratio	0.012	-	-	0.019	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	20	0	23	44	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	22	0	25	48	0	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	22	0	120	22
Stage 1	-	-	-	-	22	-
Stage 2	-	-	-	-	98	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1607	-	880	1061
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	931	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1607	-	866	1061
Mov Cap-2 Maneuver	-	-	-	-	866	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1061	-	-	1607	-
HCM Lane V/C Ratio	0.01	-	-	0.016	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	30	0	1	67	0	0	0	7	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	33	0	1	73	0	0	0	8	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	73	0	0	33	0	0	108	108	33	111	108	73
Stage 1	-	-	-	-	-	-	33	33	-	75	75	-
Stage 2	-	-	-	-	-	-	75	75	-	36	33	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1540	-	-	1592	-	-	876	786	1046	872	786	995
Stage 1	-	-	-	-	-	-	988	872	-	939	836	-
Stage 2	-	-	-	-	-	-	939	836	-	985	872	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1540	-	-	1592	-	-	876	786	1046	865	786	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	881	785	-	877	784	-
Stage 1	-	-	-	-	-	-	988	872	-	939	835	-
Stage 2	-	-	-	-	-	-	938	835	-	978	872	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	8.5	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1046	1540	-	-	1592	-	-	-
HCM Lane V/C Ratio	0.007	-	-	-	0.001	-	-	-
HCM Control Delay (s)	8.5	0	-	-	7.3	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	34	0	16	68	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	37	0	17	74	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	37	0	146	37
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	109	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1587	-	851	1041
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	921	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1587	-	842	1041
Mov Cap-2 Maneuver	-	-	-	-	856	-
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	911	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1041	-	-	1587	-
HCM Lane V/C Ratio	0.007	-	-	0.011	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	41	0	21	84	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	45	0	23	91	0	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	45	0	182	45
Stage 1	-	-	-	-	45	-
Stage 2	-	-	-	-	137	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1576	-	812	1031
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	895	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1576	-	800	1031
Mov Cap-2 Maneuver	-	-	-	-	828	-
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	882	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1031	-	-	1576	-
HCM Lane V/C Ratio	0.009	-	-	0.014	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	51	0	30	105	2	0	0	13	3	0	0
Conflicting Peds, #/hr	0	0	0	0	0	3	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	76	0	45	157	3	0	0	19	4	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	160	0	0	76	0	0	324	325	79	334	324	158
Stage 1	-	-	-	-	-	-	76	76	-	248	248	-
Stage 2	-	-	-	-	-	-	248	249	-	86	76	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1432	-	-	1536	-	-	633	596	987	623	597	893
Stage 1	-	-	-	-	-	-	938	836	-	760	705	-
Stage 2	-	-	-	-	-	-	760	704	-	927	836	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1432	-	-	1532	-	-	619	578	985	596	579	893
Mov Cap-2 Maneuver	-	-	-	-	-	-	690	638	-	692	635	-
Stage 1	-	-	-	-	-	-	938	836	-	760	684	-
Stage 2	-	-	-	-	-	-	738	683	-	906	836	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	8.7	10.2
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	985	1432	-	-	1532	-	-	692
HCM Lane V/C Ratio	0.02	-	-	-	0.029	-	-	0.006
HCM Control Delay (s)	8.7	0	-	-	7.4	-	-	10.2
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	3	411	9	16	1	2	431	8	3	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	5	2	489	11	19	1	2	140	10	4	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	304	1092	483	862	1678	742	2	562	956	21	1164	0
Arrive On Green	0.00	0.29	0.29	0.24	0.44	0.44	0.00	0.30	0.30	0.01	0.31	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1680	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	5	2	489	11	19	1	2	140	10	4	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1680	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.1	0.1	14.3	0.2	0.6	0.1	0.1	2.1	0.7	0.1	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.1	14.3	0.2	0.6	0.1	0.1	2.1	0.7	0.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	304	1093	483	862	1678	742	2	562	956	21	1164	0
V/C Ratio(X)	0.00	0.00	0.00	0.57	0.01	0.03	0.40	0.00	0.15	0.47	0.00	0.00
Avail Cap(c_a), veh/h	304	1093	483	862	1678	742	98	562	956	98	1164	0
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)	0.00	1.00	1.00	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	30.5	23.7	40.3	18.8	13.0	59.9	29.8	9.2	58.9	28.9	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.5	0.0	0.1	35.1	0.0	0.3	5.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	7.2	0.1	0.3	0.1	0.0	1.0	0.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	30.5	23.7	40.8	18.8	13.1	95.0	29.8	9.5	64.7	28.9	0.0
LnGrp LOS		C	C	D	B	B	F	C	A	E	C	
Approach Vol, veh/h		7			519			143			14	
Approach Delay, s/veh		28.6			39.3			10.4			54.5	
Approach LOS		C			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	33.1	40.0	4.7	42.3	14.6	58.5	5.9	41.0
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	23.5	34.5	6.5	35.5	5.0	53.0	6.5	35.5
Max Q Clear Time (g_c+I1), s	16.3	2.1	2.1	2.1	0.0	2.6	2.7	4.1
Green Ext Time (p_c), s	0.6	0.0	0.0	0.3	0.0	0.1	0.0	0.3

Intersection Summary	
HCM 2010 Ctrl Delay	33.5
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	79	0	19	0	0	1	20	364	3	2	284	127
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	95	0	22	0	0	1	24	439	4	2	342	153
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	113	0	220	2	0	39	45	2589	24	5	2532	1076
Arrive On Green	0.06	0.00	0.14	0.00	0.00	0.02	0.03	0.69	0.69	0.00	0.67	0.67
Sat Flow, veh/h	1810	0	1615	1810	0	1615	1810	3760	34	1810	3800	1615
Grp Volume(v), veh/h	95	0	22	0	0	1	24	222	221	2	342	153
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1615	1810	1900	1894	1810	1900	1615
Q Serve(g_s), s	4.7	0.0	1.1	0.0	0.0	0.1	1.2	3.7	3.7	0.1	3.0	3.1
Cycle Q Clear(g_c), s	4.7	0.0	1.1	0.0	0.0	0.1	1.2	3.7	3.7	0.1	3.0	3.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	113	0	220	2	0	39	45	1308	1304	5	2532	1076
V/C Ratio(X)	0.84	0.00	0.10	0.00	0.00	0.03	0.53	0.17	0.17	0.41	0.14	0.14
Avail Cap(c_a), veh/h	113	0	574	101	0	563	101	1308	1304	101	2532	1076
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.8	0.0	34.0	0.0	0.0	42.9	43.3	4.9	4.9	44.8	5.5	5.5
Incr Delay (d2), s/veh	39.4	0.0	0.1	0.0	0.0	0.1	3.5	0.3	0.3	18.9	0.1	0.3
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	3.6	0.0	0.5	0.0	0.0	0.0	0.6	2.0	2.0	0.1	1.6	1.5
LnGrp Delay(d),s/veh	81.2	0.0	34.1	0.0	0.0	43.0	46.9	5.2	5.2	63.8	5.6	5.8
LnGrp LOS	F		C			D	D	A	A	E	A	A
Approach Vol, veh/h		117			1			467			497	
Approach Delay, s/veh		72.3			43.0			7.4			5.9	
Approach LOS		E			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	67.5	0.0	17.8	6.8	65.5	10.1	7.7
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	5.6	31.4
Max Q Clear Time (g_c+I1), s	2.1	5.7	0.0	3.1	3.2	5.1	6.7	2.1
Green Ext Time (p_c), s	0.0	2.8	0.0	0.0	0.0	2.9	0.0	0.1

Intersection Summary	
HCM 2010 Ctrl Delay	13.8
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	422	21	120	203	0	0	0	0	409	2	233
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	449	17	128	216	0				435	2	184
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	839	357	665	2410	0				494	2	443
Arrive On Green	0.00	0.07	0.07	0.73	1.00	0.00				0.27	0.27	0.27
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1802	8	1615
Grp Volume(v), veh/h	0	449	17	128	216	0				437	0	184
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	13.7	1.2	2.6	0.0	0.0				27.7	0.0	11.2
Cycle Q Clear(g_c), s	0.0	13.7	1.2	2.6	0.0	0.0				27.7	0.0	11.2
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	839	357	665	2410	0				496	0	443
V/C Ratio(X)	0.00	0.54	0.05	0.19	0.09	0.00				0.88	0.00	0.42
Avail Cap(c_a), veh/h	0	839	357	665	2410	0				822	0	733
HCM Platoon Ratio	1.00	0.33	0.33	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.97	0.97	0.99	0.99	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	49.7	43.9	10.4	0.0	0.0				41.7	0.0	35.7
Incr Delay (d2), s/veh	0.0	2.4	0.2	0.1	0.1	0.0				6.4	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	7.5	0.6	1.3	0.0	0.0				14.7	0.0	5.1
LnGrp Delay(d),s/veh	0.0	52.1	44.1	10.5	0.1	0.0				48.0	0.0	36.3
LnGrp LOS		D	D	B	A					D		D
Approach Vol, veh/h		466			344						621	
Approach Delay, s/veh		51.8			3.9						44.5	
Approach LOS		D			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	49.6	32.0		38.4		81.6		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	23.5	* 27		54.5		54.5		
Max Q Clear Time (g_c+I1), s	4.6	15.7		29.7		2.0		
Green Ext Time (p_c), s	0.9	1.3		3.2		0.9		

Intersection Summary	
HCM 2010 Ctrl Delay	37.1
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	237	593	0	0	293	334	31	0	96	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	258	645	0	0	318	328	34	0	18			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	283	2755	0	0	2050	871	347	0	310			
Arrive On Green	0.31	1.00	0.00	0.00	0.54	0.54	0.19	0.00	0.19			
Sat Flow, veh/h	1810	3800	0	0	3800	1615	1810	0	1615			
Grp Volume(v), veh/h	258	645	0	0	318	328	34	0	18			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	16.5	0.0	0.0	0.0	5.0	14.1	1.9	0.0	1.1			
Cycle Q Clear(g_c), s	16.5	0.0	0.0	0.0	5.0	14.1	1.9	0.0	1.1			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	283	2755	0	0	2050	871	347	0	310			
V/C Ratio(X)	0.91	0.23	0.00	0.00	0.16	0.38	0.10	0.00	0.06			
Avail Cap(c_a), veh/h	550	2755	0	0	2050	871	347	0	310			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.97	0.97	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	40.5	0.0	0.0	0.0	13.9	16.0	40.0	0.0	39.6			
Incr Delay (d2), s/veh	4.6	0.2	0.0	0.0	0.2	1.2	0.6	0.0	0.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	8.5	0.1	0.0	0.0	2.7	6.6	1.0	0.0	0.5			
LnGrp Delay(d),s/veh	45.0	0.2	0.0	0.0	14.0	17.2	40.5	0.0	40.0			
LnGrp LOS	D	A			B	B	D		D			
Approach Vol, veh/h		903			646			52				
Approach Delay, s/veh		13.0			15.6			40.3				
Approach LOS		B			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		92.0			22.3	69.7		28.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		87.0			36.5	47.0		23.0
Max Q Clear Time (g_c+I1), s		2.0			18.5	16.1		3.9
Green Ext Time (p_c), s		4.8			0.3	4.7		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	15.0
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	10	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	0	11	0	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	22	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	22	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	1006	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	1000	-
Mov Cap-2 Maneuver	-	-	-	-	955	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	1006	-

Approach	EB	WB	NB
HCM Control Delay, s	0		
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	-	-	-
HCM Lane LOS	-	-	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	22	0	12	10	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	0	13	11	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	24	0	61	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1604	-	950	1058
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	991	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1604	-	942	1058
Mov Cap-2 Maneuver	-	-	-	-	925	-
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	983	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1058	-	-	1604	-
HCM Lane V/C Ratio	0.029	-	-	0.008	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	50	0	13	22	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	54	0	14	24	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	54	0	106	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1564	-	897	1019
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1564	-	889	1019
Mov Cap-2 Maneuver	-	-	-	-	895	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	967	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.7	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1564	-
HCM Lane V/C Ratio	0.03	-	-	0.009	-
HCM Control Delay (s)	8.6	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	78	0	5	35	0	0	0	3	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	85	0	5	38	0	0	0	3	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	38	0	0	85	0	0	134	134	85	135	134	38
Stage 1	-	-	-	-	-	-	85	85	-	49	49	-
Stage 2	-	-	-	-	-	-	49	49	-	86	85	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1585	-	-	1524	-	-	842	760	980	841	760	1040
Stage 1	-	-	-	-	-	-	928	828	-	969	858	-
Stage 2	-	-	-	-	-	-	969	858	-	927	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1585	-	-	1524	-	-	840	758	980	836	758	1040
Mov Cap-2 Maneuver	-	-	-	-	-	-	862	770	-	857	768	-
Stage 1	-	-	-	-	-	-	928	828	-	969	855	-
Stage 2	-	-	-	-	-	-	966	855	-	924	828	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.9	8.7	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	980	1585	-	-	1524	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	0.004	-	-	-
HCM Control Delay (s)	8.7	0	-	-	7.4	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	81	0	10	40	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	88	0	11	43	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	88	0	153	88
Stage 1	-	-	-	-	88	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1520	-	843	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	963	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1520	-	837	976
Mov Cap-2 Maneuver	-	-	-	-	864	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	956	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	976	-	-	1520	-
HCM Lane V/C Ratio	0.025	-	-	0.007	-
HCM Control Delay (s)	8.8	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	103	0	9	50	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	112	0	10	54	0	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	112	0	186	112
Stage 1	-	-	-	-	112	-
Stage 2	-	-	-	-	74	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1490	-	808	947
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	954	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1490	-	803	947
Mov Cap-2 Maneuver	-	-	-	-	843	-
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	948	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	947	-	-	1490	-
HCM Lane V/C Ratio	0.024	-	-	0.007	-
HCM Control Delay (s)	8.9	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	124	0	16	59	0	0	0	36	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	185	0	24	88	0	0	0	54	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	88	0	0	185	0	0	321	321	185	348	321	88
Stage 1	-	-	-	-	-	-	185	185	-	136	136	-
Stage 2	-	-	-	-	-	-	136	136	-	212	185	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1520	-	-	1402	-	-	636	599	862	610	599	976
Stage 1	-	-	-	-	-	-	821	751	-	872	788	-
Stage 2	-	-	-	-	-	-	872	788	-	795	751	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1520	-	-	1402	-	-	628	589	862	565	589	976
Mov Cap-2 Maneuver	-	-	-	-	-	-	728	668	-	663	659	-
Stage 1	-	-	-	-	-	-	821	751	-	872	775	-
Stage 2	-	-	-	-	-	-	857	775	-	745	751	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	9.5	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	862	1520	-	-	1402	-	-	-
HCM Lane V/C Ratio	0.062	-	-	-	0.017	-	-	-
HCM Control Delay (s)	9.5	0	-	-	7.6	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	6	6	452	14	6	1	4	526	9	7	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	6	3	466	14	6	1	4	257	9	7	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	3	1282	567	685	2176	961	2	546	929	20	1128	0
Arrive On Green	0.00	0.34	0.34	0.19	0.57	0.57	0.00	0.29	0.29	0.01	0.30	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	6	3	466	14	6	1	4	257	9	7	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.1	0.1	14.4	0.2	0.2	0.1	0.2	4.5	0.6	0.2	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.1	14.4	0.2	0.2	0.1	0.2	4.5	0.6	0.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	3	1283	567	685	2176	961	2	546	929	20	1128	0
V/C Ratio(X)	0.00	0.00	0.01	0.68	0.01	0.01	0.40	0.01	0.28	0.46	0.01	0.00
Avail Cap(c_a), veh/h	151	1283	567	685	2176	961	83	546	929	83	1128	0
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)	0.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	26.4	20.1	45.3	11.0	11.0	59.9	30.5	12.1	59.0	29.7	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.2	0.0	0.0	35.1	0.0	0.7	6.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.1	7.4	0.1	0.1	0.1	0.1	2.1	0.3	0.1	0.0
LnGrp Delay(d),s/veh	0.0	26.4	20.1	47.4	11.0	11.0	95.0	30.5	12.9	65.2	29.7	0.0
LnGrp LOS		C	C	D	B	B	F	C	B	E	C	
Approach Vol, veh/h		9			486			262			16	
Approach Delay, s/veh		24.3			45.9			13.5			49.7	
Approach LOS		C			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	28.2	46.0	4.7	41.1	0.0	74.2	5.8	40.0
Change Period (Y+Rc), s	5.5	* 5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	19.5	* 41	5.5	34.5	5.0	55.0	5.5	34.5
Max Q Clear Time (g_c+I1), s	16.4	2.1	2.1	2.2	0.0	2.2	2.6	6.5
Green Ext Time (p_c), s	0.3	0.0	0.0	0.5	0.0	0.9	0.0	0.5

Intersection Summary	
HCM 2010 Ctrl Delay	34.8
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	165	0	24	1	1	4	8	313	5	0	396	69
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	174	0	25	1	1	4	8	329	5	0	417	73
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	210	0	252	2	10	40	18	2503	38	2	2319	985
Arrive On Green	0.12	0.00	0.16	0.00	0.03	0.03	0.01	0.67	0.67	0.00	0.61	0.61
Sat Flow, veh/h	1810	0	1615	1810	333	1332	1810	3733	57	1810	3800	1614
Grp Volume(v), veh/h	174	0	25	1	0	5	8	167	167	0	417	73
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1665	1810	1900	1890	1810	1900	1614
Q Serve(g_s), s	8.5	0.0	1.2	0.0	0.0	0.3	0.4	2.9	2.9	0.0	4.3	0.6
Cycle Q Clear(g_c), s	8.5	0.0	1.2	0.0	0.0	0.3	0.4	2.9	2.9	0.0	4.3	0.6
Prop In Lane	1.00		1.00	1.00		0.80	1.00		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	210	0	252	2	0	50	18	1274	1267	2	2319	985
V/C Ratio(X)	0.83	0.00	0.10	0.40	0.00	0.10	0.44	0.13	0.13	0.00	0.18	0.07
Avail Cap(c_a), veh/h	308	0	574	101	0	401	101	1274	1267	101	2319	985
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	0.0	32.6	44.9	0.0	42.5	44.3	5.4	5.4	0.0	7.7	1.1
Incr Delay (d2), s/veh	7.5	0.0	0.1	34.8	0.0	0.3	6.1	0.2	0.2	0.0	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	0.0	0.5	0.0	0.0	0.1	0.2	1.6	1.6	0.0	2.3	0.3
LnGrp Delay(d),s/veh	46.4	0.0	32.6	79.7	0.0	42.8	50.4	5.6	5.6	0.0	7.8	1.2
LnGrp LOS	D		C	E		D	D	A	A		A	A
Approach Vol, veh/h		199			6			342			490	
Approach Delay, s/veh		44.6			48.9			6.6			6.9	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	65.8	4.6	19.5	5.4	60.4	16.0	8.2
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	15.3	* 22
Max Q Clear Time (g_c+I1), s	0.0	4.9	2.0	3.2	2.4	6.3	10.5	2.3
Green Ext Time (p_c), s	0.0	2.7	0.0	0.3	0.0	2.6	0.1	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	14.3
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

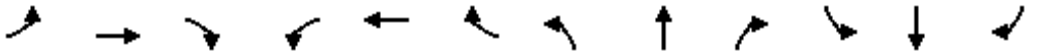
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	500	40	127	154	0	0	0	0	349	2	319
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	532	43	135	164	0				371	2	262
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1188	505	564	2545	0				429	2	385
Arrive On Green	0.00	0.63	0.63	0.62	1.00	0.00				0.24	0.24	0.24
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1800	10	1615
Grp Volume(v), veh/h	0	532	43	135	164	0				373	0	262
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	8.8	1.3	4.0	0.0	0.0				23.7	0.0	17.7
Cycle Q Clear(g_c), s	0.0	8.8	1.3	4.0	0.0	0.0				23.7	0.0	17.7
Prop In Lane	0.00		1.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	1188	505	564	2545	0				432	0	385
V/C Ratio(X)	0.00	0.45	0.09	0.24	0.06	0.00				0.86	0.00	0.68
Avail Cap(c_a), veh/h	0	1188	505	564	2545	0				701	0	626
HCM Platoon Ratio	1.00	2.00	2.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.96	0.96	0.99	0.99	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	17.1	15.7	16.3	0.0	0.0				43.8	0.0	41.5
Incr Delay (d2), s/veh	0.0	1.2	0.3	0.1	0.0	0.0				6.4	0.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.6	0.6	2.0	0.0	0.0				12.6	0.0	8.1
LnGrp Delay(d),s/veh	0.0	18.3	16.0	16.4	0.0	0.0				50.2	0.0	43.6
LnGrp LOS		B	B	B	A					D		D
Approach Vol, veh/h		575			299						635	
Approach Delay, s/veh		18.1			7.4						47.5	
Approach LOS		B			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	42.9	43.0		34.1		85.9		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	20.5	* 38		46.5		62.5		
Max Q Clear Time (g_c+I1), s	6.0	10.8		25.7		2.0		
Green Ext Time (p_c), s	0.6	2.2		2.9		0.7		

Intersection Summary	
HCM 2010 Ctrl Delay	28.4
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	340	509	0	0	258	422	22	1	115	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	382	572	0	0	290	449	25	1	20			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	417	2882	0	0	1895	805	276	11	256			
Arrive On Green	0.08	0.25	0.00	0.00	0.50	0.50	0.16	0.16	0.16			
Sat Flow, veh/h	1810	3800	0	0	3800	1614	1743	70	1615			
Grp Volume(v), veh/h	382	572	0	0	290	449	26	0	20			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1614	1813	0	1615			
Q Serve(g_s), s	25.2	14.3	0.0	0.0	5.0	23.2	1.5	0.0	1.3			
Cycle Q Clear(g_c), s	25.2	14.3	0.0	0.0	5.0	23.2	1.5	0.0	1.3			
Prop In Lane	1.00		0.00	0.00		1.00	0.96		1.00			
Lane Grp Cap(c), veh/h	417	2882	0	0	1895	805	287	0	256			
V/C Ratio(X)	0.92	0.20	0.00	0.00	0.15	0.56	0.09	0.00	0.08			
Avail Cap(c_a), veh/h	686	2882	0	0	1895	805	287	0	256			
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.97	0.97	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	54.3	16.2	0.0	0.0	16.3	20.9	43.1	0.0	43.0			
Incr Delay (d2), s/veh	7.1	0.2	0.0	0.0	0.2	2.8	0.6	0.0	0.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	13.5	7.6	0.0	0.0	2.7	11.0	0.8	0.0	0.6			
LnGrp Delay(d),s/veh	61.4	16.4	0.0	0.0	16.5	23.7	43.7	0.0	43.6			
LnGrp LOS	E	B			B	C	D		D			
Approach Vol, veh/h		954			739			46				
Approach Delay, s/veh		34.4			20.8			43.7				
Approach LOS		C			C			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		96.0			31.1	64.9		24.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		91.0			45.5	42.0		19.0
Max Q Clear Time (g_c+I1), s		16.3			27.2	25.2		3.5
Green Ext Time (p_c), s		4.5			0.5	4.0		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	28.9
HCM 2010 LOS	C

APPENDIX 5.2:

E+P CONDITIONS TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		E+P
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**			Critical Approach Speed (Major)			40 mph
Minor Street:	**Driveway 1**			Critical Approach Speed (Minor)			25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **251** vpd Minor Street Future ADT = **251** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **251**	*1* **251**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **251**	*1* **251**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 3% **B** 2%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	E+P
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Driveway 2**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **764** vpd Minor Street Future ADT = **262** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or **RURAL (R)**

In built up area of isolated community of < 10,000 population ……

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
CONDITION A - Minimum Vehicular Volume	Urban	Rural	Urban	Rural
Satisfied / Not Satisfied: XX / XX				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **764** / 1 **262**	8,000	5,600	2,400	1,680
2 + / 1	9,600	6,720	2,400	1,680
2 + / 2 +	9,600	6,720	3,200	2,240
1 / 2 +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied / Not Satisfied: XX	Urban	Rural	Urban	Rural
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **764** / 1 **262**	12,000	8,400	1,200	850
2 + / 1	14,400	10,080	1,200	850
2 + / 2 +	14,400	10,080	1,600	1,120
1 / 2 +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / Not Satisfied: XX				
No one condition satisfied, but following conditions fulfilled 80% of more ….. A: 10% B: 6%	2 CONDITIONS 80%		2 CONDITIONS 80%	

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		E+P
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 3**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **1,339** vpd Minor Street Future ADT = **313** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **1,339**	*1* **313**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **1,339**	*1* **313**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 13% **B** 11%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		E+P
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Decker Road**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **1,700** vpd Minor Street Future ADT = **49** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **1,700**	*1* **49**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **1,700**	*1* **49**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 2% **B** 4%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		E+P
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**			Critical Approach Speed (Major)			40 mph
Minor Street:	**Driveway 4**			Critical Approach Speed (Minor)			25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **2,002** vpd Minor Street Future ADT = **253** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or **RURAL (R)**

In built up area of isolated community of < 10,000 population ……

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,002**	*1* **253**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,002**	*1* **253**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied	2 CONDITIONS 80%		2 CONDITIONS 80%	
	XX				
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 11% **B** 17%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		E+P
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 5**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **2,453** vpd Minor Street Future ADT = **197** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or **RURAL (R)**

In built up area of isolated community of < 10,000 population ……

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,453**	*1* **197**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,453**	*1* **197**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied	2 CONDITIONS 80%		2 CONDITIONS 80%	
	XX				
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 8% **B** 16%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

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

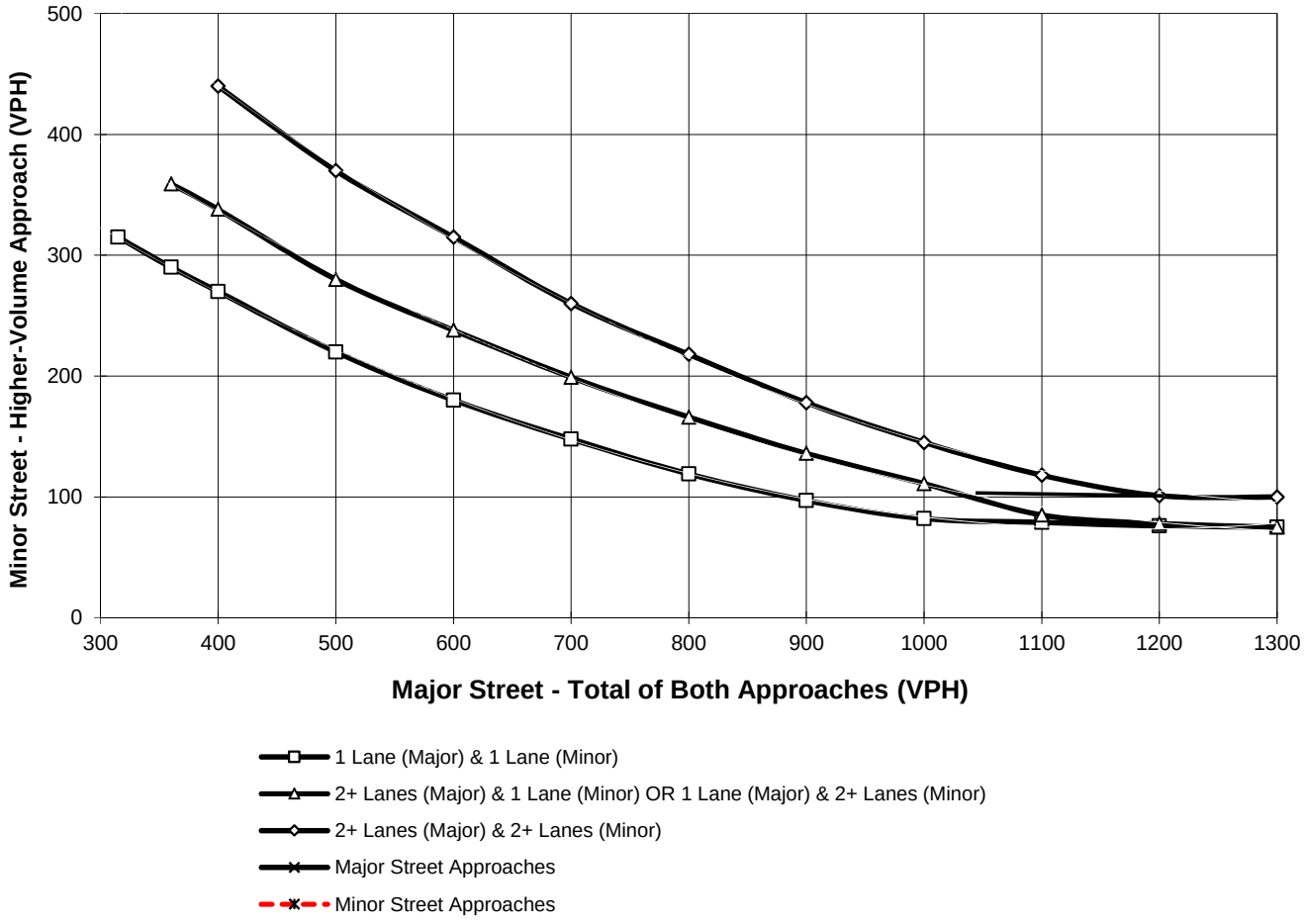
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **Existing Plus Project Conditions - Weekday PM Peak Hour**

Major Street Name = **Oleander Avenue** Total of Both Approaches (VPH) = **199**
Number of Approach Lanes Major Street = **2**

Minor Street Name = **Driveway 6** High Volume Approach (VPH) = **18**
Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



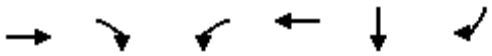
*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

This Page Intentionally Left Blank

APPENDIX 5.3:

E+P CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

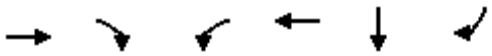


Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	449	22	128	216	437	248
v/c Ratio	0.31	0.03	0.34	0.09	0.79	0.34
Control Delay	25.9	0.0	30.0	9.4	48.7	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	0.0	30.0	9.4	48.7	4.5
Queue Length 50th (ft)	117	0	38	27	311	0
Queue Length 95th (ft)	146	0	61	56	379	52
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	1452	771	372	2339	862	998
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	14	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.03	0.34	0.09	0.51	0.25

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	258	645	318	363	34	104
v/c Ratio	0.78	0.23	0.16	0.31	0.09	0.23
Control Delay	37.7	6.0	16.1	2.6	40.8	9.1
Queue Delay	0.1	0.6	0.0	0.0	0.0	0.0
Total Delay	37.8	6.5	16.1	2.6	40.8	9.1
Queue Length 50th (ft)	183	73	62	0	22	0
Queue Length 95th (ft)	195	105	98	52	51	47
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	577	2755	1984	1165	364	448
Starvation Cap Reductn	23	1624	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.57	0.16	0.31	0.09	0.23

Intersection Summary



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	532	43	135	164	373	339
v/c Ratio	0.31	0.05	0.42	0.07	0.78	0.46
Control Delay	23.8	2.9	30.7	7.6	52.3	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.8	2.9	30.7	7.6	52.3	5.3
Queue Length 50th (ft)	130	0	34	18	270	0
Queue Length 95th (ft)	218	16	55	41	341	64
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	1697	888	324	2489	736	943
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	130	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.05	0.42	0.07	0.51	0.36

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	382	572	290	474	26	129
v/c Ratio	0.83	0.20	0.16	0.41	0.09	0.32
Control Delay	39.7	2.8	18.7	3.1	44.1	9.7
Queue Delay	0.2	0.3	0.0	0.0	0.0	0.0
Total Delay	39.9	3.1	18.7	3.1	44.1	9.7
Queue Length 50th (ft)	254	50	61	0	17	0
Queue Length 95th (ft)	301	10	98	58	44	53
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	720	2881	1847	1154	300	409
Starvation Cap Reductn	43	1639	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.46	0.16	0.41	0.09	0.32

Intersection Summary

APPENDIX 5.4:

E+P CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2593*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*963*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*13.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:10 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2195*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*807*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*11.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:11 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4114*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1528*	pc/h/ln
S	*68.8*	mph
D = v_p / S	*22.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:12 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3740*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1382*	pc/h/ln
S	*69.6*	mph
D = v_p / S	*19.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:12 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Southbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*North of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3880*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1441*	pc/h/ln
S	*69.3*	mph
D = v_p / S	*20.8*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:12 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3466*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1281*	pc/h/ln
S	*69.9*	mph
D = v_p / S	*18.3*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:13 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3303*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1227*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*17.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:13 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Northbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*South of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Existing Plus Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2788*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1025*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*14.6*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:14 AM

APPENDIX 5.5:

E+P CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing Plus Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	195
Freeway Volume, V_F	2593
Ramp Volume, V_R	505
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off; L_{down} = 1420 ft; V_D = 107 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2593	0.92	Level	5	0	0.976	1.00	2889
Ramp	505	0.92	Level	19	0	0.913	1.00	601
UpStream								
DownStream	107	0.92	Level	27	0	0.881	1.00	132

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.660 using Equation (Exhibit 13-7)

V_{12} = 2111 pc/h

V_3 or V_{av34} 778 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2889	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2288	Exhibit 13-8	7200	No
V_R	601	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2111	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 20.7 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.352 (Exhibit 13-12)

S_R = 60.1 mph (Exhibit 13-12)

S_0 = 76.8 mph (Exhibit 13-12)

S = 63.9 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:06 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing Plus Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	505 veh/h	Freeway Volume, V_F	2088	V_D =	veh/h
		Ramp Volume, V_R	107		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2088	0.92	Level	1	0	0.995	1.00	2281
Ramp	107	0.92	Level	27	0	0.881	1.00	132
UpStream	505	0.92	Level	19	0	0.913	1.00	601
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 583.22 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 1334 pc/h

V_3 or V_{av34} = 947 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1334 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2413	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1466	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.2 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.314 (Exibit 13-11)

S_R = 61.2 mph (Exhibit 13-11)

S_0 = 68.4 mph (Exhibit 13-11)

S = 63.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing Plus Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
- ☑ Yes ☐ On
- ☐ No ☑ Off
- L_{up} = 1395 ft
- V_u = 109 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	300
Deceleration Lane Length L_D	
Freeway Volume, V_F	3631
Ramp Volume, V_R	483
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3631	0.92	Level	3	0	0.985	1.00	4006
Ramp	483	0.92	Level	14	0	0.935	1.00	562
UpStream	109	0.92	Level	13	0	0.939	1.00	126
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

- L_{EQ} = 1062.15 (Equation 13-6 or 13-7)
- P_{FM} = 0.586 using Equation (Exhibit 13-6)
- V_{12} = 2347 pc/h
- V_3 or V_{av34} = 1659 pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
- If Yes, V_{12a} = 2347 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4568	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2909	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

- D_R = 26.0 (pc/mi/ln)
- LOS = C (Exhibit 13-2)

Speed Determination

- M_S = 0.366 (Exibit 13-11)
- S_R = 59.8 mph (Exhibit 13-11)
- S_0 = 65.8 mph (Exhibit 13-11)
- S = 61.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

- L_{EQ} = (Equation 13-12 or 13-13)
- P_{FD} = using Equation (Exhibit 13-7)
- V_{12} = pc/h
- V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

- D_R = (pc/mi/ln)
- LOS = (Exhibit 13-2)

Speed Determination

- D_s = (Exhibit 13-12)
- S_R = mph (Exhibit 13-12)
- S_0 = mph (Exhibit 13-12)
- S = mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:04 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	Existing Plus Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	3740
Ramp Volume, V_R	109
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off; L_{down} = 1395 ft; V_D = 483 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3740	0.92	Level	4	0	0.980	1.00	4147
Ramp	109	0.92	Level	13	0	0.939	1.00	126
UpStream								
DownStream	483	0.92	Level	14	0	0.935	1.00	562

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.651 using Equation (Exhibit 13-7)

V_{12} = 2742 pc/h

V_3 or V_{av34} 1405 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4147	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4021	Exhibit 13-8	7200	No
V_R	126	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2742	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 25.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.309 (Exhibit 13-12)

S_R = 61.3 mph (Exhibit 13-12)

S_0 = 75.2 mph (Exhibit 13-12)

S = 65.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:05 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing Plus Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	195	L_{down} =	1420 ft
V_u =	veh/h	Freeway Volume, V_F	3880	V_D =	143 veh/h
		Ramp Volume, V_R	557		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3880	0.92	Level	5	0	0.976	1.00	4323
Ramp	557	0.92	Level	14	0	0.935	1.00	648
UpStream								
DownStream	143	0.92	Level	13	0	0.939	1.00	166

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.622 using Equation (Exhibit 13-7)

V_{12} = 2934 pc/h

V_3 or V_{av34} 1389 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4323	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3675	Exhibit 13-8	7200	No
V_R	648	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2934	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 27.7 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.356 (Exhibit 13-12)

S_R = 60.0 mph (Exhibit 13-12)

S_0 = 75.3 mph (Exhibit 13-12)

S = 64.2 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:05 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing Plus Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 1420 ft	Acceleration Lane Length, L_A: 260	L_{down} = ft
V_u = 557 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3323	
	Ramp Volume, V_R: 143	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3323	0.92	Level	3	0	0.985	1.00	3666
Ramp	143	0.92	Level	13	0	0.939	1.00	166
UpStream	557	0.92	Level	14	0	0.935	1.00	648
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 886.89 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 2144 pc/h

V_3 or V_{av34} = 1522 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2144 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3832	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2310	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 21.8 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.337 (Exibit 13-11)

S_R = 60.6 mph (Exhibit 13-11)

S_0 = 66.3 mph (Exhibit 13-11)

S = 62.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing Plus Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 1395 ft	Acceleration Lane Length, L_A: 300	L_{down} = ft
V_u = 124 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2664	
	Ramp Volume, V_R: 639	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2664	0.92	Level	2	0	0.990	1.00	2925
Ramp	639	0.92	Level	14	0	0.935	1.00	743
UpStream	124	0.92	Level	10	0	0.952	1.00	142
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 869.55 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1714 pc/h

V_3 or V_{av34} 1211 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 1714 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3668	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2457	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 22.4 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.340 (Exibit 13-11)

S_R= 60.5 mph (Exhibit 13-11)

S_0= 67.4 mph (Exhibit 13-11)

S = 62.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:06 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing Plus Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1395 ft
V_u = veh/h	Deceleration Lane Length L_D: 280	V_D = 639 veh/h
	Freeway Volume, V_F: 2788	
	Ramp Volume, V_R: 124	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2788	0.92	Level	3	0	0.985	1.00	3076
Ramp	124	0.92	Level	10	0	0.952	1.00	142
UpStream								
DownStream	639	0.92	Level	14	0	0.935	1.00	743

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.677 using Equation (Exhibit 13-7)

V_{12} = 2127 pc/h

V_3 or V_{av34} 949 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3076	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2934	Exhibit 13-8	7200	No
V_R	142	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2127	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 20.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.311 (Exhibit 13-12)

S_R = 61.3 mph (Exhibit 13-12)

S_0 = 76.8 mph (Exhibit 13-12)

S = 65.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:06 AM

APPENDIX 6.1:

EAP (2017) CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	16	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	0	17	0	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	35	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	35	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	-	-	983	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	993	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	983	-
Mov Cap-2 Maneuver	-	-	-	-	942	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	993	-

Approach	EB	WB	NB
HCM Control Delay, s	0		
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	-	-	-
HCM Lane LOS	-	-	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	7	0	28	16	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	0	30	17	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	8	0	86	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	78	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1625	-	920	1080
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	950	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1625	-	903	1080
Mov Cap-2 Maneuver	-	-	-	-	883	-
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	932	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.6	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1080	-	-	1625	-
HCM Lane V/C Ratio	0.012	-	-	0.019	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	20	0	23	44	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	22	0	25	48	0	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	22	0	120	22
Stage 1	-	-	-	-	22	-
Stage 2	-	-	-	-	98	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1607	-	880	1061
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	931	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1607	-	866	1061
Mov Cap-2 Maneuver	-	-	-	-	866	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1061	-	-	1607	-
HCM Lane V/C Ratio	0.01	-	-	0.016	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	30	0	1	67	0	0	0	4	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	33	0	1	73	0	0	0	4	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	73	0	0	33	0	0	108	108	33	110	108	73
Stage 1	-	-	-	-	-	-	33	33	-	75	75	-
Stage 2	-	-	-	-	-	-	75	75	-	35	33	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1540	-	-	1592	-	-	876	786	1046	873	786	995
Stage 1	-	-	-	-	-	-	988	872	-	939	836	-
Stage 2	-	-	-	-	-	-	939	836	-	986	872	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1540	-	-	1592	-	-	876	786	1046	869	786	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	881	785	-	878	784	-
Stage 1	-	-	-	-	-	-	988	872	-	939	835	-
Stage 2	-	-	-	-	-	-	938	835	-	982	872	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	8.5	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1046	1540	-	-	1592	-	-	-
HCM Lane V/C Ratio	0.004	-	-	-	0.001	-	-	-
HCM Control Delay (s)	8.5	0	-	-	7.3	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	34	0	16	68	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	37	0	17	74	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	37	0	146	37
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	109	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1587	-	851	1041
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	921	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1587	-	842	1041
Mov Cap-2 Maneuver	-	-	-	-	856	-
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	911	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1041	-	-	1587	-
HCM Lane V/C Ratio	0.007	-	-	0.011	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	41	0	21	84	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	45	0	23	91	0	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	45	0	182	45
Stage 1	-	-	-	-	45	-
Stage 2	-	-	-	-	137	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1576	-	812	1031
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	895	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1576	-	800	1031
Mov Cap-2 Maneuver	-	-	-	-	828	-
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	882	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1031	-	-	1576	-
HCM Lane V/C Ratio	0.009	-	-	0.014	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	51	0	30	105	2	0	0	13	3	0	0
Conflicting Peds, #/hr	0	0	0	0	0	3	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	76	0	45	157	3	0	0	19	4	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	160	0	0	76	0	0	324	325	79	334	324	158
Stage 1	-	-	-	-	-	-	76	76	-	248	248	-
Stage 2	-	-	-	-	-	-	248	249	-	86	76	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1432	-	-	1536	-	-	633	596	987	623	597	893
Stage 1	-	-	-	-	-	-	938	836	-	760	705	-
Stage 2	-	-	-	-	-	-	760	704	-	927	836	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1432	-	-	1532	-	-	619	578	985	596	579	893
Mov Cap-2 Maneuver	-	-	-	-	-	-	690	638	-	692	635	-
Stage 1	-	-	-	-	-	-	938	836	-	760	684	-
Stage 2	-	-	-	-	-	-	738	683	-	906	836	-

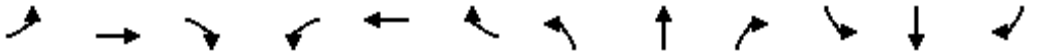
Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	8.7	10.2
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	985	1432	-	-	1532	-	-	692
HCM Lane V/C Ratio	0.02	-	-	-	0.029	-	-	0.006
HCM Control Delay (s)	8.7	0	-	-	7.4	-	-	10.2
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	3	423	9	17	1	2	446	8	3	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	5	2	504	11	20	1	2	158	10	4	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	304	1092	483	862	1678	742	2	562	956	21	1164	0
Arrive On Green	0.00	0.29	0.29	0.24	0.44	0.44	0.00	0.30	0.30	0.01	0.31	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1680	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	5	2	504	11	20	1	2	158	10	4	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1680	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.1	0.1	14.8	0.2	0.7	0.1	0.1	2.4	0.7	0.1	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.1	14.8	0.2	0.7	0.1	0.1	2.4	0.7	0.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	304	1093	483	862	1678	742	2	562	956	21	1164	0
V/C Ratio(X)	0.00	0.00	0.00	0.58	0.01	0.03	0.40	0.00	0.17	0.47	0.00	0.00
Avail Cap(c_a), veh/h	304	1093	483	862	1678	742	98	562	956	98	1164	0
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)	0.00	1.00	1.00	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	30.5	23.7	40.5	18.8	13.0	59.9	29.8	9.2	58.9	28.9	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.1	35.1	0.0	0.4	5.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	7.5	0.1	0.3	0.1	0.0	1.1	0.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	30.5	23.7	41.1	18.8	13.1	95.0	29.8	9.6	64.7	28.9	0.0
LnGrp LOS		C	C	D	B	B	F	C	A	E	C	
Approach Vol, veh/h		7			535			161			14	
Approach Delay, s/veh		28.6			39.6			10.4			54.5	
Approach LOS		C			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	33.1	40.0	4.7	42.3	14.6	58.5	5.9	41.0
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	23.5	34.5	6.5	35.5	5.0	53.0	6.5	35.5
Max Q Clear Time (g_c+I1), s	16.8	2.1	2.1	2.1	0.0	2.7	2.7	4.4
Green Ext Time (p_c), s	0.6	0.0	0.0	0.3	0.0	0.1	0.0	0.3

Intersection Summary	
HCM 2010 Ctrl Delay	33.2
HCM 2010 LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	0	19	0	0	1	20	378	3	2	295	127
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	96	0	22	0	0	1	24	455	4	2	355	153
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	113	0	220	2	0	39	45	2590	23	5	2532	1076
Arrive On Green	0.06	0.00	0.14	0.00	0.00	0.02	0.03	0.69	0.69	0.00	0.67	0.67
Sat Flow, veh/h	1810	0	1615	1810	0	1615	1810	3761	33	1810	3800	1615
Grp Volume(v), veh/h	96	0	22	0	0	1	24	230	229	2	355	153
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1615	1810	1900	1894	1810	1900	1615
Q Serve(g_s), s	4.7	0.0	1.1	0.0	0.0	0.1	1.2	3.9	3.9	0.1	3.1	3.1
Cycle Q Clear(g_c), s	4.7	0.0	1.1	0.0	0.0	0.1	1.2	3.9	3.9	0.1	3.1	3.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	113	0	220	2	0	39	45	1308	1304	5	2532	1076
V/C Ratio(X)	0.85	0.00	0.10	0.00	0.00	0.03	0.53	0.18	0.18	0.41	0.14	0.14
Avail Cap(c_a), veh/h	113	0	574	101	0	563	101	1308	1304	101	2532	1076
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.8	0.0	34.0	0.0	0.0	42.9	43.3	5.0	5.0	44.8	5.5	5.5
Incr Delay (d2), s/veh	41.5	0.0	0.1	0.0	0.0	0.1	3.5	0.3	0.3	18.9	0.1	0.3
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	3.7	0.0	0.5	0.0	0.0	0.0	0.6	2.1	2.1	0.1	1.7	1.5
LnGrp Delay(d),s/veh	83.3	0.0	34.1	0.0	0.0	43.0	46.9	5.3	5.3	63.8	5.6	5.8
LnGrp LOS	F		C			D	D	A	A	E	A	A
Approach Vol, veh/h		118			1			483			510	
Approach Delay, s/veh		74.1			43.0			7.3			5.9	
Approach LOS		E			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	67.5	0.0	17.8	6.8	65.5	10.1	7.7
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	5.6	31.4
Max Q Clear Time (g_c+I1), s	2.1	5.9	0.0	3.1	3.2	5.1	6.7	2.1
Green Ext Time (p_c), s	0.0	3.0	0.0	0.0	0.0	3.0	0.0	0.1

Intersection Summary	
HCM 2010 Ctrl Delay	13.8
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

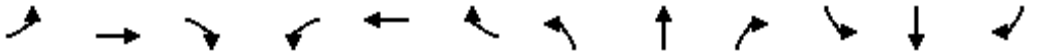
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	437	21	124	210	0	0	0	0	425	2	239
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	465	17	132	223	0				452	2	190
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	808	343	662	2373	0				512	2	459
Arrive On Green	0.00	0.07	0.07	0.73	1.00	0.00				0.28	0.28	0.28
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1802	8	1615
Grp Volume(v), veh/h	0	465	17	132	223	0				454	0	190
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	14.2	1.2	2.7	0.0	0.0				28.8	0.0	11.5
Cycle Q Clear(g_c), s	0.0	14.2	1.2	2.7	0.0	0.0				28.8	0.0	11.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	808	343	662	2373	0				514	0	459
V/C Ratio(X)	0.00	0.58	0.05	0.20	0.09	0.00				0.88	0.00	0.41
Avail Cap(c_a), veh/h	0	808	343	662	2373	0				822	0	733
HCM Platoon Ratio	1.00	0.33	0.33	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.97	0.97	0.99	0.99	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	50.6	44.5	10.6	0.0	0.0				41.1	0.0	34.9
Incr Delay (d2), s/veh	0.0	2.9	0.3	0.1	0.1	0.0				7.0	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	7.8	0.6	1.3	0.0	0.0				15.4	0.0	5.2
LnGrp Delay(d),s/veh	0.0	53.4	44.7	10.6	0.1	0.0				48.0	0.0	35.5
LnGrp LOS		D	D	B	A					D		D
Approach Vol, veh/h		482			355						644	
Approach Delay, s/veh		53.1			4.0						44.3	
Approach LOS		D			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	49.4	31.0		39.6		80.4		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	24.5	* 26		54.5		54.5		
Max Q Clear Time (g_c+I1), s	4.7	16.2		30.8		2.0		
Green Ext Time (p_c), s	0.9	1.3		3.3		1.0		

Intersection Summary	
HCM 2010 Ctrl Delay	37.5
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	245	617	0	0	304	347	31	0	100	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	266	671	0	0	330	342	34	0	23			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	291	2755	0	0	2034	864	347	0	310			
Arrive On Green	0.32	1.00	0.00	0.00	0.54	0.54	0.19	0.00	0.19			
Sat Flow, veh/h	1810	3800	0	0	3800	1615	1810	0	1615			
Grp Volume(v), veh/h	266	671	0	0	330	342	34	0	23			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	17.0	0.0	0.0	0.0	5.3	15.0	1.9	0.0	1.4			
Cycle Q Clear(g_c), s	17.0	0.0	0.0	0.0	5.3	15.0	1.9	0.0	1.4			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	291	2755	0	0	2034	864	347	0	310			
V/C Ratio(X)	0.92	0.24	0.00	0.00	0.16	0.40	0.10	0.00	0.07			
Avail Cap(c_a), veh/h	550	2755	0	0	2034	864	347	0	310			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.96	0.96	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	39.9	0.0	0.0	0.0	14.2	16.4	40.0	0.0	39.8			
Incr Delay (d2), s/veh	4.6	0.2	0.0	0.0	0.2	1.4	0.6	0.0	0.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	8.8	0.1	0.0	0.0	2.8	7.0	1.0	0.0	0.7			
LnGrp Delay(d),s/veh	44.5	0.2	0.0	0.0	14.4	17.8	40.5	0.0	40.2			
LnGrp LOS	D	A			B	B	D		D			
Approach Vol, veh/h		937			672			57				
Approach Delay, s/veh		12.8			16.1			40.4				
Approach LOS		B			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		92.0			22.8	69.2		28.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		87.0			36.5	47.0		23.0
Max Q Clear Time (g_c+I1), s		2.0			19.0	17.0		3.9
Green Ext Time (p_c), s		5.1			0.3	4.9		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	15.1
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	10	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	0	11	0	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	22	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	22	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	1006	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	1000	-
Mov Cap-2 Maneuver	-	-	-	-	955	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	1006	-

Approach	EB	WB	NB
HCM Control Delay, s	0		
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	-	-	-
HCM Lane LOS	-	-	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	22	0	12	10	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	0	13	11	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	24	0	61	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1604	-	950	1058
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	991	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1604	-	942	1058
Mov Cap-2 Maneuver	-	-	-	-	925	-
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	983	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1058	-	-	1604	-
HCM Lane V/C Ratio	0.029	-	-	0.008	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	50	0	13	22	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	54	0	14	24	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	54	0	106	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1564	-	897	1019
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1564	-	889	1019
Mov Cap-2 Maneuver	-	-	-	-	895	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	967	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.7	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1564	-
HCM Lane V/C Ratio	0.03	-	-	0.009	-
HCM Control Delay (s)	8.6	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	78	0	5	35	0	0	0	3	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	85	0	5	38	0	0	0	3	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	38	0	0	85	0	0	134	134	85	135	134	38
Stage 1	-	-	-	-	-	-	85	85	-	49	49	-
Stage 2	-	-	-	-	-	-	49	49	-	86	85	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1585	-	-	1524	-	-	842	760	980	841	760	1040
Stage 1	-	-	-	-	-	-	928	828	-	969	858	-
Stage 2	-	-	-	-	-	-	969	858	-	927	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1585	-	-	1524	-	-	840	758	980	836	758	1040
Mov Cap-2 Maneuver	-	-	-	-	-	-	862	770	-	857	768	-
Stage 1	-	-	-	-	-	-	928	828	-	969	855	-
Stage 2	-	-	-	-	-	-	966	855	-	924	828	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.9	8.7	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	980	1585	-	-	1524	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	0.004	-	-	-
HCM Control Delay (s)	8.7	0	-	-	7.4	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	81	0	10	40	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	88	0	11	43	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	88	0	153	88
Stage 1	-	-	-	-	88	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1520	-	843	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	963	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1520	-	837	976
Mov Cap-2 Maneuver	-	-	-	-	864	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	956	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	976	-	-	1520	-
HCM Lane V/C Ratio	0.025	-	-	0.007	-
HCM Control Delay (s)	8.8	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	103	0	9	50	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	112	0	10	54	0	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	112	0	186	112
Stage 1	-	-	-	-	112	-
Stage 2	-	-	-	-	74	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1490	-	808	947
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	954	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1490	-	803	947
Mov Cap-2 Maneuver	-	-	-	-	843	-
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	948	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	947	-	-	1490	-
HCM Lane V/C Ratio	0.024	-	-	0.007	-
HCM Control Delay (s)	8.9	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	124	0	16	59	0	0	0	36	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	185	0	24	88	0	0	0	54	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	88	0	0	185	0	0	321	321	185	348	321	88
Stage 1	-	-	-	-	-	-	185	185	-	136	136	-
Stage 2	-	-	-	-	-	-	136	136	-	212	185	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1520	-	-	1402	-	-	636	599	862	610	599	976
Stage 1	-	-	-	-	-	-	821	751	-	872	788	-
Stage 2	-	-	-	-	-	-	872	788	-	795	751	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1520	-	-	1402	-	-	628	589	862	565	589	976
Mov Cap-2 Maneuver	-	-	-	-	-	-	728	668	-	663	659	-
Stage 1	-	-	-	-	-	-	821	751	-	872	775	-
Stage 2	-	-	-	-	-	-	857	775	-	745	751	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	9.5	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	862	1520	-	-	1402	-	-	-
HCM Lane V/C Ratio	0.062	-	-	-	0.017	-	-	-
HCM Control Delay (s)	9.5	0	-	-	7.6	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	6	6	468	15	6	1	4	541	9	7	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	6	3	482	15	6	1	4	273	9	7	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	3	1282	567	685	2176	961	2	546	929	20	1128	0
Arrive On Green	0.00	0.34	0.34	0.19	0.57	0.57	0.00	0.29	0.29	0.01	0.30	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	6	3	482	15	6	1	4	273	9	7	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.1	0.1	14.9	0.2	0.2	0.1	0.2	4.8	0.6	0.2	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.1	14.9	0.2	0.2	0.1	0.2	4.8	0.6	0.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	3	1283	567	685	2176	961	2	546	929	20	1128	0
V/C Ratio(X)	0.00	0.00	0.01	0.70	0.01	0.01	0.40	0.01	0.29	0.46	0.01	0.00
Avail Cap(c_a), veh/h	151	1283	567	685	2176	961	83	546	929	83	1128	0
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)	0.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	26.4	20.1	45.5	11.0	11.0	59.9	30.5	12.2	59.0	29.7	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.7	0.0	0.0	35.1	0.0	0.8	6.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.1	7.8	0.1	0.1	0.1	0.1	2.2	0.3	0.1	0.0
LnGrp Delay(d),s/veh	0.0	26.4	20.1	48.2	11.0	11.0	95.0	30.5	13.0	65.2	29.7	0.0
LnGrp LOS		C	C	D	B	B	F	C	B	E	C	
Approach Vol, veh/h		9			503			278			16	
Approach Delay, s/veh		24.3			46.6			13.6			49.7	
Approach LOS		C			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	28.2	46.0	4.7	41.1	0.0	74.2	5.8	40.0
Change Period (Y+Rc), s	5.5	* 5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	19.5	* 41	5.5	34.5	5.0	55.0	5.5	34.5
Max Q Clear Time (g_c+I1), s	16.9	2.1	2.1	2.2	0.0	2.2	2.6	6.8
Green Ext Time (p_c), s	0.3	0.0	0.0	0.6	0.0	0.9	0.0	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	35.0
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	166	0	24	1	1	4	8	325	5	0	412	69
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	175	0	25	1	1	4	8	342	5	0	434	73
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	211	0	253	2	10	40	18	2502	37	2	2317	984
Arrive On Green	0.12	0.00	0.16	0.00	0.03	0.03	0.01	0.67	0.67	0.00	0.61	0.61
Sat Flow, veh/h	1810	0	1615	1810	333	1332	1810	3736	55	1810	3800	1614
Grp Volume(v), veh/h	175	0	25	1	0	5	8	174	173	0	434	73
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1665	1810	1900	1890	1810	1900	1614
Q Serve(g_s), s	8.5	0.0	1.2	0.0	0.0	0.3	0.4	3.0	3.0	0.0	4.5	0.6
Cycle Q Clear(g_c), s	8.5	0.0	1.2	0.0	0.0	0.3	0.4	3.0	3.0	0.0	4.5	0.6
Prop In Lane	1.00		1.00	1.00		0.80	1.00		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	211	0	253	2	0	50	18	1273	1266	2	2317	984
V/C Ratio(X)	0.83	0.00	0.10	0.40	0.00	0.10	0.44	0.14	0.14	0.00	0.19	0.07
Avail Cap(c_a), veh/h	308	0	574	101	0	401	101	1273	1266	101	2317	984
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	0.0	32.5	44.9	0.0	42.5	44.3	5.4	5.4	0.0	7.7	1.1
Incr Delay (d2), s/veh	7.7	0.0	0.1	34.8	0.0	0.3	6.1	0.2	0.2	0.0	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.0	0.5	0.0	0.0	0.1	0.2	1.6	1.6	0.0	2.4	0.3
LnGrp Delay(d),s/veh	46.5	0.0	32.6	79.7	0.0	42.8	50.4	5.6	5.6	0.0	7.9	1.2
LnGrp LOS	D		C	E		D	D	A	A		A	A
Approach Vol, veh/h		200			6			355			507	
Approach Delay, s/veh		44.8			48.9			6.6			7.0	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	65.8	4.6	19.6	5.4	60.4	16.0	8.2
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	15.3	* 22
Max Q Clear Time (g_c+I1), s	0.0	5.0	2.0	3.2	2.4	6.5	10.5	2.3
Green Ext Time (p_c), s	0.0	2.8	0.0	0.3	0.0	2.7	0.1	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	14.2
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	515	40	132	159	0	0	0	0	363	2	330
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	548	43	140	169	0				386	2	274
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1124	478	578	2512	0				445	2	399
Arrive On Green	0.00	0.59	0.59	0.32	0.66	0.00				0.25	0.25	0.25
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1801	9	1615
Grp Volume(v), veh/h	0	548	43	140	169	0				388	0	274
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	9.9	1.4	6.8	1.9	0.0				24.6	0.0	18.5
Cycle Q Clear(g_c), s	0.0	9.9	1.4	6.8	1.9	0.0				24.6	0.0	18.5
Prop In Lane	0.00		1.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	1124	478	578	2512	0				448	0	399
V/C Ratio(X)	0.00	0.49	0.09	0.24	0.07	0.00				0.87	0.00	0.69
Avail Cap(c_a), veh/h	0	1124	478	578	2512	0				701	0	626
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.96	0.96	0.99	0.99	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	19.3	17.5	30.1	7.2	0.0				43.3	0.0	40.9
Incr Delay (d2), s/veh	0.0	1.4	0.4	0.1	0.1	0.0				7.0	0.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.4	0.6	3.4	1.0	0.0				13.2	0.0	8.5
LnGrp Delay(d),s/veh	0.0	20.7	17.9	30.2	7.3	0.0				50.3	0.0	43.0
LnGrp LOS		C	B	C	A					D		D
Approach Vol, veh/h		591			309						662	
Approach Delay, s/veh		20.5			17.7						47.3	
Approach LOS		C			B						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	43.8	41.0		35.2		84.8		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	22.5	* 36		46.5		62.5		
Max Q Clear Time (g_c+I1), s	8.8	11.9		26.6		3.9		
Green Ext Time (p_c), s	0.6	2.2		3.0		0.8		

Intersection Summary	
HCM 2010 Ctrl Delay	31.3
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	349	529	0	0	268	439	22	1	120	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	392	594	0	0	301	468	25	1	26			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	427	2882	0	0	1874	796	276	11	256			
Arrive On Green	0.08	0.25	0.00	0.00	0.49	0.49	0.16	0.16	0.16			
Sat Flow, veh/h	1810	3800	0	0	3800	1614	1743	70	1615			
Grp Volume(v), veh/h	392	594	0	0	301	468	26	0	26			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1614	1813	0	1615			
Q Serve(g_s), s	25.8	14.8	0.0	0.0	5.2	24.8	1.5	0.0	1.7			
Cycle Q Clear(g_c), s	25.8	14.8	0.0	0.0	5.2	24.8	1.5	0.0	1.7			
Prop In Lane	1.00		0.00	0.00		1.00	0.96		1.00			
Lane Grp Cap(c), veh/h	427	2882	0	0	1874	796	287	0	256			
V/C Ratio(X)	0.92	0.21	0.00	0.00	0.16	0.59	0.09	0.00	0.10			
Avail Cap(c_a), veh/h	686	2882	0	0	1874	796	287	0	256			
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.97	0.97	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	54.2	16.4	0.0	0.0	16.7	21.7	43.1	0.0	43.2			
Incr Delay (d2), s/veh	7.9	0.2	0.0	0.0	0.2	3.2	0.6	0.0	0.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	13.9	7.9	0.0	0.0	2.8	11.8	0.8	0.0	0.8			
LnGrp Delay(d),s/veh	62.1	16.6	0.0	0.0	16.9	24.9	43.7	0.0	44.0			
LnGrp LOS	E	B			B	C	D		D			
Approach Vol, veh/h		986			769			52				
Approach Delay, s/veh		34.7			21.8			43.9				
Approach LOS		C			C			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		96.0			31.8	64.2		24.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		91.0			45.5	42.0		19.0
Max Q Clear Time (g_c+I1), s		16.8			27.8	26.8		3.7
Green Ext Time (p_c), s		4.8			0.5	4.1		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	29.5
HCM 2010 LOS	C

APPENDIX 6.2:

EAP (2017) CONDITIONS TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS		EAP (2017)
				CALC CHS	DATE	05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE	
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street: **Driveway 1**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes **1** lane

Major Street Future ADT = **251** vpd Minor Street Future ADT = **251** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **251**	*1* **251**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **251**	*1* **251**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 3% **B** 2%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		EAP (2017)
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 2**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **764** vpd Minor Street Future ADT = **262** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
CONDITION A - Minimum Vehicular Volume	Urban	Rural	Urban	Rural
XX Satisfied / XX Not Satisfied				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **764** / *1* **262**	8,000	5,600	2,400	1,680
2 + / *1*	9,600	6,720	2,400	1,680
2 + / *2* +	9,600	6,720	3,200	2,240
1 / *2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied / XX Not Satisfied				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street	Urban	Rural	Urban	Rural
1 **764** / *1* **262**	12,000	8,400	1,200	850
2 + / *1*	14,400	10,080	1,200	850
2 + / *2* +	14,400	10,080	1,600	1,120
1 / *2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / XX Not Satisfied	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more ….. **A** 10% **B** 6%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet
(Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAP (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Driveway 3**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **1,339** vpd Minor Street Future ADT = **313** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT: Vehicles Per Day on Major Street (Total of Both Approaches)		Minimum Requirements EADT: Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	Urban	Rural	Urban	Rural
CONDITION A - Minimum Vehicular Volume				
Satisfied / Not Satisfied: XX / XX				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **1,339** / *1* **313**	8,000	5,600	2,400	1,680
2 + / *1*	9,600	6,720	2,400	1,680
2 + / *2* +	9,600	6,720	3,200	2,240
1 / *2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	Urban	Rural	Urban	Rural
Satisfied / Not Satisfied: XX				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **1,339** / *1* **313**	12,000	8,400	1,200	850
2 + / *1*	14,400	10,080	1,200	850
2 + / *2* +	14,400	10,080	1,600	1,120
1 / *2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / Not Satisfied: XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more ….. A: 13% B: 11%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet
(Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAP (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Decker Road**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes **1** lane

Major Street Future ADT = **1,702** vpd Minor Street Future ADT = **51** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
CONDITION A - Minimum Vehicular Volume	Urban	Rural	Urban	Rural
Satisfied / Not Satisfied: XX				
Number of lanes for moving traffic on each approach				
Major Street: 1 **1,702** / Minor Street: 1 **51**	8,000	5,600	2,400	1,680
2 + / 1	9,600	6,720	2,400	1,680
2 + / 2 +	9,600	6,720	3,200	2,240
1 / 2 +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied / Not Satisfied: XX				
Number of lanes for moving traffic on each approach				
Major Street: 1 **1,702** / Minor Street: 1 **51**	12,000	8,400	1,200	850
2 + / 1	14,400	10,080	1,200	850
2 + / 2 +	14,400	10,080	1,600	1,120
1 / 2 +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / Not Satisfied: XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more ….. A: 2% B: 4%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAP (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Driveway 4**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **2,006** vpd Minor Street Future ADT = **253** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
CONDITION A - Minimum Vehicular Volume	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied: XX / Not Satisfied: XX	Urban	Rural	Urban	Rural
Number of lanes for moving traffic on each approach: Major Street / Minor Street				
1 **2,006** / 1 **253**	8,000	5,600	2,400	1,680
2 + / 1	9,600	6,720	2,400	1,680
2 + / 2 +	9,600	6,720	3,200	2,240
1 / 2 +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied / Not Satisfied: XX	Urban	Rural	Urban	Rural
Number of lanes for moving traffic on each approach: Major Street / Minor Street				
1 **2,006** / 1 **253**	12,000	8,400	1,200	850
2 + / 1	14,400	10,080	1,200	850
2 + / 2 +	14,400	10,080	1,600	1,120
1 / 2 +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / Not Satisfied: XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more ….. A: 11% B: 17%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAP (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Driveway 5**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **2,457** vpd Minor Street Future ADT = **197** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,457**	*1* **197**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,457**	*1* **197**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 8% **B** 16%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

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

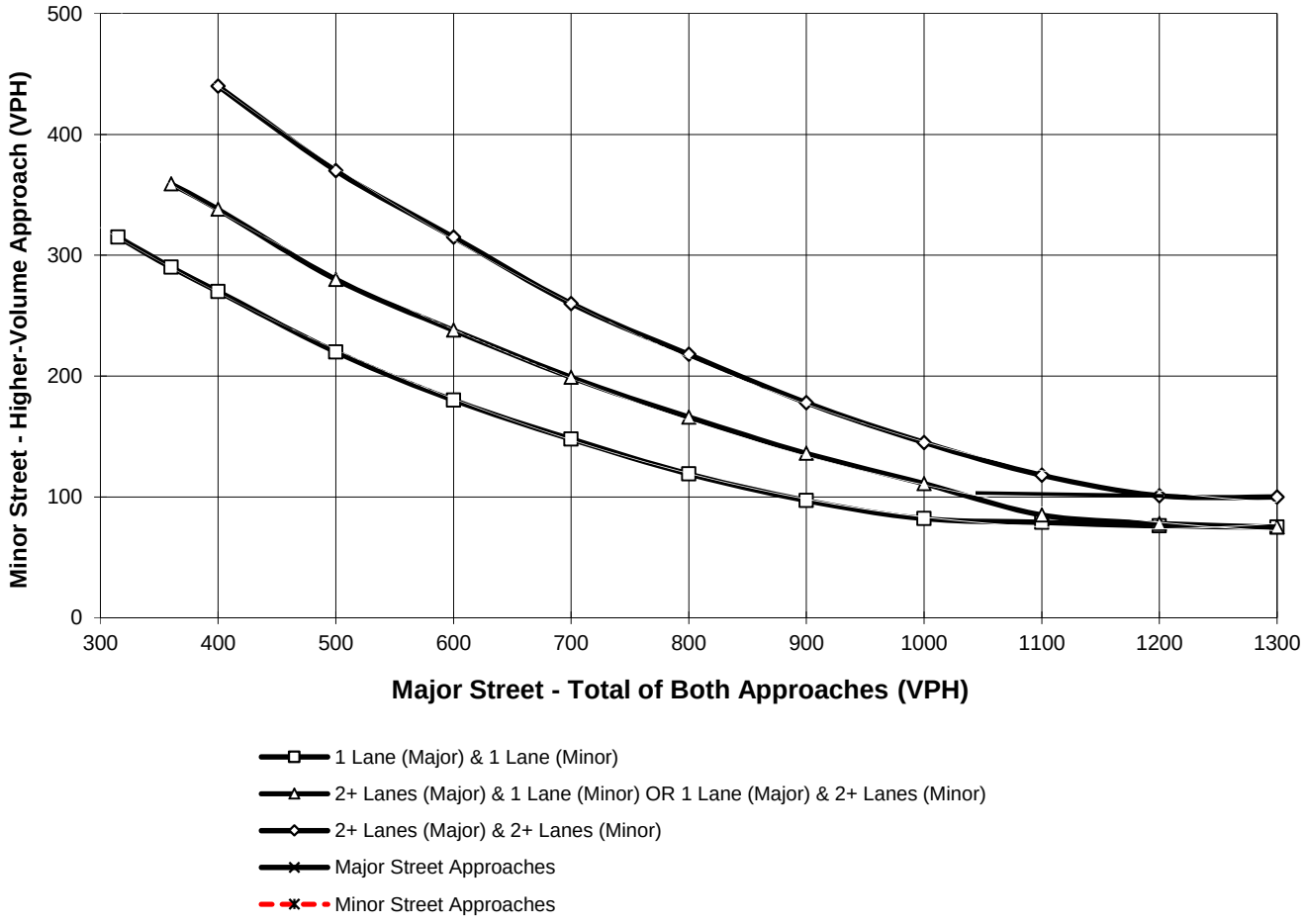
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **EAP (2017) Conditions - Weekday PM Peak Hour**

Major Street Name = **Oleander Avenue**
Total of Both Approaches (VPH) = **199**
Number of Approach Lanes Major Street = **2**

Minor Street Name = **Driveway 6**
High Volume Approach (VPH) = **18**
Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



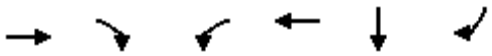
*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

This Page Intentionally Left Blank

APPENDIX 6.3:

EAP (2017) CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

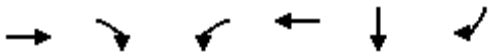


Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	465	22	132	223	454	254
v/c Ratio	0.34	0.03	0.34	0.10	0.79	0.34
Control Delay	27.6	0.1	29.0	9.9	48.2	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.6	0.1	29.0	9.9	48.2	4.3
Queue Length 50th (ft)	126	0	38	28	322	0
Queue Length 95th (ft)	155	0	61	57	390	51
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	1385	738	387	2303	862	1001
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	16	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.03	0.34	0.10	0.53	0.25

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	266	671	330	377	34	109
v/c Ratio	0.79	0.24	0.17	0.32	0.09	0.24
Control Delay	36.7	6.1	16.5	2.6	40.8	8.9
Queue Delay	0.1	0.6	0.0	0.0	0.0	0.0
Total Delay	36.8	6.7	16.5	2.6	40.8	8.9
Queue Length 50th (ft)	188	78	65	0	22	0
Queue Length 95th (ft)	200	115	103	53	51	49
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	577	2755	1967	1165	364	452
Starvation Cap Reductn	26	1618	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.59	0.17	0.32	0.09	0.24

Intersection Summary



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	548	43	140	169	388	351
v/c Ratio	0.34	0.05	0.39	0.07	0.78	0.46
Control Delay	26.1	3.1	28.2	8.0	52.0	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	3.1	28.2	8.0	52.0	5.1
Queue Length 50th (ft)	140	0	34	18	280	0
Queue Length 95th (ft)	231	16	53	40	353	63
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	1604	844	356	2459	736	951
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	136	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.05	0.39	0.07	0.53	0.37

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	392	594	301	493	26	135
v/c Ratio	0.83	0.21	0.16	0.43	0.09	0.33
Control Delay	38.5	2.6	19.1	3.2	44.1	9.6
Queue Delay	0.2	0.3	0.0	0.0	0.0	0.0
Total Delay	38.6	2.9	19.1	3.2	44.1	9.6
Queue Length 50th (ft)	260	52	64	0	17	0
Queue Length 95th (ft)	307	2	103	60	44	54
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	720	2881	1826	1156	300	414
Starvation Cap Reductn	37	1616	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.47	0.16	0.43	0.09	0.33

Intersection Summary

APPENDIX 6.4:

EAP (2017) CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2696*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1001*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*14.3*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:15 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2284*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*840*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*12.0*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:20 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4280*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1582*	pc/h/ln
S	*68.3*	mph
D = v_p / S	*23.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:16 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3891*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1438*	pc/h/ln
S	*69.3*	mph
D = v_p / S	*20.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:16 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4036*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1499*	pc/h/ln
S	*69.0*	mph
D = v_p / S	*21.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:17 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3605*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1332*	pc/h/ln
S	*69.8*	mph
D = v_p / S	*19.1*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:17 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3434*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1275*	pc/h/ln
S	*69.9*	mph
D = v_p / S	*18.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:17 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2900*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1066*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*15.2*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:18 AM

APPENDIX 6.5:

EAP (2017) CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAP (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	195	L_{down} =	1420 ft
V_u =	veh/h	Freeway Volume, V_F	2696	V_D =	111 veh/h
		Ramp Volume, V_R	523		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2696	0.92	Level	5	0	0.976	1.00	3004
Ramp	523	0.92	Level	19	0	0.913	1.00	622
UpStream								
DownStream	111	0.92	Level	27	0	0.881	1.00	137

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.656 using Equation (Exhibit 13-7)

V_{12} = 2185 pc/h

V_3 or V_{av34} 819 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3004	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2382	Exhibit 13-8	7200	No
V_R	622	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2185	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 21.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.354 (Exhibit 13-12)

S_R = 60.1 mph (Exhibit 13-12)

S_0 = 76.8 mph (Exhibit 13-12)

S = 63.9 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:07 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAP (2017)

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 1420 ft	Acceleration Lane Length, L_A: 260	L_{down} = ft
V_u = 523 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2173	
	Ramp Volume, V_R: 111	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2173	0.92	Level	1	0	0.995	1.00	2374
Ramp	111	0.92	Level	27	0	0.881	1.00	137
UpStream	523	0.92	Level	19	0	0.913	1.00	622
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 604.19 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 1388 pc/h

V_3 or V_{av34} 986 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1388 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2511	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1525	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.7 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.316 (Exibit 13-11)

S_R = 61.2 mph (Exhibit 13-11)

S_0 = 68.3 mph (Exhibit 13-11)

S = 63.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAP (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
- ☑ Yes ☐ On
- ☐ No ☑ Off
- L_{up} = 1395 ft
- V_u = 113 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	300
Deceleration Lane Length L_D	
Freeway Volume, V_F	3778
Ramp Volume, V_R	502
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3778	0.92	Level	3	0	0.985	1.00	4168
Ramp	502	0.92	Level	14	0	0.935	1.00	584
UpStream	113	0.92	Level	13	0	0.939	1.00	131
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

- L_{EQ} = 1101.53 (Equation 13-6 or 13-7)
- P_{FM} = 0.586 using Equation (Exhibit 13-6)
- V_{12} = 2442 pc/h
- V_3 or V_{av34} = 1726 pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
- If Yes, V_{12a} = 2442 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4752	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3026	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

- D_R = 26.9 (pc/mi/ln)
- LOS = C (Exhibit 13-2)

Speed Determination

- M_S = 0.374 (Exibit 13-11)
- S_R = 59.5 mph (Exhibit 13-11)
- S_0 = 65.6 mph (Exhibit 13-11)
- S = 61.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

- L_{EQ} = (Equation 13-12 or 13-13)
- P_{FD} = using Equation (Exhibit 13-7)
- V_{12} = pc/h
- V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

- D_R = (pc/mi/ln)
- LOS = (Exhibit 13-2)

Speed Determination

- D_s = (Exhibit 13-12)
- S_R = mph (Exhibit 13-12)
- S_0 = mph (Exhibit 13-12)
- S = mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:09 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAP (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	280	L_{down} =	1395 ft
V_u =	veh/h	Freeway Volume, V_F	3891	V_D =	502 veh/h
		Ramp Volume, V_R	113		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3891	0.92	Level	4	0	0.980	1.00	4314
Ramp	113	0.92	Level	13	0	0.939	1.00	131
UpStream								
DownStream	502	0.92	Level	14	0	0.935	1.00	584

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.646 using Equation (Exhibit 13-7)

V_{12} = 2834 pc/h

V_3 or V_{av34} 1480 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4314	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4183	Exhibit 13-8	7200	No
V_R	131	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2834	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 26.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.310 (Exhibit 13-12)

S_R = 61.3 mph (Exhibit 13-12)

S_0 = 74.9 mph (Exhibit 13-12)

S = 65.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:09 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAP (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1420 ft
V_u = veh/h	Deceleration Lane Length L_D: 195	V_D = 148 veh/h
	Freeway Volume, V_F: 4036	
	Ramp Volume, V_R: 578	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4036	0.92	Level	5	0	0.976	1.00	4497
Ramp	578	0.92	Level	14	0	0.935	1.00	672
UpStream								
DownStream	148	0.92	Level	13	0	0.939	1.00	171

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.617 using Equation (Exhibit 13-7)

V_{12} = 3031 pc/h

V_3 or V_{av34} 1466 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4497	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3825	Exhibit 13-8	7200	No
V_R	672	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3031	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 28.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.358 (Exhibit 13-12)

S_R = 60.0 mph (Exhibit 13-12)

S_0 = 75.0 mph (Exhibit 13-12)

S = 64.1 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:10 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAP (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	578 veh/h	Freeway Volume, V_F	3457	V_D =	veh/h
		Ramp Volume, V_R	148		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3457	0.92	Level	3	0	0.985	1.00	3814
Ramp	148	0.92	Level	13	0	0.939	1.00	171
UpStream	578	0.92	Level	14	0	0.935	1.00	672
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 919.63 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 2230 pc/h

V_3 or V_{av34} = 1584 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2230 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3985	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2401	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 22.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.341 (Exibit 13-11)

S_R = 60.5 mph (Exhibit 13-11)

S_0 = 66.1 mph (Exhibit 13-11)

S = 62.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAP (2017)

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 1395 ft	Acceleration Lane Length, L_A: 300	L_{down} = ft
V_u = 129 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2772	
	Ramp Volume, V_R: 663	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2772	0.92	Level	2	0	0.990	1.00	3043
Ramp	663	0.92	Level	13	0	0.939	1.00	767
UpStream	129	0.92	Level	10	0	0.952	1.00	147
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 899.94 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1783 pc/h

V_3 or V_{av34} 1260 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 1783 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3810	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2550	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 23.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.344 (Exibit 13-11)

S_R= 60.4 mph (Exhibit 13-11)

S_0= 67.3 mph (Exhibit 13-11)

S = 62.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAP (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1395 ft
V_u = veh/h	Deceleration Lane Length L_D: 280	V_D = 663 veh/h
	Freeway Volume, V_F: 2900	
	Ramp Volume, V_R: 129	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2900	0.92	Level	3	0	0.985	1.00	3199
Ramp	129	0.92	Level	10	0	0.952	1.00	147
UpStream								
DownStream	663	0.92	Level	13	0	0.939	1.00	767

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.673 using Equation (Exhibit 13-7)

V_{12} = 2202 pc/h

V_3 or V_{av34} 997 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3199	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3052	Exhibit 13-8	7200	No
V_R	147	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2202	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 20.7 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.311 (Exhibit 13-12)

S_R = 61.3 mph (Exhibit 13-12)

S_0 = 76.8 mph (Exhibit 13-12)

S = 65.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:11 AM

APPENDIX 7.1:

EAPC (2017) CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	16	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	0	17	0	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	35	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	35	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	-	-	983	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	993	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	983	-
Mov Cap-2 Maneuver	-	-	-	-	942	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	993	-

Approach	EB	WB	NB
HCM Control Delay, s	0		
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	-	-	-
HCM Lane LOS	-	-	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	7	0	28	16	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	0	30	17	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	8	0	86	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	78	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1625	-	920	1080
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	950	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1625	-	903	1080
Mov Cap-2 Maneuver	-	-	-	-	883	-
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	932	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.6	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1080	-	-	1625	-
HCM Lane V/C Ratio	0.012	-	-	0.019	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	20	0	23	44	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	22	0	25	48	0	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	22	0	120	22
Stage 1	-	-	-	-	22	-
Stage 2	-	-	-	-	98	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1607	-	880	1061
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	931	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1607	-	866	1061
Mov Cap-2 Maneuver	-	-	-	-	866	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1061	-	-	1607	-
HCM Lane V/C Ratio	0.01	-	-	0.016	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	30	0	1	67	0	0	0	4	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	33	0	1	73	0	0	0	4	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	73	0	0	33	0	0	108	108	33	110	108	73
Stage 1	-	-	-	-	-	-	33	33	-	75	75	-
Stage 2	-	-	-	-	-	-	75	75	-	35	33	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1540	-	-	1592	-	-	876	786	1046	873	786	995
Stage 1	-	-	-	-	-	-	988	872	-	939	836	-
Stage 2	-	-	-	-	-	-	939	836	-	986	872	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1540	-	-	1592	-	-	876	786	1046	869	786	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	881	785	-	878	784	-
Stage 1	-	-	-	-	-	-	988	872	-	939	835	-
Stage 2	-	-	-	-	-	-	938	835	-	982	872	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	8.5	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1046	1540	-	-	1592	-	-	-
HCM Lane V/C Ratio	0.004	-	-	-	0.001	-	-	-
HCM Control Delay (s)	8.5	0	-	-	7.3	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	34	0	16	68	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	37	0	17	74	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	37	0	146	37
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	109	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1587	-	851	1041
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	921	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1587	-	842	1041
Mov Cap-2 Maneuver	-	-	-	-	856	-
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	911	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1041	-	-	1587	-
HCM Lane V/C Ratio	0.007	-	-	0.011	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	41	0	21	84	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	45	0	23	91	0	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	45	0	182	45
Stage 1	-	-	-	-	45	-
Stage 2	-	-	-	-	137	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1576	-	812	1031
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	895	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1576	-	800	1031
Mov Cap-2 Maneuver	-	-	-	-	828	-
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	882	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1031	-	-	1576	-
HCM Lane V/C Ratio	0.009	-	-	0.014	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	51	0	30	105	2	0	0	13	3	0	0
Conflicting Peds, #/hr	0	0	0	0	0	3	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	76	0	45	157	3	0	0	19	4	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	160	0	0	76	0	0	324	325	79	334	324	158
Stage 1	-	-	-	-	-	-	76	76	-	248	248	-
Stage 2	-	-	-	-	-	-	248	249	-	86	76	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1432	-	-	1536	-	-	633	596	987	623	597	893
Stage 1	-	-	-	-	-	-	938	836	-	760	705	-
Stage 2	-	-	-	-	-	-	760	704	-	927	836	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1432	-	-	1532	-	-	619	578	985	596	579	893
Mov Cap-2 Maneuver	-	-	-	-	-	-	690	638	-	692	635	-
Stage 1	-	-	-	-	-	-	938	836	-	760	684	-
Stage 2	-	-	-	-	-	-	738	683	-	906	836	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	8.7	10.2
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	985	1432	-	-	1532	-	-	692
HCM Lane V/C Ratio	0.02	-	-	-	0.029	-	-	0.006
HCM Control Delay (s)	8.7	0	-	-	7.4	-	-	10.2
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	21	8	534	45	17	8	5	487	8	6	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	25	8	636	54	20	10	6	207	10	7	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	3	1311	580	534	2035	900	22	579	984	22	1158	0
Arrive On Green	0.00	0.35	0.35	0.15	0.54	0.54	0.01	0.30	0.30	0.01	0.30	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1680	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	25	8	636	54	20	10	6	207	10	7	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1680	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.5	0.3	15.5	0.7	0.6	0.6	0.2	5.0	0.6	0.1	0.0
Cycle Q Clear(g_c), s	0.0	0.5	0.3	15.5	0.7	0.6	0.6	0.2	5.0	0.6	0.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	3	1311	580	534	2035	900	22	579	984	22	1158	0
V/C Ratio(X)	0.00	0.02	0.01	1.19	0.03	0.02	0.46	0.01	0.21	0.46	0.01	0.00
Avail Cap(c_a), veh/h	172	1311	580	534	2035	900	86	579	984	86	1158	0
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)	0.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	22.7	22.6	44.7	11.5	11.5	51.5	25.5	27.1	51.5	25.4	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	102.8	0.0	0.0	5.5	0.0	0.5	5.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.2	15.3	0.4	0.3	0.3	0.1	2.3	0.3	0.1	0.0
LnGrp Delay(d),s/veh	0.0	22.7	22.7	147.6	11.5	11.5	57.0	25.5	27.6	57.0	25.4	0.0
LnGrp LOS		C	C	F	B	B	E	C	C	E	C	
Approach Vol, veh/h		33			710			223			17	
Approach Delay, s/veh		22.7			133.4			28.9			44.0	
Approach LOS		C			F			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.0	41.7	5.8	37.5	0.0	61.7	5.8	37.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	15.5	32.5	5.0	32.0	5.0	43.0	5.0	32.0
Max Q Clear Time (g_c+I1), s	17.5	2.5	2.6	2.1	0.0	2.7	2.6	7.0
Green Ext Time (p_c), s	0.0	0.3	0.0	0.4	0.0	0.3	0.0	0.4

Intersection Summary		
HCM 2010 Ctrl Delay		104.4
HCM 2010 LOS		F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	0	19	0	0	1	20	430	3	2	412	127
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	96	0	22	0	0	1	24	518	4	2	496	153
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	123	0	230	2	0	39	45	2571	20	5	2510	1067
Arrive On Green	0.07	0.00	0.14	0.00	0.00	0.02	0.03	0.68	0.68	0.00	0.66	0.66
Sat Flow, veh/h	1810	0	1615	1810	0	1615	1810	3766	29	1810	3800	1615
Grp Volume(v), veh/h	96	0	22	0	0	1	24	261	261	2	496	153
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1615	1810	1900	1895	1810	1900	1615
Q Serve(g_s), s	4.7	0.0	1.1	0.0	0.0	0.1	1.2	4.6	4.6	0.1	4.6	3.2
Cycle Q Clear(g_c), s	4.7	0.0	1.1	0.0	0.0	0.1	1.2	4.6	4.6	0.1	4.6	3.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	123	0	230	2	0	39	45	1297	1294	5	2510	1067
V/C Ratio(X)	0.78	0.00	0.10	0.00	0.00	0.03	0.53	0.20	0.20	0.41	0.20	0.14
Avail Cap(c_a), veh/h	197	0	574	101	0	488	105	1297	1294	101	2510	1067
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.3	0.0	33.6	0.0	0.0	42.9	43.3	5.2	5.2	44.8	6.0	5.7
Incr Delay (d2), s/veh	4.0	0.0	0.1	0.0	0.0	0.1	3.5	0.3	0.4	18.9	0.2	0.3
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	2.5	0.0	0.5	0.0	0.0	0.0	0.6	2.5	2.5	0.1	2.5	1.5
LnGrp Delay(d),s/veh	45.3	0.0	33.6	0.0	0.0	43.0	46.9	5.6	5.6	63.8	6.1	6.0
LnGrp LOS	D		C			D	D	A	A	E	A	A
Approach Vol, veh/h		118			1			546			651	
Approach Delay, s/veh		43.1			43.0			7.4			6.3	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	67.0	0.0	18.3	6.8	64.9	10.6	7.7
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.2	27.8	9.8	27.2
Max Q Clear Time (g_c+I1), s	2.1	6.6	0.0	3.1	3.2	6.6	6.7	2.1
Green Ext Time (p_c), s	0.0	3.8	0.0	0.0	0.0	3.8	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	10.1
HCM 2010 LOS	B

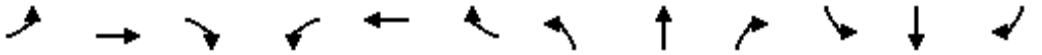
Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	479	37	250	262	0	0	0	0	1482	2	334
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	510	34	266	279	0				1577	2	291
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	681	289	188	1219	0				1062	1	949
Arrive On Green	0.00	0.18	0.18	0.21	0.64	0.00				0.59	0.59	0.59
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1807	2	1615
Grp Volume(v), veh/h	0	510	34	266	279	0				1579	0	291
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	15.3	2.1	12.5	3.7	0.0				70.5	0.0	10.9
Cycle Q Clear(g_c), s	0.0	15.3	2.1	12.5	3.7	0.0				70.5	0.0	10.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	681	289	188	1219	0				1063	0	949
V/C Ratio(X)	0.00	0.75	0.12	1.41	0.23	0.00				1.49	0.00	0.31
Avail Cap(c_a), veh/h	0	681	289	188	1219	0				1063	0	949
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.96	0.96	0.93	0.93	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	46.7	41.3	47.5	15.3	0.0				24.8	0.0	12.5
Incr Delay (d2), s/veh	0.0	7.1	0.8	211.7	0.4	0.0				223.4	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	8.7	1.0	17.3	2.0	0.0				100.8	0.0	4.9
LnGrp Delay(d),s/veh	0.0	53.8	42.1	259.2	15.7	0.0				248.2	0.0	12.6
LnGrp LOS		D	D	F	B					F		B
Approach Vol, veh/h		544			545						1870	
Approach Delay, s/veh		53.1			134.5						211.5	
Approach LOS		D			F						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	17.0	27.0		76.0		44.0		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	12.5	21.5		70.5		38.5		
Max Q Clear Time (g_c+I1), s	14.5	17.3		72.5		5.7		
Green Ext Time (p_c), s	0.0	1.4		0.0		3.3		

Intersection Summary	
HCM 2010 Ctrl Delay	168.2
HCM 2010 LOS	F



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	282	1679	0	0	440	632	73	0	398	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	307	1825	0	0	478	652	79	0	347			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	353	2217	0	0	1254	533	452	0	404			
Arrive On Green	0.26	0.78	0.00	0.00	0.33	0.33	0.25	0.00	0.25			
Sat Flow, veh/h	1810	3800	0	0	3800	1615	1810	0	1615			
Grp Volume(v), veh/h	307	1825	0	0	478	652	79	0	347			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	9.7	17.9	0.0	0.0	5.8	19.8	2.1	0.0	12.3			
Cycle Q Clear(g_c), s	9.7	17.9	0.0	0.0	5.8	19.8	2.1	0.0	12.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	353	2217	0	0	1254	533	452	0	404			
V/C Ratio(X)	0.87	0.82	0.00	0.00	0.38	1.22	0.17	0.00	0.86			
Avail Cap(c_a), veh/h	377	2217	0	0	1254	533	452	0	404			
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.58	0.58	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	21.5	4.8	0.0	0.0	15.4	20.1	17.6	0.0	21.5			
Incr Delay (d2), s/veh	10.9	2.1	0.0	0.0	0.9	116.7	0.8	0.0	20.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	5.8	9.5	0.0	0.0	3.1	26.0	1.1	0.0	7.8			
LnGrp Delay(d),s/veh	32.4	6.9	0.0	0.0	16.3	136.8	18.5	0.0	42.1			
LnGrp LOS	C	A			B	F	B		D			
Approach Vol, veh/h		2132			1130			426				
Approach Delay, s/veh		10.6			85.8			37.7				
Approach LOS		B			F			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		40.0			15.2	24.8		20.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		35.0			12.5	19.0		15.0
Max Q Clear Time (g_c+I1), s		19.9			11.7	21.8		14.3
Green Ext Time (p_c), s		10.8			0.0	0.0		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	36.8
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	10	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	0	11	0	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	22	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	22	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	1006	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	1000	-
Mov Cap-2 Maneuver	-	-	-	-	955	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	1006	-

Approach	EB	WB	NB
HCM Control Delay, s	0		
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	-	-	-
HCM Lane LOS	-	-	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	22	0	12	10	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	0	13	11	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	24	0	61	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1604	-	950	1058
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	991	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1604	-	942	1058
Mov Cap-2 Maneuver	-	-	-	-	925	-
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	983	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1058	-	-	1604	-
HCM Lane V/C Ratio	0.029	-	-	0.008	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	50	0	13	22	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	54	0	14	24	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	54	0	106	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1564	-	897	1019
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1564	-	889	1019
Mov Cap-2 Maneuver	-	-	-	-	895	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	967	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.7	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1564	-
HCM Lane V/C Ratio	0.03	-	-	0.009	-
HCM Control Delay (s)	8.6	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	78	0	5	35	0	0	0	3	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	85	0	5	38	0	0	0	3	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	38	0	0	85	0	0	134	134	85	135	134	38
Stage 1	-	-	-	-	-	-	85	85	-	49	49	-
Stage 2	-	-	-	-	-	-	49	49	-	86	85	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1585	-	-	1524	-	-	842	760	980	841	760	1040
Stage 1	-	-	-	-	-	-	928	828	-	969	858	-
Stage 2	-	-	-	-	-	-	969	858	-	927	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1585	-	-	1524	-	-	840	758	980	836	758	1040
Mov Cap-2 Maneuver	-	-	-	-	-	-	862	770	-	857	768	-
Stage 1	-	-	-	-	-	-	928	828	-	969	855	-
Stage 2	-	-	-	-	-	-	966	855	-	924	828	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.9	8.7	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	980	1585	-	-	1524	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	0.004	-	-	-
HCM Control Delay (s)	8.7	0	-	-	7.4	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	81	0	10	40	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	88	0	11	43	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	88	0	153	88
Stage 1	-	-	-	-	88	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1520	-	843	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	963	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1520	-	837	976
Mov Cap-2 Maneuver	-	-	-	-	864	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	956	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	976	-	-	1520	-
HCM Lane V/C Ratio	0.025	-	-	0.007	-
HCM Control Delay (s)	8.8	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	103	0	9	50	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	112	0	10	54	0	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	112	0	186	112
Stage 1	-	-	-	-	112	-
Stage 2	-	-	-	-	74	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1490	-	808	947
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	954	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1490	-	803	947
Mov Cap-2 Maneuver	-	-	-	-	843	-
Stage 1	-	-	-	-	918	-
Stage 2	-	-	-	-	948	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	947	-	-	1490	-
HCM Lane V/C Ratio	0.024	-	-	0.007	-
HCM Control Delay (s)	8.9	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	124	0	16	59	0	0	0	36	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	185	0	24	88	0	0	0	54	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	88	0	0	185	0	0	321	321	185	348	321	88
Stage 1	-	-	-	-	-	-	185	185	-	136	136	-
Stage 2	-	-	-	-	-	-	136	136	-	212	185	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1520	-	-	1402	-	-	636	599	862	610	599	976
Stage 1	-	-	-	-	-	-	821	751	-	872	788	-
Stage 2	-	-	-	-	-	-	872	788	-	795	751	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1520	-	-	1402	-	-	628	589	862	565	589	976
Mov Cap-2 Maneuver	-	-	-	-	-	-	728	668	-	663	659	-
Stage 1	-	-	-	-	-	-	821	751	-	872	775	-
Stage 2	-	-	-	-	-	-	857	775	-	745	751	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	9.5	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	862	1520	-	-	1402	-	-	-
HCM Lane V/C Ratio	0.062	-	-	-	0.017	-	-	-
HCM Control Delay (s)	9.5	0	-	-	7.6	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	50	12	518	37	6	5	6	665	9	9	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	52	9	534	38	6	5	6	401	9	9	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	4	1300	575	322	1858	821	12	640	1088	20	1298	0
Arrive On Green	0.00	0.34	0.34	0.09	0.49	0.49	0.01	0.34	0.34	0.01	0.34	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	52	9	534	38	6	5	6	401	9	9	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.9	0.3	8.4	0.5	0.2	0.3	0.2	6.2	0.5	0.1	0.0
Cycle Q Clear(g_c), s	0.0	0.9	0.3	8.4	0.5	0.2	0.3	0.2	6.2	0.5	0.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	4	1300	575	322	1858	821	12	640	1088	20	1298	0
V/C Ratio(X)	0.00	0.04	0.02	1.66	0.02	0.01	0.42	0.01	0.37	0.45	0.01	0.00
Avail Cap(c_a), veh/h	190	1300	575	322	1858	821	95	640	1088	95	1298	0
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)	0.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	20.8	14.2	43.3	12.5	12.5	47.0	21.0	11.4	46.7	20.6	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	310.0	0.0	0.0	8.8	0.0	1.0	5.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.5	0.1	18.0	0.3	0.1	0.2	0.1	2.9	0.3	0.1	0.0
LnGrp Delay(d),s/veh	0.0	20.9	14.3	353.3	12.6	12.5	55.8	21.0	12.4	52.4	20.7	0.0
LnGrp LOS		C	B	F	B	B	E	C	B	D	C	
Approach Vol, veh/h		61			578			412			18	
Approach Delay, s/veh		19.9			327.3			13.0			36.5	
Approach LOS		B			F			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.9	38.0	5.1	37.9	0.0	51.9	5.6	37.5
Change Period (Y+Rc), s	5.5	* 5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.5	* 33	5.0	32.0	5.0	33.0	5.0	32.0
Max Q Clear Time (g_c+I1), s	10.4	2.9	2.3	2.1	0.0	2.5	2.5	8.2
Green Ext Time (p_c), s	0.0	0.2	0.0	0.9	0.0	1.1	0.0	0.9

Intersection Summary	
HCM 2010 Ctrl Delay	183.7
HCM 2010 LOS	F

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	166	0	24	1	1	4	8	464	5	0	474	69
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	175	0	25	1	1	4	8	488	5	0	499	73
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	212	0	253	2	10	40	18	2515	26	2	2317	984
Arrive On Green	0.12	0.00	0.16	0.00	0.03	0.03	0.01	0.67	0.67	0.00	0.61	0.61
Sat Flow, veh/h	1810	0	1615	1810	333	1332	1810	3755	38	1810	3800	1614
Grp Volume(v), veh/h	175	0	25	1	0	5	8	247	246	0	499	73
Grp Sat Flow(s),veh/h/ln	1810	0	1615	1810	0	1665	1810	1900	1893	1810	1900	1614
Q Serve(g_s), s	8.5	0.0	1.2	0.0	0.0	0.3	0.4	4.4	4.4	0.0	5.3	0.6
Cycle Q Clear(g_c), s	8.5	0.0	1.2	0.0	0.0	0.3	0.4	4.4	4.4	0.0	5.3	0.6
Prop In Lane	1.00		1.00	1.00		0.80	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	212	0	253	2	0	50	18	1273	1268	2	2317	984
V/C Ratio(X)	0.83	0.00	0.10	0.40	0.00	0.10	0.44	0.19	0.19	0.00	0.22	0.07
Avail Cap(c_a), veh/h	310	0	574	101	0	400	101	1273	1268	101	2317	984
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	0.0	32.5	44.9	0.0	42.5	44.3	5.6	5.6	0.0	7.9	1.1
Incr Delay (d2), s/veh	7.5	0.0	0.1	34.8	0.0	0.3	6.1	0.3	0.3	0.0	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.0	0.5	0.0	0.0	0.1	0.2	2.5	2.4	0.0	2.8	0.3
LnGrp Delay(d),s/veh	46.3	0.0	32.6	79.7	0.0	42.8	50.4	6.0	6.0	0.0	8.1	1.2
LnGrp LOS	D		C	E		D	D	A	A		A	A
Approach Vol, veh/h		200			6			501			572	
Approach Delay, s/veh		44.6			48.9			6.7			7.2	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	65.8	4.6	19.6	5.4	60.4	16.0	8.2
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	15.4	* 22
Max Q Clear Time (g_c+I1), s	0.0	6.4	2.0	3.2	2.4	7.3	10.5	2.3
Green Ext Time (p_c), s	0.0	3.6	0.0	0.3	0.0	3.5	0.1	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	13.1
HCM 2010 LOS	B

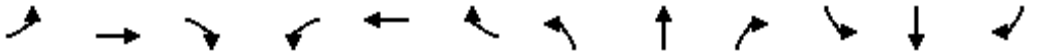
Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	635	89	621	186	0	0	0	0	793	2	375
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	676	95	661	198	0				844	2	322
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	681	289	550	1979	0				700	2	626
Arrive On Green	0.00	0.18	0.18	0.10	0.17	0.00				0.39	0.39	0.39
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1805	4	1615
Grp Volume(v), veh/h	0	676	95	661	198	0				846	0	322
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	21.3	6.2	36.5	5.3	0.0				46.5	0.0	18.3
Cycle Q Clear(g_c), s	0.0	21.3	6.2	36.5	5.3	0.0				46.5	0.0	18.3
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	681	289	550	1979	0				701	0	626
V/C Ratio(X)	0.00	0.99	0.33	1.20	0.10	0.00				1.21	0.00	0.51
Avail Cap(c_a), veh/h	0	681	289	550	1979	0				701	0	626
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.96	0.96	0.92	0.92	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	49.2	43.0	54.0	26.0	0.0				36.8	0.0	28.1
Incr Delay (d2), s/veh	0.0	32.1	2.9	105.8	0.1	0.0				106.0	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	14.2	3.0	34.5	2.8	0.0				43.8	0.0	8.3
LnGrp Delay(d),s/veh	0.0	81.2	45.8	159.8	26.1	0.0				142.8	0.0	28.8
LnGrp LOS		F	D	F	C					F		C
Approach Vol, veh/h		771			859						1168	
Approach Delay, s/veh		76.9			129.0						111.4	
Approach LOS		E			F						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	41.0	27.0		52.0		68.0		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	36.5	21.5		46.5		62.5		
Max Q Clear Time (g_c+I1), s	38.5	23.3		48.5		7.3		
Green Ext Time (p_c), s	0.0	0.0		0.0		3.9		

Intersection Summary	
HCM 2010 Ctrl Delay	107.3
HCM 2010 LOS	F



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	457	970	0	0	763	1471	43	1	215	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	513	1090	0	0	857	1628	48	1	133			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	354	3008	0	0	2153	915	222	5	202			
Arrive On Green	0.39	1.00	0.00	0.00	0.57	0.57	0.13	0.13	0.13			
Sat Flow, veh/h	1810	3800	0	0	3800	1614	1774	37	1615			
Grp Volume(v), veh/h	513	1090	0	0	857	1628	49	0	133			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1614	1811	0	1615			
Q Serve(g_s), s	23.5	0.0	0.0	0.0	15.1	68.0	2.9	0.0	9.4			
Cycle Q Clear(g_c), s	23.5	0.0	0.0	0.0	15.1	68.0	2.9	0.0	9.4			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	354	3008	0	0	2153	915	226	0	202			
V/C Ratio(X)	1.45	0.36	0.00	0.00	0.40	1.78	0.22	0.00	0.66			
Avail Cap(c_a), veh/h	354	3008	0	0	2153	915	226	0	202			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.10	0.10	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	36.5	0.0	0.0	0.0	14.5	26.0	47.2	0.0	50.1			
Incr Delay (d2), s/veh	203.1	0.0	0.0	0.0	0.6	355.4	2.2	0.0	15.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	31.6	0.0	0.0	0.0	8.0	120.3	1.6	0.0	5.1			
LnGrp Delay(d),s/veh	239.6	0.0	0.0	0.0	15.1	381.4	49.4	0.0	65.7			
LnGrp LOS	F	A			B	F	D		E			
Approach Vol, veh/h		1603			2485			182				
Approach Delay, s/veh		76.7			255.1			61.3				
Approach LOS		E			F			E				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		100.0			27.0	73.0		20.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		95.0			23.5	68.0		15.0
Max Q Clear Time (g_c+I1), s		2.0			25.5	70.0		11.4
Green Ext Time (p_c), s		39.8			0.0	0.0		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	179.8
HCM 2010 LOS	F

APPENDIX 7.2:

EAPC (2017) CONDITIONS TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet
(Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAPC (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Driveway 1**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes **1** lane

Major Street Future ADT = **251** vpd Minor Street Future ADT = **251** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
CONDITION A - Minimum Vehicular Volume	Urban	Rural	Urban	Rural
XX Satisfied / XX Not Satisfied				
Number of lanes for moving traffic on each approach				
Major Street: *1* **251** / Minor Street: *1* **251**	8,000	5,600	2,400	1,680
2 + / *1*	9,600	6,720	2,400	1,680
2 + / *2* +	9,600	6,720	3,200	2,240
1 / *2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied / XX Not Satisfied				
Number of lanes for moving traffic on each approach				
Major Street: *1* **251** / Minor Street: *1* **251**	12,000	8,400	1,200	850
2 + / *1*	14,400	10,080	1,200	850
2 + / *2* +	14,400	10,080	1,600	1,120
1 / *2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / XX Not Satisfied	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more ….. **A** 3% **B** 2%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		EAPC (2017)
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 2**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **764** vpd Minor Street Future ADT = **262** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **764**	*1* **262**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **764**	*1* **262**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 10% **B** 6%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAPC (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Driveway 3**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **1,339** vpd Minor Street Future ADT = **313** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
CONDITION A - Minimum Vehicular Volume	Urban	Rural	Urban	Rural
XX Satisfied / XX Not Satisfied				
Number of lanes for moving traffic on each approach				
Major Street: *1* **1,339** / Minor Street: *1* **313**	8,000	5,600	2,400	1,680
Major Street: *2 +* / Minor Street: *1*	9,600	6,720	2,400	1,680
Major Street: *2 +* / Minor Street: *2 +*	9,600	6,720	3,200	2,240
Major Street: *1* / Minor Street: *2 +*	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	Urban	Rural	Urban	Rural
Satisfied / XX Not Satisfied				
Number of lanes for moving traffic on each approach				
Major Street: *1* **1,339** / Minor Street: *1* **313**	12,000	8,400	1,200	850
Major Street: *2 +* / Minor Street: *1*	14,400	10,080	1,200	850
Major Street: *2 +* / Minor Street: *2 +*	14,400	10,080	1,600	1,120
Major Street: *1* / Minor Street: *2 +*	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / XX Not Satisfied				
No one condition satisfied, but following conditions fulfilled 80% of more ….. **A** 13% **B** 11%	2 CONDITIONS 80%		2 CONDITIONS 80%	

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet
(Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAPC (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Decker Road**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes **1** lane

Major Street Future ADT = **1,702** vpd Minor Street Future ADT = **51** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **1,702**	*1* **51**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **1,702**	*1* **51**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 2% **B** 4%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet
(Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	EAPC (2017)
				CALC CHS	DATE 05/19/15
Jurisdiction: **County of Riverside**				CHK	DATE
Major Street: **Oleander Avenue**				Critical Approach Speed (Major)	40 mph
Minor Street: **Driveway 4**				Critical Approach Speed (Minor)	25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes **1** lane

Major Street Future ADT = **2,006** vpd Minor Street Future ADT = **253** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or **RURAL (R)**

In built up area of isolated community of < 10,000 population ……

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
XX	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
CONDITION A - Minimum Vehicular Volume	Urban	Rural	Urban	Rural
Satisfied / Not Satisfied: XX				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **2,006** / *1* **253**	8,000	5,600	2,400	1,680
2 + / *1*	9,600	6,720	2,400	1,680
2 + / *2* +	9,600	6,720	3,200	2,240
1 / *2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied / Not Satisfied: XX				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street	Urban	Rural	Urban	Rural
1 **2,006** / *1* **253**	12,000	8,400	1,200	850
2 + / *1*	14,400	10,080	1,200	850
2 + / *2* +	14,400	10,080	1,600	1,120
1 / *2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / Not Satisfied: XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more ….. **A** 11% **B** 17%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet
(Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		EAPC (2017)
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 5**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **2,457** vpd Minor Street Future ADT = **197** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,457**	*1* **197**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **2,457**	*1* **197**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 8% **B** 16%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

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

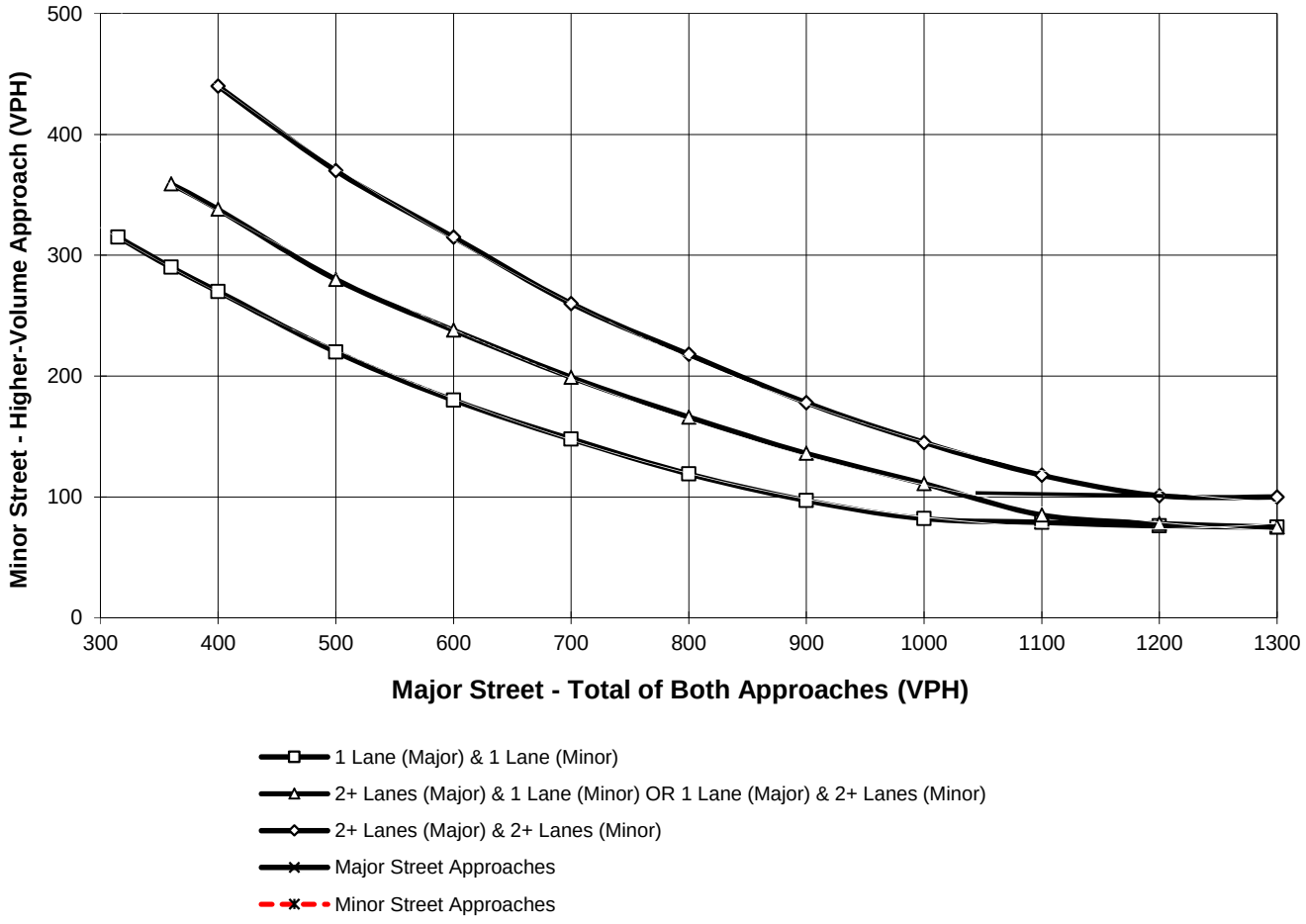
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **EAPC (2017) Conditions - Weekday PM Peak Hour**

Major Street Name = **Oleander Avenue**
Total of Both Approaches (VPH) = **199**
Number of Approach Lanes Major Street = **2**

Minor Street Name = **Driveway 6**
High Volume Approach (VPH) = **18**
Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



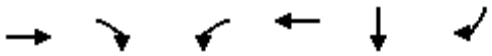
*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

This Page Intentionally Left Blank

APPENDIX 7.3:

EAPC (2017) CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS

This Page Intentionally Left Blank



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	510	39	266	279	1579	355
v/c Ratio	0.75	0.10	1.35	0.23	1.41	0.30
Control Delay	54.5	4.4	233.6	26.1	216.8	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.7	0.0
Total Delay	54.5	4.4	233.6	26.1	217.6	6.0
Queue Length 50th (ft)	189	0	~275	77	~1645	54
Queue Length 95th (ft)	248	14	#445	108	#1910	102
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	680	392	197	1219	1116	1195
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	1	0	0	0	163	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.10	1.35	0.23	1.66	0.30

Intersection Summary

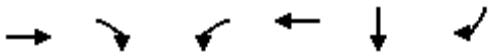
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	307	1825	478	687	79	433
v/c Ratio	0.82	0.82	0.38	0.64	0.17	0.79
Control Delay	68.9	13.0	16.9	5.1	18.8	28.8
Queue Delay	0.0	43.3	0.0	0.0	0.0	0.0
Total Delay	68.9	56.3	16.9	5.1	18.8	28.8
Queue Length 50th (ft)	225	277	66	5	22	111
Queue Length 95th (ft)	m276	m159	101	71	52	#246
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	395	2216	1245	1070	475	550
Starvation Cap Reductn	0	543	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	1.09	0.38	0.64	0.17	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	676	95	661	198	846	399
v/c Ratio	0.99	0.24	1.15	0.10	1.15	0.44
Control Delay	82.5	18.5	111.3	10.7	117.2	9.8
Queue Delay	36.5	0.0	0.0	0.0	0.7	0.0
Total Delay	119.0	18.5	111.3	10.7	117.9	9.8
Queue Length 50th (ft)	264	20	~600	20	~770	63
Queue Length 95th (ft)	#385	69	#830	29	#1014	145
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	680	392	577	1979	736	903
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	134	0	0	0	75	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.24	0.24	1.15	0.10	1.28	0.44

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.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	513	1090	857	1653	49	242
v/c Ratio	1.38	0.36	0.40	1.32	0.21	0.61
Control Delay	214.6	6.3	15.2	170.5	49.7	21.8
Queue Delay	2.3	50.3	0.1	0.0	0.0	0.0
Total Delay	216.9	56.6	15.3	170.5	49.7	21.8
Queue Length 50th (ft)	~452	195	177	~1507	35	45
Queue Length 95th (ft)	m#393	m152	216	#1743	73	126
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	372	3008	2153	1252	237	394
Starvation Cap Reductn	70	2022	0	0	0	0
Spillback Cap Reductn	0	0	230	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.70	1.11	0.45	1.32	0.21	0.61

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.

m Volume for 95th percentile queue is metered by upstream signal.

APPENDIX 7.4:

EAPC (2017) CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAPC (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3753*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1448*	pc/h/ln
S	*69.3*	mph
D = v_p / S	*20.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:19 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAPC (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2867*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1080*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*15.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:19 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAP (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5279*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*9*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.957*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1999*	pc/h/ln
S	*62.6*	mph
D = v_p / S	*31.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:20 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAPC (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4941*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1862*	pc/h/ln
S	*64.9*	mph
D = v_p / S	*28.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:20 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Southbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*North of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*EAPC (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5121*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.952*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1948*	pc/h/ln
S	*63.5*	mph
D = v_p / S	*30.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAPC (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4755*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.952*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1809*	pc/h/ln
S	*65.7*	mph
D = v_p / S	*27.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:21 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Northbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*North of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*EAPC (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4517*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*11*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.948*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1727*	pc/h/ln
S	*66.8*	mph
D = v_p / S	*25.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:22 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*EAPC (2017)*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3501*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1313*	pc/h/ln
S	*69.9*	mph
D = v_p / S	*18.8*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:22 AM

APPENDIX 7.5:

EAPC (2017) CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAPC (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	195	L_{down} =	1420 ft
V_u =	veh/h	Freeway Volume, V_F	3753	V_D =	189 veh/h
		Ramp Volume, V_R	1074		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3753	0.92	Level	13	0	0.939	1.00	4345
Ramp	1074	0.92	Level	26	0	0.885	1.00	1319
UpStream								
DownStream	189	0.92	Level	26	0	0.885	1.00	232

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.591 using Equation (Exhibit 13-7)

V_{12} = 3106 pc/h

V_3 or V_{av34} 1239 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4345	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3026	Exhibit 13-8	7200	No
V_R	1319	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3106	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 29.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.417 (Exhibit 13-12)

S_R = 58.3 mph (Exhibit 13-12)

S_0 = 75.9 mph (Exhibit 13-12)

S = 62.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:12 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAPC (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	1074 veh/h	Freeway Volume, V_F	2678	V_D =	veh/h
		Ramp Volume, V_R	189		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2678	0.92	Level	7	0	0.966	1.00	3013
Ramp	189	0.92	Level	26	0	0.885	1.00	232
UpStream	1074	0.92	Level	26	0	0.885	1.00	1319
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 761.27 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 1762 pc/h

V_3 or V_{av34} = 1251 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1762 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3245	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1994	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 19.3 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.326 (Exibit 13-11)

S_R = 60.9 mph (Exhibit 13-11)

S_0 = 67.3 mph (Exhibit 13-11)

S = 63.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAPC (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	300	☑ No	☐ Off
L_{up} =	1395 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	327 veh/h	Freeway Volume, V_F	4615	V_D =	veh/h
		Ramp Volume, V_R	665		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4615	0.92	Level	8	0	0.962	1.00	5217
Ramp	665	0.92	Level	18	0	0.917	1.00	788
UpStream	327	0.92	Level	18	0	0.917	1.00	387
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1369.67 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 3057 pc/h

V_3 or V_{av34} = 2160 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3057 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6005	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3845	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 33.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.476 (Exibit 13-11)

S_R = 56.7 mph (Exhibit 13-11)

S_0 = 64.0 mph (Exhibit 13-11)

S = 59.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	EAPC (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	4941
Ramp Volume, V_R	327
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1395 ft
V_D = 665 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4941	0.92	Level	8	0	0.962	1.00	5585
Ramp	327	0.92	Level	18	0	0.917	1.00	387
UpStream								
DownStream	665	0.92	Level	18	0	0.917	1.00	788

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R = mph (Exhibit 13-11)
S_0 = mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.603 using Equation (Exhibit 13-7)
V_{12} = 3519 pc/h
V_3 or V_{av34} 2066 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5585	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5198	Exhibit 13-8	7200	No
V_R	387	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3519	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 32.0 (pc/mi/ln)
LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.333 (Exhibit 13-12)
S_R = 60.7 mph (Exhibit 13-12)
S_0 = 72.6 mph (Exhibit 13-12)
S = 64.6 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:14 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAPC (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1420 ft
V_u = veh/h	Deceleration Lane Length L_D: 195	V_D = 438 veh/h
	Freeway Volume, V_F: 5121	
	Ramp Volume, V_R: 803	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5121	0.92	Level	10	0	0.952	1.00	5845
Ramp	803	0.92	Level	19	0	0.913	1.00	956
UpStream								
DownStream	438	0.92	Level	22	0	0.901	1.00	528

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.570 using Equation (Exhibit 13-7)

V_{12} = 3742 pc/h

V_3 or V_{av34} 2103 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5845	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4889	Exhibit 13-8	7200	No
V_R	956	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3742	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 34.7 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.384 (Exhibit 13-12)

S_R = 59.2 mph (Exhibit 13-12)

S_0 = 72.5 mph (Exhibit 13-12)

S = 63.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:13 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAPC (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 1420 ft	Acceleration Lane Length, L_A: 260	L_{down} = ft
V_u = 803 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 4317	
	Ramp Volume, V_R: 438	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4317	0.92	Level	8	0	0.962	1.00	4880
Ramp	438	0.92	Level	22	0	0.901	1.00	528
UpStream	803	0.92	Level	19	0	0.913	1.00	956
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1224.15 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 2854 pc/h

V_3 or V_{av34} = 2026 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2854 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5408	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3382	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 30.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.412 (Exibit 13-11)

S_R = 58.5 mph (Exhibit 13-11)

S_0 = 64.5 mph (Exhibit 13-11)

S = 60.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAPC (2017)

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	300	☑ No	☐ Off
L_{up} =	1395 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	199 veh/h	Freeway Volume, V_F	3302	V_D =	veh/h
		Ramp Volume, V_R	1215		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3302	0.92	Level	7	0	0.966	1.00	3715
Ramp	1215	0.92	Level	22	0	0.901	1.00	1466
UpStream	199	0.92	Level	14	0	0.935	1.00	231
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1193.33 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 2177 pc/h

V_3 or V_{av34} 1538 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2177 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5181	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3643	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 31.3 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.443 (Exibit 13-11)

S_R = 57.6 mph (Exhibit 13-11)

S_0 = 66.3 mph (Exhibit 13-11)

S = 59.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	EAPC (2017)

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1395 ft
V_u = veh/h	Deceleration Lane Length L_D: 280	V_D = 1215 veh/h
	Freeway Volume, V_F: 3501	
	Ramp Volume, V_R: 199	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3501	0.92	Level	7	0	0.966	1.00	3939
Ramp	199	0.92	Level	14	0	0.935	1.00	231
UpStream								
DownStream	1215	0.92	Level	22	0	0.901	1.00	1466

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.651 using Equation (Exhibit 13-7)

V_{12} = 2645 pc/h

V_3 or V_{av34} 1294 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3939	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3708	Exhibit 13-8	7200	No
V_R	231	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2645	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 24.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.319 (Exhibit 13-12)

S_R = 61.1 mph (Exhibit 13-12)

S_0 = 75.6 mph (Exhibit 13-12)

S = 65.2 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:16 AM

APPENDIX 7.6:

EAPC (2017) CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	21	8	534	45	17	8	5	487	8	6	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	25	8	636	54	20	10	6	207	10	7	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	274	1045	462	1013	1821	805	21	507	1765	21	1013	0
Arrive On Green	0.00	0.28	0.28	0.28	0.48	0.48	0.01	0.27	0.27	0.01	0.27	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1680	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	25	8	636	54	20	10	6	207	10	7	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1680	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	0.6	0.4	18.4	0.9	0.6	0.7	0.3	0.4	0.7	0.2	0.0
Cycle Q Clear(g_c), s	0.0	0.6	0.4	18.4	0.9	0.6	0.7	0.3	0.4	0.7	0.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	274	1045	462	1013	1821	805	21	507	1765	21	1013	0
V/C Ratio(X)	0.00	0.02	0.02	0.63	0.03	0.02	0.47	0.01	0.12	0.47	0.01	0.00
Avail Cap(c_a), veh/h	274	1045	462	1013	1821	805	83	507	1765	83	1013	0
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)	0.00	1.00	1.00	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	31.7	23.9	37.8	16.5	11.0	58.9	32.4	6.8	58.9	32.3	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.1	0.9	0.0	0.1	5.8	0.0	0.1	5.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.3	0.2	9.3	0.5	0.3	0.4	0.2	1.2	0.4	0.1	0.0
LnGrp Delay(d),s/veh	0.0	31.8	24.0	38.7	16.5	11.1	64.7	32.4	6.9	64.7	32.3	0.0
LnGrp LOS		C	C	D	B	B	E	C	A	E	C	
Approach Vol, veh/h		33			710			223			17	
Approach Delay, s/veh		29.9			36.2			10.2			51.4	
Approach LOS		C			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	38.1	38.5	5.9	37.5	13.6	63.0	5.9	37.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	29.5	33.0	5.5	32.0	5.0	57.5	5.5	32.0
Max Q Clear Time (g_c+I1), s	20.4	2.6	2.7	2.2	0.0	2.9	2.7	2.4
Green Ext Time (p_c), s	0.9	0.1	0.0	0.4	0.0	0.2	0.0	0.4

Intersection Summary	
HCM 2010 Ctrl Delay	30.4
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	479	37	250	262	0	0	0	0	1482	2	334
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	510	34	266	279	0				1850	0	0
Adj No. of Lanes	0	2	1	2	2	0				2	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	889	378	318	1365	0				1987	1043	0
Arrive On Green	0.00	0.08	0.08	0.18	0.72	0.00				0.55	0.00	0.00
Sat Flow, veh/h	0	3800	1615	3619	3800	0				3619	1900	0
Grp Volume(v), veh/h	0	510	34	266	279	0				1850	0	0
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	1900	0
Q Serve(g_s), s	0.0	15.6	2.3	8.5	2.9	0.0				56.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	15.6	2.3	8.5	2.9	0.0				56.6	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	889	378	318	1365	0				1987	1043	0
V/C Ratio(X)	0.00	0.57	0.09	0.84	0.20	0.00				0.93	0.00	0.00
Avail Cap(c_a), veh/h	0	889	378	335	1365	0				2187	1148	0
HCM Platoon Ratio	1.00	0.33	0.33	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.99	0.99	0.96	0.96	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	49.6	43.5	48.6	11.2	0.0				25.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	2.7	0.5	14.3	0.3	0.0				7.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	8.5	1.1	4.8	1.5	0.0				30.1	0.0	0.0
LnGrp Delay(d),s/veh	0.0	52.2	44.0	63.0	11.5	0.0				32.4	0.0	0.0
LnGrp LOS		D	D	E	B					C		
Approach Vol, veh/h		544			545						1850	
Approach Delay, s/veh		51.7			36.6						32.4	
Approach LOS		D			D						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.1	33.6		71.4		48.6		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	11.1	20.9		72.5		36.5		
Max Q Clear Time (g_c+I1), s	10.5	17.6		58.6		4.9		
Green Ext Time (p_c), s	0.0	1.2		7.3		3.3		

Intersection Summary	
HCM 2010 Ctrl Delay	36.8
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	282	1679	0	0	440	632	73	0	398	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	307	1825	0	0	478	0	79	0	347			
Adj No. of Lanes	2	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	418	2217	0	0	1556	661	452	0	404			
Arrive On Green	0.15	0.78	0.00	0.00	0.41	0.00	0.25	0.00	0.25			
Sat Flow, veh/h	3619	3800	0	0	3800	1615	1810	0	1615			
Grp Volume(v), veh/h	307	1825	0	0	478	0	79	0	347			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	4.9	17.9	0.0	0.0	5.1	0.0	2.1	0.0	12.3			
Cycle Q Clear(g_c), s	4.9	17.9	0.0	0.0	5.1	0.0	2.1	0.0	12.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	418	2217	0	0	1556	661	452	0	404			
V/C Ratio(X)	0.74	0.82	0.00	0.00	0.31	0.00	0.17	0.00	0.86			
Avail Cap(c_a), veh/h	513	2217	0	0	1556	661	452	0	404			
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.46	0.46	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	24.5	4.8	0.0	0.0	12.0	0.0	17.6	0.0	21.5			
Incr Delay (d2), s/veh	1.4	1.7	0.0	0.0	0.5	0.0	0.8	0.0	20.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.5	9.3	0.0	0.0	2.8	0.0	1.1	0.0	7.8			
LnGrp Delay(d),s/veh	25.9	6.5	0.0	0.0	12.5	0.0	18.5	0.0	42.1			
LnGrp LOS	C	A			B		B		D			
Approach Vol, veh/h		2132			478			426				
Approach Delay, s/veh		9.3			12.5			37.7				
Approach LOS		A			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		40.0			10.4	29.6		20.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		35.0			8.5	23.0		15.0
Max Q Clear Time (g_c+I1), s		19.9			6.9	7.1		14.3
Green Ext Time (p_c), s		9.7			0.1	10.1		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	13.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	50	12	518	37	6	5	6	665	9	9	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	0	52	9	534	38	6	5	6	401	9	9	0
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	278	1077	476	986	1821	804	12	507	1742	20	1030	0
Arrive On Green	0.00	0.28	0.28	0.27	0.48	0.48	0.01	0.27	0.27	0.01	0.27	0.00
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	3800	0
Grp Volume(v), veh/h	0	52	9	534	38	6	5	6	401	9	9	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	0
Q Serve(g_s), s	0.0	1.2	0.4	15.1	0.6	0.2	0.3	0.3	0.8	0.6	0.2	0.0
Cycle Q Clear(g_c), s	0.0	1.2	0.4	15.1	0.6	0.2	0.3	0.3	0.8	0.6	0.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	278	1077	476	986	1821	804	12	507	1742	20	1030	0
V/C Ratio(X)	0.00	0.05	0.02	0.54	0.02	0.01	0.43	0.01	0.23	0.46	0.01	0.00
Avail Cap(c_a), veh/h	278	1077	476	986	1821	804	83	507	1742	83	1030	0
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)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	31.2	23.7	37.2	16.4	11.0	59.4	32.4	7.6	59.0	32.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.3	0.0	0.0	9.2	0.0	0.3	6.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.6	0.2	7.6	0.3	0.1	0.2	0.2	2.5	0.3	0.1	0.0
LnGrp Delay(d),s/veh	0.0	31.3	23.8	37.6	16.5	11.0	68.6	32.4	7.9	65.2	32.0	0.0
LnGrp LOS		C	C	D	B	B	E	C	A	E	C	
Approach Vol, veh/h		61			578			412			18	
Approach Delay, s/veh		30.2			35.9			9.0			48.6	
Approach LOS		C			D			A			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	37.2	39.5	5.3	38.0	13.7	63.0	5.8	37.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	28.5	34.0	5.5	32.0	5.0	57.5	5.5	32.0
Max Q Clear Time (g_c+I1), s	17.1	3.2	2.3	2.2	0.0	2.6	2.6	2.8
Green Ext Time (p_c), s	0.8	0.2	0.0	0.9	0.0	0.1	0.0	0.9

Intersection Summary	
HCM 2010 Ctrl Delay	25.4
HCM 2010 LOS	C

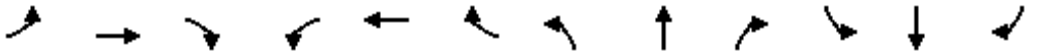
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	635	89	621	186	0	0	0	0	793	2	375
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	676	95	661	198	0				584	366	322
Adj No. of Lanes	0	2	1	2	2	0				1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	871	370	804	1889	0				744	384	338
Arrive On Green	0.00	0.08	0.08	0.37	0.83	0.00				0.41	0.41	0.41
Sat Flow, veh/h	0	3800	1615	3619	3800	0				1810	934	821
Grp Volume(v), veh/h	0	676	95	661	198	0				584	0	688
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1755
Q Serve(g_s), s	0.0	21.0	6.7	19.8	1.2	0.0				33.7	0.0	45.6
Cycle Q Clear(g_c), s	0.0	21.0	6.7	19.8	1.2	0.0				33.7	0.0	45.6
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.47
Lane Grp Cap(c), veh/h	0	871	370	804	1889	0				744	0	722
V/C Ratio(X)	0.00	0.78	0.26	0.82	0.10	0.00				0.78	0.00	0.95
Avail Cap(c_a), veh/h	0	871	370	804	1889	0				762	0	739
HCM Platoon Ratio	1.00	0.33	0.33	1.67	1.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.98	0.98	0.90	0.90	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	52.4	45.8	35.6	5.2	0.0				30.7	0.0	34.2
Incr Delay (d2), s/veh	0.0	6.6	1.6	5.8	0.1	0.0				5.3	0.0	22.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.8	3.2	10.4	0.6	0.0				17.8	0.0	26.4
LnGrp Delay(d),s/veh	0.0	59.0	47.5	41.4	5.3	0.0				36.0	0.0	56.3
LnGrp LOS		E	D	D	A					D		E
Approach Vol, veh/h		771			859						1272	
Approach Delay, s/veh		57.6			33.1						47.0	
Approach LOS		E			C						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	32.2	33.0		54.8		65.2		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	26.5	* 28		50.5		58.5		
Max Q Clear Time (g_c+I1), s	21.8	23.0		47.6		3.2		
Green Ext Time (p_c), s	1.1	1.3		1.8		2.0		

Intersection Summary	
HCM 2010 Ctrl Delay	45.7
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	457	970	0	0	763	1471	43	1	215	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	513	1090	0	0	857	0	48	1	133			
Adj No. of Lanes	2	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	594	2692	0	0	1957	832	370	8	336			
Arrive On Green	0.05	0.23	0.00	0.00	0.52	0.00	0.21	0.21	0.21			
Sat Flow, veh/h	3619	3800	0	0	3800	1615	1774	37	1615			
Grp Volume(v), veh/h	513	1090	0	0	857	0	49	0	133			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1811	0	1615			
Q Serve(g_s), s	16.9	29.1	0.0	0.0	16.9	0.0	2.6	0.0	8.5			
Cycle Q Clear(g_c), s	16.9	29.1	0.0	0.0	16.9	0.0	2.6	0.0	8.5			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	594	2692	0	0	1957	832	377	0	336			
V/C Ratio(X)	0.86	0.40	0.00	0.00	0.44	0.00	0.13	0.00	0.40			
Avail Cap(c_a), veh/h	950	2692	0	0	1957	832	377	0	336			
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.53	0.53	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	55.4	24.6	0.0	0.0	18.2	0.0	38.6	0.0	41.0			
Incr Delay (d2), s/veh	1.5	0.2	0.0	0.0	0.7	0.0	0.7	0.0	3.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	8.6	15.5	0.0	0.0	9.0	0.0	1.4	0.0	4.1			
LnGrp Delay(d),s/veh	57.0	24.8	0.0	0.0	18.9	0.0	39.4	0.0	44.4			
LnGrp LOS	E	C			B		D		D			
Approach Vol, veh/h		1603			857			182				
Approach Delay, s/veh		35.1			18.9			43.1				
Approach LOS		D			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		90.0			23.2	66.8		30.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		85.0			31.5	50.0		25.0
Max Q Clear Time (g_c+I1), s		31.1			18.9	18.9		10.5
Green Ext Time (p_c), s		11.7			0.8	10.6		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	30.4
HCM 2010 LOS	C

APPENDIX 7.7:

EAPC (2017) CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	510	39	266	279	994	940
v/c Ratio	0.71	0.09	0.78	0.23	0.89	0.82
Control Delay	52.7	4.4	56.5	35.7	32.0	25.7
Queue Delay	0.0	0.0	0.0	0.0	48.4	49.3
Total Delay	52.7	4.4	56.5	35.7	80.4	75.0
Queue Length 50th (ft)	192	1	102	94	602	507
Queue Length 95th (ft)	251	12	#154	134	#845	708
Internal Link Dist (ft)	844			267		1109
Turn Bay Length (ft)		100	80			
Base Capacity (vph)	720	411	354	1206	1147	1166
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	321	321
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.09	0.75	0.23	1.20	1.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	307	1825	478	687	79	433
v/c Ratio	0.60	0.82	0.32	0.36	0.17	0.79
Control Delay	18.5	16.0	13.6	0.5	18.8	28.8
Queue Delay	0.0	6.0	0.0	0.0	0.0	0.0
Total Delay	18.5	21.9	13.6	0.5	18.8	28.8
Queue Length 50th (ft)	55	452	59	0	22	111
Queue Length 95th (ft)	53	529	89	0	52	#246
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	538	2216	1487	1900	475	550
Starvation Cap Reductn	0	346	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.98	0.32	0.36	0.17	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	676	95	661	198	650	595
v/c Ratio	0.68	0.17	0.79	0.10	0.88	0.74
Control Delay	46.7	14.7	85.9	30.8	47.8	31.2
Queue Delay	0.0	0.0	51.0	0.0	0.0	0.0
Total Delay	46.7	14.7	136.9	30.8	47.8	31.2
Queue Length 50th (ft)	248	15	274	64	442	313
Queue Length 95th (ft)	316	58	333	98	599	445
Internal Link Dist (ft)	844			267		1109
Turn Bay Length (ft)		100	80			
Base Capacity (vph)	987	547	839	1969	799	860
Starvation Cap Reductn	0	0	240	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.17	1.10	0.10	0.81	0.69

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	513	1090	857	1653	49	242
v/c Ratio	0.79	0.41	0.44	0.88	0.12	0.48
Control Delay	35.4	5.5	20.3	6.8	39.7	20.2
Queue Delay	0.2	0.6	0.4	0.0	0.0	0.0
Total Delay	35.6	6.2	20.7	6.8	39.7	20.2
Queue Length 50th (ft)	188	106	204	0	31	64
Queue Length 95th (ft)	208	131	273	0	65	140
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	997	2691	1927	1877	395	509
Starvation Cap Reductn	107	1122	0	0	0	0
Spillback Cap Reductn	0	0	565	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.69	0.63	0.88	0.12	0.48

Intersection Summary

APPENDIX 8.1:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	207	50	50	284	25	25	830	25	25	91	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	27	225	54	54	309	27	27	902	27	27	99	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1305	1151	113	1277	1150	916	126	0	0	929	0	0
Stage 1	167	167	-	970	970	-	-	-	-	-	-	-
Stage 2	1138	984	-	307	180	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	138	~ 200	945	145	~ 200	333	1473	-	-	744	-	-
Stage 1	840	764	-	307	334	-	-	-	-	-	-	-
Stage 2	247	329	-	707	754	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 185	945	-	~ 185	333	1473	-	-	744	-	-
Mov Cap-2 Maneuver	-	~ 185	-	-	~ 185	-	-	-	-	-	-	-
Stage 1	808	734	-	295	321	-	-	-	-	-	-	-
Stage 2	~ 8	316	-	444	725	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.2	1.8
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	-	219	-	192	744	-	-
HCM Lane V/C Ratio	0.018	-	-	-	1.276	-	1.749	0.037	-	-
HCM Control Delay (s)	7.5	0	-	-	198.7	-	$ 400.2	10	0	-
HCM Lane LOS	A	A	-	-	F	-	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	-	14.7	-	23.4	0.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	257	359	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	384	536	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	536	0	-	0	920	536
Stage 1	-	-	-	-	536	-
Stage 2	-	-	-	-	384	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1042	-	-	-	303	549
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	693	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1042	-	-	-	303	549
Mov Cap-2 Maneuver	-	-	-	-	496	-
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	693	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1042	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	201	11	558	499	49	17	6	719	56	7	12
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	5	239	9	664	594	58	20	7	527	67	8	14
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	24	1300	575	891	2251	994	39	640	1088	87	690	586
Arrive On Green	0.01	0.34	0.34	0.25	0.59	0.59	0.02	0.34	0.34	0.05	0.36	0.36
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	1900	1614
Grp Volume(v), veh/h	5	239	9	664	594	58	20	7	527	67	8	14
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	1614
Q Serve(g_s), s	0.1	4.2	0.4	16.1	7.2	1.4	1.0	0.2	9.2	3.5	0.3	0.5
Cycle Q Clear(g_c), s	0.1	4.2	0.4	16.1	7.2	1.4	1.0	0.2	9.2	3.5	0.3	0.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	24	1300	575	891	2251	994	39	640	1088	87	690	586
V/C Ratio(X)	0.21	0.18	0.02	0.75	0.26	0.06	0.51	0.01	0.48	0.77	0.01	0.02
Avail Cap(c_a), veh/h	190	1300	575	891	2251	994	95	640	1088	95	690	586
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	0.86	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.9	21.9	25.1	33.0	9.4	8.2	46.0	21.0	13.9	44.7	19.4	19.4
Incr Delay (d2), s/veh	1.6	0.3	0.0	2.6	0.2	0.1	3.8	0.0	1.5	25.9	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	2.2	0.2	8.3	3.8	0.7	0.6	0.1	4.3	2.4	0.1	0.2
LnGrp Delay(d),s/veh	48.6	22.3	25.2	35.7	9.6	8.3	49.8	21.0	15.5	70.6	19.4	19.5
LnGrp LOS	D	C	C	D	A	A	D	C	B	E	B	B
Approach Vol, veh/h		253			1316			554			89	
Approach Delay, s/veh		22.9			22.7			16.8			57.9	
Approach LOS		C			C			B			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	29.4	38.0	6.6	40.0	5.1	62.3	9.0	37.5
Change Period (Y+Rc), s	5.5	* 5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.5	* 33	5.0	32.0	5.0	33.0	5.0	32.0
Max Q Clear Time (g_c+I1), s	18.1	6.2	3.0	2.5	2.1	9.2	5.5	11.2
Green Ext Time (p_c), s	0.0	0.9	0.0	1.2	0.0	3.8	0.0	1.2

Intersection Summary	
HCM 2010 Ctrl Delay	22.7
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	131	10	117	10	10	10	211	641	11	11	454	138
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	158	12	141	12	12	12	254	772	13	13	547	166
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	195	20	231	26	43	43	280	2300	39	27	1814	770
Arrive On Green	0.11	0.15	0.15	0.01	0.05	0.05	0.16	0.62	0.62	0.02	0.48	0.48
Sat Flow, veh/h	1810	128	1506	1810	873	873	1810	3726	63	1810	3800	1613
Grp Volume(v), veh/h	158	0	153	12	0	24	254	394	391	13	547	166
Grp Sat Flow(s),veh/h/ln	1810	0	1634	1810	0	1746	1810	1900	1889	1810	1900	1613
Q Serve(g_s), s	8.5	0.0	8.7	0.7	0.0	1.3	13.8	10.0	10.0	0.7	8.8	3.5
Cycle Q Clear(g_c), s	8.5	0.0	8.7	0.7	0.0	1.3	13.8	10.0	10.0	0.7	8.8	3.5
Prop In Lane	1.00		0.92	1.00		0.50	1.00		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	195	0	251	26	0	87	280	1173	1166	27	1814	770
V/C Ratio(X)	0.81	0.00	0.61	0.47	0.00	0.28	0.91	0.34	0.34	0.47	0.30	0.22
Avail Cap(c_a), veh/h	279	0	523	90	0	377	280	1173	1166	90	1814	770
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.6	0.0	39.5	48.9	0.0	45.8	41.5	9.2	9.2	48.8	16.0	5.2
Incr Delay (d2), s/veh	7.4	0.0	0.9	4.9	0.0	0.6	29.9	0.8	0.8	4.7	0.4	0.6
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	4.7	0.0	4.0	0.4	0.0	0.7	9.2	5.5	5.5	0.4	4.7	1.7
LnGrp Delay(d),s/veh	51.0	0.0	40.4	53.8	0.0	46.4	71.4	10.0	10.0	53.5	16.4	5.8
LnGrp LOS	D		D	D		D	E	B	B	D	B	A
Approach Vol, veh/h		311			36			1039			726	
Approach Delay, s/veh		45.8			48.9			25.0			14.6	
Approach LOS		D			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.0	67.2	5.9	20.8	20.0	53.2	16.3	10.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	5.0	38.0	5.0	32.0	15.5	27.5	15.4	* 22
Max Q Clear Time (g_c+I1), s	2.7	12.0	2.7	10.7	15.8	10.8	10.5	3.3
Green Ext Time (p_c), s	0.0	5.4	0.0	0.8	0.0	4.8	0.4	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	24.9
HCM 2010 LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	846	130	239	476	0	0	0	0	1449	2	630
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	900	138	254	506	0				1541	2	593
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	839	357	671	2422	0				1002	1	895
Arrive On Green	0.00	0.22	0.22	0.12	0.21	0.00				0.55	0.55	0.55
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1807	2	1615
Grp Volume(v), veh/h	0	900	138	254	506	0				1543	0	593
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	26.5	8.7	15.5	13.2	0.0				66.5	0.0	31.0
Cycle Q Clear(g_c), s	0.0	26.5	8.7	15.5	13.2	0.0				66.5	0.0	31.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	839	357	671	2423	0				1003	0	895
V/C Ratio(X)	0.00	1.07	0.39	0.38	0.21	0.00				1.54	0.00	0.66
Avail Cap(c_a), veh/h	0	839	357	671	2423	0				1003	0	895
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.92	0.92	0.75	0.75	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	46.7	39.8	39.9	22.4	0.0				26.8	0.0	18.8
Incr Delay (d2), s/veh	0.0	51.2	2.9	0.1	0.1	0.0				247.4	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	19.8	4.2	7.8	7.0	0.0				101.8	0.0	14.1
LnGrp Delay(d),s/veh	0.0	97.9	42.7	40.0	22.5	0.0				274.2	0.0	20.7
LnGrp LOS		F	D	D	C					F		C
Approach Vol, veh/h		1038			760						2136	
Approach Delay, s/veh		90.6			28.4						203.8	
Approach LOS		F			C						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	51.0	32.0		72.0		83.0		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	11.5	* 27		66.5		42.5		
Max Q Clear Time (g_c+I1), s	17.5	28.5		68.5		15.2		
Green Ext Time (p_c), s	0.0	0.0		0.0		2.3		

Intersection Summary	
HCM 2010 Ctrl Delay	140.0
HCM 2010 LOS	F

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	553	1742	0	0	580	628	135	0	426	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	601	1893	0	0	630	659	147	0	358			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	637	2509	0	0	1013	430	467	0	417			
Arrive On Green	0.70	1.00	0.00	0.00	0.27	0.27	0.26	0.00	0.26			
Sat Flow, veh/h	1810	3800	0	0	3800	1613	1810	0	1615			
Grp Volume(v), veh/h	601	1893	0	0	630	659	147	0	358			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1613	1810	0	1615			
Q Serve(g_s), s	35.2	0.0	0.0	0.0	17.5	32.0	7.9	0.0	25.3			
Cycle Q Clear(g_c), s	35.2	0.0	0.0	0.0	17.5	32.0	7.9	0.0	25.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	637	2509	0	0	1013	430	467	0	417			
V/C Ratio(X)	0.94	0.75	0.00	0.00	0.62	1.53	0.31	0.00	0.86			
Avail Cap(c_a), veh/h	656	2509	0	0	1013	430	467	0	417			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	16.7	0.0	0.0	0.0	38.7	44.0	35.9	0.0	42.4			
Incr Delay (d2), s/veh	3.2	0.2	0.0	0.0	2.9	250.9	1.8	0.0	19.9			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	17.6	0.1	0.0	0.0	9.6	44.2	4.1	0.0	13.6			
LnGrp Delay(d),s/veh	19.9	0.2	0.0	0.0	41.6	294.9	37.7	0.0	62.3			
LnGrp LOS	B	A			D	F	D		E			
Approach Vol, veh/h		2494			1289			505				
Approach Delay, s/veh		5.0			171.1			55.1				
Approach LOS		A			F			E				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		84.2			47.2	37.0		36.0
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0
Max Green Setting (Gmax), s		79.0			43.5	* 32		31.0
Max Q Clear Time (g_c+I1), s		2.0			37.2	34.0		27.3
Green Ext Time (p_c), s		17.0			4.8	0.0		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	60.8
HCM 2010 LOS	E

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	397	50	50	311	25	25	251	25	25	790	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	27	432	54	54	338	27	27	273	27	27	859	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1450	1281	872	1511	1281	286	886	0	0	300	0	0
Stage 1	927	927	-	341	341	-	-	-	-	-	-	-
Stage 2	523	354	-	1170	940	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	110	~ 167	353	100	~ 167	758	773	-	-	1273	-	-
Stage 1	324	~ 350	-	678	642	-	-	-	-	-	-	-
Stage 2	541	634	-	237	345	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 153	353	-	~ 153	758	773	-	-	1273	-	-
Mov Cap-2 Maneuver	-	~ 153	-	-	~ 153	-	-	-	-	-	-	-
Stage 1	310	~ 335	-	650	615	-	-	-	-	-	-	-
Stage 2	225	607	-	-	~ 331	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.8	0.2
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	773	-	-	-	163	-	163	1273	-	-
HCM Lane V/C Ratio	0.035	-	-	-	2.981	-	2.241	0.021	-	-
HCM Control Delay (s)	9.8	0	-	-$	950.5	-$	622.7	7.9	0	-
HCM Lane LOS	A	A	-	-	F	-	F	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	-	44.5	-	29.9	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	447	386	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	667	576	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	576	0	-	0	1243	576
Stage 1	-	-	-	-	576	-
Stage 2	-	-	-	-	667	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1007	-	-	-	194	521
Stage 1	-	-	-	-	566	-
Stage 2	-	-	-	-	514	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1007	-	-	-	194	521
Mov Cap-2 Maneuver	-	-	-	-	401	-
Stage 1	-	-	-	-	566	-
Stage 2	-	-	-	-	514	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1007	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	497	143	740	661	572	406	248	149	793	10	331	128
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	512	147	760	681	590	419	256	154	533	10	341	132
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	190	1300	575	2724	4000	1767	95	737	1253	22	884	336
Arrive On Green	0.05	0.34	0.34	0.75	1.00	1.00	0.05	0.39	0.39	0.01	0.34	0.34
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	2625	998
Grp Volume(v), veh/h	512	147	760	681	590	419	256	154	533	10	245	228
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	1723
Q Serve(g_s), s	5.0	2.5	32.5	5.4	0.0	0.0	5.0	5.1	8.6	0.5	9.3	9.6
Cycle Q Clear(g_c), s	5.0	2.5	32.5	5.4	0.0	0.0	5.0	5.1	8.6	0.5	9.3	9.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.58
Lane Grp Cap(c), veh/h	190	1300	575	2724	4000	1767	95	737	1253	22	640	580
V/C Ratio(X)	2.69	0.11	1.32	0.25	0.15	0.24	2.69	0.21	0.43	0.45	0.38	0.39
Avail Cap(c_a), veh/h	190	1300	575	2724	4000	1767	95	737	1253	95	640	580
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	0.66	0.66	0.66	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.0	21.4	31.2	3.6	0.0	0.0	45.0	19.4	12.0	46.6	24.0	24.1
Incr Delay (d2), s/veh	774.4	0.2	157.1	0.0	0.1	0.2	788.6	0.6	1.1	5.3	1.7	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	23.0	1.3	40.0	2.7	0.0	0.1	23.3	2.8	4.0	0.3	5.2	4.9
LnGrp Delay(d),s/veh	819.4	21.6	188.3	3.6	0.1	0.2	833.6	20.0	13.1	51.9	25.7	26.1
LnGrp LOS	F	C	F	A	A	A	F	C	B	D	C	C
Approach Vol, veh/h		1419			1690			943			483	
Approach Delay, s/veh		398.7			1.5			237.0			26.4	
Approach LOS		F			A			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	79.0	38.0	10.5	37.5	9.5	107.5	5.7	42.3
Change Period (Y+Rc), s	5.5	* 5.5	5.5	* 5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.5	* 33	5.0	* 32	5.0	33.0	5.0	32.0
Max Q Clear Time (g_c+I1), s	7.4	34.5	7.0	11.6	7.0	2.0	2.5	10.6
Green Ext Time (p_c), s	0.0	0.0	0.0	1.5	0.0	4.8	0.0	1.9

Intersection Summary	
HCM 2010 Ctrl Delay	177.4
HCM 2010 LOS	F

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	230	10	207	10	10	10	100	983	10	10	1479	276
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	242	11	218	11	11	11	105	1035	11	11	1557	291
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	281	16	323	24	48	48	101	2036	22	24	1901	807
Arrive On Green	0.16	0.21	0.21	0.01	0.06	0.06	0.06	0.54	0.54	0.01	0.50	0.50
Sat Flow, veh/h	1810	78	1549	1810	873	873	1810	3753	40	1810	3800	1613
Grp Volume(v), veh/h	242	0	229	11	0	22	105	524	522	11	1557	291
Grp Sat Flow(s),veh/h/ln	1810	0	1627	1810	0	1746	1810	1900	1893	1810	1900	1613
Q Serve(g_s), s	11.7	0.0	11.7	0.5	0.0	1.1	5.0	15.7	15.7	0.5	31.2	4.4
Cycle Q Clear(g_c), s	11.7	0.0	11.7	0.5	0.0	1.1	5.0	15.7	15.7	0.5	31.2	4.4
Prop In Lane	1.00		0.95	1.00		0.50	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	281	0	339	24	0	97	101	1031	1027	24	1901	807
V/C Ratio(X)	0.86	0.00	0.67	0.46	0.00	0.23	1.04	0.51	0.51	0.46	0.82	0.36
Avail Cap(c_a), veh/h	310	0	578	101	0	419	101	1031	1027	101	1901	807
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.1	0.0	32.8	44.1	0.0	40.7	42.5	13.0	13.0	44.1	19.0	2.7
Incr Delay (d2), s/veh	18.3	0.0	0.9	4.9	0.0	0.4	102.3	1.8	1.8	4.9	4.1	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.3	0.0	5.3	0.3	0.0	0.5	5.3	8.7	8.6	0.3	17.3	2.2
LnGrp Delay(d),s/veh	55.4	0.0	33.7	49.0	0.0	41.1	145.5	14.8	14.8	49.0	23.1	4.0
LnGrp LOS	E		C	D		D	F	B	B	D	C	A
Approach Vol, veh/h		471			33			1151			1859	
Approach Delay, s/veh		44.8			43.7			26.7			20.3	
Approach LOS		D			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.7	54.3	5.7	24.3	9.5	50.5	19.5	10.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	15.4	* 22
Max Q Clear Time (g_c+I1), s	2.5	17.7	2.5	13.7	7.0	33.2	13.7	3.1
Green Ext Time (p_c), s	0.0	7.7	0.0	1.2	0.0	0.0	0.3	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	25.9
HCM 2010 LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	784	163	666	932	0	0	0	0	796	2	707
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	834	173	709	991	0				847	2	675
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	681	289	550	1979	0				700	2	626
Arrive On Green	0.00	0.18	0.18	0.10	0.17	0.00				0.39	0.39	0.39
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1805	4	1615
Grp Volume(v), veh/h	0	834	173	709	991	0				849	0	675
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	21.5	11.8	36.5	28.4	0.0				46.5	0.0	46.5
Cycle Q Clear(g_c), s	0.0	21.5	11.8	36.5	28.4	0.0				46.5	0.0	46.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	681	289	550	1979	0				701	0	626
V/C Ratio(X)	0.00	1.22	0.60	1.29	0.50	0.00				1.21	0.00	1.08
Avail Cap(c_a), veh/h	0	681	289	550	1979	0				701	0	626
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.94	0.94	0.71	0.71	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	49.3	45.3	54.0	35.5	0.0				36.8	0.0	36.8
Incr Delay (d2), s/veh	0.0	113.4	8.4	139.4	0.6	0.0				107.8	0.0	59.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	22.0	6.0	39.6	15.1	0.0				44.2	0.0	30.9
LnGrp Delay(d),s/veh	0.0	162.6	53.6	193.4	36.2	0.0				144.5	0.0	95.8
LnGrp LOS		F	D	F	D					F		F
Approach Vol, veh/h		1007			1700						1524	
Approach Delay, s/veh		143.9			101.7						122.9	
Approach LOS		F			F						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	41.0	27.0		52.0		68.0		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	36.5	21.5		46.5		62.5		
Max Q Clear Time (g_c+I1), s	38.5	23.5		48.5		30.4		
Green Ext Time (p_c), s	0.0	0.0		0.0		10.2		

Intersection Summary	
HCM 2010 Ctrl Delay	119.4
HCM 2010 LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	587	992	0	0	1245	1555	353	3	227	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	660	1115	0	0	1399	1722	397	3	146			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	354	3008	0	0	2153	915	225	2	202			
Arrive On Green	0.39	1.00	0.00	0.00	0.57	0.57	0.13	0.13	0.13			
Sat Flow, veh/h	1810	3800	0	0	3800	1614	1797	14	1615			
Grp Volume(v), veh/h	660	1115	0	0	1399	1722	400	0	146			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1614	1810	0	1615			
Q Serve(g_s), s	23.5	0.0	0.0	0.0	30.3	68.0	15.0	0.0	10.4			
Cycle Q Clear(g_c), s	23.5	0.0	0.0	0.0	30.3	68.0	15.0	0.0	10.4			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	354	3008	0	0	2153	915	226	0	202			
V/C Ratio(X)	1.86	0.37	0.00	0.00	0.65	1.88	1.77	0.00	0.72			
Avail Cap(c_a), veh/h	354	3008	0	0	2153	915	226	0	202			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	36.5	0.0	0.0	0.0	17.8	26.0	52.5	0.0	50.5			
Incr Delay (d2), s/veh	389.1	0.0	0.0	0.0	1.5	401.3	362.9	0.0	20.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	49.9	0.0	0.0	0.0	16.2	132.0	30.3	0.0	5.8			
LnGrp Delay(d),s/veh	425.6	0.0	0.0	0.0	19.4	427.3	415.4	0.0	70.6			
LnGrp LOS	F	A			B	F	F		E			
Approach Vol, veh/h		1775			3121			546				
Approach Delay, s/veh		158.3			244.5			323.2				
Approach LOS		F			F			F				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		100.0			27.0	73.0		20.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		95.0			23.5	68.0		15.0
Max Q Clear Time (g_c+I1), s		2.0			25.5	70.0		17.0
Green Ext Time (p_c), s		61.0			0.0	0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	224.3
HCM 2010 LOS	F

APPENDIX 8.2:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	282	0	16	334	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	307	0	17	363	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	307	0	705	307
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	398	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1265	-	406	738
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	683	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1265	-	401	738
Mov Cap-2 Maneuver	-	-	-	-	574	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	674	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	738	-	-	1265	-
HCM Lane V/C Ratio	0.01	-	-	0.014	-
HCM Control Delay (s)	9.9	-	-	7.9	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	289	0	28	350	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	314	0	30	380	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	314	0	755	314
Stage 1	-	-	-	-	314	-
Stage 2	-	-	-	-	441	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1258	-	379	731
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	653	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1258	-	370	731
Mov Cap-2 Maneuver	-	-	-	-	547	-
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	637	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	731	-	-	1258	-
HCM Lane V/C Ratio	0.018	-	-	0.024	-
HCM Control Delay (s)	10	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	302	0	23	378	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	328	0	25	411	0	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	328	0	789	328
Stage 1	-	-	-	-	328	-
Stage 2	-	-	-	-	461	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1243	-	362	718
Stage 1	-	-	-	-	734	-
Stage 2	-	-	-	-	639	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1243	-	355	718
Mov Cap-2 Maneuver	-	-	-	-	535	-
Stage 1	-	-	-	-	734	-
Stage 2	-	-	-	-	626	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	718	-	-	1243	-
HCM Lane V/C Ratio	0.015	-	-	0.02	-
HCM Control Delay (s)	10.1	-	-	8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	237	50	50	351	25	25	830	25	25	91	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	27	258	54	54	382	27	27	902	27	27	99	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1341	1151	113	1293	1150	916	126	0	0	929	0	0
Stage 1	167	167	-	970	970	-	-	-	-	-	-	-
Stage 2	1174	984	-	323	180	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	131	~ 200	945	141	~ 200	333	1473	-	-	744	-	-
Stage 1	840	764	-	307	~ 334	-	-	-	-	-	-	-
Stage 2	236	329	-	693	754	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 185	945	-	~ 185	333	1473	-	-	744	-	-
Mov Cap-2 Maneuver	-	~ 185	-	-	~ 185	-	-	-	-	-	-	-
Stage 1	808	734	-	295	~ 321	-	-	-	-	-	-	-
Stage 2	-	316	-	407	725	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.2	1.8
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	-	215	-	191	744	-	-
HCM Lane V/C Ratio	0.018	-	-	-	1.451	-	2.14	0.037	-	-
HCM Control Delay (s)	7.5	0	-	-	268.9	-	$ 570	10	0	-
HCM Lane LOS	A	A	-	-	F	-	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	-	18.5	-	32	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	287	0	16	426	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	312	0	17	463	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	312	0	810	312
Stage 1	-	-	-	-	312	-
Stage 2	-	-	-	-	498	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1260	-	352	733
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	615	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1260	-	347	733
Mov Cap-2 Maneuver	-	-	-	-	526	-
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	607	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	733	-	-	1260	-
HCM Lane V/C Ratio	0.01	-	-	0.014	-
HCM Control Delay (s)	10	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	294	0	21	442	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	320	0	23	480	0	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	320	0	846	320
Stage 1	-	-	-	-	320	-
Stage 2	-	-	-	-	526	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1251	-	335	725
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	597	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1251	-	329	725
Mov Cap-2 Maneuver	-	-	-	-	509	-
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	586	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	725	-	-	1251	-
HCM Lane V/C Ratio	0.013	-	-	0.018	-
HCM Control Delay (s)	10	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

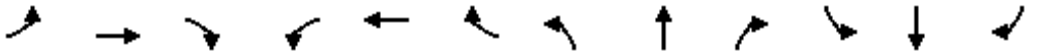
Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	304	0	30	463	0	0	0	13	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	3	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	454	0	45	691	0	0	0	19	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	691	0	0	454	0	0	1235	1235	457	1244	1235	691
Stage 1	-	-	-	-	-	-	454	454	-	781	781	-
Stage 2	-	-	-	-	-	-	781	781	-	463	454	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	913	-	-	1117	-	-	155	178	608	152	178	448
Stage 1	-	-	-	-	-	-	589	573	-	391	408	-
Stage 2	-	-	-	-	-	-	391	408	-	583	573	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	913	-	-	1114	-	-	150	171	606	142	171	448
Mov Cap-2 Maneuver	-	-	-	-	-	-	324	338	-	322	332	-
Stage 1	-	-	-	-	-	-	589	573	-	391	392	-
Stage 2	-	-	-	-	-	-	375	392	-	563	573	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	11.1	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	606	913	-	-	1114	-	-	-
HCM Lane V/C Ratio	0.032	-	-	-	0.04	-	-	-
HCM Control Delay (s)	11.1	0	-	-	8.4	-	-	0
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	201	11	675	499	49	17	6	771	56	7	12
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	5	239	11	804	594	58	20	7	545	67	8	14
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	23	1176	520	534	1713	757	38	579	984	86	630	535
Arrive On Green	0.01	0.31	0.31	0.15	0.45	0.45	0.02	0.30	0.30	0.05	0.33	0.33
Sat Flow, veh/h	3619	3800	1680	3619	3800	1680	1810	1900	3230	1810	1900	1615
Grp Volume(v), veh/h	5	239	11	804	594	58	20	7	545	67	8	14
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1680	1810	1900	1615	1810	1900	1615
Q Serve(g_s), s	0.1	4.9	0.5	15.5	10.7	2.1	1.1	0.3	14.8	3.8	0.3	0.6
Cycle Q Clear(g_c), s	0.1	4.9	0.5	15.5	10.7	2.1	1.1	0.3	14.8	3.8	0.3	0.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	23	1176	520	534	1713	757	38	579	984	86	630	535
V/C Ratio(X)	0.21	0.20	0.02	1.50	0.35	0.08	0.53	0.01	0.55	0.78	0.01	0.03
Avail Cap(c_a), veh/h	172	1176	520	534	1713	757	86	579	984	86	630	535
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	0.81	0.81	0.81	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.9	26.7	25.2	44.7	18.8	16.4	50.9	25.5	30.5	49.4	23.6	23.7
Incr Delay (d2), s/veh	1.7	0.4	0.1	235.0	0.4	0.2	4.1	0.0	2.2	32.6	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	2.6	0.2	25.2	5.7	1.0	0.6	0.1	6.9	2.7	0.2	0.3
LnGrp Delay(d),s/veh	53.6	27.1	25.3	279.8	19.2	16.6	55.0	25.5	32.8	82.0	23.6	23.8
LnGrp LOS	D	C	C	F	B	B	D	C	C	F	C	C
Approach Vol, veh/h		255			1456			572			89	
Approach Delay, s/veh		27.5			163.0			33.5			67.6	
Approach LOS		C			F			C			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.0	38.0	6.7	40.3	5.2	52.8	9.5	37.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	15.5	32.5	5.0	32.0	5.0	43.0	5.0	32.0
Max Q Clear Time (g_c+I1), s	17.5	6.9	3.1	2.6	2.1	12.7	5.8	16.8
Green Ext Time (p_c), s	0.0	3.5	0.0	1.2	0.0	3.5	0.0	1.2

Intersection Summary	
HCM 2010 Ctrl Delay	113.6
HCM 2010 LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	183	10	125	10	10	10	228	641	11	11	454	255
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	220	12	150	12	12	12	275	772	13	13	547	307
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	254	21	266	26	43	43	280	2216	37	27	1729	735
Arrive On Green	0.14	0.18	0.18	0.01	0.05	0.05	0.16	0.59	0.59	0.02	0.45	0.45
Sat Flow, veh/h	1810	121	1512	1810	873	873	1810	3726	63	1810	3800	1615
Grp Volume(v), veh/h	220	0	162	12	0	24	275	394	391	13	547	307
Grp Sat Flow(s),veh/h/ln	1810	0	1633	1810	0	1746	1810	1900	1889	1810	1900	1615
Q Serve(g_s), s	11.9	0.0	9.1	0.7	0.0	1.3	15.1	10.6	10.6	0.7	9.2	12.8
Cycle Q Clear(g_c), s	11.9	0.0	9.1	0.7	0.0	1.3	15.1	10.6	10.6	0.7	9.2	12.8
Prop In Lane	1.00		0.93	1.00		0.50	1.00		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	254	0	287	26	0	87	280	1130	1123	27	1729	735
V/C Ratio(X)	0.87	0.00	0.56	0.47	0.00	0.28	0.98	0.35	0.35	0.47	0.32	0.42
Avail Cap(c_a), veh/h	358	0	523	90	0	300	280	1130	1123	90	1729	735
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.1	0.0	37.7	48.9	0.0	45.8	42.1	10.4	10.4	48.8	17.4	18.3
Incr Delay (d2), s/veh	11.2	0.0	0.6	4.9	0.0	0.6	48.0	0.8	0.9	4.7	0.5	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	6.7	0.0	4.1	0.4	0.0	0.7	11.3	5.7	5.7	0.4	4.9	6.0
LnGrp Delay(d),s/veh	53.3	0.0	38.3	53.8	0.0	46.4	90.1	11.2	11.2	53.5	17.8	20.1
LnGrp LOS	D		D	D		D	F	B	B	D	B	C
Approach Vol, veh/h		382			36			1060			867	
Approach Delay, s/veh		47.0			48.9			31.7			19.2	
Approach LOS		D			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.0	65.0	5.9	23.1	20.0	51.0	18.5	10.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.0	38.0	5.0	32.0	15.5	27.5	19.8	17.2
Max Q Clear Time (g_c+I1), s	2.7	12.6	2.7	11.1	17.1	14.8	13.9	3.3
Green Ext Time (p_c), s	0.0	5.7	0.0	0.7	0.0	4.6	0.2	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	29.8
HCM 2010 LOS	C

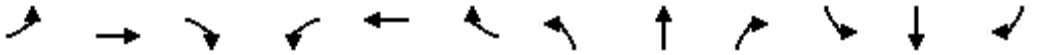
Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	886	142	239	516	0	0	0	0	1449	2	707
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	943	146	254	549	0				1541	2	688
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	839	357	173	1346	0				1002	1	895
Arrive On Green	0.00	0.22	0.22	0.10	0.35	0.00				0.55	0.55	0.55
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1807	2	1615
Grp Volume(v), veh/h	0	943	146	254	549	0				1543	0	688
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	26.5	9.3	11.5	13.1	0.0				66.5	0.0	39.7
Cycle Q Clear(g_c), s	0.0	26.5	9.3	11.5	13.1	0.0				66.5	0.0	39.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	839	357	173	1346	0				1003	0	895
V/C Ratio(X)	0.00	1.12	0.41	1.46	0.41	0.00				1.54	0.00	0.77
Avail Cap(c_a), veh/h	0	839	357	173	1346	0				1003	0	895
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.89	0.89	0.72	0.72	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	46.7	40.0	54.3	29.3	0.0				26.8	0.0	20.8
Incr Delay (d2), s/veh	0.0	69.6	3.1	230.6	0.7	0.0				247.4	0.0	4.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	22.0	4.4	16.8	7.0	0.0				101.8	0.0	18.6
LnGrp Delay(d),s/veh	0.0	116.3	43.1	284.8	29.9	0.0				274.2	0.0	24.9
LnGrp LOS		F	D	F	C					F		C
Approach Vol, veh/h		1089			803						2231	
Approach Delay, s/veh		106.5			110.5						197.3	
Approach LOS		F			F						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	16.0	32.0		72.0		48.0		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	11.5	26.5		66.5		42.5		
Max Q Clear Time (g_c+I1), s	13.5	28.5		68.5		15.1		
Green Ext Time (p_c), s	0.0	0.0		0.0		7.4		

Intersection Summary	
HCM 2010 Ctrl Delay	156.4
HCM 2010 LOS	F



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	587	1748	0	0	594	628	162	0	426	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	638	1900	0	0	646	648	176	0	377			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	653	2491	0	0	971	413	422	0	377			
Arrive On Green	0.36	0.66	0.00	0.00	0.26	0.26	0.23	0.00	0.23			
Sat Flow, veh/h	1810	3800	0	0	3800	1615	1810	0	1615			
Grp Volume(v), veh/h	638	1900	0	0	646	648	176	0	377			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	31.3	31.0	0.0	0.0	13.7	23.0	7.4	0.0	21.0			
Cycle Q Clear(g_c), s	31.3	31.0	0.0	0.0	13.7	23.0	7.4	0.0	21.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	653	2491	0	0	971	413	422	0	377			
V/C Ratio(X)	0.98	0.76	0.00	0.00	0.67	1.57	0.42	0.00	1.00			
Avail Cap(c_a), veh/h	653	2491	0	0	971	413	422	0	377			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	28.4	10.7	0.0	0.0	30.0	33.5	29.3	0.0	34.5			
Incr Delay (d2), s/veh	6.2	0.2	0.0	0.0	3.6	268.0	3.0	0.0	46.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	16.7	16.2	0.0	0.0	7.7	40.9	4.1	0.0	14.2			
LnGrp Delay(d),s/veh	34.6	10.9	0.0	0.0	33.6	301.5	32.3	0.0	81.0			
LnGrp LOS	C	B			C	F	C		F			
Approach Vol, veh/h		2538			1294			553				
Approach Delay, s/veh		16.8			167.8			65.5				
Approach LOS		B			F			E				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		64.0			36.0	28.0		26.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		59.0			32.5	23.0		21.0
Max Q Clear Time (g_c+I1), s		33.0			33.3	25.0		23.0
Green Ext Time (p_c), s		17.2			0.0	0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	67.5
HCM 2010 LOS	E

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	472	0	10	361	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	513	0	11	392	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	513	0	927	513
Stage 1	-	-	-	-	513	-
Stage 2	-	-	-	-	414	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1063	-	300	565
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	671	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1063	-	297	565
Mov Cap-2 Maneuver	-	-	-	-	493	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	664	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	565	-	-	1063	-
HCM Lane V/C Ratio	0.042	-	-	0.01	-
HCM Control Delay (s)	11.7	-	-	8.4	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	494	0	12	371	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	537	0	13	403	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	537	0	966	537
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	429	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1041	-	285	548
Stage 1	-	-	-	-	590	-
Stage 2	-	-	-	-	661	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1041	-	281	548
Mov Cap-2 Maneuver	-	-	-	-	480	-
Stage 1	-	-	-	-	590	-
Stage 2	-	-	-	-	653	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	548	-	-	1041	-
HCM Lane V/C Ratio	0.056	-	-	0.013	-
HCM Control Delay (s)	12	-	-	8.5	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	522	0	13	383	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	567	0	14	416	0	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	567	0	1012	567
Stage 1	-	-	-	-	567	-
Stage 2	-	-	-	-	445	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1015	-	267	527
Stage 1	-	-	-	-	572	-
Stage 2	-	-	-	-	650	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1015	-	263	527
Mov Cap-2 Maneuver	-	-	-	-	464	-
Stage 1	-	-	-	-	572	-
Stage 2	-	-	-	-	641	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	12.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	527	-	-	1015	-
HCM Lane V/C Ratio	0.058	-	-	0.014	-
HCM Control Delay (s)	12.2	-	-	8.6	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	475	50	50	346	25	25	251	25	25	790	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	27	516	54	54	376	27	27	273	27	27	859	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1469	1281	872	1553	1281	286	886	0	0	300	0	0
Stage 1	927	927	-	341	341	-	-	-	-	-	-	-
Stage 2	542	354	-	1212	940	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	107	~ 167	353	93	~ 167	758	773	-	-	1273	-	-
Stage 1	324	~ 350	-	678	642	-	-	-	-	-	-	-
Stage 2	528	634	-	225	~ 345	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 153	353	-	~ 153	758	773	-	-	1273	-	-
Mov Cap-2 Maneuver	-	~ 153	-	-	~ 153	-	-	-	-	-	-	-
Stage 1	310	~ 335	-	650	615	-	-	-	-	-	-	-
Stage 2	189	607	-	-	~ 331	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.8	0.2
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	773	-	-	-	162	-	162	1273	-	-
HCM Lane V/C Ratio	0.035	-	-	-	3.523	-	2.489	0.021	-	-
HCM Control Delay (s)	9.8	0	-	$ 1192.6	-	$ 732.7	-	7.9	0	-
HCM Lane LOS	A	A	-	-	F	-	F	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	-	55	-	34.5	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	525	0	10	421	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	571	0	11	458	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	571	0	1050	571
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	479	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1012	-	254	524
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	627	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1012	-	251	524
Mov Cap-2 Maneuver	-	-	-	-	454	-
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	620	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	12.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	524	-	-	1012	-
HCM Lane V/C Ratio	0.046	-	-	0.011	-
HCM Control Delay (s)	12.2	-	-	8.6	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	547	0	9	431	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	595	0	10	468	0	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	595	0	1083	595
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	488	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	991	-	243	508
Stage 1	-	-	-	-	555	-
Stage 2	-	-	-	-	621	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	991	-	241	508
Mov Cap-2 Maneuver	-	-	-	-	444	-
Stage 1	-	-	-	-	555	-
Stage 2	-	-	-	-	615	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	12.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	508	-	-	991	-
HCM Lane V/C Ratio	0.045	-	-	0.01	-
HCM Control Delay (s)	12.4	-	-	8.7	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	568	0	16	440	0	0	0	36	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	92	67	67	67	67	67	67	67	67	67
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	848	0	24	657	0	0	0	54	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	657	0	0	848	0	0	1552	1552	848	1579	1552	657
Stage 1	-	-	-	-	-	-	848	848	-	704	704	-
Stage 2	-	-	-	-	-	-	704	704	-	875	848	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	940	-	-	798	-	-	93	115	364	89	115	468
Stage 1	-	-	-	-	-	-	359	380	-	431	443	-
Stage 2	-	-	-	-	-	-	431	443	-	347	380	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	940	-	-	798	-	-	91	112	364	74	112	468
Mov Cap-2 Maneuver	-	-	-	-	-	-	272	290	-	227	280	-
Stage 1	-	-	-	-	-	-	359	380	-	431	430	-
Stage 2	-	-	-	-	-	-	418	430	-	296	380	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	16.6	0
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	364	940	-	-	798	-	-	-
HCM Lane V/C Ratio	0.148	-	-	-	0.03	-	-	-
HCM Control Delay (s)	16.6	0	-	-	9.7	-	-	0
HCM Lane LOS	C	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.5	0	-	-	0.1	-	-	-

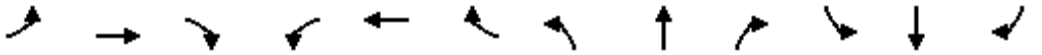
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	497	143	740	723	572	406	248	149	932	10	331	128
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	512	147	760	745	590	419	256	154	676	10	341	132
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	190	1300	575	1467	2680	1184	95	717	1219	22	884	336
Arrive On Green	0.05	0.34	0.34	0.41	0.71	0.71	0.05	0.38	0.38	0.01	0.34	0.34
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	2625	998
Grp Volume(v), veh/h	512	147	760	745	590	419	256	154	676	10	245	228
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	1723
Q Serve(g_s), s	5.0	2.5	32.5	14.6	5.1	9.3	5.0	5.2	11.6	0.5	9.3	9.6
Cycle Q Clear(g_c), s	5.0	2.5	32.5	14.6	5.1	9.3	5.0	5.2	11.6	0.5	9.3	9.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.58
Lane Grp Cap(c), veh/h	190	1300	575	1467	2680	1184	95	717	1219	22	640	580
V/C Ratio(X)	2.69	0.11	1.32	0.51	0.22	0.35	2.69	0.21	0.55	0.45	0.38	0.39
Avail Cap(c_a), veh/h	190	1300	575	1467	2680	1184	95	717	1219	95	640	580
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	0.60	0.60	0.60	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.0	21.4	79.3	21.2	4.9	5.5	45.0	20.0	12.7	46.6	24.0	24.1
Incr Delay (d2), s/veh	774.4	0.2	157.1	0.1	0.1	0.5	788.6	0.7	1.8	5.3	1.7	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	23.0	1.3	25.1	7.3	2.7	4.4	23.3	2.9	5.4	0.3	5.2	4.9
LnGrp Delay(d),s/veh	819.4	21.6	236.4	21.2	5.0	6.0	833.6	20.7	14.5	51.9	25.7	26.1
LnGrp LOS	F	C	F	C	A	A	F	C	B	D	C	C
Approach Vol, veh/h		1419			1754			1086			483	
Approach Delay, s/veh		424.5			12.1			208.5			26.4	
Approach LOS		F			B			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	45.0	38.0	9.5	37.5	9.5	73.5	5.7	41.3
Change Period (Y+Rc), s	5.5	* 5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.5	* 33	5.0	32.0	5.0	33.0	5.0	32.0
Max Q Clear Time (g_c+I1), s	16.6	34.5	7.0	11.6	7.0	11.3	2.5	13.6
Green Ext Time (p_c), s	0.0	0.0	0.0	3.6	0.0	4.8	0.0	3.5

Intersection Summary	
HCM 2010 Ctrl Delay	181.9
HCM 2010 LOS	F

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	369	10	225	10	10	10	108	983	10	10	1479	338
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	388	11	237	11	11	11	114	1035	11	11	1557	356
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	310	16	349	24	48	48	101	1977	21	24	1841	782
Arrive On Green	0.17	0.22	0.22	0.01	0.06	0.06	0.06	0.53	0.53	0.01	0.48	0.48
Sat Flow, veh/h	1810	72	1554	1810	873	873	1810	3753	40	1810	3800	1613
Grp Volume(v), veh/h	388	0	248	11	0	22	114	524	522	11	1557	356
Grp Sat Flow(s),veh/h/ln	1810	0	1626	1810	0	1746	1810	1900	1893	1810	1900	1613
Q Serve(g_s), s	15.4	0.0	12.6	0.5	0.0	1.1	5.0	16.2	16.2	0.5	32.2	5.7
Cycle Q Clear(g_c), s	15.4	0.0	12.6	0.5	0.0	1.1	5.0	16.2	16.2	0.5	32.2	5.7
Prop In Lane	1.00		0.96	1.00		0.50	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	310	0	365	24	0	97	101	1001	997	24	1841	782
V/C Ratio(X)	1.25	0.00	0.68	0.46	0.00	0.23	1.13	0.52	0.52	0.46	0.85	0.46
Avail Cap(c_a), veh/h	310	0	578	101	0	419	101	1001	997	101	1841	782
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	0.0	31.9	44.1	0.0	40.7	42.5	13.9	13.9	44.1	20.3	2.9
Incr Delay (d2), s/veh	137.7	0.0	0.8	4.9	0.0	0.4	130.4	2.0	2.0	4.9	5.0	1.9
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	19.5	0.0	5.7	0.3	0.0	0.5	6.1	9.0	9.0	0.3	17.9	2.9
LnGrp Delay(d),s/veh	175.0	0.0	32.8	49.0	0.0	41.1	172.9	15.9	15.9	49.0	25.3	4.8
LnGrp LOS	F		C	D		D	F	B	B	D	C	A
Approach Vol, veh/h		636			33			1160			1924	
Approach Delay, s/veh		119.5			43.7			31.3			21.6	
Approach LOS		F			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.7	52.9	5.7	25.7	9.5	49.1	20.9	10.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	5.0	28.0	5.0	32.0	5.0	28.0	15.4	* 22
Max Q Clear Time (g_c+I1), s	2.5	18.2	2.5	14.6	7.0	34.2	17.4	3.1
Green Ext Time (p_c), s	0.0	7.4	0.0	1.5	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	41.4
HCM 2010 LOS	D

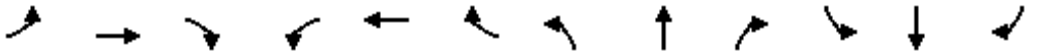
Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	891	194	666	953	0	0	0	0	796	2	748
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	948	206	709	1014	0				847	2	719
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	681	289	550	1979	0				700	2	626
Arrive On Green	0.00	0.18	0.18	0.10	0.17	0.00				0.39	0.39	0.39
Sat Flow, veh/h	0	3800	1615	1810	3800	0				1805	4	1615
Grp Volume(v), veh/h	0	948	206	709	1014	0				849	0	719
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1615
Q Serve(g_s), s	0.0	21.5	14.4	36.5	29.1	0.0				46.5	0.0	46.5
Cycle Q Clear(g_c), s	0.0	21.5	14.4	36.5	29.1	0.0				46.5	0.0	46.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	681	289	550	1979	0				701	0	626
V/C Ratio(X)	0.00	1.39	0.71	1.29	0.51	0.00				1.21	0.00	1.15
Avail Cap(c_a), veh/h	0	681	289	550	1979	0				701	0	626
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.92	0.92	0.71	0.71	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	49.3	46.3	54.0	35.8	0.0				36.8	0.0	36.8
Incr Delay (d2), s/veh	0.0	184.8	12.9	139.3	0.7	0.0				107.8	0.0	84.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	28.7	7.4	39.6	15.5	0.0				44.2	0.0	35.4
LnGrp Delay(d),s/veh	0.0	234.1	59.2	193.3	36.5	0.0				144.5	0.0	121.3
LnGrp LOS		F	E	F	D					F		F
Approach Vol, veh/h		1154			1723						1568	
Approach Delay, s/veh		202.9			101.0						133.9	
Approach LOS		F			F						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	41.0	27.0		52.0		68.0		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	36.5	21.5		46.5		62.5		
Max Q Clear Time (g_c+I1), s	38.5	23.5		48.5		31.1		
Green Ext Time (p_c), s	0.0	0.0		0.0		11.3		

Intersection Summary	
HCM 2010 Ctrl Delay	139.1
HCM 2010 LOS	F



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	679	1007	0	0	1252	1555	367	3	227	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	763	1131	0	0	1407	1722	412	3	146			
Adj No. of Lanes	1	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	354	3008	0	0	2153	915	225	2	202			
Arrive On Green	0.39	1.00	0.00	0.00	0.57	0.57	0.13	0.13	0.13			
Sat Flow, veh/h	1810	3800	0	0	3800	1614	1797	13	1615			
Grp Volume(v), veh/h	763	1131	0	0	1407	1722	415	0	146			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1614	1810	0	1615			
Q Serve(g_s), s	23.5	0.0	0.0	0.0	30.6	68.0	15.0	0.0	10.4			
Cycle Q Clear(g_c), s	23.5	0.0	0.0	0.0	30.6	68.0	15.0	0.0	10.4			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	354	3008	0	0	2153	915	226	0	202			
V/C Ratio(X)	2.15	0.38	0.00	0.00	0.65	1.88	1.83	0.00	0.72			
Avail Cap(c_a), veh/h	354	3008	0	0	2153	915	226	0	202			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	36.5	0.0	0.0	0.0	17.9	26.0	52.5	0.0	50.5			
Incr Delay (d2), s/veh	519.8	0.0	0.0	0.0	1.6	401.3	392.1	0.0	20.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	62.8	0.0	0.0	0.0	16.3	132.0	32.1	0.0	5.8			
LnGrp Delay(d),s/veh	556.3	0.0	0.0	0.0	19.5	427.3	444.6	0.0	70.6			
LnGrp LOS	F	A			B	F	F		E			
Approach Vol, veh/h		1894			3129			561				
Approach Delay, s/veh		224.1			243.9			347.3				
Approach LOS		F			F			F				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		100.0			27.0	73.0		20.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		95.0			23.5	68.0		15.0
Max Q Clear Time (g_c+I1), s		2.0			25.5	70.0		17.0
Green Ext Time (p_c), s		61.6			0.0	0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	247.6
HCM 2010 LOS	F

APPENDIX 8.3:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

___ DIST	___ CO	___ RTE	___ PM		TRAFFIC CONDITIONS		**2035 NP**
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Decker Road**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Oleander Avenue**				Critical Approach Speed (Minor)		40 mph

Major Street Approach Lanes = **2** lane Minor Street Approach Lanes **1** lane

Major Street Future ADT = **9,750** vpd Minor Street Future ADT = **3,530** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT: Vehicles Per Day on Major Street (Total of Both Approaches)		Minimum Requirements EADT: Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
XX					
CONDITION A - Minimum Vehicular Volume					
Satisfied	Not Satisfied				
XX					
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1	*1*	8,000	5,600	2,400	1,680
2 + **9,750**	*1* **3,530**	9,600 *	6,720	2,400 *	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1	*1*	12,000	8,400	1,200	850
2 + **9,750**	*1* **3,530**	14,400	10,080	1,200 *	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 100% **B** 68%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

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

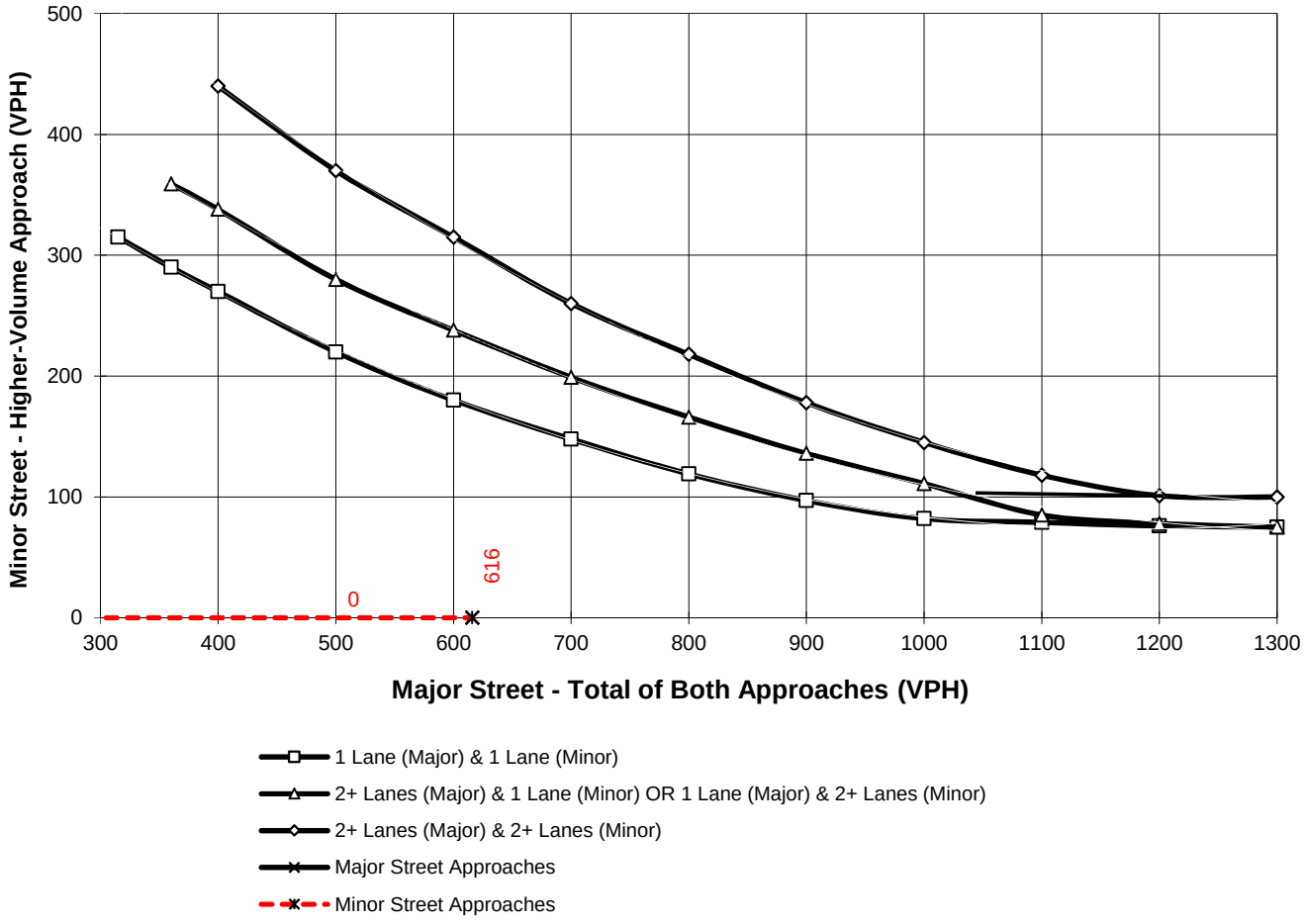
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **2035 Without Project Conditions - Weekday AM Peak Hour**

Major Street Name = **Oleander Avenue** Total of Both Approaches (VPH) = **616**
Number of Approach Lanes Major Street = **1**

Minor Street Name = **Driveway 6** High Volume Approach (VPH) = **0**
Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



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

APPENDIX 8.4:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		2035 WP
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 1**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **7,310** vpd Minor Street Future ADT = **251** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN / RURAL	Minimum Requirements EADT			
	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
CONDITION A - Minimum Vehicular Volume	Urban	Rural	Urban	Rural
XX Satisfied / XX Not Satisfied				
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **7,310** / 1 **251**	8,000	5,600	2,400	1,680
2 + / 1	9,600	6,720	2,400	1,680
2 + / 2 +	9,600	6,720	3,200	2,240
1 / 2 +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied / XX Not Satisfied	Urban	Rural	Urban	Rural
Number of lanes for moving traffic on each approach				
Major Street / Minor Street				
1 **7,310** / 1 **251**	12,000	8,400	1,200	850
2 + / 1	14,400	10,080	1,200	850
2 + / 2 +	14,400	10,080	1,600	1,120
1 / 2 +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B				
Satisfied / XX Not Satisfied	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more ….. **A** 10% **B** 21%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		2035 WP
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 2**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **7,823** vpd Minor Street Future ADT = **262** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **7,823**	*1* **262**	8,000	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic					
Satisfied	Not Satisfied	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **7,823**	*1* **262**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 11% **B** 22%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM				
				TRAFFIC CONDITIONS		**2035 WP**	
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**			Critical Approach Speed (Major)		40	mph
Minor Street:	**Driveway 3**			Critical Approach Speed (Minor)		25	mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes **1** lane

Major Street Future ADT = **8,398** vpd Minor Street Future ADT = **313** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **8,398**	*1* **313**	8,000 *	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **8,398**	*1* **313**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 13% **B** 26%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM		TRAFFIC CONDITIONS		2035 WP
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**				Critical Approach Speed (Major)		40 mph
Minor Street:	**Driveway 4**				Critical Approach Speed (Minor)		25 mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **8,463** vpd Minor Street Future ADT = **253** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); …….. [ ]

or **RURAL (R)**

In built up area of isolated community of < 10,000 population …… [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **8,463**	*1* **253**	8,000 *	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **8,463**	*1* **253**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 11% **B** 21%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

DIST	CO	RTE	PM				
				TRAFFIC CONDITIONS		**2035 WP**	
				CALC	CHS	DATE	05/19/15
Jurisdiction:	**County of Riverside**			CHK		DATE	
Major Street:	**Oleander Avenue**			Critical Approach Speed (Major)		40	mph
Minor Street:	**Driveway 5**			Critical Approach Speed (Minor)		25	mph

Major Street Approach Lanes = **1** lane Minor Street Approach Lanes = **1** lane

Major Street Future ADT = **8,914** vpd Minor Street Future ADT = **197** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); ……..

or

In built up area of isolated community of < 10,000 population ……

RURAL (R)

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
XX					
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **8,914**	*1* **197**	8,000 *	5,600	2,400	1,680
2 +	*1*	9,600	6,720	2,400	1,680
2 +	*2* +	9,600	6,720	3,200	2,240
1	*2* +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
	XX				
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **8,914**	*1* **197**	12,000	8,400	1,200	850
2 +	*1*	14,400	10,080	1,200	850
2 +	*2* +	14,400	10,080	1,600	1,120
1	*2* +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B					
Satisfied	Not Satisfied				
	XX	2 CONDITIONS 80%		2 CONDITIONS 80%	
No one condition satisfied, but following conditions fulfilled 80% of more …..	**A** 8% **B** 16%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

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

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

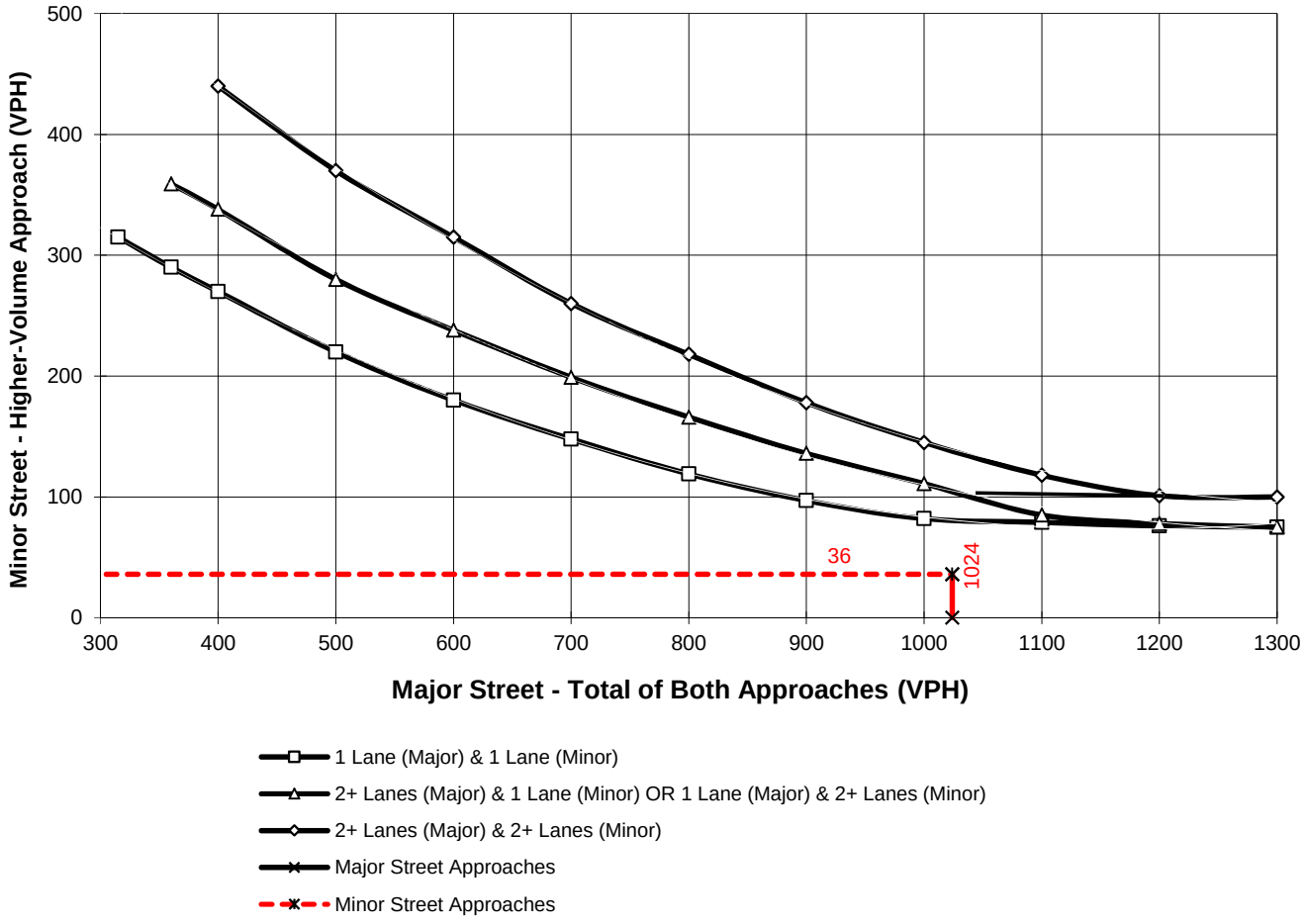
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **2035 With Project Conditions - Weekday PM Peak Hour**

Major Street Name = **Oleander Avenue**
Total of Both Approaches (VPH) = **1024**
Number of Approach Lanes Major Street = **1**

Minor Street Name = **Driveway 6**
High Volume Approach (VPH) = **36**
Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED

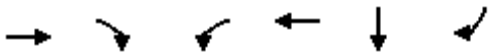


*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

APPENDIX 8.5:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS

This Page Intentionally Left Blank



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	900	138	254	506	1543	670
v/c Ratio	1.07	0.29	1.40	0.38	1.47	0.59
Control Delay	96.9	20.7	249.1	50.6	240.7	15.4
Queue Delay	0.0	0.0	0.0	4.4	1.3	0.0
Total Delay	96.9	20.7	249.1	55.0	242.0	15.4
Queue Length 50th (ft)	~387	41	~269	212	~1638	246
Queue Length 95th (ft)	#510	98	#436	268	#1903	361
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	839	476	182	1345	1052	1127
Starvation Cap Reductn	0	0	0	747	0	0
Spillback Cap Reductn	0	0	0	0	229	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.07	0.29	1.40	0.85	1.87	0.59

Intersection Summary

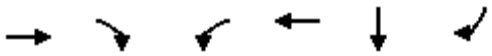
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	601	1893	630	683	147	463
v/c Ratio	0.87	0.76	0.62	0.83	0.30	0.86
Control Delay	24.5	9.9	41.9	23.8	37.8	53.5
Queue Delay	2.7	48.4	0.5	0.0	0.0	0.0
Total Delay	27.3	58.3	42.3	23.8	37.8	53.5
Queue Length 50th (ft)	100	512	215	185	92	301
Queue Length 95th (ft)	m44	m215	275	#358	151	#481
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	688	2501	1013	825	490	538
Starvation Cap Reductn	34	1158	0	0	0	0
Spillback Cap Reductn	0	0	107	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.92	1.41	0.70	0.83	0.30	0.86

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	834	173	709	991	849	752
v/c Ratio	1.23	0.43	1.23	0.50	1.15	0.95
Control Delay	156.4	27.9	140.1	20.7	118.8	54.6
Queue Delay	2.3	0.0	0.0	1.5	0.8	0.0
Total Delay	158.7	27.9	140.1	22.3	119.5	54.6
Queue Length 50th (ft)	~398	66	~677	234	~775	510
Queue Length 95th (ft)	#519	136	#882	m200	#1020	#771
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	680	402	577	1979	736	789
Starvation Cap Reductn	0	0	0	752	0	0
Spillback Cap Reductn	182	0	0	0	82	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.67	0.43	1.23	0.81	1.30	0.95

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.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	660	1115	1399	1747	400	255
v/c Ratio	1.77	0.37	0.65	1.41	1.69	0.66
Control Delay	379.2	6.8	19.6	208.4	360.0	25.9
Queue Delay	2.3	50.4	0.3	0.0	0.0	0.0
Total Delay	381.4	57.2	19.9	208.4	360.0	25.9
Queue Length 50th (ft)	~677	204	353	~1676	~453	60
Queue Length 95th (ft)	m#451	m144	416	#1911	#640	146
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	372	3008	2153	1243	237	388
Starvation Cap Reductn	69	2038	0	0	0	0
Spillback Cap Reductn	0	0	216	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.18	1.15	0.72	1.41	1.69	0.66

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

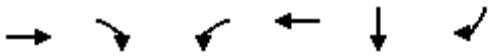
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

APPENDIX 8.6:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS

This Page Intentionally Left Blank



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	943	151	254	549	1543	752
v/c Ratio	1.12	0.32	1.40	0.41	1.47	0.67
Control Delay	114.0	24.4	247.9	30.4	240.7	18.7
Queue Delay	0.0	0.0	0.0	2.1	0.0	0.0
Total Delay	114.0	24.4	247.9	32.5	240.7	18.7
Queue Length 50th (ft)	~422	55	~263	159	~1638	324
Queue Length 95th (ft)	#547	116	#430	207	#1903	464
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	839	469	182	1345	1052	1115
Starvation Cap Reductn	0	0	0	629	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.12	0.32	1.40	0.77	1.47	0.67

Intersection Summary

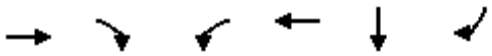
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	638	1900	646	683	176	463
v/c Ratio	0.96	0.76	0.64	0.79	0.40	0.94
Control Delay	55.1	13.3	33.1	16.5	32.4	58.2
Queue Delay	46.4	47.6	0.0	0.0	0.0	0.0
Total Delay	101.4	60.9	33.1	16.5	32.4	58.2
Queue Length 50th (ft)	344	331	165	95	85	226
Queue Length 95th (ft)	#559	416	221	#257	146	#414
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	686	2491	1006	864	443	494
Starvation Cap Reductn	180	794	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.26	1.12	0.64	0.79	0.40	0.94

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBT	EBR	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	948	206	709	1014	849	796
v/c Ratio	1.39	0.51	1.23	0.51	1.15	1.01
Control Delay	223.8	31.9	140.0	21.2	118.8	68.6
Queue Delay	2.7	0.0	0.0	1.7	0.8	0.0
Total Delay	226.5	31.9	140.0	22.9	119.6	68.6
Queue Length 50th (ft)	~489	88	~678	246	~775	~584
Queue Length 95th (ft)	#614	167	#882	m205	#1020	#852
Internal Link Dist (ft)	844			267	1109	
Turn Bay Length (ft)		100	80			270
Base Capacity (vph)	680	405	577	1979	736	786
Starvation Cap Reductn	0	0	0	747	0	0
Spillback Cap Reductn	207	0	0	0	85	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.00	0.51	1.23	0.82	1.30	1.01

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.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	763	1131	1407	1747	415	255
v/c Ratio	2.05	0.38	0.65	1.41	1.75	0.67
Control Delay	498.6	7.0	19.7	209.4	386.6	27.1
Queue Delay	2.3	50.4	0.3	0.0	0.0	0.0
Total Delay	500.8	57.3	20.0	209.4	386.6	27.1
Queue Length 50th (ft)	~839	208	357	~1679	~478	64
Queue Length 95th (ft)	m#487	m139	420	#1914	#668	150
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	372	3008	2153	1241	237	383
Starvation Cap Reductn	69	2046	0	0	0	0
Spillback Cap Reductn	0	0	244	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.52	1.18	0.74	1.41	1.75	0.67

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.

m Volume for 95th percentile queue is metered by upstream signal.

APPENDIX 8.7:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6931*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2574*	pc/h/ln
S	*48.1*	mph
D = v_p / S	*53.5*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:24 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5141*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1909*	pc/h/ln
S	*64.2*	mph
D = v_p / S	*29.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:24 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6859*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2535*	pc/h/ln
S	*49.3*	mph
D = v_p / S	*51.4*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:24 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6284*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2311*	pc/h/ln
S	*55.7*	mph
D = v_p / S	*41.5*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:25 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6864*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2537*	pc/h/ln
S	*49.3*	mph
D = v_p / S	*51.5*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:25 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Southbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*South of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6235*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2304*	pc/h/ln
S	*55.9*	mph
D = v_p / S	*41.2*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:25 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6942*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2578*	pc/h/ln
S	*48.0*	mph
D = v_p / S	*53.7*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:26 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Northbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*South of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2035 Without Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5291*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1955*	pc/h/ln
S	*63.4*	mph
D = v_p / S	*30.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:26 AM

APPENDIX 8.8:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6980*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2592*	pc/h/ln
S	*47.5*	mph
D = v_p / S	*54.5*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:27 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5150*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1913*	pc/h/ln
S	*64.1*	mph
D = v_p / S	*29.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:28 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Northbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*North of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6882*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2543*	pc/h/ln
S	*49.1*	mph
D = v_p / S	*51.8*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:28 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6304*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2318*	pc/h/ln
S	*55.5*	mph
D = v_p / S	*41.8*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:28 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Southbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*North of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6889*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2546*	pc/h/ln
S	*49.0*	mph
D = v_p / S	*52.0*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:29 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6257*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2312*	pc/h/ln
S	*55.7*	mph
D = v_p / S	*41.5*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:29 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CHS*	Highway/Direction of Travel	*I-215 Northbound*
Agency or Company	*Urban Crossroads, Inc.*	From/To	*North of Harley Knox Bl.*
Date Performed	*5/18/2015*	Jurisdiction	*Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6998*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2599*	pc/h/ln
S	*47.3*	mph
D = v_p / S	*55.0*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:29 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5300*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1968*	pc/h/ln
S	*63.2*	mph
D = v_p / S	*31.2*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:30 AM

APPENDIX 8.9:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	195
Freeway Volume, V_F	6931
Ramp Volume, V_R	2177
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1420 ft
V_D = 387 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6931	0.92	Level	5	0	0.976	1.00	7722
Ramp	2177	0.92	Level	7	0	0.966	1.00	2449
UpStream								
DownStream	387	0.92	Level	26	0	0.885	1.00	475

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.454 using Equation (Exhibit 13-7)
V_{12} = 4845 pc/h
V_3 or V_{av34} 2877 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = 5022 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	7722	Exhibit 13-8	7200	Yes
$V_{FO} = V_F - V_R$	5273	Exhibit 13-8	7200	No
V_R	2449	Exhibit 13-10	2100	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4845	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 45.7 (pc/mi/ln)
LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.518 (Exhibit 13-12)
S_R= 55.5 mph (Exhibit 13-12)
S_0= 70.2 mph (Exhibit 13-12)
S = 59.9 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:18 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	2177 veh/h	Freeway Volume, V_F	4754	V_D =	veh/h
		Ramp Volume, V_R	387		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4754	0.92	Level	4	0	0.980	1.00	5271
Ramp	387	0.92	Level	26	0	0.885	1.00	475
UpStream	2177	0.92	Level	7	0	0.966	1.00	2449
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1296.48 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 3082 pc/h

V_3 or V_{av34} = 2189 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3082 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5746	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3557	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 31.4 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.434 (Exibit 13-11)

S_R = 57.8 mph (Exhibit 13-11)

S_0 = 63.9 mph (Exhibit 13-11)

S = 60.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
- ☑ Yes ☐ On
- ☐ No ☑ Off
- L_{up} = 1395 ft
- V_u = 630 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	300
Deceleration Lane Length L_D	
Freeway Volume, V_F	5654
Ramp Volume, V_R	1205
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5654	0.92	Level	2	0	0.990	1.00	6207
Ramp	1205	0.92	Level	16	0	0.926	1.00	1415
UpStream	630	0.92	Level	17	0	0.922	1.00	743
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

- L_{EQ} = 1715.71 (Equation 13-6 or 13-7)
- P_{FM} = 0.566 using Equation (Exhibit 13-6)
- V_{12} = 3510 pc/h
- V_3 or V_{av34} = 2697 pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
- If Yes, V_{12a} = 3546 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7622	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4961	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

- D_R = 41.6 (pc/mi/ln)
- LOS = F (Exhibit 13-2)

Speed Determination

- M_S = 0.851 (Exibit 13-11)
- S_R = 46.2 mph (Exhibit 13-11)
- S_0 = 61.3 mph (Exhibit 13-11)
- S = 50.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

- L_{EQ} = (Equation 13-12 or 13-13)
- P_{FD} = using Equation (Exhibit 13-7)
- V_{12} = pc/h
- V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

- D_R = (pc/mi/ln)
- LOS = (Exhibit 13-2)

Speed Determination

- D_s = (Exhibit 13-12)
- S_R = mph (Exhibit 13-12)
- S_0 = mph (Exhibit 13-12)
- S = mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:19 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	6284
Ramp Volume, V_R	630
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1395 ft
V_D = 1205 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6284	0.92	Level	3	0	0.985	1.00	6933
Ramp	630	0.92	Level	17	0	0.922	1.00	743
UpStream								
DownStream	1205	0.92	Level	16	0	0.926	1.00	1415

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.552 using Equation (Exhibit 13-7)
V_{12} = 4163 pc/h
V_3 or V_{av34} 2770 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = 4233 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6933	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	6190	Exhibit 13-8	7200	No
V_R	743	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4163	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 38.1 (pc/mi/ln)
LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.365 (Exhibit 13-12)
S_R= 59.8 mph (Exhibit 13-12)
S_0= 70.2 mph (Exhibit 13-12)
S = 63.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:19 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	195
Freeway Volume, V_F	6864
Ramp Volume, V_R	1534
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1420 ft
V_D = 905 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6864	0.92	Level	4	0	0.980	1.00	7610
Ramp	1534	0.92	Level	16	0	0.926	1.00	1801
UpStream								
DownStream	905	0.92	Level	21	0	0.905	1.00	1087

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R = mph (Exhibit 13-11)
S_0 = mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.487 using Equation (Exhibit 13-7)
V_{12} = 4629 pc/h
V_3 or V_{av34} 2981 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = 4910 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	7610	Exhibit 13-8	7200	Yes
$V_{FO} = V_F - V_R$	5809	Exhibit 13-8	7200	No
V_R	1801	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4629	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 44.7 (pc/mi/ln)
LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.460 (Exhibit 13-12)
S_R = 57.1 mph (Exhibit 13-12)
S_0 = 70.2 mph (Exhibit 13-12)
S = 61.2 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:20 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway/Ramp		Downstream Adj Ramp	
☑ Yes	☐ On	Freeway Number of Lanes, N	3	☐ Yes	☐ On
☐ No	☑ Off	Ramp Number of Lanes, N	1	☑ No	☐ Off
L_{up} =	1420 ft	Acceleration Lane Length, L_A	260	L_{down} =	ft
V_u =	1534 veh/h	Deceleration Lane Length L_D		V_D =	veh/h
		Freeway Volume, V_F	5330		
		Ramp Volume, V_R	905		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5330	0.92	Level	1	0	0.995	1.00	5822
Ramp	905	0.92	Level	21	0	0.905	1.00	1087
UpStream	1534	0.92	Level	16	0	0.926	1.00	1801
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1545.37 (Equation 13-6 or 13-7)

P_{FM} = 0.577 using Equation (Exhibit 13-6)

V_{12} = 3358 pc/h

V_3 or V_{av34} = 2464 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3358 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6909	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4445	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 38.0 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.630 (Exibit 13-11)

S_R = 52.4 mph (Exhibit 13-11)

S_0 = 62.5 mph (Exhibit 13-11)

S = 55.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
- ☑ Yes ☐ On
- ☐ No ☑ Off
- L_{up} = 1395 ft
- V_u = 601 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	300
Deceleration Lane Length L_D	
Freeway Volume, V_F	4690
Ramp Volume, V_R	2252
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4690	0.92	Level	4	0	0.980	1.00	5200
Ramp	2252	0.92	Level	7	0	0.966	1.00	2533
UpStream	601	0.92	Level	11	0	0.948	1.00	689
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

- L_{EQ} = 1739.46 (Equation 13-6 or 13-7)
- P_{FM} = 0.564 using Equation (Exhibit 13-6)
- V_{12} = 2933 pc/h
- V_3 or V_{av34} = 2267 pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
- If Yes, V_{12a} = 2971 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7733	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5504	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

- D_R = 45.4 (pc/mi/ln)
- LOS = F (Exhibit 13-2)

Speed Determination

- M_S = 1.252 (Exibit 13-11)
- S_R = 34.9 mph (Exhibit 13-11)
- S_0 = 63.8 mph (Exhibit 13-11)
- S = 40.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

- L_{EQ} = (Equation 13-12 or 13-13)
- P_{FD} = using Equation (Exhibit 13-7)
- V_{12} = pc/h
- V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

- D_R = (pc/mi/ln)
- LOS = (Exhibit 13-2)

Speed Determination

- D_s = (Exhibit 13-12)
- S_R = mph (Exhibit 13-12)
- S_0 = mph (Exhibit 13-12)
- S = mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:20 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1395 ft
V_u = veh/h	Deceleration Lane Length L_D: 280	V_D = 2252 veh/h
	Freeway Volume, V_F: 5291	
	Ramp Volume, V_R: 601	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5291	0.92	Level	4	0	0.980	1.00	5866
Ramp	601	0.92	Level	11	0	0.948	1.00	689
UpStream								
DownStream	2252	0.92	Level	7	0	0.966	1.00	2533

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.582 using Equation (Exhibit 13-7)

V_{12} = 3700 pc/h

V_3 or V_{av34} 2166 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5866	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5177	Exhibit 13-8	7200	No
V_R	689	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3700	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 33.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.360 (Exhibit 13-12)

S_R = 59.9 mph (Exhibit 13-12)

S_0 = 72.2 mph (Exhibit 13-12)

S = 63.9 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:21 AM

APPENDIX 8.10:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	195
Freeway Volume, V_F	6980
Ramp Volume, V_R	2226
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1420 ft
V_D = 396 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6980	0.92	Level	5	0	0.976	1.00	7777
Ramp	2226	0.92	Level	8	0	0.962	1.00	2516
UpStream								
DownStream	396	0.92	Level	25	0	0.889	1.00	484

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.450 using Equation (Exhibit 13-7)
V_{12} = 4883 pc/h
V_3 or V_{av34} 2894 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = 5077 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	7777	Exhibit 13-8	7200	Yes
$V_{FO} = V_F - V_R$	5261	Exhibit 13-8	7200	No
V_R	2516	Exhibit 13-10	2100	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4883	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 46.2 (pc/mi/ln)
LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.524 (Exhibit 13-12)
S_R= 55.3 mph (Exhibit 13-12)
S_0= 70.2 mph (Exhibit 13-12)
S = 59.7 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:23 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	2226 veh/h	Freeway Volume, V_F	4754	V_D =	veh/h
		Ramp Volume, V_R	396		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4754	0.92	Level	4	0	0.980	1.00	5271
Ramp	396	0.92	Level	25	0	0.889	1.00	484
UpStream	2226	0.92	Level	8	0	0.962	1.00	2516
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1298.41 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 3082 pc/h

V_3 or V_{av34} = 2189 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3082 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5755	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3566	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 31.4 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.436 (Exibit 13-11)

S_R = 57.8 mph (Exhibit 13-11)

S_0 = 63.9 mph (Exhibit 13-11)

S = 60.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 1395 ft
V_u = 649 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	300
Deceleration Lane Length L_D	
Freeway Volume, V_F	5655
Ramp Volume, V_R	1227
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5655	0.92	Level	2	0	0.990	1.00	6208
Ramp	1227	0.92	Level	16	0	0.926	1.00	1440
UpStream	649	0.92	Level	17	0	0.922	1.00	765
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1721.27 (Equation 13-6 or 13-7)
P_{FM} = 0.565 using Equation (Exhibit 13-6)
V_{12} = 3509 pc/h
V_3 or V_{av34} = 2699 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
If Yes, V_{12a} = 3547 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7648	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4987	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 41.8 (pc/mi/ln)
LOS = F (Exhibit 13-2)

Speed Determination

M_S = 0.865 (Exibit 13-11)
S_R = 45.8 mph (Exhibit 13-11)
S_0 = 61.3 mph (Exhibit 13-11)
S = 50.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R = mph (Exhibit 13-12)
S_0 = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	6304
Ramp Volume, V_R	649
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1395 ft
V_D = 1227 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6304	0.92	Level	3	0	0.985	1.00	6955
Ramp	649	0.92	Level	17	0	0.922	1.00	765
UpStream								
DownStream	1227	0.92	Level	16	0	0.926	1.00	1440

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.551 using Equation (Exhibit 13-7)
V_{12} = 4175 pc/h
V_3 or V_{av34} 2780 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = 4255 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6955	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	6190	Exhibit 13-8	7200	No
V_R	765	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4175	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 38.3 (pc/mi/ln)
LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.367 (Exhibit 13-12)
S_R= 59.7 mph (Exhibit 13-12)
S_0= 70.2 mph (Exhibit 13-12)
S = 63.4 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:24 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	195
Freeway Volume, V_F	6889
Ramp Volume, V_R	1559
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1420 ft
V_D = 926 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6889	0.92	Level	4	0	0.980	1.00	7638
Ramp	1559	0.92	Level	16	0	0.926	1.00	1830
UpStream								
DownStream	926	0.92	Level	21	0	0.905	1.00	1112

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$
D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.485 using Equation (Exhibit 13-7)
V_{12} = 4646 pc/h
V_3 or V_{av34} 2992 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = 4938 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	7638	Exhibit 13-8	7200	Yes
$V_{FO} = V_F - V_R$	5808	Exhibit 13-8	7200	No
V_R	1830	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4646	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = 45.0 (pc/mi/ln)
LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.463 (Exhibit 13-12)
S_R= 57.0 mph (Exhibit 13-12)
S_0= 70.2 mph (Exhibit 13-12)
S = 61.1 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:24 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	1559 veh/h	Freeway Volume, V_F	5331	V_D =	veh/h
		Ramp Volume, V_R	926		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5331	0.92	Level	1	0	0.995	1.00	5824
Ramp	926	0.92	Level	21	0	0.905	1.00	1112
UpStream	1559	0.92	Level	16	0	0.926	1.00	1830
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1551.14 (Equation 13-6 or 13-7)

P_{FM} = 0.576 using Equation (Exhibit 13-6)

V_{12} = 3357 pc/h

V_3 or V_{av34} = 2467 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3357 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6936	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4469	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 38.2 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.638 (Exibit 13-11)

S_R = 52.1 mph (Exhibit 13-11)

S_0 = 62.5 mph (Exhibit 13-11)

S = 55.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 1395 ft
V_u = 610 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	300
Deceleration Lane Length L_D	
Freeway Volume, V_F	4690
Ramp Volume, V_R	2308
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4690	0.92	Level	4	0	0.980	1.00	5200
Ramp	2308	0.92	Level	8	0	0.962	1.00	2609
UpStream	610	0.92	Level	11	0	0.948	1.00	700
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1755.73 (Equation 13-6 or 13-7)
P_{FM} = 0.563 using Equation (Exhibit 13-6)
V_{12} = 2928 pc/h
V_3 or V_{av34} = 2272 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
If Yes, V_{12a} = 2971 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7809	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5580	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 45.9 (pc/mi/ln)
LOS = F (Exhibit 13-2)

Speed Determination

M_S = 1.328 (Exibit 13-11)
S_R = 32.8 mph (Exhibit 13-11)
S_0 = 63.8 mph (Exhibit 13-11)
S = 38.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R = mph (Exhibit 13-12)
S_0 = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1395 ft
V_u = veh/h	Deceleration Lane Length L_D: 280	V_D = 2308 veh/h
	Freeway Volume, V_F: 5300	
	Ramp Volume, V_R: 610	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5300	0.92	Level	5	0	0.976	1.00	5905
Ramp	610	0.92	Level	11	0	0.948	1.00	700
UpStream								
DownStream	2308	0.92	Level	8	0	0.962	1.00	2609

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.580 using Equation (Exhibit 13-7)

V_{12} = 3720 pc/h

V_3 or V_{av34} 2185 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5905	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5205	Exhibit 13-8	7200	No
V_R	700	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3720	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 33.7 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.361 (Exhibit 13-12)

S_R= 59.9 mph (Exhibit 13-12)

S_0= 72.2 mph (Exhibit 13-12)

S = 63.9 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:25 AM

APPENDIX 8.11:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	207	50	50	284	25	25	830	25	25	91	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	27	225	54	54	309	27	27	902	27	27	99	27
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	52	314	75	81	394	34	63	965	28	129	452	112
Arrive On Green	0.03	0.21	0.21	0.04	0.23	0.23	0.54	0.54	0.54	0.54	0.54	0.54
Sat Flow, veh/h	1810	1482	356	1810	1723	151	26	1799	53	136	841	209
Grp Volume(v), veh/h	27	0	279	54	0	336	956	0	0	153	0	0
Grp Sat Flow(s),veh/h/ln	1810	0	1837	1810	0	1873	1878	0	0	1187	0	0
Q Serve(g_s), s	1.1	0.0	10.6	2.2	0.0	12.7	15.9	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.1	0.0	10.6	2.2	0.0	12.7	36.1	0.0	0.0	3.2	0.0	0.0
Prop In Lane	1.00		0.19	1.00		0.08	0.03		0.03	0.18		0.18
Lane Grp Cap(c), veh/h	52	0	390	81	0	428	1057	0	0	693	0	0
V/C Ratio(X)	0.52	0.00	0.72	0.66	0.00	0.78	0.90	0.00	0.00	0.22	0.00	0.00
Avail Cap(c_a), veh/h	123	0	662	123	0	675	1106	0	0	728	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.0	0.0	27.5	35.3	0.0	27.3	16.4	0.0	0.0	8.8	0.0	0.0
Incr Delay (d2), s/veh	3.0	0.0	2.5	3.4	0.0	1.2	9.8	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	5.6	1.2	0.0	6.7	21.2	0.0	0.0	1.6	0.0	0.0
LnGrp Delay(d),s/veh	39.0	0.0	30.0	38.8	0.0	28.5	26.2	0.0	0.0	8.9	0.0	0.0
LnGrp LOS	D		C	D		C	C			A		
Approach Vol, veh/h		306			390			956			153	
Approach Delay, s/veh		30.8			29.9			26.2			8.9	
Approach LOS		C			C			C			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		45.8	7.9	21.5		45.8	6.7	22.7
Change Period (Y+Rc), s		5.5	4.5	5.5		5.5	4.5	5.5
Max Green Setting (Gmax), s		42.3	5.1	27.1		42.3	5.1	27.1
Max Q Clear Time (g_c+I1), s		38.1	4.2	12.6		5.2	3.1	14.7
Green Ext Time (p_c), s		2.3	0.0	2.7		7.0	0.0	2.5

Intersection Summary	
HCM 2010 Ctrl Delay	26.3
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	201	11	558	499	49	17	6	719	56	7	12
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	5	239	9	664	594	58	20	7	527	67	8	14
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	235	1045	496	883	1726	762	37	507	1650	86	559	474
Arrive On Green	0.06	0.28	0.28	0.41	0.76	0.76	0.02	0.27	0.27	0.05	0.29	0.29
Sat Flow, veh/h	3619	3800	1680	3619	3800	1678	1810	1900	3230	1810	1900	1613
Grp Volume(v), veh/h	5	239	9	664	594	58	20	7	527	67	8	14
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1678	1810	1900	1615	1810	1900	1613
Q Serve(g_s), s	0.2	5.8	0.2	18.8	6.1	0.8	1.3	0.3	2.0	4.4	0.4	0.7
Cycle Q Clear(g_c), s	0.2	5.8	0.2	18.8	6.1	0.8	1.3	0.3	2.0	4.4	0.4	0.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	235	1045	496	883	1726	762	37	507	1650	86	559	474
V/C Ratio(X)	0.02	0.23	0.02	0.75	0.34	0.08	0.55	0.01	0.32	0.78	0.01	0.03
Avail Cap(c_a), veh/h	235	1045	496	883	1726	762	80	507	1650	128	559	474
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.5	33.7	11.7	32.4	8.7	4.6	58.2	32.4	7.9	56.5	30.0	30.2
Incr Delay (d2), s/veh	0.0	0.5	0.1	3.1	0.5	0.2	4.6	0.0	0.5	8.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	3.1	0.1	9.7	3.3	0.4	0.7	0.2	3.4	2.4	0.2	0.3
LnGrp Delay(d),s/veh	52.6	34.2	11.8	35.5	9.2	4.8	62.8	32.4	8.4	64.7	30.1	30.3
LnGrp LOS	D	C	B	D	A	A	E	C	A	E	C	C
Approach Vol, veh/h		253			1316			554			89	
Approach Delay, s/veh		33.7			22.3			10.7			56.2	
Approach LOS		C			C			B			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	33.8	38.5	6.9	40.8	12.3	60.0	10.2	37.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	26.5	33.0	5.3	35.2	5.0	54.5	8.5	32.0
Max Q Clear Time (g_c+I1), s	20.8	7.8	3.3	2.7	2.2	8.1	6.4	4.0
Green Ext Time (p_c), s	0.8	0.9	0.0	1.2	0.5	2.5	0.0	1.2

Intersection Summary	
HCM 2010 Ctrl Delay	22.0
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	846	130	239	476	0	0	0	0	1449	2	630
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	900	138	254	506	0				1541	2	593
Adj No. of Lanes	0	2	1	2	2	0				2	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1128	479	315	1601	0				1763	3	784
Arrive On Green	0.00	0.59	0.59	0.03	0.14	0.00				0.49	0.49	0.49
Sat Flow, veh/h	0	3800	1615	3619	3800	0				3619	5	1610
Grp Volume(v), veh/h	0	900	138	254	506	0				1541	0	595
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1616
Q Serve(g_s), s	0.0	21.9	5.0	8.4	14.4	0.0				45.6	0.0	35.9
Cycle Q Clear(g_c), s	0.0	21.9	5.0	8.4	14.4	0.0				45.6	0.0	35.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1128	479	315	1601	0				1763	0	787
V/C Ratio(X)	0.00	0.80	0.29	0.81	0.32	0.00				0.87	0.00	0.76
Avail Cap(c_a), veh/h	0	1128	479	347	1601	0				2006	0	895
HCM Platoon Ratio	1.00	2.00	2.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.95	0.95	0.75	0.75	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	21.6	18.2	57.3	36.1	0.0				27.5	0.0	25.0
Incr Delay (d2), s/veh	0.0	5.6	1.4	8.3	0.4	0.0				4.2	0.0	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	12.1	2.4	4.6	7.7	0.0				23.7	0.0	16.6
LnGrp Delay(d),s/veh	0.0	27.2	19.6	65.6	36.5	0.0				31.7	0.0	28.2
LnGrp LOS		C	B	E	D					C		C
Approach Vol, veh/h		1038			760						2136	
Approach Delay, s/veh		26.2			46.2						30.7	
Approach LOS		C			D						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	14.9	41.1		64.0		56.0		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	11.5	26.5		66.5		42.5		
Max Q Clear Time (g_c+I1), s	10.4	23.9		47.6		16.4		
Green Ext Time (p_c), s	0.1	1.6		10.8		6.7		

Intersection Summary	
HCM 2010 Ctrl Delay	32.5
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	553	1742	0	0	580	628	135	0	426	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	601	1893	0	0	630	0	147	0	358			
Adj No. of Lanes	2	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	1267	2502	0	0	1013	431	467	0	417			
Arrive On Green	0.70	1.00	0.00	0.00	0.27	0.00	0.26	0.00	0.26			
Sat Flow, veh/h	3619	3800	0	0	3800	1615	1810	0	1615			
Grp Volume(v), veh/h	601	1893	0	0	630	0	147	0	358			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	9.0	0.0	0.0	0.0	17.5	0.0	7.9	0.0	25.3			
Cycle Q Clear(g_c), s	9.0	0.0	0.0	0.0	17.5	0.0	7.9	0.0	25.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1267	2502	0	0	1013	431	467	0	417			
V/C Ratio(X)	0.47	0.76	0.00	0.00	0.62	0.00	0.31	0.00	0.86			
Avail Cap(c_a), veh/h	1312	2502	0	0	1013	431	467	0	417			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.44	0.44	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	13.0	0.0	0.0	0.0	38.7	0.0	35.9	0.0	42.4			
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.0	2.9	0.0	1.8	0.0	19.9			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.3	0.3	0.0	0.0	9.6	0.0	4.1	0.0	13.6			
LnGrp Delay(d),s/veh	13.1	1.0	0.0	0.0	41.6	0.0	37.7	0.0	62.3			
LnGrp LOS	B	A			D		D		E			
Approach Vol, veh/h		2494			630			505				
Approach Delay, s/veh		3.9			41.6			55.1				
Approach LOS		A			D			E				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		84.0			47.0	37.0		36.0
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0
Max Green Setting (Gmax), s		79.0			43.5	* 32		31.0
Max Q Clear Time (g_c+I1), s		2.0			11.0	19.5		27.3
Green Ext Time (p_c), s		17.9			14.6	2.1		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	17.6
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	397	50	50	311	25	25	251	25	25	790	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	27	432	54	54	338	27	27	273	27	27	859	27
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	50	478	60	76	526	42	76	680	64	57	876	27
Arrive On Green	0.03	0.29	0.29	0.04	0.30	0.30	0.49	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	1810	1656	207	1810	1737	139	62	1386	130	29	1785	55
Grp Volume(v), veh/h	27	0	486	54	0	365	327	0	0	913	0	0
Grp Sat Flow(s),veh/h/ln	1810	0	1863	1810	0	1876	1578	0	0	1869	0	0
Q Serve(g_s), s	1.3	0.0	21.7	2.6	0.0	14.6	0.0	0.0	0.0	22.1	0.0	0.0
Cycle Q Clear(g_c), s	1.3	0.0	21.7	2.6	0.0	14.6	9.3	0.0	0.0	42.1	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.07	0.08		0.08	0.03		0.03
Lane Grp Cap(c), veh/h	50	0	538	76	0	568	819	0	0	960	0	0
V/C Ratio(X)	0.54	0.00	0.90	0.71	0.00	0.64	0.40	0.00	0.00	0.95	0.00	0.00
Avail Cap(c_a), veh/h	104	0	581	104	0	584	819	0	0	960	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	41.6	0.0	29.7	41.0	0.0	26.1	13.6	0.0	0.0	21.9	0.0	0.0
Incr Delay (d2), s/veh	3.4	0.0	16.0	6.2	0.0	1.7	0.1	0.0	0.0	18.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	13.6	1.4	0.0	7.8	4.8	0.0	0.0	26.4	0.0	0.0
LnGrp Delay(d),s/veh	44.9	0.0	45.7	47.2	0.0	27.9	13.7	0.0	0.0	40.1	0.0	0.0
LnGrp LOS	D		D	D		C	B			D		
Approach Vol, veh/h		513			419			327			913	
Approach Delay, s/veh		45.7			30.4			13.7			40.1	
Approach LOS		D			C			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		48.0	8.1	30.5		48.0	6.9	31.8
Change Period (Y+Rc), s		5.5	4.5	5.5		5.5	4.5	5.5
Max Green Setting (Gmax), s		42.5	5.0	27.0		42.5	5.0	27.0
Max Q Clear Time (g_c+I1), s		11.3	4.6	23.7		44.1	3.3	16.6
Green Ext Time (p_c), s		7.4	0.0	1.3		0.0	0.0	2.8

Intersection Summary	
HCM 2010 Ctrl Delay	35.6
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	497	143	740	661	572	406	248	149	793	10	331	128
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	512	147	760	681	590	419	256	154	533	10	341	132
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	566	2071	1132	606	2113	933	234	745	1808	21	700	266
Arrive On Green	0.16	0.55	0.55	0.28	0.93	0.93	0.13	0.39	0.39	0.01	0.27	0.27
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	2625	998
Grp Volume(v), veh/h	512	147	760	681	590	419	256	154	533	10	245	228
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	1723
Q Serve(g_s), s	16.7	2.2	35.8	20.1	1.8	3.7	15.5	6.4	10.4	0.7	13.0	13.4
Cycle Q Clear(g_c), s	16.7	2.2	35.8	20.1	1.8	3.7	15.5	6.4	10.4	0.7	13.0	13.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.58
Lane Grp Cap(c), veh/h	566	2071	1132	606	2113	933	234	745	1808	21	507	459
V/C Ratio(X)	0.90	0.07	0.67	1.12	0.28	0.45	1.10	0.21	0.29	0.47	0.48	0.50
Avail Cap(c_a), veh/h	582	2071	1132	606	2113	933	234	745	1808	75	507	459
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.86	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.7	12.9	22.3	43.2	2.0	2.0	52.3	24.1	13.9	58.9	37.0	37.2
Incr Delay (d2), s/veh	16.8	0.1	3.2	73.2	0.3	1.3	86.7	0.6	0.4	5.8	3.3	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	9.6	1.2	17.3	16.1	0.9	1.7	13.4	3.5	4.8	0.4	7.3	6.9
LnGrp Delay(d),s/veh	66.6	13.0	25.5	116.4	2.2	3.4	138.9	24.7	14.3	64.7	40.3	41.0
LnGrp LOS	E	B	C	F	A	A	F	C	B	E	D	D
Approach Vol, veh/h		1419			1690			943			483	
Approach Delay, s/veh		39.0			48.5			49.9			41.1	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.6	71.9	21.0	37.5	23.3	73.2	5.9	52.6
Change Period (Y+Rc), s	4.5	5.5	5.5	* 5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	20.1	32.4	15.5	* 32	19.3	33.2	5.0	42.5
Max Q Clear Time (g_c+I1), s	22.1	37.8	17.5	15.4	18.7	5.7	2.7	12.4
Green Ext Time (p_c), s	0.0	0.0	0.0	1.4	0.1	5.8	0.0	1.9

Intersection Summary	
HCM 2010 Ctrl Delay	45.0
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	784	163	666	932	0	0	0	0	796	2	707
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	834	173	709	991	0				847	2	675
Adj No. of Lanes	0	2	1	2	2	0				2	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1029	437	1228	2492	0				1402	2	624
Arrive On Green	0.00	0.54	0.54	0.11	0.22	0.00				0.39	0.39	0.39
Sat Flow, veh/h	0	3800	1615	3619	3800	0				3619	5	1611
Grp Volume(v), veh/h	0	834	173	709	991	0				847	0	677
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1616
Q Serve(g_s), s	0.0	21.5	7.5	22.3	26.8	0.0				22.5	0.0	46.5
Cycle Q Clear(g_c), s	0.0	21.5	7.5	22.3	26.8	0.0				22.5	0.0	46.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1029	437	1228	2492	0				1402	0	626
V/C Ratio(X)	0.00	0.81	0.40	0.58	0.40	0.00				0.60	0.00	1.08
Avail Cap(c_a), veh/h	0	1029	437	1228	2492	0				1402	0	626
HCM Platoon Ratio	1.00	2.00	2.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.97	0.97	0.41	0.41	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	25.0	21.8	45.1	26.7	0.0				29.4	0.0	36.8
Incr Delay (d2), s/veh	0.0	6.7	2.6	0.2	0.2	0.0				0.7	0.0	59.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	12.1	3.6	11.2	14.2	0.0				11.3	0.0	31.1
LnGrp Delay(d),s/veh	0.0	31.7	24.4	45.3	26.9	0.0				30.1	0.0	96.7
LnGrp LOS		C	C	D	C					C		F
Approach Vol, veh/h		1007			1700						1524	
Approach Delay, s/veh		30.4			34.6						59.7	
Approach LOS		C			C						E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	46.5	38.0		52.0		84.5		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	25.5	* 33		46.5		62.5		
Max Q Clear Time (g_c+I1), s	24.3	23.5		48.5		28.8		
Green Ext Time (p_c), s	0.4	2.7		0.0		6.4		

Intersection Summary	
HCM 2010 Ctrl Delay	42.6
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	587	992	0	0	1245	1555	353	3	227	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	660	1115	0	0	1399	0	397	3	146			
Adj No. of Lanes	2	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	827	2673	0	0	1647	700	449	3	404			
Arrive On Green	0.46	1.00	0.00	0.00	0.43	0.00	0.25	0.25	0.25			
Sat Flow, veh/h	3619	3800	0	0	3800	1615	1797	14	1615			
Grp Volume(v), veh/h	660	1115	0	0	1399	0	400	0	146			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	18.7	0.0	0.0	0.0	39.6	0.0	25.5	0.0	8.9			
Cycle Q Clear(g_c), s	18.7	0.0	0.0	0.0	39.6	0.0	25.5	0.0	8.9			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	827	2673	0	0	1647	700	453	0	404			
V/C Ratio(X)	0.80	0.42	0.00	0.00	0.85	0.00	0.88	0.00	0.36			
Avail Cap(c_a), veh/h	827	2673	0	0	1647	700	453	0	404			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.66	0.66	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	30.2	0.0	0.0	0.0	30.5	0.0	43.3	0.0	37.1			
Incr Delay (d2), s/veh	3.5	0.3	0.0	0.0	5.7	0.0	21.5	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			
%ile BackOfQ(50%),veh/ln	9.6	0.1	0.0	0.0	22.1	0.0	15.5	0.0	4.3			
LnGrp Delay(d),s/veh	33.7	0.3	0.0	0.0	36.2	0.0	64.8	0.0	39.6			
LnGrp LOS	C	A			D		E		D			
Approach Vol, veh/h		1775			1399			546				
Approach Delay, s/veh		12.7			36.2			58.1				
Approach LOS		B			D			E				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		89.4			32.4	57.0		35.0
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0
Max Green Setting (Gmax), s		80.0			24.5	* 52		30.0
Max Q Clear Time (g_c+I1), s		2.0			20.7	41.6		27.5
Green Ext Time (p_c), s		7.4			2.3	4.8		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	28.2
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

APPENDIX 8.12:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS INTERSECTION OPERATIONS ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	237	50	50	351	25	25	830	25	25	91	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	27	258	54	54	382	27	27	902	27	27	99	27
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	51	368	77	79	451	32	60	940	28	118	412	102
Arrive On Green	0.03	0.24	0.24	0.04	0.26	0.26	0.52	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	1810	1525	319	1810	1754	124	27	1798	53	125	788	196
Grp Volume(v), veh/h	27	0	312	54	0	409	956	0	0	153	0	0
Grp Sat Flow(s),veh/h/ln	1810	0	1844	1810	0	1878	1878	0	0	1109	0	0
Q Serve(g_s), s	1.2	0.0	12.5	2.4	0.0	16.7	19.4	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.2	0.0	12.5	2.4	0.0	16.7	39.9	0.0	0.0	3.5	0.0	0.0
Prop In Lane	1.00		0.17	1.00		0.07	0.03		0.03	0.18		0.18
Lane Grp Cap(c), veh/h	51	0	446	79	0	483	1027	0	0	632	0	0
V/C Ratio(X)	0.53	0.00	0.70	0.69	0.00	0.85	0.93	0.00	0.00	0.24	0.00	0.00
Avail Cap(c_a), veh/h	114	0	619	114	0	631	1031	0	0	635	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	38.7	0.0	27.9	38.0	0.0	28.5	18.6	0.0	0.0	10.0	0.0	0.0
Incr Delay (d2), s/veh	3.2	0.0	0.8	3.9	0.0	6.6	14.1	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	6.4	1.3	0.0	9.5	24.5	0.0	0.0	1.8	0.0	0.0
LnGrp Delay(d),s/veh	41.8	0.0	28.7	41.9	0.0	35.1	32.7	0.0	0.0	10.1	0.0	0.0
LnGrp LOS	D		C	D		D	C			B		
Approach Vol, veh/h		339			463			956			153	
Approach Delay, s/veh		29.8			35.9			32.7			10.1	
Approach LOS		C			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		47.7	8.0	25.0		47.7	6.8	26.2
Change Period (Y+Rc), s		5.5	4.5	5.5		5.5	4.5	5.5
Max Green Setting (Gmax), s		42.3	5.1	27.1		42.3	5.1	27.1
Max Q Clear Time (g_c+I1), s		41.9	4.4	14.5		5.5	3.2	18.7
Green Ext Time (p_c), s		0.2	0.0	2.5		7.0	0.0	2.1

Intersection Summary	
HCM 2010 Ctrl Delay	31.1
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	201	11	675	499	49	17	6	771	56	7	12
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	5	239	11	804	594	58	20	7	545	67	8	14
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	23	1053	500	845	1917	847	37	507	1616	86	574	488
Arrive On Green	0.01	0.28	0.28	0.39	0.84	0.84	0.02	0.27	0.27	0.05	0.30	0.30
Sat Flow, veh/h	3619	3800	1680	3619	3800	1680	1810	1900	3230	1810	1900	1615
Grp Volume(v), veh/h	5	239	11	804	594	58	20	7	545	67	8	14
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1680	1810	1900	1615	1810	1900	1615
Q Serve(g_s), s	0.2	5.8	0.6	25.9	4.0	0.5	1.3	0.3	7.9	4.4	0.4	0.7
Cycle Q Clear(g_c), s	0.2	5.8	0.6	25.9	4.0	0.5	1.3	0.3	7.9	4.4	0.4	0.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	23	1053	500	845	1917	847	37	507	1616	86	574	488
V/C Ratio(X)	0.22	0.23	0.02	0.95	0.31	0.07	0.55	0.01	0.34	0.78	0.01	0.03
Avail Cap(c_a), veh/h	151	1053	500	860	1917	847	80	507	1616	98	574	488
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.3	33.4	29.8	35.9	5.0	2.5	58.2	32.4	8.2	56.5	29.3	29.5
Incr Delay (d2), s/veh	1.7	0.5	0.1	18.8	0.4	0.1	4.6	0.0	0.6	24.6	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	3.1	0.3	15.0	2.2	0.3	0.7	0.2	3.6	2.8	0.2	0.3
LnGrp Delay(d),s/veh	61.0	34.0	29.9	54.7	5.4	2.6	62.8	32.4	8.7	81.1	29.4	29.6
LnGrp LOS	E	C	C	D	A	A	E	C	A	F	C	C
Approach Vol, veh/h		255			1456			572			89	
Approach Delay, s/veh		34.3			32.5			10.9			68.4	
Approach LOS		C			C			B			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	32.5	38.8	6.9	41.8	5.3	66.0	11.2	37.5
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	28.5	33.0	5.3	33.2	5.0	56.5	6.5	* 32
Max Q Clear Time (g_c+I1), s	27.9	7.8	3.3	2.7	2.2	6.0	6.4	9.9
Green Ext Time (p_c), s	0.2	3.5	0.0	0.1	0.0	3.6	0.0	1.2

Intersection Summary	
HCM 2010 Ctrl Delay	28.8
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	886	142	239	516	0	0	0	0	1449	2	707
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	943	146	254	549	0				1541	2	688
Adj No. of Lanes	0	2	1	2	2	0				2	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1218	518	311	1687	0				1680	2	748
Arrive On Green	0.00	0.64	0.64	0.09	0.44	0.00				0.46	0.46	0.46
Sat Flow, veh/h	0	3800	1615	3619	3800	0				3619	5	1611
Grp Volume(v), veh/h	0	943	146	254	549	0				1541	0	690
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1616
Q Serve(g_s), s	0.0	21.2	4.8	8.3	11.3	0.0				47.7	0.0	47.9
Cycle Q Clear(g_c), s	0.0	21.2	4.8	8.3	11.3	0.0				47.7	0.0	47.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1218	518	311	1687	0				1680	0	750
V/C Ratio(X)	0.00	0.77	0.28	0.82	0.33	0.00				0.92	0.00	0.92
Avail Cap(c_a), veh/h	0	1218	518	329	1687	0				1734	0	774
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.93	0.93	0.84	0.84	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	18.4	15.5	53.9	21.7	0.0				30.0	0.0	30.0
Incr Delay (d2), s/veh	0.0	4.5	1.3	11.1	0.4	0.0				8.0	0.0	15.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.5	2.3	4.6	6.0	0.0				25.6	0.0	24.6
LnGrp Delay(d),s/veh	0.0	23.0	16.8	65.0	22.1	0.0				38.0	0.0	45.9
LnGrp LOS		C	B	E	C					D		D
Approach Vol, veh/h		1089			803						2231	
Approach Delay, s/veh		22.1			35.7						40.5	
Approach LOS		C			D						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	14.8	44.0		61.2		58.8		
Change Period (Y+Rc), s	4.5	5.5		5.5		5.5		
Max Green Setting (Gmax), s	10.9	36.1		57.5		51.5		
Max Q Clear Time (g_c+I1), s	10.3	23.2		49.9		13.3		
Green Ext Time (p_c), s	0.0	5.6		5.8		7.8		

Intersection Summary	
HCM 2010 Ctrl Delay	34.7
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	587	1748	0	0	594	628	162	0	426	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	638	1900	0	0	646	0	176	0	377			
Adj No. of Lanes	2	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	966	2450	0	0	1224	520	523	0	467			
Arrive On Green	0.27	0.64	0.00	0.00	0.32	0.00	0.29	0.00	0.29			
Sat Flow, veh/h	3619	3800	0	0	3800	1615	1810	0	1615			
Grp Volume(v), veh/h	638	1900	0	0	646	0	176	0	377			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	14.1	32.0	0.0	0.0	12.5	0.0	6.9	0.0	19.5			
Cycle Q Clear(g_c), s	14.1	32.0	0.0	0.0	12.5	0.0	6.9	0.0	19.5			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	966	2450	0	0	1224	520	523	0	467			
V/C Ratio(X)	0.66	0.78	0.00	0.00	0.53	0.00	0.34	0.00	0.81			
Avail Cap(c_a), veh/h	966	2450	0	0	1224	520	523	0	467			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.44	0.44	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	29.4	11.4	0.0	0.0	24.9	0.0	25.2	0.0	29.7			
Incr Delay (d2), s/veh	0.6	1.1	0.0	0.0	1.6	0.0	1.7	0.0	14.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	7.1	17.0	0.0	0.0	6.8	0.0	3.7	0.0	10.5			
LnGrp Delay(d),s/veh	30.0	12.5	0.0	0.0	26.5	0.0	26.9	0.0	43.7			
LnGrp LOS	C	B			C		C		D			
Approach Vol, veh/h		2538			646			553				
Approach Delay, s/veh		16.9			26.5			38.3				
Approach LOS		B			C			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		63.1			29.1	34.0		31.0
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0
Max Green Setting (Gmax), s		54.0			21.5	* 29		26.0
Max Q Clear Time (g_c+I1), s		34.0			16.1	14.5		21.5
Green Ext Time (p_c), s		11.6			4.0	2.3		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	21.7
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	475	50	50	346	25	25	251	25	25	790	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	27	516	54	54	376	27	27	273	27	27	859	27
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	162	505	53	71	417	30	73	680	64	53	902	28
Arrive On Green	0.09	0.30	0.30	0.04	0.24	0.24	0.51	0.51	0.51	0.51	0.51	0.51
Sat Flow, veh/h	1810	1692	177	1810	1752	126	66	1344	127	30	1783	55
Grp Volume(v), veh/h	27	0	570	54	0	403	327	0	0	913	0	0
Grp Sat Flow(s),veh/h/ln	1810	0	1869	1810	0	1878	1537	0	0	1868	0	0
Q Serve(g_s), s	1.4	0.0	29.5	2.9	0.0	20.6	0.0	0.0	0.0	24.1	0.0	0.0
Cycle Q Clear(g_c), s	1.4	0.0	29.5	2.9	0.0	20.6	10.3	0.0	0.0	46.6	0.0	0.0
Prop In Lane	1.00		0.09	1.00		0.07	0.08		0.08	0.03		0.03
Lane Grp Cap(c), veh/h	162	0	558	71	0	447	817	0	0	982	0	0
V/C Ratio(X)	0.17	0.00	1.02	0.76	0.00	0.90	0.40	0.00	0.00	0.93	0.00	0.00
Avail Cap(c_a), veh/h	162	0	558	92	0	560	817	0	0	982	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	41.6	0.0	34.7	47.0	0.0	36.5	14.6	0.0	0.0	23.5	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	43.9	17.4	0.0	13.6	1.5	0.0	0.0	16.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	21.8	1.8	0.0	12.3	5.7	0.0	0.0	28.2	0.0	0.0
LnGrp Delay(d),s/veh	41.8	0.0	78.5	64.4	0.0	50.2	16.1	0.0	0.0	39.5	0.0	0.0
LnGrp LOS	D		F	E		D	B			D		
Approach Vol, veh/h		597			457			327			913	
Approach Delay, s/veh		76.9			51.8			16.1			39.5	
Approach LOS		E			D			B			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		55.5	8.4	35.0		55.5	14.3	29.0
Change Period (Y+Rc), s		5.5	4.5	5.5		5.5	5.5	* 5.5
Max Green Setting (Gmax), s		50.0	5.0	29.5		50.0	5.0	* 30
Max Q Clear Time (g_c+I1), s		12.3	4.9	31.5		48.6	3.4	22.6
Green Ext Time (p_c), s		7.6	0.0	0.0		0.9	0.5	1.0

Intersection Summary	
HCM 2010 Ctrl Delay	48.4
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

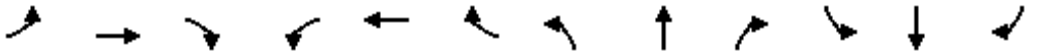
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	497	143	740	723	572	406	248	149	932	10	331	128
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1976	1900	1900	1976	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	512	147	760	745	590	419	256	154	676	10	341	132
Adj No. of Lanes	2	2	1	2	2	1	1	1	2	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	522	1077	679	1273	1897	838	219	657	2253	60	700	266
Arrive On Green	0.14	0.28	0.28	0.59	0.83	0.83	0.12	0.35	0.35	0.03	0.27	0.27
Sat Flow, veh/h	3619	3800	1680	3619	3800	1679	1810	1900	3230	1810	2625	998
Grp Volume(v), veh/h	512	147	760	745	590	419	256	154	676	10	245	228
Grp Sat Flow(s),veh/h/ln	1810	1900	1680	1810	1900	1679	1810	1900	1615	1810	1900	1723
Q Serve(g_s), s	16.9	3.5	34.0	15.5	4.2	9.8	14.5	6.9	0.0	0.6	13.0	13.4
Cycle Q Clear(g_c), s	16.9	3.5	34.0	15.5	4.2	9.8	14.5	6.9	0.0	0.6	13.0	13.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.58
Lane Grp Cap(c), veh/h	522	1077	679	1273	1897	838	219	657	2253	60	507	459
V/C Ratio(X)	0.98	0.14	1.12	0.59	0.31	0.50	1.17	0.23	0.30	0.17	0.48	0.50
Avail Cap(c_a), veh/h	522	1077	679	1273	1897	838	219	657	2253	75	507	459
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.85	0.85	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.2	32.1	57.0	19.2	5.3	7.5	52.8	27.9	6.9	56.4	37.0	37.2
Incr Delay (d2), s/veh	34.4	0.3	72.3	0.4	0.4	1.8	114.7	0.8	0.3	0.5	3.3	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	11.0	1.9	13.6	7.6	2.1	4.8	14.2	3.8	4.3	0.3	7.3	6.9
LnGrp Delay(d),s/veh	85.6	32.3	129.3	19.6	5.7	9.3	167.4	28.8	7.3	56.9	40.3	41.0
LnGrp LOS	F	C	F	B	A	A	F	C	A	E	D	D
Approach Vol, veh/h		1419			1754			1086			483	
Approach Delay, s/veh		103.5			12.5			48.1			41.0	
Approach LOS		F			B			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	47.8	39.5	19.0	37.5	21.8	65.5	9.5	47.0
Change Period (Y+Rc), s	5.5	* 5.5	4.5	5.5	4.5	5.5	5.5	* 5.5
Max Green Setting (Gmax), s	19.5	* 34	14.5	32.0	17.3	36.2	5.0	* 42
Max Q Clear Time (g_c+I1), s	17.5	36.0	16.5	15.4	18.9	11.8	2.6	8.9
Green Ext Time (p_c), s	1.0	0.0	0.0	1.4	0.0	4.9	0.4	2.0

Intersection Summary	
HCM 2010 Ctrl Delay	50.8
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.



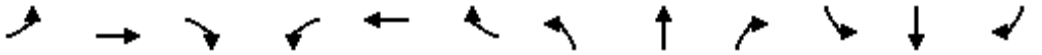
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	891	194	666	953	0	0	0	0	796	2	748
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	948	206	709	1014	0				847	2	719
Adj No. of Lanes	0	2	1	2	2	0				2	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1086	462	1681	3025	0				1402	2	624
Arrive On Green	0.00	0.57	0.57	0.15	0.26	0.00				0.39	0.39	0.39
Sat Flow, veh/h	0	3800	1615	3619	3800	0				3619	4	1611
Grp Volume(v), veh/h	0	948	206	709	1014	0				847	0	721
Grp Sat Flow(s),veh/h/ln	0	1900	1615	1810	1900	0				1810	0	1616
Q Serve(g_s), s	0.0	25.6	8.8	21.3	25.9	0.0				22.5	0.0	46.5
Cycle Q Clear(g_c), s	0.0	25.6	8.8	21.3	25.9	0.0				22.5	0.0	46.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1086	462	1681	3025	0				1402	0	626
V/C Ratio(X)	0.00	0.87	0.45	0.42	0.34	0.00				0.60	0.00	1.15
Avail Cap(c_a), veh/h	0	1086	462	1681	3025	0				1402	0	626
HCM Platoon Ratio	1.00	2.00	2.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.96	0.96	0.36	0.36	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	23.8	20.2	36.2	18.6	0.0				29.4	0.0	36.8
Incr Delay (d2), s/veh	0.0	9.3	3.0	0.0	0.1	0.0				0.7	0.0	85.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	14.6	4.3	10.7	13.7	0.0				11.3	0.0	35.6
LnGrp Delay(d),s/veh	0.0	33.2	23.2	36.2	18.7	0.0				30.1	0.0	122.4
LnGrp LOS		C	C	D	B					C		F
Approach Vol, veh/h		1154			1723						1568	
Approach Delay, s/veh		31.4			25.9						72.5	
Approach LOS		C			C						E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	61.9	39.8		52.0		101.7		
Change Period (Y+Rc), s	5.5	* 5.5		5.5		5.5		
Max Green Setting (Gmax), s	23.7	* 34		46.5		62.5		
Max Q Clear Time (g_c+I1), s	23.3	27.6		48.5		27.9		
Green Ext Time (p_c), s	0.1	2.6		0.0		6.6		

Intersection Summary	
HCM 2010 Ctrl Delay	43.8
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	679	1007	0	0	1252	1555	367	3	227	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1900	1900	0	0	1900	1900	1900	1900	1900			
Adj Flow Rate, veh/h	763	1131	0	0	1407	0	412	3	146			
Adj No. of Lanes	2	2	0	0	2	1	0	1	1			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89			
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0			
Cap, veh/h	799	2533	0	0	1583	673	449	3	404			
Arrive On Green	0.22	0.67	0.00	0.00	0.42	0.00	0.25	0.25	0.25			
Sat Flow, veh/h	3619	3800	0	0	3800	1615	1797	13	1615			
Grp Volume(v), veh/h	763	1131	0	0	1407	0	415	0	146			
Grp Sat Flow(s),veh/h/ln	1810	1900	0	0	1900	1615	1810	0	1615			
Q Serve(g_s), s	25.0	17.0	0.0	0.0	41.2	0.0	26.8	0.0	8.9			
Cycle Q Clear(g_c), s	25.0	17.0	0.0	0.0	41.2	0.0	26.8	0.0	8.9			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	799	2533	0	0	1583	673	453	0	404			
V/C Ratio(X)	0.95	0.45	0.00	0.00	0.89	0.00	0.92	0.00	0.36			
Avail Cap(c_a), veh/h	799	2533	0	0	1583	673	453	0	404			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.60	0.60	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	46.2	9.5	0.0	0.0	32.4	0.0	43.8	0.0	37.1			
Incr Delay (d2), s/veh	15.1	0.3	0.0	0.0	7.8	0.0	25.9	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			
%ile BackOfQ(50%),veh/ln	14.2	8.9	0.0	0.0	23.2	0.0	16.6	0.0	4.3			
LnGrp Delay(d),s/veh	61.3	9.8	0.0	0.0	40.3	0.0	69.7	0.0	39.6			
LnGrp LOS	E	A			D		E		D			
Approach Vol, veh/h		1894			1407			561				
Approach Delay, s/veh		30.6			40.3			61.9				
Approach LOS		C			D			E				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		85.0			30.0	55.0		35.0
Change Period (Y+Rc), s		5.0			3.5	5.0		5.0
Max Green Setting (Gmax), s		80.0			26.5	50.0		30.0
Max Q Clear Time (g_c+I1), s		19.0			27.0	43.2		28.8
Green Ext Time (p_c), s		20.0			0.0	5.4		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	38.6
HCM 2010 LOS	D

APPENDIX 8.13:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	900	138	254	506	1541	672
v/c Ratio	0.94	0.26	0.74	0.35	0.77	0.62
Control Delay	57.8	18.5	42.9	48.1	25.2	16.8
Queue Delay	0.0	0.0	0.0	1.9	48.6	0.0
Total Delay	57.8	18.5	42.9	50.1	73.8	16.8
Queue Length 50th (ft)	~392	36	105	212	430	249
Queue Length 95th (ft)	#520	88	147	268	511	363
Internal Link Dist (ft)	844			267		1109
Turn Bay Length (ft)		100	80			
Base Capacity (vph)	956	525	366	1443	2105	1127
Starvation Cap Reductn	0	0	0	753	0	0
Spillback Cap Reductn	0	0	0	0	841	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.26	0.69	0.73	1.22	0.60

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.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	601	1893	630	683	147	463
v/c Ratio	0.44	0.76	0.62	0.36	0.30	0.86
Control Delay	33.7	24.3	41.9	0.5	37.8	53.5
Queue Delay	1.3	47.8	0.5	0.0	0.0	0.0
Total Delay	35.0	72.1	42.3	0.5	37.8	53.5
Queue Length 50th (ft)	124	723	215	0	92	301
Queue Length 95th (ft)	m124	m778	275	0	151	#481
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	1377	2501	1013	1877	490	538
Starvation Cap Reductn	532	915	0	0	0	0
Spillback Cap Reductn	0	0	107	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	1.19	0.70	0.36	0.30	0.86

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	834	173	709	991	847	754
v/c Ratio	0.81	0.30	0.88	0.50	0.58	0.96
Control Delay	43.8	16.0	77.4	25.2	31.0	56.0
Queue Delay	0.2	0.0	48.9	47.5	0.0	0.0
Total Delay	44.0	16.0	126.3	72.7	31.0	56.0
Queue Length 50th (ft)	302	38	295	284	255	512
Queue Length 95th (ft)	383	98	m#355	353	317	#775
Internal Link Dist (ft)	844			267		1109
Turn Bay Length (ft)		100	80			
Base Capacity (vph)	1036	579	807	1986	1472	789
Starvation Cap Reductn	0	0	209	1079	0	0
Spillback Cap Reductn	16	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.30	1.19	1.09	0.58	0.96

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	660	1115	1399	1747	400	255
v/c Ratio	0.85	0.44	0.85	0.93	0.84	0.45
Control Delay	22.4	1.6	36.7	10.9	59.9	22.5
Queue Delay	3.8	0.3	47.9	0.0	0.0	0.0
Total Delay	26.2	1.9	84.5	10.9	59.9	22.5
Queue Length 50th (ft)	31	9	477	0	296	85
Queue Length 95th (ft)	86	29	561	#21	#449	162
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	775	2533	1646	1877	475	565
Starvation Cap Reductn	61	758	0	0	0	0
Spillback Cap Reductn	0	0	493	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.92	0.63	1.21	0.93	0.84	0.45

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

APPENDIX 8.14:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS OFF-RAMP QUEUING ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	943	151	254	549	1541	754
v/c Ratio	0.80	0.24	0.76	0.33	0.86	0.75
Control Delay	39.1	15.0	68.9	23.3	33.8	23.6
Queue Delay	0.0	0.0	0.0	1.4	0.0	0.0
Total Delay	39.1	15.0	68.9	24.7	33.8	23.6
Queue Length 50th (ft)	291	39	97	139	508	344
Queue Length 95th (ft)	375	m95	#149	181	608	504
Internal Link Dist (ft)	844			267		1109
Turn Bay Length (ft)		100	80			
Base Capacity (vph)	1176	635	345	1651	1820	1016
Starvation Cap Reductn	0	0	0	868	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.24	0.74	0.70	0.85	0.74

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	638	1900	646	683	176	463
v/c Ratio	0.70	0.83	0.53	0.36	0.32	0.76
Control Delay	36.2	18.6	26.8	0.5	27.1	33.1
Queue Delay	0.9	47.3	0.0	0.0	0.0	0.0
Total Delay	37.1	65.9	26.8	0.5	27.1	33.1
Queue Length 50th (ft)	166	397	148	0	78	197
Queue Length 95th (ft)	223	499	199	0	134	#321
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	907	2280	1224	1900	548	609
Starvation Cap Reductn	89	695	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	1.20	0.53	0.36	0.32	0.76

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	948	206	709	1014	847	798
v/c Ratio	0.87	0.34	0.95	0.51	0.58	1.02
Control Delay	47.8	17.3	79.2	17.6	30.9	69.2
Queue Delay	48.1	0.0	44.3	25.0	0.0	0.0
Total Delay	95.9	17.3	123.5	42.5	30.9	69.2
Queue Length 50th (ft)	357	71	294	266	255	~590
Queue Length 95th (ft)	#455	127	m#356	m312	317	#857
Internal Link Dist (ft)	844			267		1109
Turn Bay Length (ft)		100	80			
Base Capacity (vph)	1086	608	750	1979	1472	786
Starvation Cap Reductn	0	0	152	998	0	0
Spillback Cap Reductn	268	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.16	0.34	1.19	1.03	0.58	1.02

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.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	763	1131	1407	1747	415	255
v/c Ratio	0.93	0.45	0.88	0.93	0.87	0.45
Control Delay	51.8	7.4	39.6	10.9	63.4	23.1
Queue Delay	47.6	0.2	47.3	0.0	7.6	0.0
Total Delay	99.5	7.5	86.9	10.9	71.0	23.1
Queue Length 50th (ft)	284	109	496	0	310	88
Queue Length 95th (ft)	m296	122	583	#21	#476	166
Internal Link Dist (ft)		267	594		929	
Turn Bay Length (ft)	60			100		265
Base Capacity (vph)	839	2533	1602	1877	475	562
Starvation Cap Reductn	235	488	0	0	0	0
Spillback Cap Reductn	0	0	433	0	39	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.26	0.55	1.20	0.93	0.95	0.45

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

APPENDIX 8.15:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5961*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2214*	pc/h/ln
S	*58.1*	mph
D = v_p / S	*38.1*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:33 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4171*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1564*	pc/h/ln
S	*68.5*	mph
D = v_p / S	*22.8*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 11:55 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5899*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2191*	pc/h/ln
S	*58.6*	mph
D = v_p / S	*37.4*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:34 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5324*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1968*	pc/h/ln
S	*63.2*	mph
D = v_p / S	*31.2*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 11:56 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5903*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2192*	pc/h/ln
S	*58.6*	mph
D = v_p / S	*37.4*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:35 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5274*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1959*	pc/h/ln
S	*63.3*	mph
D = v_p / S	*30.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 11:56 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5970*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2228*	pc/h/ln
S	*57.7*	mph
D = v_p / S	*38.6*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:35 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 Without Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4319*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1604*	pc/h/ln
S	*68.1*	mph
D = v_p / S	*23.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 11:56 AM

APPENDIX 8.16:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS BASIC FREEWAY SEGMENT ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6003*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.5*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2240*	pc/h/ln
S	*57.5*	mph
D = v_p / S	*39.0*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:39 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4173*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1565*	pc/h/ln
S	*68.5*	mph
D = v_p / S	*22.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 12:33 PM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5918*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2198*	pc/h/ln
S	*58.4*	mph
D = v_p / S	*37.6*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:40 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5340*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1973*	pc/h/ln
S	*63.1*	mph
D = v_p / S	*31.3*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 12:33 PM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5925*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2200*	pc/h/ln
S	*58.4*	mph
D = v_p / S	*37.7*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/18/2015 2:40 AM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Southbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5292*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1965*	pc/h/ln
S	*63.2*	mph
D = v_p / S	*31.1*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 12:34 PM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*North of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6018*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2246*	pc/h/ln
S	*57.3*	mph
D = v_p / S	*39.2*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*CHS*
Agency or Company	*Urban Crossroads, Inc.*
Date Performed	*5/18/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-215 Northbound*
From/To	*South of Harley Knox Bl.*
Jurisdiction	*Caltrans*
Analysis Year	*2035 With Project w/ IMPROV*

Project Description *Knox Logistics Center Phase II TIA (JN 09347)*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4320*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1612*	pc/h/ln
S	*68.0*	mph
D = v_p / S	*23.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

HCS 2010™ Version 6.65 Generated: 5/19/2015 12:34 PM

APPENDIX 8.17:

HORIZON YEAR (2035) WITHOUT PROJECT CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	195	L_{down} =	1420 ft
V_u =	veh/h	Freeway Volume, V_F	5961	V_D =	387 veh/h
		Ramp Volume, V_R	2177		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5961	0.92	Level	5	0	0.976	1.00	6641
Ramp	2177	0.92	Level	7	0	0.966	1.00	2449
UpStream								
DownStream	387	0.92	Level	26	0	0.885	1.00	475

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.481 using Equation (Exhibit 13-7)

V_{12} = 4467 pc/h

V_3 or V_{av34} 2174 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6641	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4192	Exhibit 13-8	7200	No
V_R	2449	Exhibit 13-10	2100	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4467	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 40.9 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.518 (Exhibit 13-12)

S_R = 55.5 mph (Exhibit 13-12)

S_0 = 72.2 mph (Exhibit 13-12)

S = 60.0 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:41 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No ☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	2177 veh/h	Freeway Volume, V_F	3784	V_D = veh/h
		Ramp Volume, V_R	387	
		Freeway Free-Flow Speed, S_{FF}	70.0	
		Ramp Free-Flow Speed, S_{FR}	45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3784	0.92	Level	5	0	0.976	1.00	4216
Ramp	387	0.92	Level	26	0	0.885	1.00	475
UpStream	2177	0.92	Level	7	0	0.966	1.00	2449
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1070.71 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 2465 pc/h

V_3 or V_{av34} = 1751 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2465 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4691	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2940	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.371 (Exibit 13-11)

S_R = 59.6 mph (Exhibit 13-11)

S_0 = 65.5 mph (Exhibit 13-11)

S = 61.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	300	☑ No	☐ Off
L_{up} =	1395 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	630 veh/h	Freeway Volume, V_F	4694	V_D =	veh/h
		Ramp Volume, V_R	1205		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4694	0.92	Level	2	0	0.990	1.00	5153
Ramp	1205	0.92	Level	16	0	0.926	1.00	1415
UpStream	630	0.92	Level	17	0	0.922	1.00	743
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1490.15 (Equation 13-6 or 13-7)

P_{FM} = 0.580 using Equation (Exhibit 13-6)

V_{12} = 2988 pc/h

V_3 or V_{av34} 2165 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2988 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6568	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4403	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 37.3 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.613 (Exibit 13-11)

S_R= 52.8 mph (Exhibit 13-11)

S_0= 64.0 mph (Exhibit 13-11)

S = 56.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	5324
Ramp Volume, V_R	630
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1395 ft
V_D = 1205 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5324	0.92	Level	4	0	0.980	1.00	5903
Ramp	630	0.92	Level	17	0	0.922	1.00	743
UpStream								
DownStream	1205	0.92	Level	16	0	0.926	1.00	1415

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.578 using Equation (Exhibit 13-7)
V_{12} = 3727 pc/h
V_3 or V_{av34} 2176 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5903	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5160	Exhibit 13-8	7200	No
V_R	743	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3727	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 33.8 (pc/mi/ln)
LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.365 (Exhibit 13-12)
S_R= 59.8 mph (Exhibit 13-12)
S_0= 72.2 mph (Exhibit 13-12)
S = 63.8 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:42 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	195	L_{down} =	1420 ft
V_u =	veh/h	Freeway Volume, V_F	5903	V_D =	905 veh/h
		Ramp Volume, V_R	1534		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5903	0.92	Level	5	0	0.976	1.00	6577
Ramp	1534	0.92	Level	16	0	0.926	1.00	1801
UpStream								
DownStream	905	0.92	Level	21	0	0.905	1.00	1087

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.513 using Equation (Exhibit 13-7)

V_{12} = 4250 pc/h

V_3 or V_{av34} 2327 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6577	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4776	Exhibit 13-8	7200	No
V_R	1801	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4250	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 39.0 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.460 (Exhibit 13-12)

S_R = 57.1 mph (Exhibit 13-12)

S_0 = 71.6 mph (Exhibit 13-12)

S = 61.5 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:42 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway/Ramp		Downstream Adj Ramp	
☑ Yes	☐ On	Freeway Number of Lanes, N	3	☐ Yes	☐ On
☐ No	☑ Off	Ramp Number of Lanes, N	1	☑ No	☐ Off
L_{up} =	1420 ft	Acceleration Lane Length, L_A	260	L_{down} =	ft
V_u =	1534 veh/h	Deceleration Lane Length L_D		V_D =	veh/h
		Freeway Volume, V_F	4369		
		Ramp Volume, V_R	905		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4369	0.92	Level	1	0	0.995	1.00	4773
Ramp	905	0.92	Level	21	0	0.905	1.00	1087
UpStream	1534	0.92	Level	16	0	0.926	1.00	1801
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1320.88 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 2791 pc/h

V_3 or V_{av34} = 1982 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2791 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5860	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3878	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 33.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.486 (Exibit 13-11)

S_R = 56.4 mph (Exhibit 13-11)

S_0 = 64.7 mph (Exhibit 13-11)

S = 58.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	300	☑ No	☐ Off
L_{up} =	1395 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	601 veh/h	Freeway Volume, V_F	3718	V_D =	veh/h
		Ramp Volume, V_R	2252		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3718	0.92	Level	5	0	0.976	1.00	4142
Ramp	2252	0.92	Level	7	0	0.966	1.00	2533
UpStream	601	0.92	Level	11	0	0.948	1.00	689
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1513.05 (Equation 13-6 or 13-7)

P_{FM} = 0.578 using Equation (Exhibit 13-6)

V_{12} = 2396 pc/h

V_3 or V_{av34} = 1746 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2396 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6675	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4929	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 40.9 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.833 (Exibit 13-11)

S_R = 46.7 mph (Exhibit 13-11)

S_0 = 65.5 mph (Exhibit 13-11)

S = 50.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 Without Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1395 ft
V_u = veh/h	Deceleration Lane Length L_D: 280	V_D = 2252 veh/h
	Freeway Volume, V_F: 4319	
	Ramp Volume, V_R: 601	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4319	0.92	Level	5	0	0.976	1.00	4812
Ramp	601	0.92	Level	11	0	0.948	1.00	689
UpStream								
DownStream	2252	0.92	Level	7	0	0.966	1.00	2533

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.608 using Equation (Exhibit 13-7)

V_{12} = 3196 pc/h

V_3 or V_{av34} 1616 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4812	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4123	Exhibit 13-8	7200	No
V_R	689	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3196	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 29.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.360 (Exhibit 13-12)

S_R = 59.9 mph (Exhibit 13-12)

S_0 = 74.4 mph (Exhibit 13-12)

S = 64.1 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:43 AM

APPENDIX 8.18:

HORIZON YEAR (2035) WITH PROJECT CONDITIONS FREEWAY MERGE/DIVERGE ANALYSIS WORKSHEETS WITH IMPROVEMENTS

This Page Intentionally Left Blank

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1420 ft
V_u = veh/h	Deceleration Lane Length L_D: 195	V_D = 396 veh/h
	Freeway Volume, V_F: 6003	
	Ramp Volume, V_R: 2226	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6003	0.92	Level	6	0	0.971	1.00	6721
Ramp	2226	0.92	Level	8	0	0.962	1.00	2516
UpStream								
DownStream	396	0.92	Level	25	0	0.889	1.00	484

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.476 using Equation (Exhibit 13-7)

V_{12} = 4519 pc/h

V_3 or V_{av34} 2202 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6721	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4205	Exhibit 13-8	7200	No
V_R	2516	Exhibit 13-10	2100	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4519	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 41.4 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.524 (Exhibit 13-12)

S_R = 55.3 mph (Exhibit 13-12)

S_0 = 72.1 mph (Exhibit 13-12)

S = 59.9 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:44 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	2226 veh/h	Freeway Volume, V_F	3777	V_D =	veh/h
		Ramp Volume, V_R	396		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3777	0.92	Level	5	0	0.976	1.00	4208
Ramp	396	0.92	Level	25	0	0.889	1.00	484
UpStream	2226	0.92	Level	8	0	0.962	1.00	2516
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1070.93 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 2461 pc/h

V_3 or V_{av34} = 1747 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2461 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4692	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2945	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.372 (Exibit 13-11)

S_R = 59.6 mph (Exhibit 13-11)

S_0 = 65.5 mph (Exhibit 13-11)

S = 61.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	300	☑ No	☐ Off
L_{up} =	1395 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	649 veh/h	Freeway Volume, V_F	4691	V_D =	veh/h
		Ramp Volume, V_R	1227		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4691	0.92	Level	2	0	0.990	1.00	5150
Ramp	1227	0.92	Level	16	0	0.926	1.00	1440
UpStream	649	0.92	Level	17	0	0.922	1.00	765
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1494.86 (Equation 13-6 or 13-7)

P_{FM} = 0.580 using Equation (Exhibit 13-6)

V_{12} = 2984 pc/h

V_3 or V_{av34} 2166 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2984 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6590	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4424	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 37.4 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.619 (Exibit 13-11)

S_R= 52.7 mph (Exhibit 13-11)

S_0= 64.0 mph (Exhibit 13-11)

S = 55.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	AM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	280	L_{down} =	1395 ft
V_u =	veh/h	Freeway Volume, V_F	5340	V_D =	1227 veh/h
		Ramp Volume, V_R	649		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5340	0.92	Level	4	0	0.980	1.00	5920
Ramp	649	0.92	Level	17	0	0.922	1.00	765
UpStream								
DownStream	1227	0.92	Level	16	0	0.926	1.00	1440

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.577 using Equation (Exhibit 13-7)

V_{12} = 3738 pc/h

V_3 or V_{av34} 2182 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5920	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5155	Exhibit 13-8	7200	No
V_R	765	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3738	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 33.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.367 (Exhibit 13-12)

S_R = 59.7 mph (Exhibit 13-12)

S_0 = 72.2 mph (Exhibit 13-12)

S = 63.8 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:48 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	195
Freeway Volume, V_F	5925
Ramp Volume, V_R	1559
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 1420 ft

V_D = 926 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5925	0.92	Level	5	0	0.976	1.00	6601
Ramp	1559	0.92	Level	16	0	0.926	1.00	1830
UpStream								
DownStream	926	0.92	Level	21	0	0.905	1.00	1112

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.511 using Equation (Exhibit 13-7)

V_{12} = 4267 pc/h

V_3 or V_{av34} 2334 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6601	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4771	Exhibit 13-8	7200	No
V_R	1830	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4267	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 39.2 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.463 (Exhibit 13-12)

S_R = 57.0 mph (Exhibit 13-12)

S_0 = 71.6 mph (Exhibit 13-12)

S = 61.5 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:48 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Southbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	260	☑ No	☐ Off
L_{up} =	1420 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	1559 veh/h	Freeway Volume, V_F	4366	V_D =	veh/h
		Ramp Volume, V_R	926		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	45.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4366	0.92	Level	1	0	0.995	1.00	4769
Ramp	926	0.92	Level	21	0	0.905	1.00	1112
UpStream	1559	0.92	Level	16	0	0.926	1.00	1830
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1325.37 (Equation 13-6 or 13-7)

P_{FM} = 0.585 using Equation (Exhibit 13-6)

V_{12} = 2789 pc/h

V_3 or V_{av34} 1980 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2789 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5881	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3901	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 33.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.490 (Exibit 13-11)

S_R= 56.3 mph (Exhibit 13-11)

S_0= 64.7 mph (Exhibit 13-11)

S = 58.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox On-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 1395 ft	Acceleration Lane Length, L_A: 300	L_{down} = ft
V_u = 610 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3710	
	Ramp Volume, V_R: 2308	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3710	0.92	Level	5	0	0.976	1.00	4133
Ramp	2308	0.92	Level	8	0	0.962	1.00	2609
UpStream	610	0.92	Level	11	0	0.948	1.00	700
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1527.39 (Equation 13-6 or 13-7)

P_{FM} = 0.577 using Equation (Exhibit 13-6)

V_{12} = 2387 pc/h

V_3 or V_{av34} 1746 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2387 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6742	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4996	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 41.4 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.871 (Exibit 13-11)

S_R= 45.6 mph (Exhibit 13-11)

S_0= 65.5 mph (Exhibit 13-11)

S = 49.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	CHS	Freeway/Dir of Travel	I-215 Northbound
Agency or Company	Urban Crossroads, Inc.	Junction	Harley Knox Off-Ramp
Date Performed	5/19/2015	Jurisdiction	Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	2035 With Project w/ IMPROV

Project Description: Knox Logistics Center Phase II TIA (JN 09347)

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	280
Freeway Volume, V_F	4320
Ramp Volume, V_R	610
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off; L_{down} = 1395 ft; V_D = 2308 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4320	0.92	Level	6	0	0.971	1.00	4837
Ramp	610	0.92	Level	11	0	0.948	1.00	700
UpStream								
DownStream	2308	0.92	Level	8	0	0.962	1.00	2609

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

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

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

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

P_{FD} = 0.607 using Equation (Exhibit 13-7)

V_{12} = 3211 pc/h

V_3 or V_{av34} 1626 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4837	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4137	Exhibit 13-8	7200	No
V_R	700	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3211	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 29.3 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.361 (Exhibit 13-12)

S_R = 59.9 mph (Exhibit 13-12)

S_0 = 74.3 mph (Exhibit 13-12)

S = 64.1 mph (Exhibit 13-13)

HCS2010™ Version 6.65 Generated: 5/19/2015 10:49 AM