

Appendix J: Transportation Impact Study



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TRANSPORTATION CONSULTANTS



FINAL TRANSPORTATION IMPACT STUDY FOR NORTHWEST AIRPORT WAY MASTER PLAN

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Submitted by:

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EXECUTIVE SUMMARY

This report analyzes the transportation impacts associated with development of the Northwest Airport Way Master Plan ("Master Plan") and the CenterPoint Intermodal Center ("CIC"), which would occupy a portion of the Master Plan area. The project site is situated west of Airport Way between Roth Road and Lathrop Road in unincorporated San Joaquin County. This area is within the City of Manteca Sphere of Influence and the City proposes to annex the entire Master Plan area into the City. Refer to Figure 1 for project location.

A large study area bounded by State Route 99 (SR 99) on the east, Interstate 5 (I-5) on the west, French Camp Road on the north, and Louise Avenue on the south was selected for analysis. A total of 20 study intersections and various freeway segments and ramps were selected for analysis under the following scenarios:

- Existing Conditions
- Existing Plus CIC Conditions
- Cumulative No Development Conditions
- Cumulative Plus CIC Conditions
- Cumulative Plus Northwest Airport Way Master Plan Conditions

EXISTING CONDITIONS

The following study intersections currently operate at an unacceptable Level of Service (LOS) during one or both peak hours (based on the standards of the applicable agency):

- Lathrop Road/I-5 SB Ramps (off-ramp operates at LOS F during both peak hours)
- Lathrop Road/I-5 NB Ramps (off-ramp operates at LOS F during PM peak hour)
- Lathrop Road/SR 99 Frontage Road West (LOS E during PM peak hour)

Roth Road features two at-grade crossings with the Union Pacific Railroad (UPRR) between Interstate 5 and the project site. An average of 18 to 20 trains per day use each track. Both crossings have advanced warning signs, railroad crossing pavement markings, stop lines, crossing gates, flashing lights, and warning bells.

Based on data published in *Railroad Safety Statistics 2007 Final Annual Report* (Federal Railroad Administration, 2009), the warning devices presently in place at the two Roth Road at-grade railroad crossings are associated with lower levels of accident rates when considering the entire range of potential warning devices. This conclusion is confirmed by the observed accident records at each location since 2002. The westerly crossing had two accidents and the easterly crossing had one accident, all of which were associated with driver error and not railroad equipment malfunctions.

PROJECT LAND USE AND TRAVEL CHARACTERISTICS

According to the Draft Northwest Airport Master Plan (2010) and information provided by the project applicant, the CIC would consist of 3,177,521 square feet of light industrial (consisting of various distribution, high-cube warehouse, and light industrial uses)

The remainder of the Master Plan is comprised of the several properties adjacent to the CIC. Master Plan Buildout would consist of the following land use totals:

- 4,452,600 square feet of light industrial
- 205,820 square feet of community commercial

The CIC would generate 4,000 external daily trips, with 310 trips during the AM peak hour (64 percent inbound) and 470 trips during the PM peak hour (57 percent outbound). The trip generation would decrease by about ten percent under cumulative conditions due to increased internalization with the Lathrop Intermodal Terminal due to its planned expansion. Trucks would comprise approximately 53 percent of daily CIC traffic, with the majority being oriented toward freeways. Chapter 6 provides an in-depth discussion of the expected operations of the CIC and its interaction with the adjacent Lathrop Intermodal Terminal. The CIC would be accessed by several driveways located on Airport Way and Roth Road.

The Northwest Airport Master Plan is expected to generate 16,330 daily external trips, with 770 AM peak hour trips and 1,520 PM peak hour trips at buildout. Master Plan Buildout would provide new driveways on Lathrop Road.

EXISTING PLUS CIC CONDITIONS

Development of the CIC under existing conditions would cause the following significant transportation impacts:

Impact TR-1: I-5 NB Ramps/Lathrop Road intersection

Mitigation: The City of Lathrop is pursuing interim improvements for this interchange. The CIC will be paying its fair share for its impacts through the Measure K sales tax, payment of San Joaquin County Regional Transportation Impact Fee (RTIF), which are dedicating funds to improve this interchange. Impact remains significant because remaining funding sources required for implementation are unknown and improvements are subject to Caltrans approval.

Impact TR-2: Lathrop Road/SR 99 Frontage Road West intersection

Mitigation: The pending Highway 99 Widening Project includes improvements to the SR 99/Lathrop Road interchange, which will restore this intersection to an acceptable level.

Impacts to the transit, rail, bicycle, and pedestrian systems are considered less than significant. It is noted that a grade-separation of the easterly railroad crossing with Roth Road is contemplated in conjunction with the expansion of the Lathrop Intermodal Terminal.

CUMULATIVE CONDITIONS

Under cumulative no project conditions, 10 of the 20 study intersections would operate at an unacceptable LOS during one or both peak hours. Unacceptable operations at intersections within Manteca can be attributed to the assumption that planned road widenings in the City's PFIP are not in place because of historical underfunding of the program. However, the City is currently updating its PFIP and has recently indicated that the new fee will be sufficient to fully fund the required local street improvements within the City, and to partially fund improvements to selected freeway interchanges.

Impact TR-3: I-5/Roth Road interchange

Mitigation: Pay fair share for cost of installing traffic signals at the I-5 NB Ramps/Roth Road and I-5 SB Ramps/Roth Road intersections. Fair share is 10 percent for CIC and 21 percent for Master Plan Buildout. Impact remains significant because remaining funding sources required for implementation are unknown and improvements are subject to Caltrans approval.

Impact TR-4: Roth Road/Harlan Road intersection

Mitigation: Pay fair share for cost of installing traffic signal and adding lanes. Fair share is 15 percent for CIC and 30 percent for Master Plan Buildout. Impact remains significant because remaining funding sources required for implementation are unknown and improvements are subject to City of Lathrop approval.

Impact TR-5: Airport Way/Daisywood Drive intersection

Mitigation: Pay PFIP traffic impact fee. Fee covers widening of Airport Way, which would improve operations to an acceptable level, thereby mitigating impact to less than significant.

Impact TR-6: Airport Way/Lathrop Road intersection

Mitigation: Pay PFIP traffic impact fee. Fee covers widening of both streets, which would improve operations to an acceptable level, thereby mitigating impact to less than significant.

Impact TR-7: Lathrop Road/Union Road intersection

Mitigation: Pay PFIP traffic impact fee. Fee covers widening of Lathrop Road, which would improve operations to an acceptable level, thereby mitigating impact to less than significant.

Impact TR-8: Louise Avenue/Airport Way intersection

Mitigation: Pay PFIP traffic impact fee. Fee covers widening of both streets, which would improve operations to an acceptable level, thereby mitigating impact to less than significant.

Impact TR-9: I-5 mainline segment between Lathrop Road and State Route 120

Mitigation: Pay applicable RTIF, which helps fund improvements to this segment of I-5. Project will also generate revenue for infrastructure improvements (including widening of I-5) through the Measure K sales tax. Impact is considered significant and unavoidable because the identified improvements (addition of HOV lanes) do not restore operations to an acceptable level. However, the revenues generated by the CIC and Master Plan through payment of RTIF

and Measure K sales tax receipts represent mitigation in the form of a financial contribution that is roughly proportional to the impact.

Impact TR-10: I-5 northbound on-ramp at Roth Road

Mitigation: Same as Mitigation TR-9. Impact is considered significant and unavoidable.

Impacts to the transit, rail, bicycle, and pedestrian systems were less than significant. With only a few exceptions, the specific improvements required at each of the above intersections are the same for the CIC and for the Master Plan. Figure 10 displays the recommended mitigations for each scenario.

PROJECT ACCESS EVALUATION

Based on recent analyses for the City's PFIP, Fehr & Peers recommends that street right-of-ways should be reserved as follows:

- Airport Way – Right-of-way should be dedicated to provide an ultimate six-lane arterial plus a median or center turn pocket.
- Lathrop Road – The ultimate roadway cross-section consists of four lanes plus a landscaped or paved median.
- Roth Road – Right-of-way should be dedicated to provide an ultimate four-lane arterial plus a median or center turn pocket.

To accommodate an “existing plus CIC” scenario, the sections of Airport Way and Roth Road that front along portions of the CIC properties do not require widening in the near-term for capacity purposes. However, some widening will be necessary to develop left-turn pockets into the project driveways and provide raised medians in locations with restricted driveway turning movements. The City may also ask the applicant to construct frontage lanes to support future street widening or provide deceleration opportunities. The City will require that travel lanes along the frontage be constructed in their planned ultimate locations to support future widening.

Fehr & Peers recommends that the City conduct focused reviews of project access as individual projects are submitted for site plan and subsequent environmental review. The access reviews should focus on traffic signal needs/spacing, designs for driveways expected to be heavily used by trucks, and access provisions for future development on the opposite side of the street. Because the project will contribute to further deterioration of pavement on streets along the project frontage, frontage street improvements should be designed to meet the appropriate 20-year traffic index (TI) for pavement thickness.

1. INTRODUCTION

This report analyzes the transportation impacts associated with development of the Northwest Airport Way Master Plan (Master Plan) and the CenterPoint Intermodal Center (CIC), which would occupy a portion of the Master Plan area. The project site is situated west of Airport Way between Roth Road and Lathrop Road in unincorporated San Joaquin County. This area is within the City of Manteca Sphere of Influence and the City proposes to annex the entire Master Plan area and several non-Master Plan properties into the City. Refer to Figure 1 for the Master Plan location.

The analysis contained in this report will form the basis of the transportation chapter for the Environmental Impact Report (EIR). Therefore, the assumptions and methodologies used in the study are intended to comply with applicable California Environmental Quality Act (CEQA) guidelines and requirements.

A number of different public agencies provided comment letters in response to the Notice of Preparation of an EIR. Below are some of the salient comments pertaining to the transportation impact analysis:

- The transportation study should analyze the effects of the project on the Regional Congestion Management Plan, and identify mitigations for impacts.
- The Master Plan should include design standards that decrease Vehicle Miles of Travel (VMT) to reduce air quality impacts.
- The analysis needs to specifically consider safety issues at the at-grade railroad crossings in the area, and if necessary implement measures that will improve safety.
- The analysis should include a comprehensive analysis to address project impacts on Roth Road, Lathrop Road, and other roadways in Lathrop. In addition, improvements to the I-5/Roth Road and I-5/Lathrop Road interchanges should be evaluated.

The technical analysis contained in this report addresses the majority of the items listed above. In some instances, the requested type, method, or extent of analysis is not provided because it is either not required according to CEQA guidelines, not necessary based on professional engineering judgment, or may be too speculative to analyze.

ANALYSIS SCENARIOS

The following scenarios were analyzed in this study:

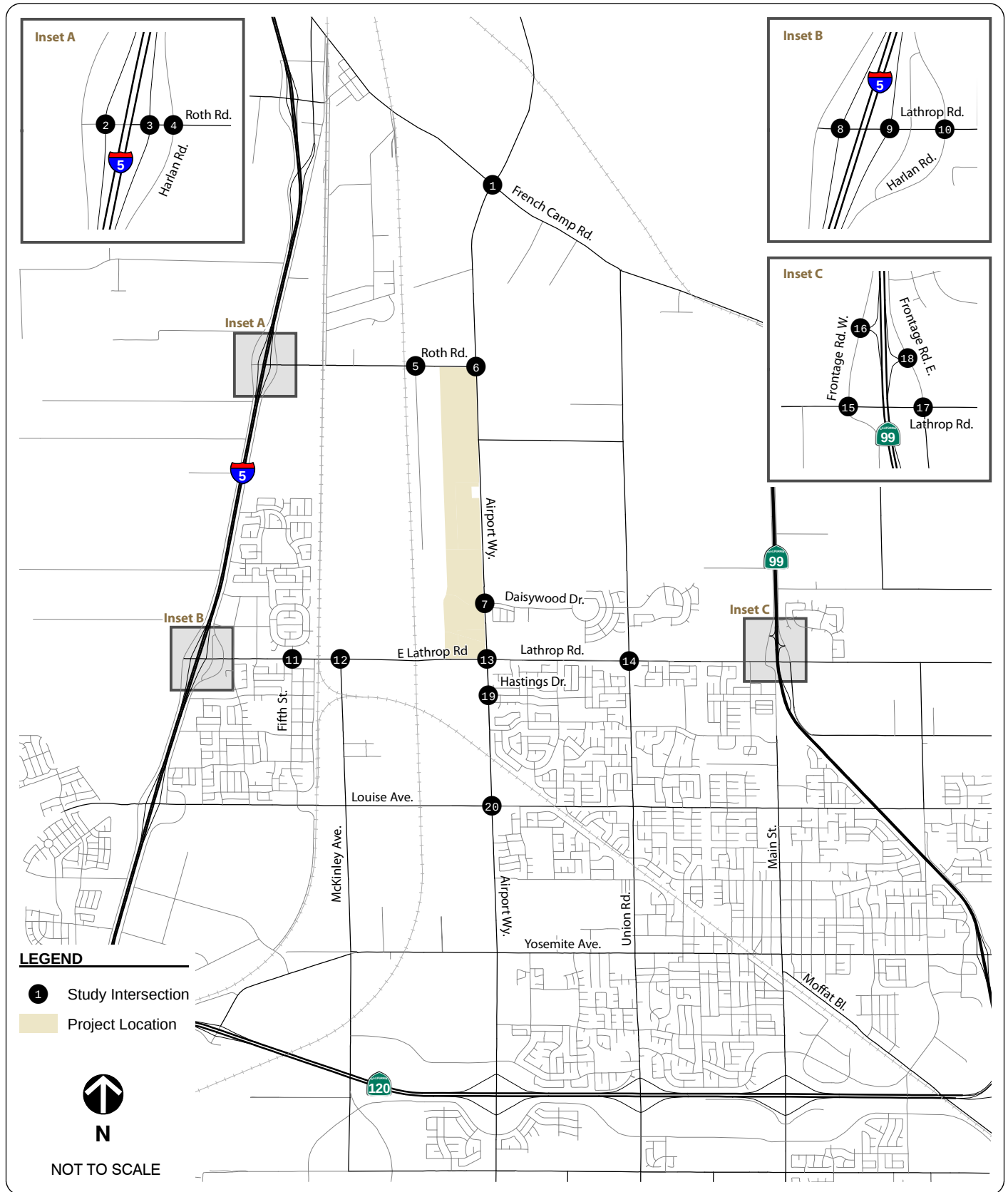
- Existing Conditions
- Existing Plus CIC Conditions

- Cumulative No Development Conditions
- Cumulative Plus CIC Conditions
- Cumulative Plus Northwest Airport Way Master Plan Conditions

STUDY AREA

The study area shown on Figure 1 was selected based on the project's expected travel characteristics (i.e., location and amount of project trips) as well as facilities susceptible to being impacted by the project. The study area is generally bounded by State Route 99 (SR 99) on the east, Interstate 5 (I-5) on the west, French Camp Road on the north, and Louise Avenue on the south.

Figure 1 shows the 20 intersections that were selected for analysis under weekday AM and PM peak hour conditions. In addition to these off-site intersections, several project access intersections were also analyzed. Various freeway segments and ramps on Interstate 5 (I-5) and State Route 99 (SR 99) were also analyzed.



REPORT ORGANIZATION

The remainder of this report is organized into the following nine chapters:

- **Chapter 2 (Analysis Methods)** – describes the analysis methodologies and assumptions used in this study.
- **Chapter 3 (Existing Conditions)** – analyzes the existing condition of the roadway, transit, bicycle, and pedestrian systems in the study area.
- **Chapter 4 (Regulatory Setting)** – describes the federal, state, regional, and local policies and regulations that may apply to the project. Also describes relevant plans and funding sources for infrastructure improvements.
- **Chapter 5 (Standards of Significance)** – presents the criteria and thresholds for identification of significant project impacts.
- **Chapter 6 (Project Travel Characteristics)** – describes the expected travel characteristics of the project including access provisions and internal circulation.
- **Chapter 7 (Existing Plus CIC Conditions)** – analyzes the project-specific impacts of the CIC and recommends mitigations for those impacts.
- **Chapter 8 (Cumulative No Project Conditions)** – analyzes transportation conditions in Year 2025 assuming no development occurs within Master Plan area.
- **Chapter 9 (Cumulative Plus Project Conditions)** – analyzes the impacts of the CIC and Master Plan Buildout under Year 2025 conditions and recommends mitigations.
- **Chapter 10 (Project Access Evaluation)** – analyzes access requirements along the project frontages for development of CIC and Master Plan Buildout.

2. ANALYSIS METHODS

This chapter describes the methodologies and assumptions used to analyze study area roadways and their intersections.

INTERSECTIONS

The operations of roadway facilities are described using the level of service (LOS) concept. LOS is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined from LOS A, with the least congested operating conditions, to LOS F, with the most congested operating conditions. LOS E represents “at-capacity” operations. Operations are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions.

Signalized Intersections

The level of service method for signalized intersections analyzes operations based on average control vehicular delay, as described in Chapter 16 of the 2000 *Highway Capacity Manual* (HCM) by the Transportation Research Board. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections was calculated using the Synchro analysis software and is correlated to a LOS designation, as shown in Table 1.

TABLE 1: INTERSECTION LEVEL OF SERVICE THRESHOLDS			
Level of Service	Signalized Intersection Control Delay (sec/veh) ¹	Unsignalized Intersection Control Delay (sec/veh) ¹	General Description
A	0 – 10.0	0 – 10.0	Little to no congestion or delays. Free Flow
B	10.1 – 20.0	10.1 – 15.0	Limited congestion, short delays
C	20.1 – 35.0	15.1 – 25.0	Modest delays and stable flow.
D	35.1 – 55.0	25.1 – 35.0	High density, heavy delays, but stable flow.
E	55.1 – 80.0	35.1 – 50.0	Operations at or near capacity
F	> 80.0	> 50.0	Over-capacity, breakdown flow.
Note: ¹ Control delay includes initial deceleration delay, queue move-up time, stopped delay, and acceleration delay. Source: <i>Highway Capacity Manual</i> , Transportation Research Board, 2000.			

Unsignalized Intersections

Operations of unsignalized study intersections are evaluated using the method contained in Chapter 17 of the 2000 HCM. At two-way or side-street stop-controlled intersections, control delay is reported for the minor movement with the worst control delay, not for the intersection as a whole. For approaches composed of a single lane, control delay is computed as the average of all movements in that lane. For all-way stop-controlled intersections, the LOS is based on the weighted average control delay of all movements. The LOS designations for unsignalized intersections are also presented in Table 1.

Peak Hour Signal Warrants

A peak-hour signal warrant analysis was conducted for all unsignalized study intersections with a LOS of E or F. The analysis applied the peak-hour traffic signal warrant recommended in the *California Manual on Uniform Traffic Control Devices* (MUTCD) (Caltrans 2006). It should be noted that the peak-hour signal warrant is only one of several warrants that are evaluated to determine the need for a traffic signal.

Even when peak-hour signal warrant is satisfied, the decision to install a signal should not be based solely upon this factor. The City of Manteca, City of Lathrop, San Joaquin County, and Caltrans should regularly monitor traffic conditions and accident data, and evaluate the full set of warrants in order to prioritize and program intersections for signalization.

FREEWAY SEGMENTS AND RAMPS

Freeway mainline segments were evaluated using two-way ADT volumes, which were collected from the Caltrans Traffic Data Branch 2008 Annual Average Daily Traffic (AADT) report. The level of service was determined using the thresholds in Table 2. These thresholds were taken from the *City of Stockton General Plan Draft Environmental Impact Report* (December 2006) and were derived from density ranges specified in the HCM 2000.

As is described later in this report, a significant proportion of project trips (particularly trucks) are expected to access Interstate 5 via the Roth Road interchange. Therefore, the analysis of this interchange includes both ramp terminal intersection operations and ramp merge/diverge operations. The merge/diverge analysis is conducted in accordance with HCM 2000 procedures.

**TABLE 2:
FREEWAY SEGMENT LEVEL OF SERVICE THRESHOLDS**

Number of Lanes	Maximum Daily Traffic Volume at...				
	LOS A	LOS B	LOS C	LOS D	LOS E
4	27,600	45,200	63,600	77,400	86,400
6	41,400	67,800	95,400	116,100	129,600
8	55,200	90,400	127,200	154,800	172,800
10	69,000	113,000	159,000	193,500	216,000

Source: *Stockton General Plan Draft Environmental Impact Reports*, City of Stockton, December 2006; *Highway Capacity Manual*, Transportation Research Board, 2000.

HEAVY VEHICLES

Many of the study roadways are traversed by significant numbers of heavy vehicles (generally defined as trucks with three or more axles). Because trucks have much greater acceleration and deceleration requirements than passenger cars, a passenger car equivalent (PCE) of 2.0 is used in all analyses to account for the effects of trucks at intersections and freeway ramps.

Given that the proposed project would generate a significant amount of truck trips, the intersection LOS calculations specifically reflect the proportion of heavy vehicles in the traffic stream each scenario. Heavy vehicle assumptions are shown in the technical appendices.

3. EXISTING CONDITIONS

This chapter describes the existing condition of the roadway, transit, rail, bicycle, and pedestrian systems in the study area.

ROADWAY SYSTEM

The following describes the freeway facilities and local roadways that would serve the project. Refer to Table 3 for existing average daily traffic (ADT) volumes and heavy vehicle percentages on the arterial roadways.

Interstate 5 (I-5) – is a major north-south interstate freeway that extends from Mexico to Canada. Within the study area, it has three lanes in each direction with a posted speed limit of 65 miles per hour (mph). Located approximately one-mile west of the CIC's main truck access off Roth Road, I-5 will serve as an important travel route for trucks.

Roth Road – is a two-lane road that extends easterly from its interchange at I-5 to Airport Way. Roth Road west of the project site has a posted speed limit of 45 mph and is within the jurisdiction of the City of Lathrop. Passing is currently permitted along a portion of the easterly segment of Roth Road (along the north project frontage), which is located in unincorporated San Joaquin County. Roth Road is an approved STAA truck route with appropriate signing between I-5 and the Lathrop Intermodal Terminal.

Airport Way – is a north-south road that extends from downtown Stockton into Manteca, and continues southerly from State Route (SR) 120 into unincorporated San Joaquin County. Airport Way between Roth Road and Lathrop Road is a two-lane undivided roadway that permits passing in certain areas. Airport Way does not have a posted speed limit along the project frontage, but generally accommodates free-flow speeds of 45 to 50 mph.

Lathrop Road – extends from its interchange at I-5 easterly through the Cities of Lathrop and Manteca, and continues easterly beyond its interchange with State Route (SR) 99. Much of Lathrop Road consists of a two-lane roadway with a center left-turn lane. However, portions of the road have been widened along the frontage of recently developed properties and at an overcrossing of the UPRR railroad tracks. Along the project frontage, Lathrop Road is a two-lane roadway divided by a center median lane with a posted speed limit of 45 mph.

Table 4 displays existing hourly traffic volumes during the morning and evening peak periods on segments of Roth Road, Airport Way, and Lathrop Road. This table indicates that the morning peak hour of traffic on Roth Road occurs from 6:00 to 7:00 AM, primarily due to the effects of early morning trucking operations. Airport Way and Lathrop Road each exhibit peak hours of 7:00 to 8:00 AM, which are typical for streets that serve as both trucking and commute routes. The evening peak hour on all three road segments occurs from 3:00 to 4:00 PM.

**TABLE 3:
AVERAGE DAILY TRAFFIC VOLUMES – EXISTING CONDITIONS**

Segment	Average Daily Traffic (ADT)	Heavy Vehicle Percentage ³
Roth Road west of Lathrop Intermodal Terminal ¹	6,100	38%
Roth Road west of Airport Way ²	3,600	28%
Airport Way north of Roth Road ²	6,500	10%
Airport Way south of Roth Road ¹	6,600	8%
Airport Way north of Lathrop Road ²	6,400	4%
Airport Way south of Lathrop Road ¹	7,600	4%
Lathrop Road west of Airport Way ¹	12,800	4%
Lathrop Road east of Airport Way ¹	10,500	6%
Lathrop Intermodal Terminal Driveway ¹	2,400	88%

Notes:

¹ Based on counts collected on May 27-28, 2009.

² Estimated from May 2009 roadway and intersection counts.

³ Heavy vehicles are defined as having three or more axles. Two-axle concrete and garbage trucks not considered in these percentages.

**TABLE 4:
HOURLY TRAFFIC VOLUMES – EXISTING CONDITIONS**

Hour	Roth Road east of Vallejo Court ¹	Airport Way south of Roth Road ¹	Lathrop Road west of Airport Way ¹
6:00 – 7:00 AM	<u>396</u> ²	293	676
7:00 – 8:00 AM	358	<u>427</u> ²	<u>805</u> ²
8:00 – 9:00 AM	315	392	739
9:00 – 10:00 AM	289	325	581
2:00 – 3:00 PM	453	477	853
3:00 – 4:00 PM	<u>565</u> ²	<u>556</u> ²	<u>1,047</u> ²
4:00 – 5:00 PM	409	538	948
5:00 – 6:00 PM	406	508	910

Notes:

¹ Based on counts collected on May 27-28, 2009.

² Peak hour volume shown in bold and underline.

Figure 2 displays the existing AM and PM peak hour turning movement volumes at the 20 study intersections. New counts were collected at four study intersections along Airport Way between French Camp Road and Hastings Drive on May 27, 2009. Counts in late 2008 or early 2009 from other studies were available for the other study intersections. As shown on Figure 2, eight intersections are signalized, with the remaining intersections controlled by stop signs.

In their NOP comment letter, the City of Lathrop requested that the traffic study evaluate every intersection on Roth Road and Lathrop Road between Manthey Avenue and Airport Way. In lieu of spending time and resources to fully satisfy this request, an alternative approach was taken whereby all intersections along Roth Road and Lathrop Road studied as part of the *City of Lathrop's 2006 Traffic Monitoring Program* are analyzed in this study. Lathrop also requested that the study area include Yosemite Avenue west of Airport Way and Louise Avenue west of Airport Way. Based on the anticipated amount and distribution of project trips, it was not necessary to extend the study area to include these facilities.

Intersection Operations

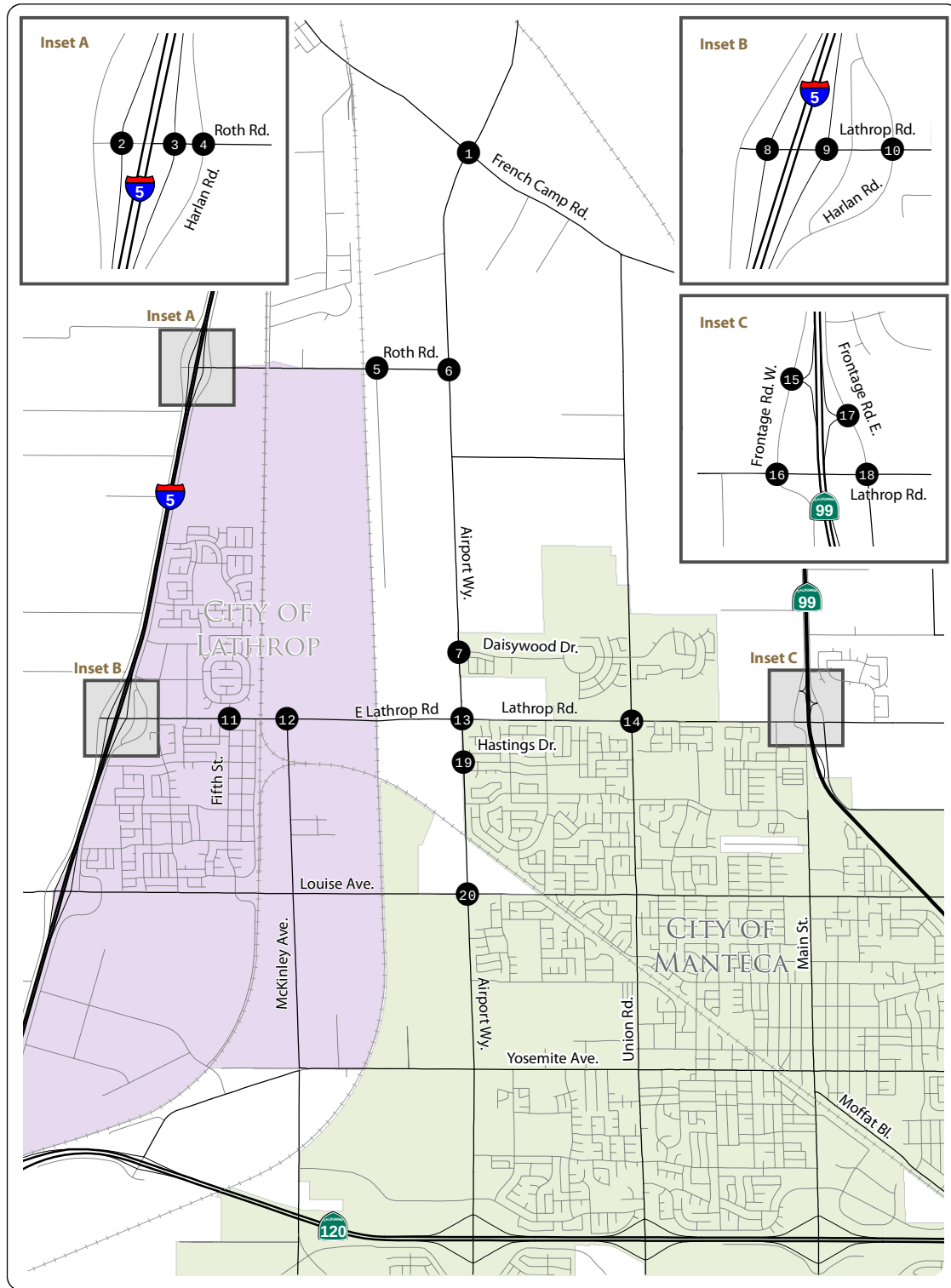
The study intersections were analyzed in accordance with procedures described previously. Table 5 displays the average delay and LOS at each intersection during the AM and PM peak hours (refer to separately bound Appendix A for technical calculations). This table also displays the form of traffic control (signal, stop signs) and jurisdiction associated with each intersection.

According to Table 5, the following intersections currently operate at LOS E or F during one or both peak hours:

- 8) Lathrop Road/I-5 SB Ramps (off-ramp operates at LOS F during both peak hours)
- 9) Lathrop Road/I-5 NB Ramps (off-ramp operates at LOS F during PM peak hour)
- 12) Lathrop Road/McKinley Avenue (side-street operates at LOS E during AM peak hour)
- 16) Lathrop Road/SR 99 Frontage Road West (LOS E during PM peak hour)

According to Appendix A, the following intersections currently satisfy the peak hour traffic volume warrant in the AM or PM peak hour for consideration of a traffic signal:

- 9) Lathrop Road/I-5 NB Ramps
- 12) Lathrop Road/McKinley Avenue
- 16) Lathrop Road/SR 99 Frontage Road West



1. French Camp Rd./Airport Wy.	2. Roth Rd./I-5 SB Ramps	3. Roth Rd./I-5 NB Ramps	4. Roth Rd./Harlan Rd.	5. Roth Rd./UPRR Intermodal Dwy.
6. Roth Rd./Airport Wy.	7. Daisywood Dr./Airport Wy.	8. Lathrop Rd./I-5 SB Ramps	9. Lathrop Rd./I-5 NB Ramps	10. Lathrop Rd./Harlan Rd.
11. Lathrop Rd./5th St.	12. Lathrop Rd./McKinley Ave.	13. Lathrop Rd./ Airport Wy.	14. Lathrop Rd./Union Rd.	15. SR 99 SB Ramps/Frontage Rd.
16. Lathrop Rd./Frontage Rd. (west)	17. SR 99 NB Ramps/Frontage Rd.	18. Lathrop Rd./Frontage Rd. (east)	19. Hastings Dr./Airport Wy.	20. Louise Ave./Airport Wy.

LEGEND

	Turn Lane
	Peak Hour Traffic Volume
	Study Intersection
	Traffic Signal
	Stop Sign
	N
	NOT TO SCALE

PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING CONDITIONS

FIGURE 2

**TABLE 5:
INTERSECTION OPERATIONS – EXISTING CONDITIONS**

Intersection	Jurisdiction	Control	AM Peak Hour		PM Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. French Camp Rd. / Airport Way	San Joaquin County	Traffic Signal	17	B	22	C
2. Roth Rd. / I-5 SB Ramps	Caltrans	Side-Street Stop	14	B	14	B
3. Roth Rd. / I-5 NB Ramps	Caltrans	Side-Street Stop	11	B	10	B
4. Roth Rd. / Harlan Rd.	City of Lathrop	All-way Stop	14	B	13	B
5. Roth Rd. / Lathrop Intermodal Terminal Driveway	San Joaquin County	Side-Street Stop	12	B	14	B
6. Roth Rd. / Airport Way	San Joaquin County	Traffic Signal	11	B	14	B
7. Daisywood Dr. / Airport Way	City of Manteca	Signal	4	A	4	A
8. Lathrop Rd. / I-5 SB Ramps ¹	Caltrans	Side-Street Stop	>150	F	>150	F
9. Lathrop Rd. / I-5 NB Ramps	Caltrans	Side-Street Stop	24	C	69	F
10. Lathrop Rd. / Harlan Rd.	City of Lathrop	Traffic Signal	28	C	28	C
11. Lathrop Rd. / Fifth St.	City of Lathrop	Traffic Signal	27	C	32	C
12. Lathrop Rd. / McKinley Ave.	City of Lathrop	Side-Street Stop	39	E	33	D
13. Lathrop Rd. / Airport Way	City of Manteca	Traffic Signal	31	C	31	C
14. Lathrop Rd. / Union Rd.	City of Manteca	Traffic Signal	37	D	29	C
15. SR 99 SB Ramps / Frontage Rd. (West)	Caltrans	Side-Street Stop	12	B	22	C
16. Lathrop Rd. / SR 99 Frontage Rd. (West)	City of Manteca	All-way Stop	13	B	39	E
17. SR 99 NB Ramps / Frontage Rd. (East)	Caltrans	Side-Street Stop	11	B	12	B
18. Lathrop Rd. / SR 99 Frontage Rd. (East)	City of Manteca	All-way Stop	11	B	15	B
19. Hastings Dr. / Airport Way	City of Manteca	Side-Street Stop	13	B	15	B
20. Louise Ave. / Airport Way	City of Manteca	Traffic Signal	22	C	31	C

Note:

¹ >150 sec/veh of delay shown because inputs exceed analysis software's ability to produce reasonable delay estimates.

Freeway Operations

Table 6 displays the average daily traffic volume and LOS for the study segments of I-5 and SR 99. As shown, each segment currently operates in the LOS D range. According to the *2008 Highway Congestion Monitoring Program* (Caltrans, 2009), northbound SR 99 from SR 120 to north of French Camp Road experiences recurrent congestion (i.e., speeds of 35 mph or less for 15 consecutive minutes) during the AM peak hour. No recurring congestion was identified on the segments of I-5 within the study area. These findings generally match results in Table 6.

**TABLE 6:
FREEWAY SEGMENT OPERATIONS – EXISTING CONDITIONS**

Freeway	Segment	Lanes	ADT	LOS ¹
I-5	North of Roth Road	6	96,000	D
	Roth Road to Lathrop Road	6	96,000	D
	Lathrop Road to Louise Avenue	6	100,000	D
	South of Louise Avenue	6	100,000	D
SR 99	North of French Camp Road	4	68,000	D
	Lathrop Road to French Camp Road	4	68,000	D
	South of Lathrop Road	4	67,000	D
Note: ¹ LOS based on daily volume per lane thresholds in Table 2.				

Table 7 displays the ramp junction analysis results at the I-5/Roth Road interchange (refer to Appendix A for technical calculations). As shown, all of the ramp merge/diverge movements operate at LOS C during both the AM and PM peak hours.

**TABLE 7:
I-5/ROTH ROAD INTERCHANGE RAMP OPERATIONS – EXISTING CONDITIONS**

Ramp	AM Peak Hour		PM Peak Hour	
	Density	LOS ¹	Density	LOS ¹
I-5 SB Off-Ramp Diverge	27	C	28	C
I-5 SB On-Ramp Merge	21	C	22	C
I-5 NB Off-Ramp Diverge	27	C	28	C
I-5 NB On-Ramp Merge	23	C	24	C
Notes: ¹ LOS is based on density, which is measured in passenger car equivalents per lane per mile.				

TRANSIT SYSTEM

Transit service in the City of Manteca is provided by Manteca Transit. The San Joaquin Regional Transit District (SJRTD) provides fixed-route and flexible-response bus service in San Joaquin County. The nearest transit route to the project site is currently located on Lathrop Road.

The *Manteca Transit Short Range Transit Plan* (2009) does not envision expanding the City's transit service to the immediate project vicinity within the next five years. This is to be expected because the area currently has limited numbers of residents and workers who would benefit from transit service.

BICYCLE/PEDESTRIAN SYSTEM

Pedestrian facilities include sidewalks, crosswalks, and pedestrian signals. Some of the major roads through the built-out portions near the project site include scattered pedestrian facilities. Examples include crosswalks at the signalized Lathrop Road/Airport Way intersection and sidewalks on the east side of Airport Way adjacent to Daisywood Drive. There are no marked on-street or off-street bicycle facilities near the project site. However, certain roads have shoulders of sufficient width to allow bicycling.

RAIL CROSSINGS

The study area includes two north-south Union Pacific Railroad (UPRR) tracks that generally parallel I-5 south from Stockton. The westerly track (i.e., Fresno Subdivision line) has at-grade railroad crossings at Roth Road and Lathrop Road. The easterly track (i.e., Oakland Subdivision line), which is about 0.6 miles from the westerly track, has an at-grade railroad crossing at Roth Road and is grade-separated from Lathrop Road. The easterly track serves the Lathrop Intermodal Terminal. Each of the at-grade crossings with Roth Road are described in more detail below. The at-grade crossing on Lathrop Road is not discussed here given its distance from the project site and plans for grade-separation by the City of Lathrop.

Westerly At-Grade Rail Crossing with Roth Road

According to US Department of Transportation Rail Crossing Inventory, an average of 18 trains per day crosses this segment of Roth Road. The crossing has advanced warning signs, railroad crossing pavement markings, stop lines, crossing gates, flashing lights, and warning bells.

Data from the Federal Railroad Administration was obtained to review the accident history at this crossing. In July 2009, a pick-up truck was stopped on Roth Road on the crossing and was struck by an Altamont Commuter Express (ACE) train. The driver of the pick-up truck was killed; no other injuries were reported. According to the accident record, all crossing equipment was functioning correctly and driver error (stopping on the tracks) caused the accident. A second fatality occurred at this crossing in June 2006. In this instance, the driver maneuvered around the crossing gates and was struck by an ACE train. These were the only two reported collisions between 2002 and 2009.

Easterly At-Grade Rail Crossing with Roth Road

According to US Department of Transportation Crossing Inventory, an average of 20 trains per day crosses this segment of Roth Road, which is in San Joaquin County. The crossing has advanced warning signs, railroad crossing pavement markings, stop lines, crossing gates, flashing lights, and warning bells. In June 2009, a collision on Roth Road caused a vehicle to become stopped on the at-grade crossing at Roth Road. The vehicle was vacated by its driver and then hit by a train. This was the only reported collision between 2002 and 2009.

Table 8-2 of the *Railroad Safety Statistics 2007 Final Annual Report* (Federal Railroad Administration, April 2009) reports motor vehicle accident rates throughout the United States at public at-grade rail crossings. The data show that the rate of accidents per 100,000-vehicle crossings (i.e., per 100k ADT) are lower when the crossing has gates, flashing lights, or warning bells versus stop signs or cross bucks (i.e., railroad crossing signs). The reported accident rate for crossings with gates or flashing lights was approximately 0.5 accidents per 100k ADT, whereas the rate was about 1.4 accidents per 100k ADT for crossings with cross bucks and 4.3 accidents per 100k ADT for crossings with stop signs.

This data provides substantial evidence that the warning devices presently in place at the two Roth Road at-grade railroad crossings are associated with lower levels of accident rates when considering the entire range of potential warning devices. This conclusion is confirmed by the observed accident records at each location since 2002. The westerly crossing had two accidents and the easterly crossing had one accident, all of which were associated with driver error and not railroad equipment malfunctions.

4. REGULATORY SETTING

This section describes the regulatory setting, including policies of the City of Manteca and other responsible agencies that may be relevant to this study.

FEDERAL AND STATE REGULATIONS

Caltrans is responsible for planning, designing, constructing, operating, and maintaining all state-owned roadways in San Joaquin County. Federal highway standards are implemented in California by Caltrans. Any improvements or modifications to the state highway system within the City of Manteca need to be approved by Caltrans, and the City of Manteca has no ability to unilaterally make improvements to the state highway system.

The *Interstate 5 Transportation Concept Report – TCR* (Caltrans, 2001) identifies a concept LOS of “D” for the segment from SR 120 to north of Roth Road. The TCR identifies the need for widening to eight lanes in the near future to relieve congestion, and ultimate widening to a 10-lane freeway. The *I-205/I-5 Corridor System Management Plan San Joaquin County Final Report* (DKS Associates, 2010) identifies the need for High Occupancy Vehicle (HOV) lanes on I-5 from I-205 to French Camp Road to reduce mainline congestion and encourage HOV use.

The *State Route 99 Transportation Concept Report – TCR* (Caltrans, 2002) identifies a concept LOS of “D” for the segment from SR 120 to north of French Camp Road. The TCR identifies the need for the ultimate need for eight lanes to meet projected travel demands.

LOCAL REGULATIONS

San Joaquin County Regional Transportation Plan

San Joaquin County, through SJCOG, periodically updates the Regional Transportation Plan (RTP), which outlines countywide transportation expenditures based on funding from sources like the federal government, the State of California, and locally collected funds. The RTP contains several proposed improvements that would benefit the regional roadway network within the study area.

San Joaquin County Congestion Management Program

The San Joaquin Council of Governments (SJCOG) operates a Regional Congestion Management Program, which monitors cumulative transportation impacts of growth on the regional roadway system, identifies deficient roadways, and develops plans to mitigate the deficiencies. The RCMP considers LOS E or F operations to be deficient and includes segments of I-5, SR 99, Airport Way, and Lathrop Road as CMP facilities.

San Joaquin County Regional Traffic Impact Fee

SJCOG has implemented a regional traffic impact fee that is assessed on new developments throughout San Joaquin County. The RTIF capital project list provides funding for various freeway and local road widening. As of 2009, the fee schedule for new non-residential development is as follows: \$1.20 per square foot for retail development, \$1.51 per square foot for office development, and \$0.90 per square foot for industrial development. These fees are adjusted annually to account for inflation and the funds go toward adding capacity on regional roadways and state highways.

Measure K

Measure K is a San Joaquin County measure that funds transportation projects through a half-cent sales tax. Measure K includes funds for widening SR 99 to six lanes between Manteca and Stockton, interchange improvements at Lathrop Road/I-5, as well as other improvements.

San Joaquin County General Plan

The LOS threshold from the San Joaquin County General Plan is relevant to this analysis since some study facilities are within unincorporated portions of the County. The San Joaquin General Plan circulation element specifies LOS D as the minimum acceptable LOS for county-owned transportation facilities.

City of Lathrop General Plan

The City of Lathrop General Plan (amended 2004) includes the following relevant goals and policies relating to its transportation system:

- Freeway interchanges should be improved to carry the demands of traffic generated by development in Lathrop, with new freeway interchanges and additional interchange ramps being added where necessary and practical in consideration of the need for fair apportionment of traffic to existing and future regional demands.
- Arterial streets serving Service Commercial and Industrial uses are to be designed and constructed to standards that reflect heavy truck traffic and the need for longer turning radii for trucks at intersections.

The General Plan identifies the following planned improvements in the study area:

- Improve Roth Road to six lanes from I-5 to Airport Way, along with railroad grade separation structures.
- Improve Airport Way to six lanes from Roth Road to SR 120.
- Improve Lathrop Road to four lanes from I-5 to the Manteca City limits, and provide railroad grade separation structures.

The City's General Plan identifies expected LOS C operations on City streets and LOS D operations at interchange ramps. However, in previous environmental documents, the City has used a LOS D standard for signalized and all-way stop intersections and a LOS E standard for side-street stop-controlled intersections for the purposes of identifying impacts.

According to the City of Lathrop Adopted Budget (Fiscal Year 2009-2010), funds are being collected for the following Capital Improvement Program (CIP) projects:

- Lathrop Road westerly grade-separation. Other sources of funding include Section 190 funds from the PUC, and State Transportation Improvement Program (STIP) funds. Completion is expected in 2012.
- I-5/Lathrop Road improvements. The City is pursuing interim improvements as the ultimate improvements are several years away. Funding for ultimate improvements through developer fees, Measure K Renewal, and other sources.

City of Manteca General Plan

The City of Manteca General Plan (2003) includes the following policies related to transportation and circulation that are relevant to this analysis:

Street System

a. Policy C-P-1

The City shall strive to attain the highest possible traffic levels of service (LOS) consistent with the financial resources available and the limits of technical feasibility. The impact of new development and land use proposals on LOS should be considered in the review process.

b. Policy C-P-2

Manteca's target for transportation LOS is to provide a Citywide average of LOS of C or better, and a minimum of LOS D at any individual location. This "C average, D minimum" shall be accomplished by attempting to provide LOS C at all locations, but accepting LOS D under the following circumstances:

- Where constructing facilities with enough capacity to provide LOS C is found to be unreasonably expensive. This applies to facilities, for example, on which it would cost significantly more per dwelling unit equivalent (DUE) to provide LOS C than to provide LOS D.
- Where it is difficult or impossible to maintain LOS C because surrounding facilities in other jurisdictions operate at LOS D or worse.
- Where free-flowing roadways or interchange ramps would discourage use of alternate travel modes.

- Where maintaining LOS C will be a disincentive to use of existing alternative modes or to the implementation of new transportation modes that would reduce vehicle travel.

Note that for the purposes of this environmental analysis, the City considers LOS D as the acceptable LOS threshold for all intersections in the City of Manteca. This LOS standard was chosen primarily because of the constrained operations on the state highway system and the LOS policies of the surrounding jurisdictions.

a. Policy C-P-3

Streets shall be dedicated, widened, extended, and constructed according to the Street cross-section diagrams established in the City Improvement Standards. Dedication and improvement of full rights-of-way as shown in the Street Standards shall not be required in existing developed areas where the City determines that such improvements are either infeasible or undesirable.

b. Policy C-P-5

Development that would necessitate roadway improvements prior to the development of lands abutting those roadway improvements shall be required to make such improvements, or participate in such improvements, as a condition of approval.

c. Policy C-P-6

New development will pay a fair share of the costs of street and other traffic and transportation improvements based on traffic generation and impacts on levels of service in conformance with the standards and policies established in the Public Facilities Implementation Plan (PFIP).

d. Policy C-P-18

In accord with the PFIP, the City shall assess development fees for traffic signals and highway interchanges sufficient to fund system-wide improvements. The development fee schedule for these traffic improvements shall be periodically reviewed, and revised as necessary.

The City also requires new development to participate in the funding and construction of collector and arterial street improvements identified in the City's Street Master Plan.

Bikeways and Pedestrian Paths

c. Policy C-P-33

The City shall establish a safe and convenient network of identified bicycle routes connecting residential areas with recreation, shopping, and employment areas within the City.

d. Policy C-P-35

Route sidewalks so that they connect to major public parking areas, transit stops, and intersections within the bikeway system.

e. Policy C-P-36

Provide adequate bicycle parking facilities at commercial, business/professional, and light industrial uses.

f. Policy CD-P-31

The pedestrian and bikeway system shall be linked to other pedestrian and bikeways in adjacent neighborhoods and ultimately, to the City-wide Pedestrian and Bikeway trail System to provide a continuous interconnected system.

City of Manteca Bicycle Master Plan

The City of Manteca Bicycle Master Plan (2003) includes the following policies related to bicycle circulation in new development areas that are relevant to this analysis:

- Require new development to construct bikeways included in the proposed system along all roadways included within or adjacent to that development.
- Require new development to provide support facilities such as bicycle racks, personal lockers, and showers at appropriate locations such as parks, major recreational destinations, park-and-ride facilities, employment centers, schools, and commercial centers.
- Provide bike crossings at appropriate intervals along new roadways that will adequately serve new large-scale commercial, office, industrial, and residential development.
- Require new development to incorporate parks and schools as important destinations for bicyclists when designing circulation plans for subdivisions and other developments.

City of Manteca Public Facilities Implementation Plan

The City of Manteca's PFIP (1993) is the implementing document for the City's General Plan policies on public infrastructure facilities. The purpose of the PFIP is to ensure adequate provision of public facilities as the city grows, and that they are developed in accordance with the City's General Plan. The PFIP is based on the City's individual water, sewer, drainage, and transportation facilities master plans. Under the PFIP, development impact fees are collected at or near the time of development and are used to finance the capacity expansion of public facilities (i.e., water, sewer collection, drainage, and transportation) necessary to accommodate the new demands.

Since the 1993 PFIP was not indexed to inflation, the current fees do not cover the costs of building the required transportation infrastructure. The City is currently updating the PFIP to develop a new list of infrastructure projects and a revised fee. It is expected that the PFIP fee will fully cover the cost of improvements to the City's street system. The revised fee is expected to be adopted by the City Council by the end of 2010.

5. STANDARDS OF SIGNIFICANCE

This chapter presents the standards of significance to be used in identifying project-specific and cumulative impacts. Separate criteria are identified for the roadway, bicycle, pedestrian, transit, and rail systems using policies of the City of Manteca and other responsible agencies.

SIGNIFICANCE CRITERIA – ROADWAY SYSTEM

The project would cause a significant impact to the roadway system if it would:

Signalized Intersections

- Worsen operations from LOS D or better to LOS E or F.
- Increase the average delay at an intersection currently operating (or projected to operate) unacceptably by three (3) seconds or more.

All-Way Stop Intersections

- Worsen operations from LOS D or better to LOS E or F.
- Increase the average delay at an intersection currently operating (or projected to operate) unacceptably by three (3) seconds or more and cause one of the peak hour signal warrants to be met.

Side-Street Stop Intersections

- Worsen operations at a facility controlled by Manteca, San Joaquin County, or Caltrans from LOS D or better to LOS E or F.
- Worsen operations at a facility controlled by Lathrop from LOS E or better to LOS F.
- Increase the average delay for the highest delayed side-street movement at an intersection currently operating (or projected to operate) unacceptably by three (3) seconds or more and cause one of the peak hour signal warrants to be met.

Freeways

- Worsen operations from LOS D or better to LOS E or F.
- Add 100 vehicles per day or more to a freeway segment that is currently operating (or projected to operate) unacceptably.
- Increase traffic by one percent or more at a freeway ramp that is currently operating (or projected to operate) unacceptably.

The above thresholds were developed based on the relevant policies of each agency as well as information in the City's *Transportation Impact Analysis Guidelines*. Although still in draft form, these guidelines have been used for several other EIRs in the area. They are also being considered for formal adoption along with updates to the City of Manteca General Plan Circulation Element.

SIGNIFICANCE CRITERIA – TRANSIT SYSTEM

The *Draft Transportation Impact Analysis Guidelines* do not currently have thresholds for impacts on the transit systems. For the purposes of this study, an impact is considered significant if the project would:

- Disrupt or interfere with existing or planned public transit services or facilities.
- Create an inconsistency with policies concerning transit systems set forth in a General Plan or other adopted policy document.

SIGNIFICANCE CRITERIA – BICYCLE/PEDESTRIAN SYSTEM

The *Draft Transportation Impact Analysis Guidelines* do not currently have thresholds for impacts on the pedestrian and bicycle systems. For the purposes of this study, an impact is considered significant if the project would:

- Disrupt or interfere with existing or planned bicycle/pedestrian facilities.
- Result in unsafe conditions for pedestrians, including unsafe pedestrian/bicycle or pedestrian/vehicle conflicts.
- Result in unsafe conditions for bicycles, including unsafe bicycle/pedestrian or bicycle/vehicle conflicts.
- Create an inconsistency with policies related to bicycle or pedestrian systems set forth in a General Plan or other adopted policy document.

SIGNIFICANCE CRITERIA – AT-GRADE RAIL CROSSINGS

The project would cause a significant impact at an at-grade railroad crossing if it would:

- Cause motorists to incur delays corresponding to LOS E or F conditions due to pre-emptions caused by train crossings.
- Add traffic to an at-grade railroad crossing that has a demonstrated record of having an above-average rate of accidents.

6. PROJECT TRAVEL CHARACTERISTICS

This chapter describes the expected travel characteristics of the Centerpoint Intermodal Center (CIC) and Northwest Airport Way Master Plan land uses. It begins by presenting the land uses within the Master Plan and the expected generation and distribution of trips. This is followed by a discussion of assumed vehicular access from the surrounding roadways and internal street connections.

LAND USE ASSUMPTIONS

The following land uses are proposed as part of CIC according to information provided by the project applicant.

CenterPoint

- 3,177,521 square feet of distribution, high-cube warehouse, and light industrial uses

Remainder Properties

- 1,275,620 sq. ft. of light industrial
- 205,821 sq. ft. of retail

The City's zoning ordinance permits both retail and business professional land uses within the community commercial zoning category. To provide for a conservative analysis approach in this study, the entire community commercial parcel (located adjacent to the Airport Way/Lathrop Road intersection) was assumed to develop with retail space (versus office) given its higher daily and PM peak hour trip generation.

TRIP GENERATION

This section describes the expected trip generation associated with the CIC and the remainder of the Master Plan.

Trip Generation of CIC

The CIC is a unique type of land use whose trip generation cannot be readily established from references such as *Trip Generation* (Institute of Transportation Engineers, 2008). The following project description is contained in the Master Plan:

"The CIC would be a separate, stand alone logistics facility that supports intermodal transportation by providing warehouse, distribution, and light industrial uses. It would capitalize on its location adjacent the Lathrop Intermodal Terminal to provide a transload center that would allow the contents of containers to be stored in on-site warehouses, assembled in on-site facilities, and distributed off-site by truck or rail."

To estimate the trip generation of CIC, Fehr & Peers obtained traffic counts collected in 2007 at a similar CIC facility located in Elwood, Illinois.¹ At the time of the counts, the CIC Elwood facility consisted of 6.9 million square feet of distribution, warehouse, and container/equipment management space. The traffic counts also included trips to/from an intermodal facility (similar to the Lathrop facility on Roth Road), which operated approximately 750,000 annual lifts.²

The CIC Elwood Facility exhibited the following trip generation characteristics:

- Daily: 13,875 trips, 68% trucks
- AM Peak Hour: 890 trips, 58% trucks, 62 percent inbound
- PM Peak Hour: 1,310 trips, 48% trucks, 56 percent outbound

The CIC Elwood data is valuable, but cannot be applied directly to the proposed CIC for several reasons. First, the Elwood data includes trips generated by the intermodal facility, whereas the intermodal facility already exists adjacent to CIC Manteca. Second, the CIC Elwood intermodal facility operates 750,000 annual lifts, whereas the Lathrop Intermodal Terminal currently operates 250,000 annual lifts.³ The Lathrop Intermodal Terminal is planned to expand to operate 400,000 annual lifts by 2013 and 730,000 annual lifts by 2020. Lastly, CIC Elwood has approximately 6.9 million square feet of supporting warehouse/distribution uses, whereas CIC Manteca would have about 3.2 million square feet. Therefore, scaling of trips and adjustments to trip rates is necessary to take into consideration the differences in annual lifts and square footage.

The following describes a procedure for estimating the cumulative daily trip generation of the industrial component of the proposed CIC Manteca facility. Because the CIC Elwood traffic data includes trips associated with the CIC square footage and intermodal facility, it is necessary for this exercise to consider the combined trips of the CIC Manteca and the Lathrop Intermodal Terminal, with appropriate adjustments for internal trips between the two adjacent uses.

1. Source: Centerpoint Intermodal Center North Joliet, Illinois Traffic Study (Hanson Professional Services, 2008)
2. An annual lift is a measure of the number of shipping containers moved between trucks and trains.
3. Source: <http://www.centerpoint-prop.com/>

- Step 1 – Estimate the gross daily trip generation of CIC Manteca

Analysis: The 2007 CIC Elwood counts are based on operations that represent an equivalent amount of annual lifts, but more than twice as much logistics/industrial space than CIC Manteca/Lathrop Intermodal Terminal would have under cumulative conditions. Based on the Elwood land uses, annual lifts, and traffic data, the logistics/industrial space at CIC Elwood is estimated to generate about 9,600 gross daily trips. Given that CIC Manteca would be 54 percent smaller in size than CIC Elwood, a commensurate decrease in trips is expected, with the resulting trip generation being 4,420 daily trips (i.e., $9,600 \times 46\%$). Adjustments for internal truck trips between the Lathrop Intermodal Terminal and CIC Manteca are described in Step 2.

- Step 2 – Determine external trips that are associated with CIC Manteca

Analysis: The Lathrop Intermodal Terminal was observed in May 2009 to generate 2,400 external daily trips, 88 percent of which were trucks. Under cumulative conditions, the planned expansion of the facility would generate 7,200 external daily trips based on the three-fold increase in annual lifts. However, by placing CIC Manteca adjacent to the Lathrop Intermodal Terminal, some Lathrop Intermodal Terminal truck trips will travel to/from CIC Manteca versus traveling externally. Based on observations from other facilities and assumptions in the *Joliet CIC Traffic Study*, this study assumes that 20 percent of Lathrop Intermodal Terminal truck trips would travel to/from CIC Manteca. This represents 425 internal trips (i.e., 850 trip ends) under existing plus CIC conditions. Given the planned extension of the Lathrop Intermodal Terminal, internalization is assumed to approximately double under cumulative conditions. These internal trip adjustments then yield the external trips associated with CIC Manteca.

- Step 3 – Determine percentage of external CIC Manteca trips that are trucks

Analysis: Trucks were observed to represent 68 percent of total external trips at CIC Elwood and 88 percent of the trips at the Lathrop Intermodal Terminal. Based on these truck percentages and trip generation calculations from above, trucks would represent 53 percent of daily CIC Manteca trips.

Steps 1 through 3 were repeated to develop the cumulative external trip generation of CIC Manteca for weekday AM and PM peak hour conditions.

A similar approach was followed for the “existing plus CIC” analysis scenario. However, since this scenario does not assume any expansion of the Lathrop Intermodal Terminal, fewer total truck trips are assumed to be internalized between the two sites. Table 8 displays the expected trip generation of CIC under existing and cumulative conditions. The internalized Lathrop Intermodal Terminal truck trips will be reflected by reduced numbers of trips entering/exiting that project’s access on Roth Road.

**TABLE 8:
TRIP GENERATION – CIC**

Land Use	Quantity	Trip Rate ¹			Trips		
		Daily	AM Peak Hour	PM Peak Hour	Daily	AM Peak Hour	PM Peak Hour
CIC (Distribution, High-Cube Warehouse, Light Industrial)	3,177 ksf	Not Applicable			4,420	327	495
Trip Generation – Existing Plus CIC Conditions							
CIC-to- Lathrop Intermodal Terminal Internalization ²					-425	-21	-28
New Trips					3,995	306	467
Trip Generation – Cumulative Plus CIC Conditions							
CIC-to- Lathrop Intermodal Terminal Internalization ²					-850	-42	-57
New Trips					3,570	285	438

Notes: ksf = thousand square feet.

¹ Refer to previous pages for methodology for calculating CIC trips.

² 20% of external truck trips generated by Lathrop Intermodal Terminal assumed to be internalized with CIC under existing plus CIC conditions. Greater internalization expected under cumulative conditions based on planned Lathrop Intermodal Terminal expansion. Reductions in external trips at Lathrop Intermodal Terminal driveway also made to reflect internal trip capture.

Under “existing plus CIC” conditions, CIC Manteca would generate approximately 4,000 external daily trips, with 305 trips during the AM peak hour (64 percent inbound) and 470 trips during the PM peak hour (57 percent outbound). The trip generation would be reduced by five to ten percent under cumulative conditions due to increased internalization with the Lathrop Intermodal Terminal due to its assumed expansion.

Table 8 shows that the gross PM peak hour trip generation of the CIC industrial uses would be 495 trips based on the application of trip rates derived from the Elwood CIC facility. An alternative approach for calculating the trip generation would have been to assume a mixture of high-cube warehouse and light industrial uses. The vast majority of CIC space will be dedicated to warehouse and distribution. If a mix of “93% high-cube warehouse/7% light industrial” was assumed, the resulting gross PM peak hour trip generation would be 487 trips based on the trip rates shown in Table 9. This information leads to the following conclusion:

- The use of traffic data from the existing CIC Elwood facility is an appropriate means for estimating the trip generation of the proposed CIC. The resulting PM peak hour trip generation estimate was checked against data from *Trip Generation* and found to correspond closely to trips associated with a reasonable and likely mix of high-cube warehouse and light industrial space to be constructed on-site.

Trip Generation of Remaining Master Plan Properties

The remaining properties in the Master Plan would permit a mix of light industrial and community commercial uses. Per direction from City staff, the light industrial properties were assumed to be developed with the following mix of uses:

- 80 percent high-cube warehouse
- 15 percent light industrial
- 5 percent retail (based on low intensity auto parts/service uses)

This mix of uses is similar to what has been constructed elsewhere in the City (e.g., Spreckels Business Park) on light industrial-zoned land. To provide for a conservative analysis approach, the community commercial was assumed to develop with retail space. Table 9 displays the trip generation of the remaining Master Plan properties.

The remaining properties would generate approximately 12,750 external daily trips, with 490 trips during the AM peak hour and 1,090 trips during the PM peak hour. The majority of AM peak hour trips are inbound (65 percent) and PM peak hour trips are outbound (55 percent).

Modest levels of internalization were assumed between the CIC industrial uses and the retail space. The number of external retail trips has been adjusted to reflect pass-by traffic from adjacent streets based on data in *Trip Generation Handbook* (ITE, 2004)

**TABLE 9:
TRIP GENERATION – REMAINING MASTER PLAN PROPERTIES**

Land Use	Quantity	Trip Rate ¹			Trips		
		Daily	AM Peak Hour	PM Peak Hour	Daily	AM Peak Hour	PM Peak Hour
High-Cube Warehouse	1,020.5 ksf	1.44	0.09	0.10	1,470	92	102
Light Industrial	191.3 ksf	6.94	0.71	0.61	1,327	136	116
Auto/Truck Parts/Service	63.8 ksf	17.10	1.35	1.93	1,091	86	123
Retail	205.82 ksf	52.75	1.15	5.01	10,857	236	1,032
Gross Trips					14,745	550	1,373
Industrial-to-Retail Internalization ²					- 389	- 31	- 34
Retail Pass-by Trips ³					- 1,600	- 33	- 254
New Trips					12,756	486	1,085

Notes:

¹ Trip rates for retail and light industrial uses from ITE *Trip Generation* (2008) best fit curve equations. Trip rates for high-cube warehouse based on average rates published in *Trip Generation*. Trip rates for auto/truck parts/service land use category from data in *San Diego Traffic Generators*, SANDAG, 1998.

² 5% of industrial trips assumed to be internalized with retail uses.

³ Retail pass-by rate assumed to be 15 percent for daily and AM peak hour conditions and 25 percent for PM peak hour conditions.

Table 10 summarizes the trip generation for the various scenarios analyzed in this study.

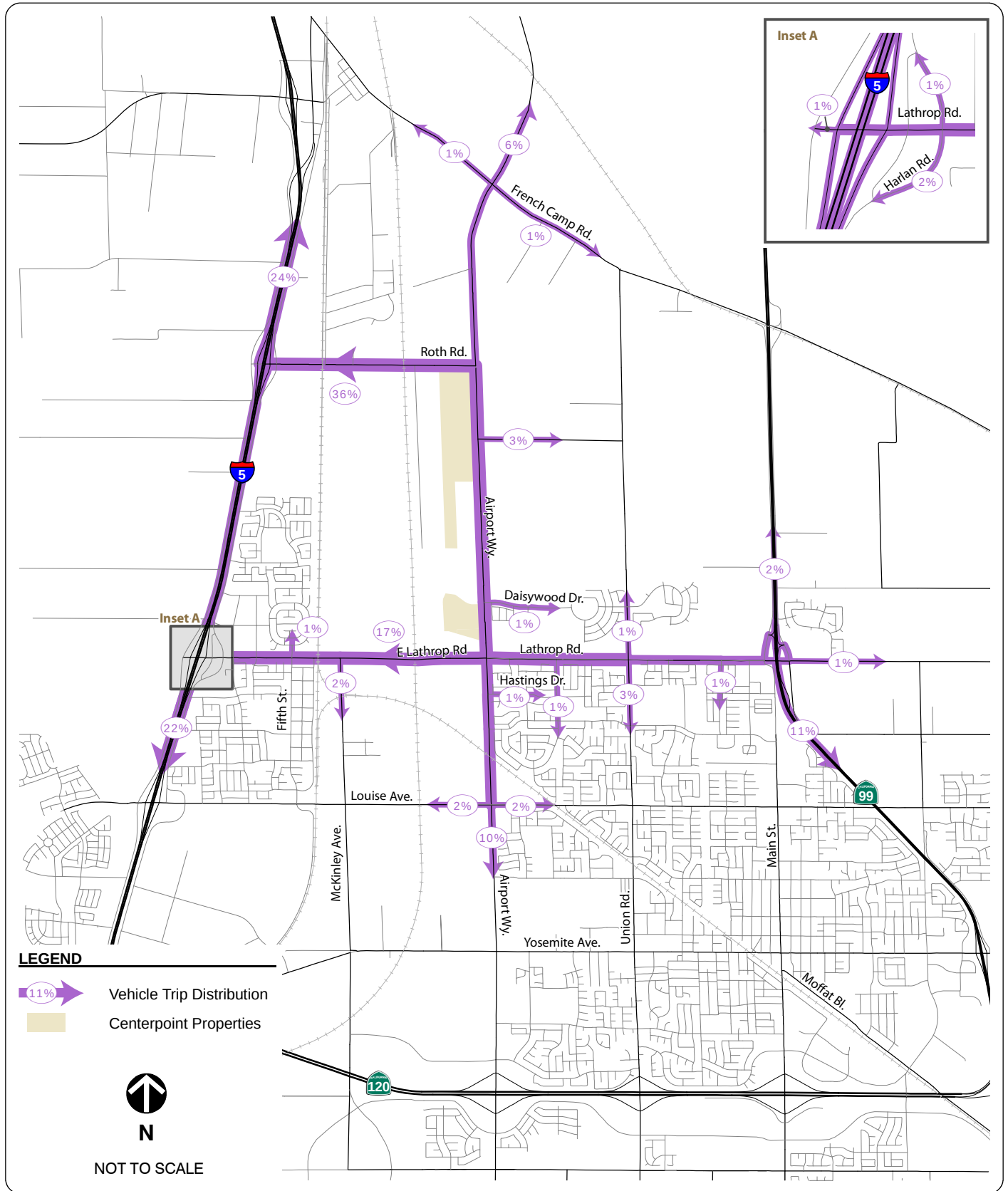
TABLE 10: TRIP GENERATION SUMMARY																			
Scenario	New Trips (Percent Trucks)																		
	Daily	AM Peak Hour	PM Peak Hour																
Existing Plus CIC	3,995 (53%)	306 (42%)	467 (29%)																
Cumulative Plus CIC	3,570 (48%)	285 (38%)	438 (24%)																
Cumulative Plus Master Plan Buildout	16,326 (16%)	771 (22%)	1,523 (11%)																
Notes: - Refer to prior tables for detailed trip generation calculations. - Overall heavy vehicle percentages based on following heavy vehicle percentages for specific land uses: <table> <tr> <th>Land Use</th><th>Daily</th><th>AM Pk Hr</th><th>PM Pk Hr</th></tr> <tr> <td>CIC (Industrial)</td><td>53%</td><td>42%</td><td>29%</td></tr> <tr> <td>Retail</td><td>2%</td><td>2%</td><td>2%</td></tr> <tr> <td>Warehouse/LI/Auto Serv.</td><td>20%</td><td>20%</td><td>15%</td></tr> </table>				Land Use	Daily	AM Pk Hr	PM Pk Hr	CIC (Industrial)	53%	42%	29%	Retail	2%	2%	2%	Warehouse/LI/Auto Serv.	20%	20%	15%
Land Use	Daily	AM Pk Hr	PM Pk Hr																
CIC (Industrial)	53%	42%	29%																
Retail	2%	2%	2%																
Warehouse/LI/Auto Serv.	20%	20%	15%																

TRIP DISTRIBUTION

Figure 3 displays the expected distribution of trips under “existing plus CIC” conditions. These percentages represent a weighted average of trips by delivery trucks, visitors, and employees. It is important to note that trucks will have a greater orientation toward freeways (I-5 and SR 99) than is shown on Figure 3. Conversely, employees will use both freeways and local streets. The usage of interstate freeways and regional routes by trucks is evidenced by turning movements at the Lathrop Intermodal Terminal at Roth Road, in which 80 percent of trips are to/from the west toward I-5.

Trips associated with CIC will be comprised of a larger percentage of trucks near freeways and a corresponding lower percentage of trucks near built out communities. Heavy vehicle percentages are then calculated for each study intersection and used in the technical impact analysis to quantify these effects.

Figure 4 shows the expected distribution of project trips under cumulative conditions.



ACCESS ASSUMPTIONS

The Draft Master Plan displays the interim and ultimate internal circulation and access plans for the Master Plan area. Refer to the exhibits in Section 2 of this EIR for illustrations of each of the two plans described below.

Interim Access Plan (CIC-Only)

This access plan consists of driveways serving the CIC from Roth Road and Airport Way. Two full-access driveways would be provided on Roth Road and as many 12 driveways would be situated on Airport Way. The Airport Way driveways would include a new signalized driveway opposite Lovelace Road and a driveway opposite the existing signalized intersection at Daisywood Drive. The interim access plan would not provide direct access to Lathrop Road.

A main north-south collector road would extend along the western portion of the property from Roth Road toward the south. This internal road would not connect the southern and northern portions of the CIC property through an easement provided by UPRR.

Ultimate Access Plan (Master Plan Buildout)

The ultimate access plan for the Master Plan consists of vehicular access from Roth Road, Airport Way, and Lathrop Road. Much of the ultimate access would be constructed with the interim plan. However, the ultimate access plan provides two new access points on Lathrop Road, including a new signalized driveway. It also completes internal street connections through the remaining Master Plan properties. This will enable travel from one end of the Master Plan to the other without using public streets.

The applicant is currently in negotiations with the City with respect to frontage improvements. For the purposes of this analysis, no capacity improvements have been assumed on any of the frontage streets. The timing/need for such improvements will be identified through the impact analysis. The City will require that travel lanes along the project frontage be constructed in their planned ultimate locations to support future widening.

7. EXISTING PLUS CIC CONDITIONS

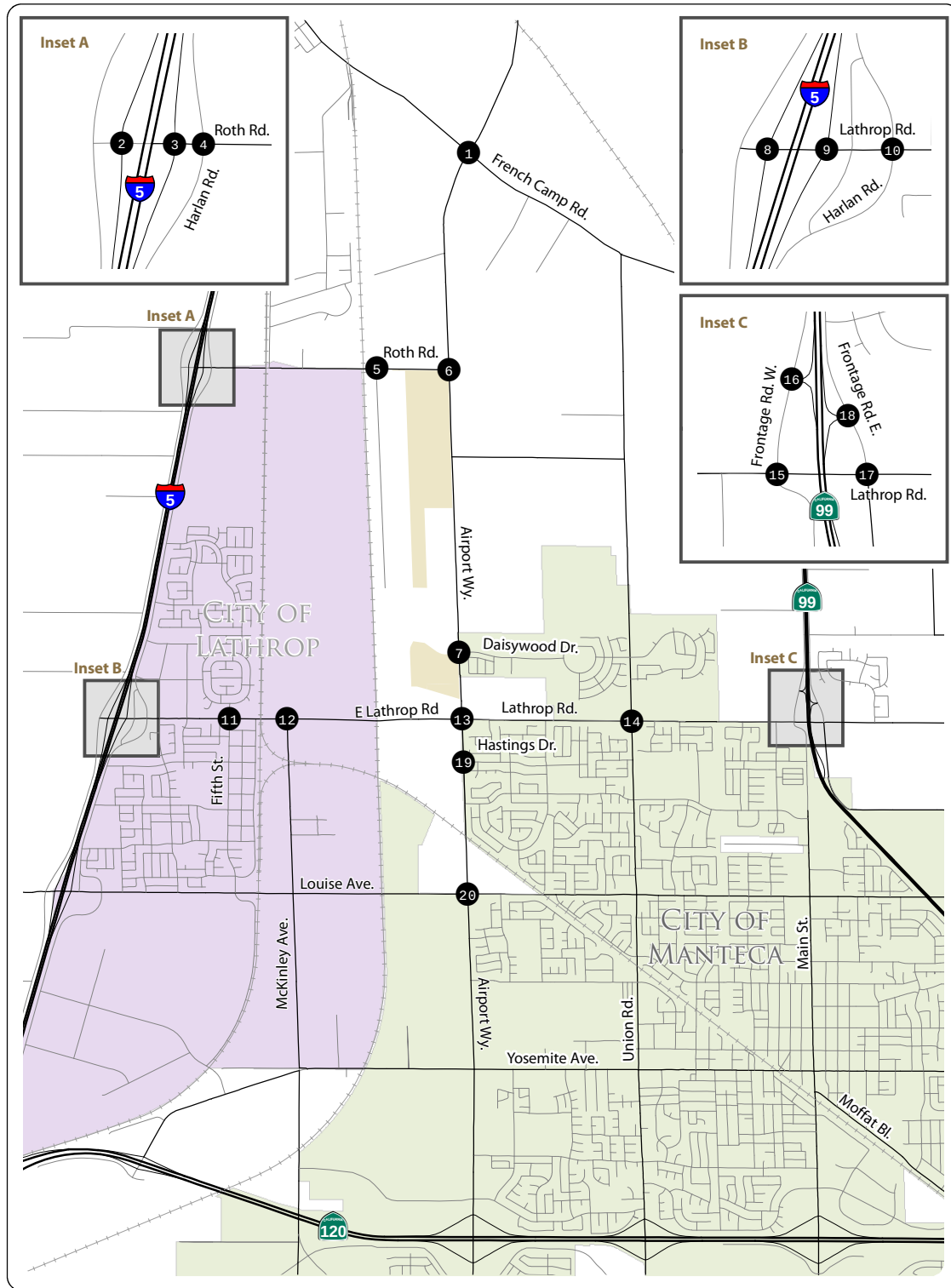
This chapter analyzes the impacts of the CIC on the surrounding transportation system under existing conditions.

TRAFFIC FORECASTS

Trips associated with the CIC were assigned to the study facilities in accordance with the trip generation and distribution assumptions described previously. Figure 5 displays CIC-only trips during the AM and PM peak hours at the study intersections. CIC-only trips were then added to the existing volumes to yield “existing plus CIC” conditions. Figure 6 displays these forecasts at the study intersections.

Table 11 displays the ADT on roadways surrounding the project site under Existing plus CIC Conditions. As shown, the greatest increase in traffic is expected to occur on Airport Way between Lathrop Road and Daisywood Drive.

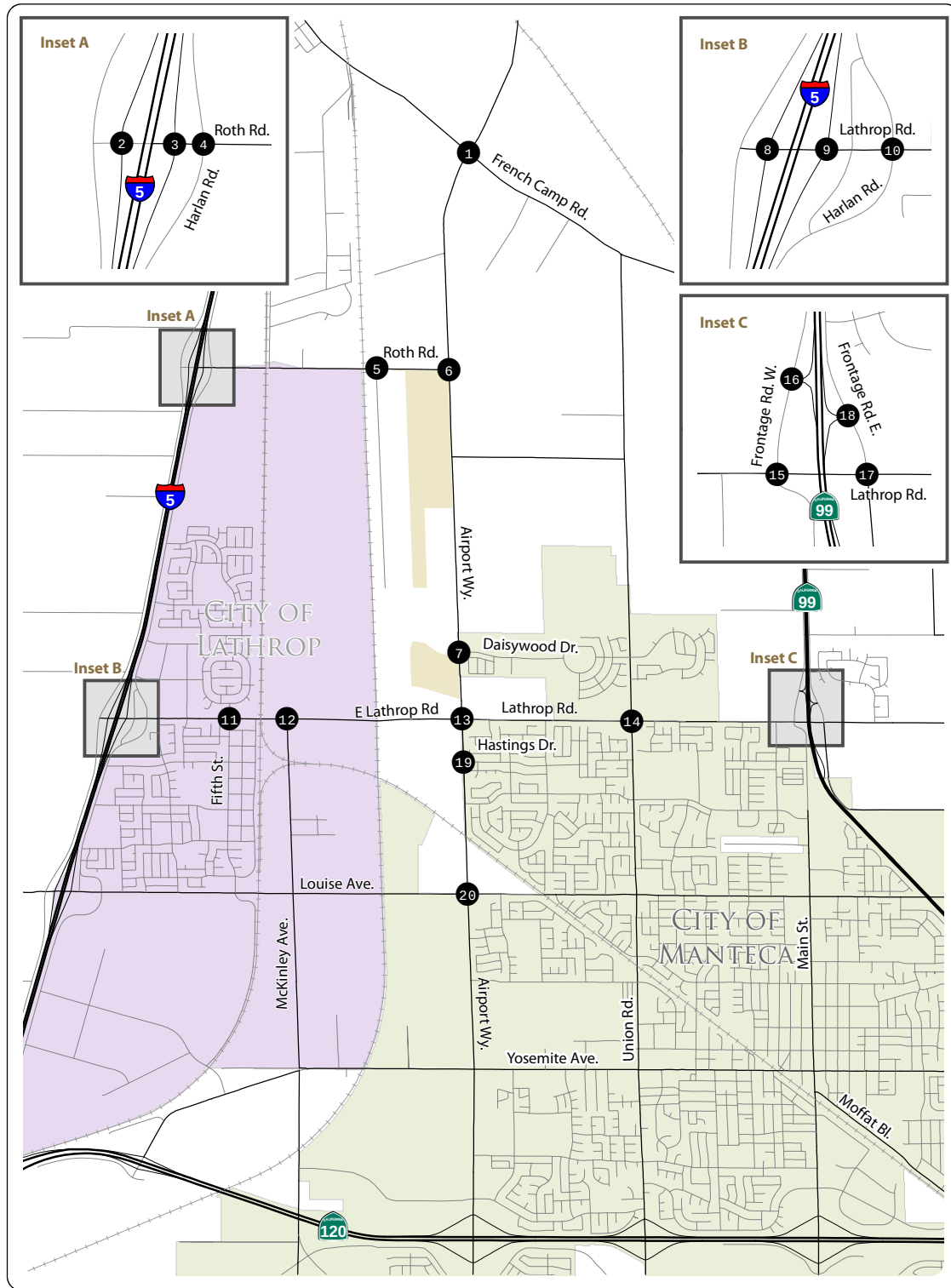
TABLE 11: AVERAGE DAILY TRAFFIC VOLUMES – EXISTING PLUS CIC CONDITIONS			
Segment	Average Daily Traffic (ADT)		
	Existing Conditions	CIC Trips	Existing Plus CIC Conditions
Roth Road west of Lathrop Intermodal Terminal	6,100	1,400	7,500
Roth Road from Lathrop Intermodal Terminal to Project Dwy.	3,600	1,400	5,000
Roth Road from Main Project Driveway to Airport Way	3,600	300	3,900
Airport Way north of Roth Road	6,500	300	6,800
Airport Way from Roth Road to Lovelace Road	6,600	400	7,000
Airport Way from Lovelace Road to Daisywood Drive	6,200	1,400	7,600
Airport Way from Daisywood Drive to Lathrop Road	6,400	2,100	8,500
Airport Way south of Lathrop Road	7,600	600	8,200
Lathrop Road west of Airport Way	12,800	700	13,500
Lathrop Road east of Airport Way	10,500	800	11,300
Lathrop Intermodal Terminal Driveway	2,400	-400	2,000
Notes: CIC trips included industrial uses (see Table 8).			



1. French Camp Rd./Airport Wy. 	2. Roth Rd./I-5 SB Ramps 	3. Roth Rd./I-5 NB Ramps 	4. Roth Rd./Harlan Rd. 	5. Roth Rd./UPRR Intermodal Dwy.
6. Roth Rd./Airport Wy. 	7. Project Access/Daisywood Dr./Airport Wy. 	8. Lathrop Rd./I-5 SB Ramps 	9. Lathrop Rd./I-5 NB Ramps 	10. Lathrop Rd./Harlan Rd.
11. Lathrop Rd./5th St. 	12. Lathrop Rd./McKinley Ave. 	13. Lathrop Rd./ Airport Wy. 	14. Lathrop Rd./Union Rd. 	15. SR 99 SB Ramps/Frontage Rd.
16. Lathrop Rd./Frontage Rd. (west) 	17. SR 99 NB Ramps/Frontage Rd. 	18. Lathrop Rd./Frontage Rd. (east) 	19. Hastings Dr./Airport Wy. 	20. Louise Ave./Airport Wy.

LEGEND

	Turn Lane		Traffic Signal
AM (PM)	Peak Hour Traffic Volume		Stop Sign
	Study Intersection		Centerpoint Properties
			N
			NOT TO SCALE



1. French Camp Rd./Airport Wy. 	2. Roth Rd./I-5 SB Ramps 	3. Roth Rd./I-5 NB Ramps 	4. Roth Rd./Harlan Rd. 	5. Roth Rd./UPRR Intermodal Dwy.
6. Roth Rd./Airport Wy. 	7. Project Access/Daisywood Dr./Airport Wy. 	8. Lathrop Rd./I-5 SB Ramps 	9. Lathrop Rd./I-5 NB Ramps 	10. Lathrop Rd./Harlan Rd.
11. Lathrop Rd./5th St. 	12. Lathrop Rd./McKinley Ave. 	13. Lathrop Rd./ Airport Wy. 	14. Lathrop Rd./Union Rd. 	15. SR 99 SB Ramps/Frontage Rd.
16. Lathrop Rd./Frontage Rd. (west) 	17. SR 99 NB Ramps/Frontage Rd. 	18. Lathrop Rd./Frontage Rd. (east) 	19. Hastings Dr./Airport Wy. 	20. Louise Ave./Airport Wy.

LEGEND

	Turn Lane		Traffic Signal		N
AM (PM)	Peak Hour Traffic Volume		Stop Sign		Centerpoint Properties
	Study Intersection				NOT TO SCALE

INTERSECTION OPERATIONS

The study intersections were reanalyzed under “existing plus CIC” conditions. Table 12 summarizes the results (refer to Appendix B for technical calculations).

TABLE 12: INTERSECTION OPERATIONS – EXISTING PLUS CIC CONDITIONS						
Intersection	Jurisdiction	Control	AM (PM) Peak Hour			
			Existing Conditions		Existing Plus CIC Conditions	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. French Camp Rd. / Airport Way	San Joaquin County	Traffic Signal	17 (22)	B (C)	17 (23)	B (C)
2. Roth Rd. / I-5 SB Ramps	Caltrans	Side-Street Stop	14 (14)	B (B)	18 (17)	C (C)
3. Roth Rd. / I-5 NB Ramps	Caltrans	Side-Street Stop	11 (10)	B (B)	11 (11)	B (B)
4. Roth Rd. / Harlan Rd.	City of Lathrop	All-way Stop	14 (13)	B (B)	17(17)	C (C)
5. Roth Rd. / Lathrop Intermodal Terminal Driveway	San Joaquin County	Side-Street Stop	12 (14)	B (B)	14 (15)	B (C)
6. Roth Rd. / Airport Way	San Joaquin County	Traffic Signal	11 (14)	B (B)	11 (15)	B (B)
7. Daisywood Dr. / Airport Way	City of Manteca	Signal	4 (4)	A (A)	11 (12)	B (B)
8. Lathrop Rd. / I-5 SB Ramps ¹	Caltrans	Side-Street Stop	>150 (>150)	F (F)	>150 (>150)	F (F)
9. Lathrop Rd. / I-5 NB Ramps	Caltrans	Side-Street Stop	24 (69)	C (F)	25 (84)	D (F)
10. Lathrop Rd. / Harlan Rd.	City of Lathrop	Traffic Signal	28 (28)	C (C)	28 (29)	C (C)
11. Lathrop Rd. / Fifth St.	City of Lathrop	Traffic Signal	27 (32)	C (C)	28 (32)	C (C)
12. Lathrop Rd. / McKinley Ave.	City of Lathrop	Side-Street Stop	39 (33)	E (D)	41 (39)	E (E)
13. Lathrop Rd. / Airport Way	City of Manteca	Traffic Signal	31 (31)	C (C)	35 (32)	C (C)
14. Lathrop Rd. / Union Rd.	City of Manteca	Traffic Signal	37 (29)	D (C)	39 (29)	D (C)
15. SR 99 SB Ramps / Frontage Rd. (West)	Caltrans	Side-Street Stop	12 (22)	B (C)	12 (23)	B (C)
16. Lathrop Rd. / SR 99 Frontage Rd. (West)	City of Manteca	All-way Stop	13 (39)	B (E)	14 (46)	B (E)
17. SR 99 NB Ramps / Frontage Rd. (East)	Caltrans	Side-Street Stop	11 (12)	B (B)	11 (12)	B (B)
18. Lathrop Rd. / SR 99 Frontage Rd. (East)	City of Manteca	All-way Stop	11 (15)	B (B)	11 (16)	B (C)
19. Hastings Dr. / Airport Way	City of Manteca	Side-Street Stop	13 (15)	B (B)	14 (16)	B (C)
20. Louise Ave. / Airport Way	City of Manteca	Traffic Signal	22 (31)	C (C)	23 (34)	C (C)
Notes:						
¹ >150 sec/veh of delay shown because inputs exceed analysis software's ability to produce reasonable delay estimates.						

According to this table, the following intersections would operate at LOS E or F under this scenario:

- 8) Lathrop Road / I-5 SB Ramps (LOS F in the AM and PM peak hours)
- 9) Lathrop Road / I-5 NB Ramps (LOS F in the PM peak hour)
- 12) Lathrop Road / McKinley Avenue (LOS E in AM and PM peak hours)
- 16) Lathrop Road / SR 99 Frontage Road West (LOS E in PM peak hour)

A peak hour signal warrant analysis at the above unsignalized intersections indicates that the warrant would be satisfied at the following three locations (refer to Appendix B for technical calculations):

- 9) Lathrop Road / I-5 NB Ramps (meets signal warrant in AM and PM peak hours)
- 12) Lathrop Road / McKinley Avenue (meets signal warrant in AM and PM peak hours)
- 16) Lathrop Road / SR 99 Frontage Road West (meets signal warrant in the PM peak hour)

FREEWAY OPERATIONS

Table 13 displays the average daily traffic volume and LOS under “existing plus CIC” conditions for the study segments of I-5 and SR 99. As shown, each segment would continue to operate at LOS D under this scenario. Table 14 displays the ramp junction analysis results at the I-5/Roth Road interchange (refer to Appendix B for technical calculations). As shown, each ramp junction will continue to operate at an acceptable LOS with the addition of CIC traffic.

TABLE 13: FREEWAY SEGMENT OPERATIONS – EXISTING PLUS CIC CONDITIONS				
Freeway	Segment	Lanes	ADT – LOS¹	
			Existing Conditions	Existing Plus CIC Conditions
I-5	North of Roth Road	6	96,000 – D	97,000 – D
	Roth Road to Lathrop Road	6	96,000 – D	96,600 – D
	Lathrop Road to Louise Avenue	6	100,000 – D	100,900 – D
	South of Louise Avenue	6	100,000 – D	100,900 – D
SR 99	North of French Camp Road	4	68,000 – D	68,200 – D
	Lathrop Road to French Camp Road	4	68,000 – D	68,100 – D
	South of Lathrop Road	4	67,000 – D	67,400 – D
Notes: ¹ LOS based on daily volume per lane thresholds in Table 2.				

**TABLE 14:
I-5/ROTH ROAD INTERCHANGE RAMP OPERATIONS – EXISTING PLUS CIC CONDITIONS**

Ramp	AM (PM) Peak Hour			
	Existing Conditions		Existing Plus CIC Conditions	
	Density	LOS ¹	Density	LOS ¹
I-5 SB Off-Ramp Diverge	27 (28)	C (C)	27 (28)	C (D)
I-5 SB On-Ramp Merge	21 (22)	C (C)	21 (23)	C (C)
I-5 NB Off-Ramp Diverge	27 (28)	C (C)	27 (28)	C (C)
I-5 NB On-Ramp Merge	23 (24)	C (C)	23 (25)	C (C)
Note: ¹ LOS is based on density, which is measured in passenger car equivalents per lane per mile.				

IMPACTS AND MITIGATIONS

This section describes the significant impacts of the CIC under existing conditions.

Impact TR-1 The CIC would exacerbate to a significant degree LOS F conditions during the AM and PM peak hours at the I-5 NB Ramps/Lathrop Road intersection. This is considered a significant impact.

The CIC would increase the average delay at this stop-controlled intersection by more than three seconds during each peak hour. Because the intersection already operates at LOS F and a traffic signal warrant is currently met, this impact is considered significant.

Mitigation TR-1 The City of Lathrop is pursuing a set of interim improvements to this interchange with funding provided through developer fees, the Measure K half-cent sales tax, the San Joaquin County Regional Transportation Impact Fees (RTIF), and other sources. The CIC would generate sales tax revenue and pay the County RTIF, which would help fund improvements to this interchange.

The type of interim improvements, their timing, their effectiveness, and the remaining funding sources required for implementation are unknown. Since improvements to this interchange are within the right-of-way of Caltrans, no assurances can be made that Caltrans will permit construction of any improvements. Therefore, this impact is considered significant and unavoidable.

Impact TR-2 The CIC would exacerbate to a significant degree LOS F conditions during the AM and PM peak hours at the Lathrop Road/SR 99 Frontage Road West intersection. This is considered a significant impact.

The CIC would increase the average delay at this all-way stop-controlled intersection by more than three seconds during each peak hour. Because the intersection already operates at LOS F and a traffic signal is currently warranted, this impact is considered significant.

Mitigation TR-2 The Highway 99 Widening Project includes improvements to the SR 99/Lathrop Road interchange. According to the geometric approval drawings, the interchange will be converted to a partial-cloverleaf (L-9) configuration. The frontage road west of SR 99 will be relocated to intersect Lathrop Road several hundred feet west of its current location. The Lathrop Road/(Relocated) Frontage Road and Lathrop Road/SR 99 SB Ramps intersections would each be signalized. These planned signalized intersections would operate at LOS C or better under "existing plus CIC" conditions.

Because improvements to the Lathrop Road/Frontage Road West intersection will occur in the near future and would restore operations to an acceptable level, this impact is considered less than significant.

Although the Lathrop Road/McKinley Road intersection satisfies the peak hour signal warrant under existing plus CIC conditions, it operates at an acceptable LOS with the CIC. Therefore, an impact was not identified at this location. Similarly, an impact was not identified at the Lathrop Road/I-5 SB Ramps intersection because it does not satisfy the peak hour signal warrant (despite operating at LOS F).

Impacts to Transit System

The CIC would not disrupt or preclude any existing or planned transit services in the study area. The CIC would also not create an inconsistency with a General Plan policy relating to transit. Impacts to the transit system are therefore considered **less than significant**.

Impacts to Bicycle/Pedestrian Systems

The Draft Master Plan shows a Class I (off-street) bicycle path that will begin at Lathrop Road and extend northerly through the Master Plan area. It will head easterly to intersect Airport Way at Daisywood Drive. Off-street bicycle facilities are not proposed within the northern area of the Master Plan because the industrial uses would not generate significant bicycle travel demand. A sidewalk and Class II (on-street) bicycle lane would be constructed along the project frontage on Airport Way. A continuous sidewalk would be constructed along the project frontage on Lathrop Road. No pedestrian or bicycle facilities are proposed on Roth Road, which is consistent with the character and use (i.e., heavily used for trucking operations) of this road.

The *City of Manteca Bicycle Master Plan* (2003) shows a Class II (on-street dedicated lane) bicycle lane on Airport Way and a suggested regional bike route on Lathrop Road west of

Airport Way. The *San Joaquin County Bicycle Master Plan* (2002) shows a proposed Class III (shared lane with vehicles) bicycle route on Roth Road. The CIC would not create an inconsistency with a General Plan policy or other adopted policy document. Therefore, CIC impacts to the bicycle and pedestrians systems are considered ***less than significant***.

Impacts to Rail Crossings

The CIC would add vehicle trips to the two at-grade railroad crossings on Roth Road, which are located between I-5 and the project site. The review of accident data at each crossing shows that the warning devices presently in place are associated with lower levels of accident rates when considering the entire range of potential warning devices. Therefore, the CIC would not add traffic to an at-grade railroad crossing that has a demonstrated record of having an above-average accident rate.

According to the existing traffic counts, 490 vehicles pass over the westerly at-grade crossing and 410 vehicles pass over the easterly at-grade crossing during the PM peak hour. On average, one train travels through each at-grade crossing during the peak hour. Assuming an average pre-emption of five minutes, this implies that 88 percent of motorists are not delayed by trains and 12 percent are delayed by trains. This equates to an average delay of 13 seconds per vehicle, which corresponds to LOS B operations. The CIC would add approximately 170 PM peak hour trips to each crossing. The average delay for all vehicles approaching each at-grade crossing would increase only slightly due to additional post-crossing vehicle platoon dispersion, but remain at an acceptable level.

The westerly at-grade railroad crossing on Roth Road is within the incorporated City limits of Lathrop. Accordingly, Lathrop would act as the lead agency in pursuing grade-separations or other improvements at this crossing. While the Lathrop General Plan identifies a grade-separation as necessary, the Lathrop CIP is not currently collecting fees from new development to help fund this improvement. Other improvements could include median separations to prevent vehicles from driving around crossing gates or pull out lanes for buses.

Caltrans, on behalf of the Union Pacific Railroad, has an application pending before the USDOT to obtain funding for various improvements associated with expansion of the Lathrop Intermodal Terminal. The application requests \$49.5 million from the Transportation Investment Generating Economic Recovery program, with Union Pacific providing the balance (\$49.5 million) of the project costs. The application includes a funding request for grade separating Roth Road from the Oakland Subdivision (i.e., the easterly crossing) via a two-lane overcrossing.

Based on the above analysis and significance criteria established for this study, CIC impacts to the at-grade rail crossings are considered ***less than significant***.

8. CUMULATIVE NO PROJECT CONDITIONS

This chapter describes cumulative transportation conditions in the study area assuming the Master Plan area remains undeveloped. It begins with a discussion of roadway and land use assumptions, followed by the “cumulative no project” traffic forecasts. Operations are then analyzed at the study facilities.

ROADWAY NETWORK AND LAND USE ASSUMPTIONS

A number of planned roadway improvements within the study area are cited in the San Joaquin Council of Governments RTP, San Joaquin County RTIF Capital Project list, Measure K Renewal, Manteca PFIP, and City of Lathrop CIP. The following set of “financially-constrained” and otherwise reasonable set of roadway improvements were assumed in place for the purposes of the cumulative analysis:

- Lathrop Road – new grade separation over western UPRR tracks and widening of Lathrop Road to be four continuous lanes between the two grade separations. *(source: City of Lathrop CIP)*
- SR 99 Widening – freeway widened from four to six lanes from SR 120 to Arch Road. This includes reconstruction of the SR 99/Lathrop Road interchange. *(source: Measure K Renewal project with programmed Prop 1B funding)*
- I-5 Widening – freeway improved to include three lanes plus an HOV lane in each direction from SR 120 to French Camp Road. *(sources: funding through RTIF, Measure K Renewal project; project description based on I-205/I-5 Corridor System Management Plan San Joaquin County Final Report, 2010. It is further noted that the Draft 2011 RTP includes the addition of HOV lanes on this freeway segment.)*

The Measure K Renewal would provide partial funding for several other roadway improvement projects in the study area. However, since City/County impact fee programs do not currently collect enough in fees to fund the remainder of the cost, these improvements are not assumed in place.

The version of the San Joaquin Council of Governments (SJCOG) travel demand model used for various other environmental studies in Manteca was also used for this study. This model predicts traffic volumes for year 2025 conditions based on a set of assumed roadway network improvements. The traffic model includes the three roadway improvements listed above. Because several other roadways in the study area are also planned to be widened, the model assumes the following additional capacity improvements so as to provide “unconstrained” travel demand forecasts (i.e., the model assumes these widenings, but the impact analysis does not):

- Lathrop Road is four continuous lanes from I-5 to SR 99
- Airport Way is four continuous lanes from SR 120 to French Camp Road

The SJCOG travel demand model was modified to include a set of realistic future development forecasts for the City of Manteca. Some of the significant projects assumed in the model include: Austin Road Business Park and Residential Community, Evans Estates, Pillsbury Estates, Villa Ticino West, Yosemite Park, The Promenade Shops, and Union Crossing. The model also assumes buildout of Union Ranch (located east of Airport Way) and the Central Lathrop Specific Plan (located west of the Lathrop Road/I-5 interchange). In addition, expanded operations are assumed at the Lathrop Intermodal Terminal, which translates into three times as many trips entering/exiting the facility from Roth Road as occurs presently.

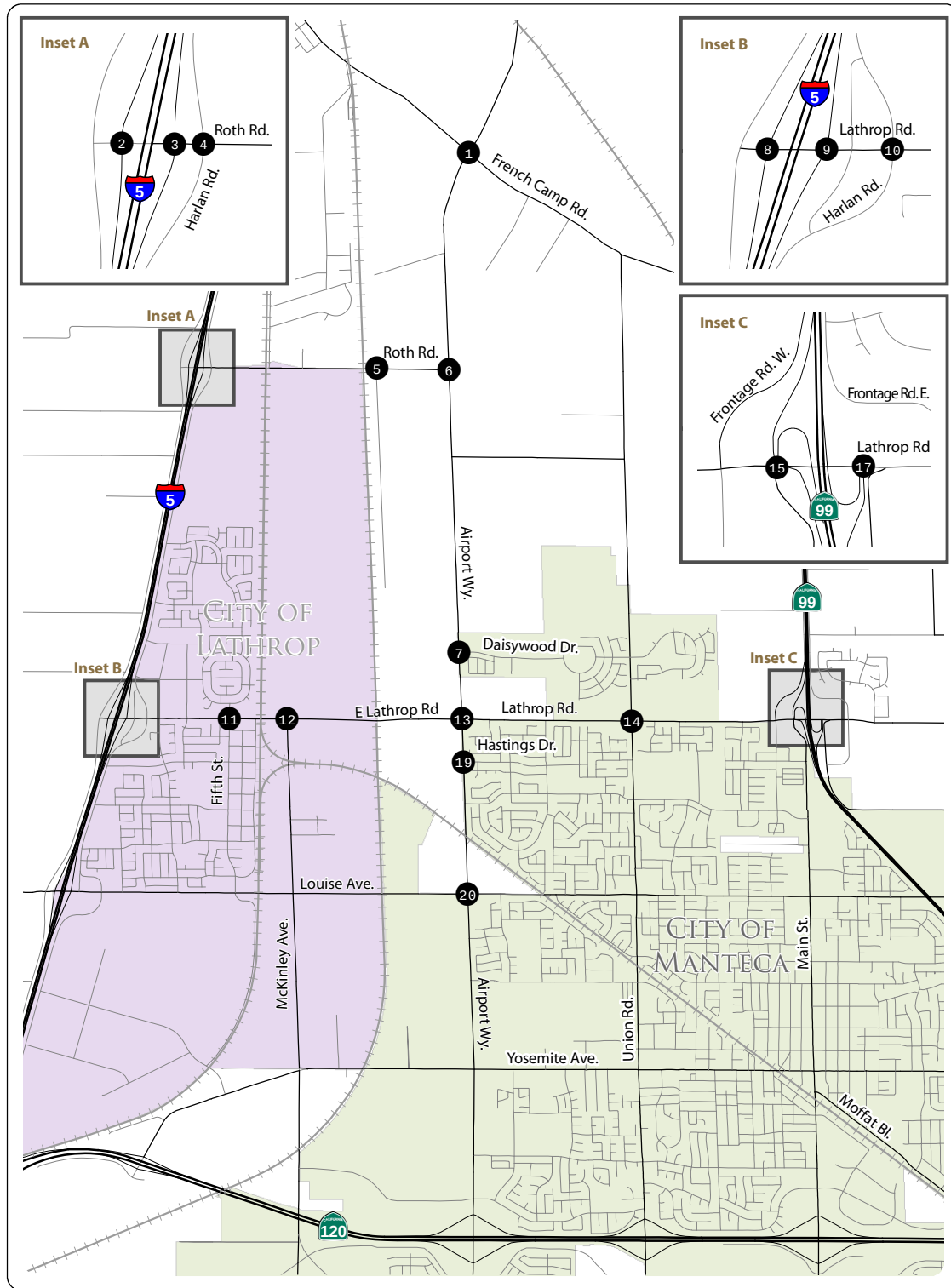
TRAFFIC FORECASTS

To account for potential inaccuracies in the base year SJCOG model that could otherwise transfer to the cumulative forecasts, the difference forecasting method was applied using the formula below:

$$\begin{aligned} \text{Cumulative No Project Turning Movement Volumes} &= \text{Existing Turning Movement Volumes} \\ &+ (2025 \text{ SJCOG Turning Movement Volumes} - 2008 \text{ SJCOG Turning Movement Volumes}) \end{aligned}$$

Figure 7 displays the cumulative no project peak hour traffic forecasts at the study intersections. Table 15 displays the cumulative no project average daily traffic volumes along the project frontage. These forecasts assume no development on the project site.

Table 15 indicates that the roadways along the project frontage are expected to experience significant growth between 2009 and 2025 conditions. On average, these facilities are expected to accommodate 275 percent more traffic in 2025 than today.



1. French Camp Rd./Airport Wy. 	2. Roth Rd./I-5 SB Ramps 	3. Roth Rd./I-5 NB Ramps 	4. Roth Rd./Harlan Rd. 	5. Roth Rd./UPRR Intermodal Dwy.
6. Roth Rd./Airport Wy. 	7. Project Access/Daisywood Dr./Airport Wy. 	8. Lathrop Rd./I-5 SB Ramps 	9. Lathrop Rd./I-5 NB Ramps 	10. Lathrop Rd./Harlan Rd.
11. Lathrop Rd./5th St. 	12. Lathrop Rd./McKinley Ave. 	13. Lathrop Rd./ Airport Wy. 	14. Lathrop Rd./Union Rd. 	15. Lathrop Rd./SR 99 SB Ramps/Main St.
16. SR 99 SB Ramps/Frontage Rd. Intersection Does Not Exist Under Cumulative Conditions	17. Lathrop Rd./SR 99 NB Ramps 	18. SR 99 NB Ramps/Frontage Rd. Intersection Does Not Exist Under Cumulative Conditions	19. Hastings Dr./Airport Wy. 	20. Louise Ave./Airport Wy.

LEGEND

Turn Lane AM (PM) Peak Hour Traffic Volume Study Intersection	Traffic Signal Stop Sign Free Right Turn	N NOT TO SCALE

TABLE 15:
AVERAGE DAILY TRAFFIC VOLUMES – CUMULATIVE NO PROJECT CONDITIONS

Segment	Average Daily Traffic (ADT)	
	Existing Conditions	Cumulative No Project Conditions
Roth Road west of Lathrop Intermodal Terminal	6,100	14,800
Roth Road from Lathrop Intermodal Terminal to Project Dwy.	3,600	9,200
Roth Road from Main Project Driveway to Airport Way	3,600	9,200
Airport Way north of Roth Road	6,500	17,000
Airport Way south of Roth Road	6,600	14,700
Airport Way north of Lathrop Road	6,400	26,900
Airport Way south of Lathrop Road	7,600	20,400
Lathrop Road west of Airport Way	12,800	25,800
Lathrop Road east of Airport Way	10,500	21,100
Lathrop Intermodal Terminal Driveway	2,400	7,200

INTERSECTION OPERATIONS

The study intersections were analyzed under “cumulative no project” conditions. The planned improvements at the SR 99/Lathrop Road interchange were assumed in place. Improvements were also assumed on Lathrop Road at the McKinley Avenue and Fifth Street intersections (to be made in accordance with the Lathrop Road UPRR grade-separation). Given its planned expansion, a traffic signal was assumed to be in place at the Roth Road driveway to the Lathrop Intermodal Terminal. No other intersection improvements were assumed. Table 16 summarizes the results (refer to Appendix C for technical calculations). This table indicates that the following 10 study intersections would operate at an unacceptable LOS during one or both peak hours.

- 2) Roth Road / I-5 SB Ramps
- 3) Roth Road / I-5 NB Ramps
- 4) Roth Road / Harlan Road
- 8) Lathrop Road / I-5 SB Ramps
- 9) Lathrop Road / I-5 NB Ramps
- 10) Lathrop Road / Harlan Road
- 13) Lathrop Road / Airport Way
- 14) Lathrop Road / Union Road

19) Hastings Drive / Airport Way

20) Louise Avenue / Airport Way

A peak hour signal warrant analysis indicates that the warrant would be satisfied at all of the above unsignalized intersections except Hastings Drive/Airport Way (refer to Appendix C for technical calculations).

**TABLE 16:
INTERSECTION OPERATIONS – CUMULATIVE NO PROJECT CONDITIONS**

Intersection	Jurisdiction	Control	AM Peak Hour		PM Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. French Camp Rd. / Airport Way	San Joaquin County	Traffic Signal	32	C	42	D
2. Roth Rd. / I-5 SB Ramps ¹	Caltrans	Side-Street Stop	76	F	>150	F
3. Roth Rd. / I-5 NB Ramps	Caltrans	Side-Street Stop	18	C	63	F
4. Roth Rd. / Harlan Rd.	City of Lathrop	All-way Stop	112	F	133	F
5. Roth Rd. / Lathrop Intermodal Terminal Driveway	San Joaquin County	Traffic Signal	19	B	19	B
6. Roth Rd. / Airport Way	San Joaquin County	Traffic Signal	14	B	16	B
7. Daisywood Dr. / Airport Way	City of Manteca	Traffic Signal	16	B	15	B
8. Lathrop Rd. / I-5 SB Ramps ¹	Caltrans	Side-Street Stop	>150	F	>150	F
9. Lathrop Rd. / I-5 NB Ramps ¹	Caltrans	Side-Street Stop	>150	F	>150	F
10. Lathrop Rd. / Harlan Rd.	City of Lathrop	Traffic Signal	136	F	61	E
11. Lathrop Rd. / Fifth St.	City of Lathrop	Traffic Signal	40	D	40	D
12. Lathrop Rd. / McKinley Ave.	City of Lathrop	Traffic Signal	9	A	8	A
13. Lathrop Rd. / Airport Way ¹	City of Manteca	Traffic Signal	112	F	>150	F
14. Lathrop Rd. / Union Rd.	City of Manteca	Traffic Signal	64	E	43	D
15. SR 99 SB Ramps / Lathrop Road	Caltrans	Traffic Signal	23	C	24	C
17. SR 99 NB Ramps / Lathrop Road	Caltrans	Traffic Signal	16	B	15	B
19. Hastings Dr. / Airport Way	City of Manteca	Side-Street Stop	79	F	75	F
20. Louise Ave. / Airport Way	City of Manteca	Traffic Signal	66	E	>150	F

Notes:

¹ >150 sec/veh of delay shown because inputs exceed analysis software's ability to produce reasonable delay estimates.

Intersections 16 and 18 do not exist under cumulative conditions.

FREEWAY OPERATIONS

Table 17 displays the average daily traffic volume and LOS for the study segments of I-5 and SR 99 under cumulative no project conditions. As shown, the segment of I-5 between Lathrop Road and Louise Avenue, and the segment south of Louise Avenue are anticipated to operate at an unacceptable LOS prior to the addition of project traffic.

Table 18 displays the ramp junction analysis results at the I-5/Roth Road interchange (refer to Appendix C for technical calculations). As shown, all of the ramp merge/diverge movements would operate at an acceptable LOS, except for the I-5 NB on-ramp merge which would operate at LOS E during the PM peak hour.

TABLE 17: FREEWAY SEGMENT OPERATIONS – CUMULATIVE NO PROJECT CONDITIONS				
Freeway	Segment	Lanes	ADT	LOS ¹
I-5	North of Roth Road	6 + 2 HOV	135,000	D
	Roth Road to Lathrop Road	6 + 2 HOV	135,000	D
	Lathrop Road to Louise Avenue	6 + 2 HOV	154,000	E
	South of Louise Avenue	6 + 2 HOV	167,000	F
SR 99	North of French Camp Road	6	100,000	D
	Lathrop Road to French Camp Road	6	98,000	D
	South of Lathrop Road	6	97,000	D
Notes: ¹ LOS based on daily volume per lane thresholds in Table 2. HOV lane assumed to have 75 percent of the vehicular capacity of a mixed-use lane.				

TABLE 18: I-5/ROTH ROAD INTERCHANGE RAMP OPERATIONS – CUMULATIVE NO PROJECT CONDITIONS				
Ramp	AM Peak Hour		PM Peak Hour	
	Density	LOS ¹	Density	LOS ¹
I-5 SB Off-Ramp Diverge	34	D	32	D
I-5 SB On-Ramp Merge	27	C	28	C
I-5 NB Off-Ramp Diverge	30	D	33	D
I-5 NB On-Ramp Merge	27	C	35	E
Notes: ¹ LOS is based on density, which is measured in passenger car equivalents per lane per mile.				

9. CUMULATIVE PLUS PROJECT CONDITIONS

This chapter analyzes the cumulative effects of the CIC and the Northwest Airport Way Master Plan on the surrounding transportation system.

TRAFFIC FORECASTS

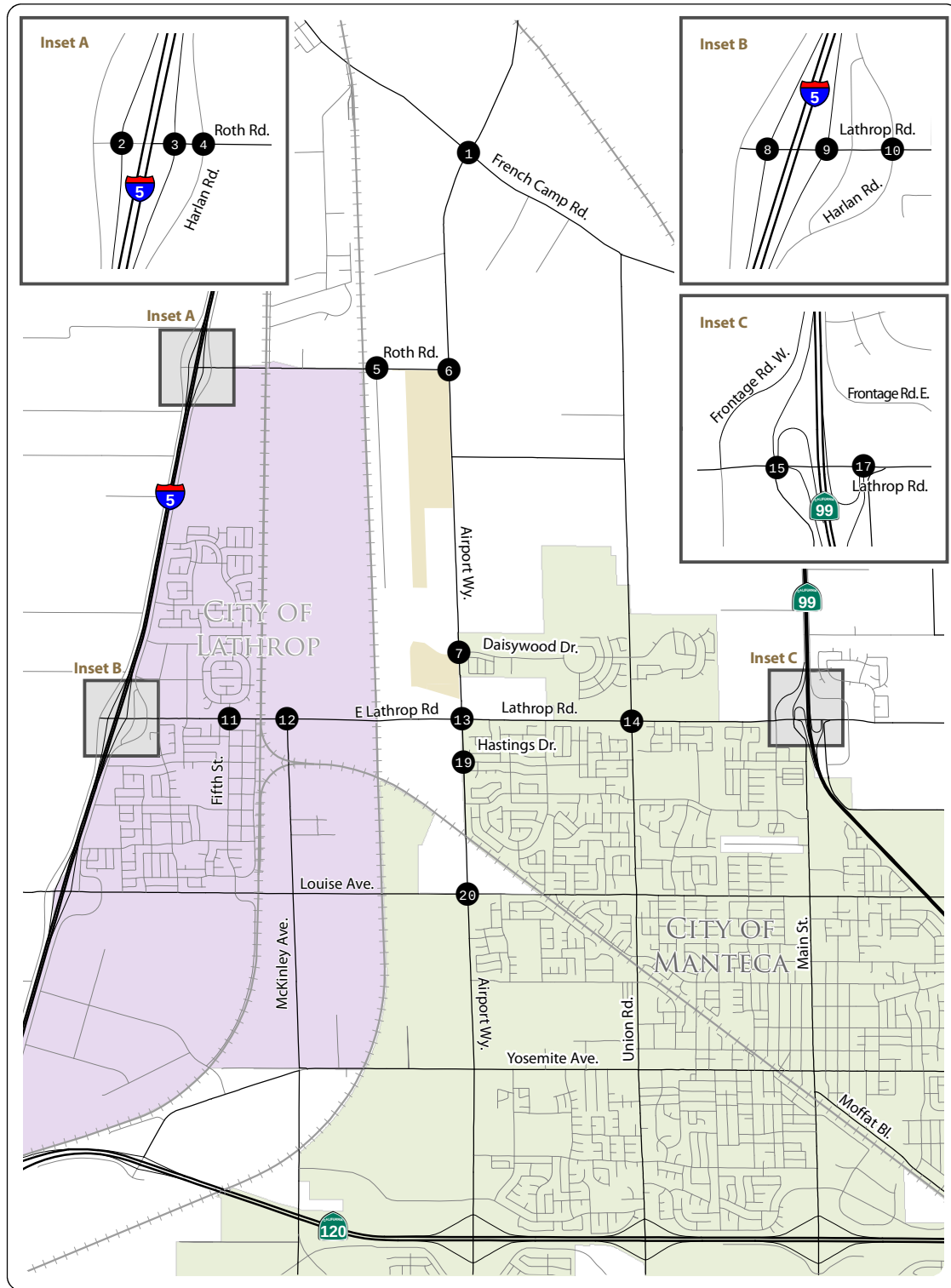
Trips generated by CIC were assigned to the study facilities in accordance with the trip generation and distribution assumptions described in Chapter 6. These trips were then added to the “cumulative no project” forecasts to yield the “cumulative plus CIC” forecasts. Figure 8 displays the cumulative plus CIC peak hour traffic forecasts at the study intersections. Table 19 displays the cumulative plus CIC average daily traffic volumes along the project frontage.

Trips generated by buildout of the Master Plan were assigned to the roadway system and then added to the no project forecasts in a similar manner. Figure 9 displays the cumulative plus Master Plan peak hour traffic forecasts at the study intersections. Table 19 displays the cumulative plus Master Plan average daily traffic volumes along the project frontage.

If the Master Plan is approved and annexed into the City of Manteca, the City would also annex the following two adjacent non-Master Plan properties:

- “East Area” – is bounded by Airport Way on the west, Lathrop Road on the south, and the Manteca limits / Del Webb Community on the north and east. Per the General Plan land use designations, this area was assumed to consist of 455 dwelling units and 10 acres of community commercial.
- “South Area” – is bounded by the UPRR Oakland Subdivision Line on the west, Lathrop Road on the north, Airport Way on the east, and the UPRR Fresno Subdivision Line on the south. Per the General Plan land use designations, this area was assumed to consist of 160 dwelling units, 143 acres of light industrial, 41 acres of public/quasi-public, and 1 acre of retail.

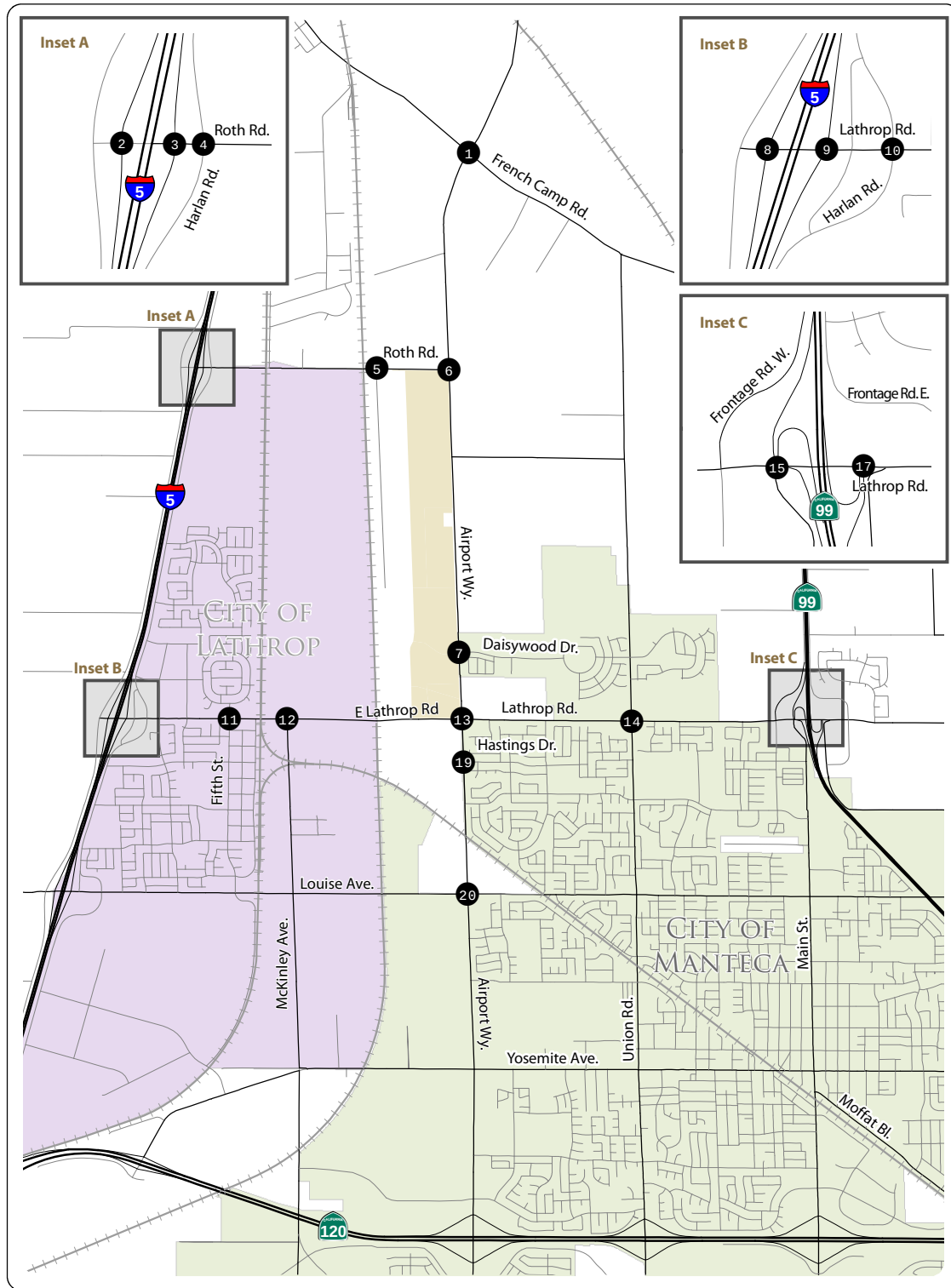
Land uses representing the East Area and South area were entered into the SJCOG travel demand model. Thus, the forecasts shown in this chapter considered trips from these areas.



1. French Camp Rd./Airport Wy. 	2. Roth Rd./I-5 SB Ramps 	3. Roth Rd./I-5 NB Ramps 	4. Roth Rd./Harlan Rd. 	5. Roth Rd./UPRR Intermodal Dwy.
6. Roth Rd./Airport Wy. 	7. Project Access/Daisywood Dr./Airport Wy. 	8. Lathrop Rd./I-5 SB Ramps 	9. Lathrop Rd./I-5 NB Ramps 	10. Lathrop Rd./Harlan Rd.
11. Lathrop Rd./5th St. 	12. Lathrop Rd./McKinley Ave. 	13. Lathrop Rd./ Airport Wy. 	14. Lathrop Rd./Union Rd. 	15. Lathrop Rd./SR 99 SB Ramps/Main St.
16. SR 99 SB Ramps/Frontage Rd. Intersection Does Not Exist Under Cumulative Conditions	17. Lathrop Rd./SR 99 NB Ramps 	18. SR 99 NB Ramps/Frontage Rd. Intersection Does Not Exist Under Cumulative Conditions	19. Hastings Dr./Airport Wy. 	20. Louise Ave./Airport Wy.

LEGEND

	Turn Lane		Stop Sign	 N NOT TO SCALE
AM (PM)	Peak Hour Traffic Volume		Free Right Turn	
	Study Intersection		Centerpoint Properties	
	Traffic Signal			



1. French Camp Rd./Airport Wy. 	2. Roth Rd./I-5 SB Ramps 	3. Roth Rd./I-5 NB Ramps 	4. Roth Rd./Harlan Rd. 	5. Roth Rd./UPRR Intermodal Dwy.
6. Roth Rd./Airport Wy. 	7. Project Access/Daisywood Dr./Airport Wy. 	8. Lathrop Rd./I-5 SB Ramps 	9. Lathrop Rd./I-5 NB Ramps 	10. Lathrop Rd./Harlan Rd.
11. Lathrop Rd./5th St. 	12. Lathrop Rd./McKinley Ave. 	13. Lathrop Rd./ Airport Wy. 	14. Lathrop Rd./Union Rd. 	15. Lathrop Rd./SR 99 SB Ramps/Main St.
16. SR 99 SB Ramps/Frontage Rd. Intersection Does Not Exist Under Cumulative Conditions	17. Lathrop Rd./SR 99 NB Ramps 	18. SR 99 NB Ramps/Frontage Rd. Intersection Does Not Exist Under Cumulative Conditions	19. Hastings Dr./Airport Wy. 	20. Louise Ave./Airport Wy.

LEGEND

	Turn Lane		Stop Sign	 N NOT TO SCALE
AM (PM)	Peak Hour Traffic Volume		Free Right Turn	
	Study Intersection		Project Location	
	Traffic Signal			

PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - CUMULATIVE PLUS MASTER PLAN BUILDOUT CONDITIONS
FIGURE 9

TABLE 19:
AVERAGE DAILY TRAFFIC VOLUMES – CUMULATIVE PLUS PROJECT CONDITIONS

Segment	Average Daily Traffic (ADT)		
	Cumulative No Project Conditions	Cumulative Plus CIC Conditions	Cumulative Plus Master Plan Conditions
Roth Road west of Lathrop Intermodal Terminal	14,800	16,100	19,200
Roth Road from Lathrop Intermodal Terminal to Project Dwy.	9,200	10,500	13,600
Roth Road from Main Project Driveway to Airport Way	9,200	9,500	11,300
Airport Way north of Roth Road	17,000	17,300	18,500
Airport Way south of Roth Road	14,700	15,100	17,300
Airport Way north of Lathrop Road	26,900	28,800	31,800
Airport Way south of Lathrop Road	20,400	20,900	23,300
Lathrop Road west of Airport Way	25,800	26,400	28,600
Lathrop Road east of Airport Way	21,100	21,800	24,500
Lathrop Intermodal Terminal Driveway	7,200	6,400	6,400

INTERSECTION OPERATIONS

The study intersections were analyzed under “cumulative plus CIC” and “cumulative plus Master Plan” conditions. Table 20 summarizes the results (refer to Appendix D for technical calculations). This table indicates that the addition of CIC traffic would exacerbate operations at the 10 intersections expected to operate unacceptably under cumulative no project conditions. However, no additional intersections would worsen from acceptable to unacceptable.

Buildout of the remainder of the Master Plan would further exacerbate unacceptable operations. Additionally, buildout of the Master Plan would also cause the Airport Way/Daisywood Drive intersection to worsen to unacceptable during the PM peak hour.

FREEWAY OPERATIONS

Table 21 displays the average daily traffic volume and LOS for the study segments of I-5 and SR 99 under cumulative plus project conditions. Although buildout of CIC and the Master Plan would increase traffic on the segments of I-5 that are projected to operate unacceptably, the resulting LOS would not change.

Table 22 displays the ramp junction analysis results at the I-5/Roth Road interchange (refer to Appendix D for technical calculations). As shown, buildout of CIC and the Master Plan would exacerbate unacceptable LOS on the northbound on-ramp during the PM peak hour.

**TABLE 20:
INTERSECTION OPERATIONS – CUMULATIVE PLUS PROJECT CONDITIONS**

Intersection	Jurisdiction	Control	AM (PM) Peak Hour					
			Cumulative No Project		Cumulative Plus CIC		Cumulative Plus Master Plan	
			Delay	LOS	Delay	LOS	Delay	LOS
1. French Camp Rd. / Airport Way	San Joaquin County	Traffic Signal	32 (42)	C (D)	32 (43)	C (D)	33 (45)	C (D)
2. Roth Rd. / I-5 SB Ramps	Caltrans	Side-Street Stop	76 (869)	F (F)	120 (>1000)	F (F)	187 (>1000)	F (F)
3. Roth Rd. / I-5 NB Ramps	Caltrans	Side-Street Stop	18 (63)	C (F)	20 (69)	C (F)	23 (120)	C (F)
4. Roth Rd. / Harlan Rd.	City of Lathrop	All-way Stop	112 (133)	F (F)	153 (183)	F (F)	185 (272)	F (F)
5. Roth Rd. / Lathrop Intermodal Terminal Driveway	San Joaquin County	Traffic Signal	19 (19)	B (B)	16 (18)	B (B)	20 (21)	C(C)
6. Roth Rd. / Airport Way	San Joaquin County	Traffic Signal	14 (16)	B (B)	15 (17)	B (B)	15 (22)	B (C)
7. Daisywood Dr. / Airport Way	City of Manteca	Traffic Signal	16 (15)	B (B)	30 (43)	C (D)	46 (132)	D (F)
8. Lathrop Rd. / I-5 SB Ramps	Caltrans	Side-Street Stop	>1000 (>1000)	F (F)	>1000 (>1000)	F (F)	>1000 (>1000)	F (F)
9. Lathrop Rd. / I-5 NB Ramps	Caltrans	Side-Street Stop	>1000 (>1000)	F (F)	>1000 (>1000)	F (F)	>1000 (>1000)	F (F)
10. Lathrop Rd. / Harlan Rd.	City of Lathrop	Traffic Signal	136 (61)	F (E)	138 (63)	F (E)	140 (68)	F (E)
11. Lathrop Rd. / Fifth St.	City of Lathrop	Traffic Signal	40 (40)	D (D)	42 (42)	D (D)	43 (47)	D (D)
12. Lathrop Rd. / McKinley Ave.	City of Lathrop	Traffic Signal	9 (8)	A (A)	9 (8)	A (A)	9 (8)	A (A)
13. Lathrop Rd. / Airport Way	City of Manteca	Traffic Signal	112 (156)	F (F)	136 (183)	F (F)	159 (227)	F (F)
14. Lathrop Rd. / Union Rd.	City of Manteca	Traffic Signal	64 (43)	E (D)	69 (44)	E (D)	74 (48)	E (D)
15. SR 99 SB Ramps / Lathrop Road	Caltrans	Traffic Signal	23 (24)	C (C)	23 (24)	C (C)	23 (25)	C (C)
17. SR 99 NB Ramps / Lathrop Road	Caltrans	Traffic Signal	16 (15)	B (B)	16 (15)	B (B)	16 (15)	B (B)
19. Hastings Dr. / Airport Way	City of Manteca	Side-Street Stop	79 (75)	F (F)	88 (80)	F (F)	119 (131)	F (F)
20. Louise Ave. / Airport Way	City of Manteca	Traffic Signal	66 (161)	E (F)	68 (168)	E (F)	71 (181)	E (F)

Notes:

Intersections 16 and 18 do not exist under cumulative conditions.

Delay estimates are shown for over-saturated conditions for purposes of determining significance of impacts.

**TABLE 21:
FREEWAY SEGMENT OPERATIONS – CUMULATIVE PLUS PROJECT CONDITIONS**

Freeway	Segment	Lanes	ADT – LOS ¹		
			Cumulative No Project	Cumulative Plus CIC	Cumulative Plus Master Plan
I-5	North of Roth Road	6 + 2 HOV	135,200 – D	136,100 – D	138,300 – D
	Roth Road to Lathrop Road	6 + 2 HOV	135,200 – D	135,700 – D	137,500 – D
	Lathrop Road to Louise Avenue	6 + 2 HOV	154,400 – E	155,200 – E	157,300 – E
	South of Louise Avenue	6 + 2 HOV	167,400 – F	168,200 – F	170,300 – F
SR 99	North of French Camp Road	6	100,000 – D	100,100 – D	100,500 – D
	Lathrop Road to French Camp Road	6	98,000 – D	98,100 – D	98,300 – D
	South of Lathrop Road	6	97,500 – D	97,900 – D	99,000 – D

Notes:

¹ LOS based on daily volume per lane thresholds in Table 2. HOV lane assumed to have 75 percent of the vehicular capacity of a mixed-use lane.

**TABLE 22:
I-5/ROTH ROAD INTERCHANGE RAMP OPERATIONS – CUMULATIVE PLUS PROJECT CONDITIONS**

Ramp	Density – LOS AM (PM) ¹		
	Cumulative No Project	Cumulative Plus CIC	Cumulative Plus Master Plan
I-5 SB Off-Ramp Diverge	34 – D (32 – D)	34 – D (32 – D)	34 – D (33 – D)
I-5 SB On-Ramp Merge	27 – C (28 – C)	27 – C (28 – D)	27 – C (29 – D)
I-5 NB Off-Ramp Diverge	30 – D (33 – D)	30 – D (33 – D)	31 – D (34 – D)
I-5 NB On-Ramp Merge	27 – C (35 – E)	27 – C (36 – E)	27 – C (37 – E)

Notes:

¹ LOS is based on density, which is measured in passenger car equivalents per lane per mile.

CMP ROADWAY SEGMENTS

Regional roadways in San Joaquin County are monitored as part of the Regional Congestion Management Program (RCMP) implemented by SJCOG. Within the study area, Lathrop Road, Airport Way, SR 99, and I-5 are designated as CMP facilities. The RCMP requires that each designated facility be analyzed to identify any project-related impacts. SR 99 and I-5 are inter-regional facilities that are being analyzed in the forthcoming Manteca General Plan EIR. This study includes CMP analyses of study segments of Lathrop Road and Airport Way.

Lathrop Road and Airport Way were evaluated using PM peak hour volumes, in accordance with the guidelines from the RCMP. The LOS was determined using the thresholds from the *Florida Department of Transportation (FDOT) Quality/Level of Service Handbook (2002)*, as specified by the RCMP.

The analysis of these facilities assumes that they are each widened to four lanes. The project will be paying the appropriate Manteca PFIP impact fee, which includes the widening of Airport Way to four lanes. The Lathrop General Plan and CIP include the widening of Lathrop Road to four lanes. Table 23 displays the PM peak hour traffic volumes and LOS for the study segments of Lathrop Road and Airport Way under cumulative plus Master Plan Buildout conditions. As shown, each segment is projected to operate at an acceptable LOS D or better.

TABLE 23: CMP ROADWAY SEGMENT OPERATIONS – CUMULATIVE PLUS MASTER PLAN BUILDOUT			
Segment	Number of Lanes	Two-Way PM Peak Hour Forecast	LOS
Lathrop Road – west of Airport Way	4	2,540	D
Lathrop Road – east of Airport Way	4	2,174	D
Airport Way – north of Lathrop Road	4	2,598	D
Airport Way – south of Lathrop Road	4	1,915	C

IMPACTS AND MITIGATIONS

This section describes the cumulatively significant impacts of the CIC and Master Plan Buildout, and recommends mitigations to reduce the significance of each impact.

The City of Manteca is currently modifying its PFIP and associated traffic impact fee. Recent discussions with the City's Public Works Department suggest that the impact fee and associated number of dwelling unit equivalents (DUEs) will be sufficient to fully fund the required road improvements within the City, and to partially fund improvements to selected freeway interchanges. This section presumes that building permits will not be issued for the Northwest Airport Way Master Plan until after the new fee becomes effective, which is expected to occur in late 2010.

Figure 10 illustrates the recommended mitigation measures under "cumulative plus CIC" and "cumulative plus Master Plan Buildout" conditions, respectively. Tables 24 and 25 illustrate their effectiveness. All technical calculations are contained in Appendix E.

Impact TR-3 Cumulatively unacceptable operations at the I-5/Roth Road interchange would be exacerbated to a significant degree by the CIC and Master Plan Buildout. This is considered a significant impact.

LOS F conditions would be exacerbated at each ramp intersection by increasing delay by more than three seconds during the AM and/or PM peak hours. Because each intersection would also meet the peak hour traffic signal warrant, this impact is considered significant.

Mitigation TR-3 (Required for both CIC and Master Plan Buildout)

The project applicants or its successors should contribute fair share funding toward the cost of installing traffic signals at the I-5 NB Ramps/Roth Road and I-5 SB Ramps/Roth Road intersections. The fair share is 10 percent for the CIC and 21 percent for the full Master Plan Buildout⁴.

The installation of traffic signals would restore operations to LOS D or better conditions. Since improvements to this interchange are within the right-of-way of Caltrans, no assurances can be made that Caltrans will permit construction of any improvements. Furthermore, the remaining funding sources required for implementation are unknown since no established funding program is currently

4. Fair share calculation is based on total AM and PM peak hour volumes on four freeway on- and off-ramps using the following formula:

$$\text{Fair Share Percentage} = [\text{Project Only Total Intersection Volume} \div (\text{Cumulative Plus Project Total Intersection Volume} - \text{Existing Count Intersection Volume})]$$

$$\text{Fair Share Percentage for CIC} = [261 \div (3,931 - 1,357)] = 10\%$$

collecting fees for this improvement. Therefore, this impact is considered significant and unavoidable despite the presence of physical improvements, which if implemented, would improve operations to acceptable levels.

Impact TR-4 Cumulatively unacceptable operations at the Roth Road/Harlan Road intersection in Lathrop would be exacerbated to a significant degree by the CIC and Master Plan Buildout. This is considered a significant impact.

LOS F conditions would be exacerbated at this intersection by increasing delay by more than three seconds during the AM and PM peak hours. Because this intersection would also meet the peak hour traffic signal warrant, this impact is considered significant.

Mitigation TR-4a (Required for CIC)

The project applicants or its successors should contribute fair share funding (calculated to be 15 percent) toward the following improvements to the Roth Road/Harlan Road intersection:

- *Installation of traffic signal*
- *Widening of westbound approach to include left-turn lane and shared through/right lane.*

Field observations suggest this improvement could be constructed within the existing right-of-way. These improvements would restore operations to LOS D or better conditions. Since improvements to this intersection are within the right-of-way of Lathrop, no assurances can be made that Lathrop will permit construction of any improvements. Furthermore, the remaining funding sources required for implementation are unknown since no established funding program is currently collecting fees for this improvement. Therefore, this impact is considered significant and unavoidable despite the presence of physical improvements, which if implemented, would improve operations to acceptable levels.

Mitigation TR-4b (Required for Master Plan Buildout)

The project applicants or its successors should contribute fair share funding (calculated to be 30 percent) toward the following improvements to the Roth Road/Harlan Road intersection:

- *Installation of traffic signal*
- *Widening of westbound approach to include left-turn lane, through lane, and shared through/right lane.*

These improvements would restore operations to LOS D or better conditions. Since improvements to this intersection are within the right-of-way of Lathrop, no assurances can be made that Lathrop will permit construction of any improvements. Furthermore, the remaining funding sources required for implementation are unknown since no established funding program is currently collecting fees for this improvement. Therefore, this impact is considered significant and unavoidable despite the presence of physical improvements, which if implemented, would improve operations to acceptable levels.

Impact TR-5 Cumulative operations at the Airport Way/Daisywood Drive intersection in Manteca worsened to an unacceptable level with the addition of the Master Plan Buildout. This is considered a significant impact.

Operations during the PM peak hour would worsen from LOS B to F with implementation of the Master Plan Buildout. This impact is considered significant.

Mitigation TR-5 (Required for Master Plan Buildout)

The project applicants or its successors should pay the appropriate PFIP impact fee, which will include the widening of Airport Way from two to four lanes along the project frontage. This would provide a second southbound lane through the Airport Way/Daisywood Drive intersection. In addition, exclusive right-turn lanes should be provided on the southbound and eastbound approaches. These additional lanes would improve operations to LOS D or better under cumulative plus Master Plan Buildout conditions, thereby mitigating Impact TR-5 to less than significant.

Impact TR-6 Cumulatively unacceptable operations at the Lathrop Road/Airport Way intersection in Manteca would be exacerbated to a significant degree by the CIC and Master Plan Buildout. This is considered a significant impact.

LOS F operations during the AM and PM peak hours would be exacerbated by increasing delay by more than three seconds with implementation of the CIC and Master Plan Buildout. This impact is considered significant.

Mitigation TR-6 (Required for CIC and Master Plan Buildout)

The project applicants or its successors should pay the appropriate PFIP impact fee, which will include the widening of Airport Way and Lathrop Road from two to four lanes along the project frontage. This would provide additional through lanes on all approaches to the Lathrop Road/Airport Way intersection. The intersection is recommended to consist of two left-turn lanes, two through lanes, and one right-turn lane on each approach. These lane configurations

would improve operations to LOS D or better under cumulative plus Master Plan Buildout conditions, thereby mitigating Impact TR-6 to less than significant.

Impact TR-7 Cumulatively unacceptable operations at the Lathrop Road/Union Road intersection in Manteca would be exacerbated to a significant degree by the CIC and Master Plan Buildout. This is considered a significant impact.

Unacceptable (LOS E) operations during the AM peak hour would be exacerbated by increasing delay by more than three seconds with implementation of the CIC and Master Plan Buildout. This impact is considered significant.

Mitigation TR-7 (Required for CIC and Master Plan Buildout)

The project applicants or its successors should pay the appropriate PFIP impact fee, which will include the widening of Lathrop Road to four lanes through the Union Road intersection. This widening would add a second through lane on the westbound approach to the intersection. This would restore AM peak hour operations to LOS D under cumulative with Master Plan Buildout conditions, thereby mitigating Impact TR-7 to less than significant.

Impact TR-8 Cumulatively unacceptable operations at the Louise Avenue/Airport Way intersection in Manteca would be exacerbated to a significant degree by the CIC and Master Plan Buildout. This is considered a significant impact.

Unacceptable (LOS E or F) operations during the AM and PM peak hours would be exacerbated to a significant degree with implementation of the CIC and Master Plan Buildout. This impact is considered significant.

Mitigation TR-8 (Required for CIC and Master Plan Buildout)

The project applicants or its successors should pay the appropriate PFIP impact fee, which will include the widening of Airport Way and Louise Avenue to four lanes. This would provide additional lanes on all approaches to the Louise Avenue/Airport Way intersection. The intersection is recommended to consist of one left-turn lane, two through lanes, and one right-turn lane on each approach. These lane configurations would improve operations to LOS D under cumulative plus Master Plan Buildout conditions, thereby mitigating Impact TR-8 to less than significant.

Impact TR-9 Cumulatively unacceptable operations on I-5 between Lathrop Road and SR 120 would be exacerbated to a significant degree by the CIC and Master Plan Buildout. This is considered a significant impact.

LOS E or F conditions on this segment would be exacerbated by the CIC and the Master Plan Buildout by virtue of more than 100 daily trips being added. This impact is considered significant.

Mitigation TR-9 (Required for both CIC and Master Plan Buildout)

The project applicants or its successors are responsible for paying the applicable Regional Traffic Impact Fee (RTIF), which helps fund improvements to this segment of I-5. In addition, the project will generate additional revenue for infrastructure improvements (including widening of I-5) through the Measure K sales tax. The widening of I-5 is a Tier I RTP improvement meaning that funding has been identified through various sources to enable its construction. Impact TR-9 is nonetheless considered significant and unavoidable because the identified improvements do not restore operations to an acceptable level. However, the revenues generated by the CIC and Master Plan through payment of RTIF and Measure K sales tax receipts represent mitigation in the form of a financial contribution that is roughly proportional to the impact.

Impact TR-10 Cumulatively unacceptable operations on the I-5 northbound on-ramp at Roth Road would be exacerbated to a significant degree by the CIC and Master Plan Buildout. This is considered a significant impact.

LOS E conditions would be exacerbated by increasing traffic on the ramp by more than one percent in the PM peak hour by the CIC and the Master Plan Buildout. This impact is considered significant.

Mitigation TR-10 (Required for both CIC and Master Plan Buildout)

The project applicants or its successors are responsible for paying the applicable Regional Traffic Impact Fee (RTIF), which helps fund improvements to this segment of I-5. In addition, the project will generate additional revenue for infrastructure improvements (including widening of I-5) through the Measure K sales tax. Impact TR-10 is considered significant and unavoidable because the identified improvements do not restore operations to an acceptable level. However, the revenues generated by the CIC and Master Plan through payment of RTIF and Measure K sales tax receipts represent mitigation in the form of a financial contribution that is roughly proportional to the impact.

Should the City determine that the updated traffic fee for the PFIP does not fully fund local street and intersection improvements, then the approach to mitigating Impacts TR-5 through TR-8 would likely be different. Instead of simply paying the PFIP fee, the project applicants or its successors would likely be required to pay the PFIP and also contribute their fair share of the cost of improvements not covered by the PFIP. Other mechanisms for mitigating impacts could also be considered such as requiring the applicants to construct improvements and be

reimbursed or credited against PFIP fees. Under this scenario, there would be no certainty that paying a fair share will assure that the necessary funding will be in place to construct the required improvements. As a result, Impacts TR-5 through TR-8 would be considered significant and unavoidable.

**TABLE 24:
MITIGATED INTERSECTION OPERATIONS – CUMULATIVE PLUS CIC CONDITIONS**

Intersection	Jurisdiction	AM (PM) Peak Hour			
		Cumulative Plus CIC		Cumulative Plus CIC with Mitigation	
		Delay	LOS	Delay	LOS
2. Roth Rd. / I-5 SB Ramps ¹	Caltrans	120 (>1000)	F (F)	39 (34)	D (C)
3. Roth Rd. / I-5 NB Ramps ¹	Caltrans	20 (69)	C (F)	21 (17)	C (B)
4. Roth Rd. / Harlan Rd. ¹	City of Lathrop	153 (183)	F (F)	39 (31)	D (C)
13. Lathrop Rd. / Airport Way ¹	City of Manteca	136 (183)	F (F)	31 (38)	C (D)
14. Lathrop Rd. / Union Rd. ¹	City of Manteca	69 (44)	E (D)	40 (38)	D (D)
20. Louise Ave. / Airport Way ¹	City of Manteca	68 (168)	E (F)	26 (31)	C (C)
Note: ¹ Refer to Figure 10 for illustration of recommended mitigation.					

TABLE 25:
MITIGATED INTERSECTION OPERATIONS –
CUMULATIVE PLUS MASTER PLAN BUILDOUT CONDITIONS

Intersection	Jurisdiction Control	AM (PM) Peak Hour			
		Cumulative Plus Master Plan		Cumulative Plus Master Plan with Mitigation	
		Delay	LOS	Delay	LOS
2. Roth Rd. / I-5 SB Ramps ¹	Caltrans	187 (>1000)	F (F)	45 (41)	D (D)
3. Roth Rd. / I-5 NB Ramps ¹	Caltrans	23 (120)	C (F)	31 (18)	C (B)
4. Roth Rd. / Harlan Rd. ¹	City of Lathrop	185 (272)	F (F)	43 (32)	D (C)
7. Daisywood Dr. / Airport Way ¹	City of Manteca	46 (132)	D (F)	33 (36)	C (D)
13. Lathrop Rd. / Airport Way ¹	City of Manteca	159 (227)	F (F)	32 (42)	C (D)
14. Lathrop Rd. / Union Rd. ¹	City of Manteca	74 (48)	E (D)	41 (41)	D (D)
20. Louise Ave. / Airport Way ¹	City of Manteca	71 (181)	E (F)	27 (33)	C (C)
Note: ¹ Refer to Figure 10 for illustration of recommended mitigation.					

Impacts to Transit System

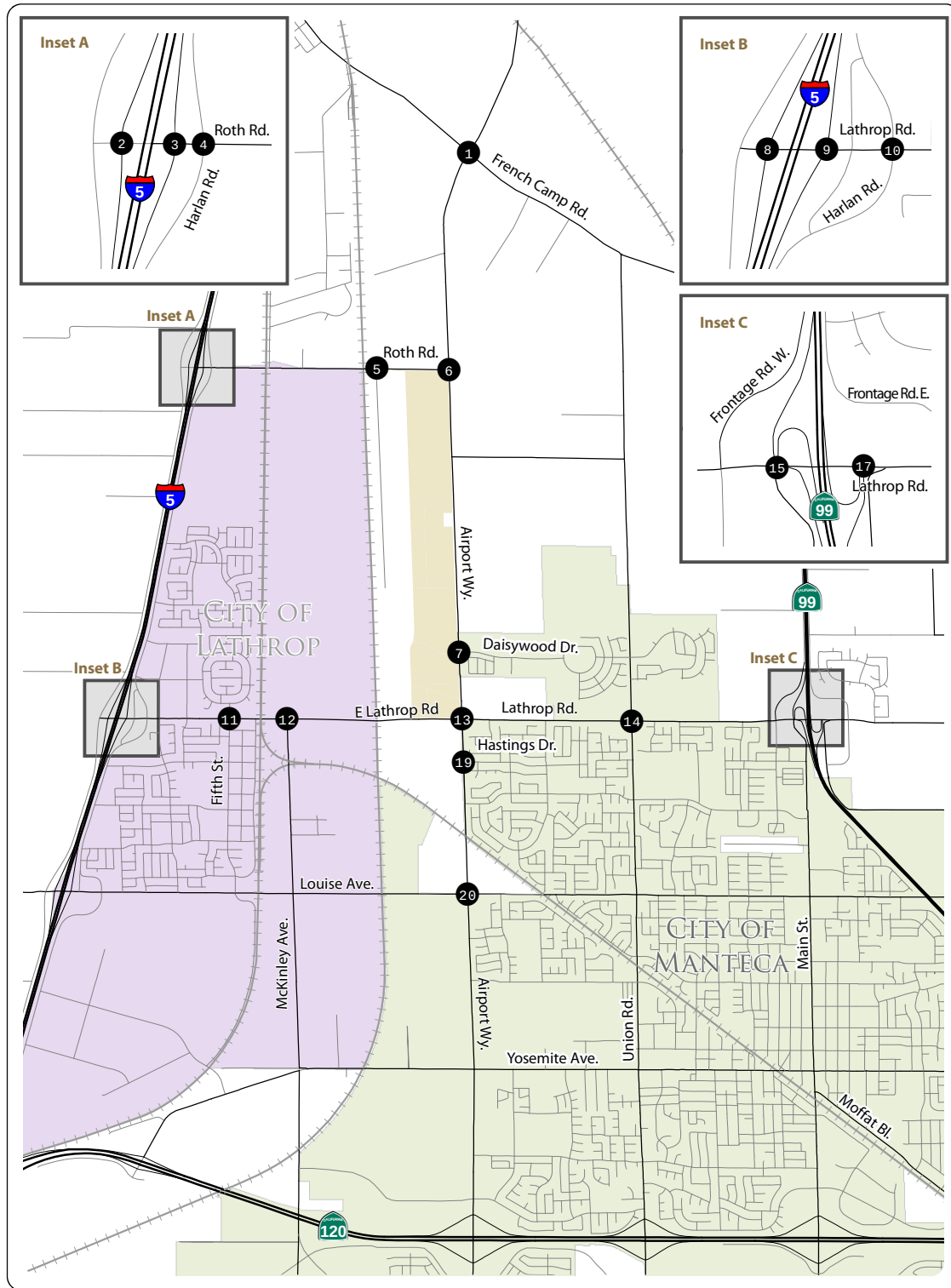
The project would not disrupt or preclude any existing or planned transit services in the study area. The project would also not create an inconsistency with a General Plan policy relating to transit. Impacts to the transit system are therefore considered ***less than significant***.

Impacts to Bicycle/Pedestrian Systems

The project would not create an inconsistency with a General Plan policy or other adopted policy document. By constructing Class I bicycle paths along the Airport Way frontage and within the site where appropriate, the project would not cause unsafe conditions for bicycles or pedestrians. Therefore, project impacts to the bicycle and pedestrians systems are considered ***less than significant***.

Impacts to Rail Crossings

The project would not add traffic to an at-grade railroad crossing that has a demonstrated record of having an above-average accident rate. Although the project would add traffic to the two at-grade crossings on Roth Road, the average delay for all vehicles approaching each at-grade crossing would increase slightly, but remain at an acceptable level. According to the *Lathrop Intermodal Terminal Expansion Tiger Discretionary Grant Application* (Caltrans and Union Pacific Railroad, 2009), an application is pending to grade-separate the easterly at-grade crossing on Roth Road in conjunction with the Lathrop Intermodal Terminal expansion. Therefore, project impacts to the at-grade rail crossings are considered ***less than significant***.



1. French Camp Rd./Airport Wy.	2. Roth Rd./I-5 SB Ramps	3. Roth Rd./I-5 NB Ramps	4. Roth Rd./Harlan Rd.	5. Roth Rd./UPRR Intermodal Dwy.
6. Roth Rd./Airport Wy.	7. Project Access/Daisywood Dr./Airport Wy.	8. Lathrop Rd./I-5 SB Ramps	9. Lathrop Rd./I-5 NB Ramps	10. Lathrop Rd./Harlan Rd.
11. Lathrop Rd./5th St.	12. Lathrop Rd./McKinley Ave.	13. Lathrop Rd./ Airport Wy.	14. Lathrop Rd./Union Rd.	15. Lathrop Rd./SR 99 SB Ramps/Main St.
16. SR 99 SB Ramps/Frontage Rd.	17. Lathrop Rd./SR 99 NB Ramps	18. SR 99 NB Ramps/Frontage Rd.	19. Hastings Dr./Airport Wy.	20. Louise Ave./Airport Wy.

Note: Mitigation measures are identical for "Cumulative Plus CIC" conditions, with exception of Intersection 4 (see asterisk) and Intersection 7, which is not impacted.

LEGEND

	Mitigation Measure		Study Intersection		Turn Lane
	"Cumulative Plus CIC" Requires a Left and Through/Right Lane		Traffic Signal		Free Right Turn
			Stop Sign		Project Location
					N
					NOT TO SCALE

10. PROJECT ACCESS EVALUATION

This chapter analyzes access requirements along the project frontages for development of CIC and Master Plan.

FRONTAGE IMPROVEMENTS

The City's PFIP list identifies improvements required to accommodate development and traffic in the Year 2025. An analysis of post-2025 conditions was also conducted to determine if development beyond the City's current General Plan (i.e., within its sphere of influence) could require further widening of streets within the City. This exercise revealed the following ultimate roadway right-of-way needs along the project frontage:

- Airport Way – Right-of-way should be dedicated to provide an ultimate six-lane arterial plus a median or center turn pocket.
- Lathrop Road – The ultimate roadway cross-section consists of four lanes plus a landscaped or paved median.
- Roth Road – Right-of-way should be dedicated to provide an ultimate four-lane arterial plus a median or center turn pocket.

The City and project applicant should coordinate on the site plan review to ensure that these ultimate right-of-way requirements are met.

According to Table 11, the sections of Airport Way and Roth Road that front along portions of the CIC properties would carry 8,500 vehicles per day or less under existing plus CIC conditions. This volume suggests that widening for capacity-enhancing purposes is not necessary in the near-term. However, some widening will be necessary to develop left-turn pockets into the project driveways and provide raised medians in locations with restricted driveway turning movements. The City will require that travel lanes along the frontage be constructed in their planned ultimate locations to support future widening.

PROJECT ACCESS INTERSECTIONS

Under the interim access plan, the CIC properties would be served by 12 access openings along Airport Way and two access openings along Roth Road. This number of access points, combined with a lack of specifics regarding on-site circulation (e.g., parking lots, truck docks, internal drive aisles, etc.), makes a focused and accurate analysis of project access intersections infeasible at this time.

Fehr & Peers recommends that the City conduct focused reviews of project access as individual projects are submitted for site plan and subsequent environmental review. The

access evaluations should be performed in accordance with the City's *Transportation Impact Study Guidelines*.

Below are some specific issues that should be addressed during the plan reviews:

- Which full access driveways will require traffic signals? A plan that situates traffic signals at uniformly spaced intervals (typically ¼-mile) is desirable.
- Will the traffic signals be coordinated? If so, improvements along Roth Road and Airport Way will require the installation of signal conduit.
- How heavily will specific driveways be used by trucks? This will dictate turn lane storage requirements, right-turn deceleration needs, and curb return radii.
- To what extent do project driveways need to accommodate future development on the opposite side of the street?
- Because the project will contribute to further deterioration of pavement on streets along the project frontage, frontage street improvements should be designed to meet the appropriate 20-year traffic index (TI) for pavement thickness.

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FEHR & PEERS
TRANSPORTATION CONSULTANTS



Technical Appendix

FINAL TRANSPORTATION IMPACT STUDY FOR NORTHWEST AIRPORT WAY MASTER PLAN

Prepared For:



City of Manteca

Michael Brandman Associates

Submitted by:

Fehr & Peers

July 27, 2010

Technical Appendix A

Existing Conditions

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1480	1776	1455	1444	1776	1524	1671	3049		1456	1473	1233
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1480	1776	1455	1444	1776	1524	1671	3049		1456	1473	1233
Volume (vph)	76	152	28	20	286	147	37	207	14	58	123	48
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	160	29	22	318	163	41	230	16	64	137	53
RTOR Reduction (vph)	0	0	19	0	0	0	0	8	0	0	0	39
Lane Group Flow (vph)	80	160	10	22	318	163	41	238	0	64	137	14
Heavy Vehicles (%)	22%	7%	11%	25%	7%	6%	8%	17%	21%	24%	29%	31%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	3.9	17.5	17.5	1.2	14.8	49.4	1.7	11.1		3.6	13.0	13.0
Effective Green, g (s)	3.9	17.5	17.5	1.2	14.8	49.4	1.7	11.1		3.6	13.0	13.0
Actuated g/C Ratio	0.08	0.35	0.35	0.02	0.30	1.00	0.03	0.22		0.07	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	117	629	515	35	532	1524	58	685		106	388	324
v/s Ratio Prot	c0.05	0.09		0.02	c0.18		0.02	0.08		c0.04	c0.09	
v/s Ratio Perm			0.01			c0.11						0.01
v/c Ratio	0.68	0.25	0.02	0.63	0.60	0.11	0.71	0.35		0.60	0.35	0.04
Uniform Delay, d1	22.1	11.3	10.4	23.9	14.8	0.0	23.6	16.1		22.2	14.8	13.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	15.3	0.2	0.0	30.3	1.8	0.1	32.4	0.3		9.3	0.6	0.1
Delay (s)	37.4	11.5	10.4	54.2	16.6	0.1	56.0	16.4		31.6	15.3	13.6
Level of Service	D	B	B	D	B	A	E	B		C	B	B
Approach Delay (s)		19.1			12.9			22.1			19.1	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM Average Control Delay			17.4			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			49.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			42.4%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↱	↑↑					↱	↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	42	4	121	27	0	0	0	0	183	4	18
Peak Hour Factor	0.70	0.70	0.70	0.95	0.95	0.95	0.25	0.25	0.25	0.80	0.80	0.80
Hourly flow rate (vph)	0	60	6	127	28	0	0	0	0	229	5	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	28			66			357	346	33	313	349	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28			66			357	346	33	313	349	14
tC, single (s)	4.3			4.8			8.2	7.2	7.6	*7.0	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.5			3.8	4.3	3.6	3.8	4.1	3.4
p0 queue free %	100			90			100	100	100	59	99	98
cM capacity (veh/h)	1513			1335			453	462	941	557	499	1030
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	40	26	127	14	14	152	104					
Volume Left	0	0	127	0	0	152	76					
Volume Right	0	6	0	0	0	0	22					
cSH	1700	1700	1335	1700	1700	557	615					
Volume to Capacity	0.02	0.02	0.10	0.01	0.01	0.27	0.17					
Queue Length 95th (ft)	0	0	8	0	0	28	15					
Control Delay (s)	0.0	0.0	8.0	0.0	0.0	13.9	12.0					
Lane LOS			A			B	B					
Approach Delay (s)	0.0		6.5			13.1						
Approach LOS						B						
Intersection Summary												
Average Delay			9.2									
Intersection Capacity Utilization			25.9%	ICU Level of Service				A				
Analysis Period (min)			15									

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

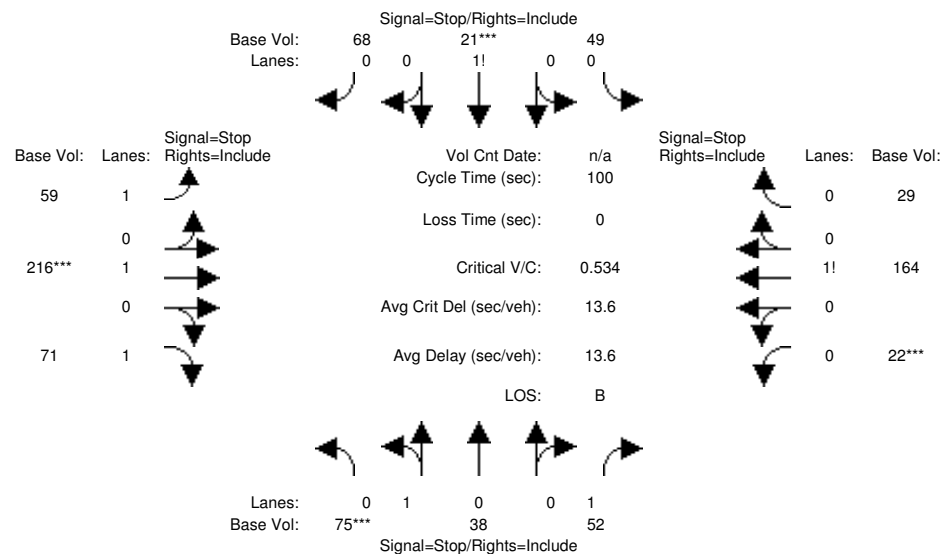
3: Roth Road & NB I-5 Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	24	201	0	0	136	171	12	1	145	0	0	0
Peak Hour Factor	0.75	0.75	0.75	0.90	0.90	0.90	0.90	0.90	0.90	0.25	0.25	0.25
Hourly flow rate (vph)	32	268	0	0	151	190	13	1	161	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									18			
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	341			268			408	673	134	445	578	171
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	341			268			408	673	134	445	578	171
tC, single (s)	4.3			4.8			7.7	6.7	7.6	8.2	7.2	7.6
tC, 2 stage (s)												
tF (s)	2.3			2.5			3.6	4.1	3.6	3.8	4.3	3.6
p0 queue free %	97			100			97	100	80	100	100	100
cM capacity (veh/h)	1146			1095			494	345	800	336	355	754
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1						
Volume Total	32	134	134	101	240	176						
Volume Left	32	0	0	0	0	13						
Volume Right	0	0	0	0	190	161						
cSH	1146	1700	1700	1700	1700	872						
Volume to Capacity	0.03	0.08	0.08	0.06	0.14	0.20						
Queue Length 95th (ft)	2	0	0	0	0	19						
Control Delay (s)	8.2	0.0	0.0	0.0	0.0	10.8						
Lane LOS	A					B						
Approach Delay (s)	0.9			0.0		10.8						
Approach LOS						B						
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			25.9%		ICU Level of Service				A			
Analysis Period (min)			15									

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #1: Roth Road / Harlan Road Existing AM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	75	38	52	49	21	68	59	216	71	22	164	29
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	75	38	52	49	21	68	59	216	71	22	164	29
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.75	0.75	0.75	0.90	0.90	0.90
PHF Volume:	83	42	58	54	23	76	79	288	95	24	182	32
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	83	42	58	54	23	76	79	288	95	24	182	32
PCE 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
MLF 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
Final Volume:	83	42	58	54	23	76	79	288	95	24	182	32
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.66	0.34	1.00	0.36	0.15	0.49	1.00	1.00	1.00	0.10	0.77	0.13
Final Sat.:	310	157	538	177	76	246	500	539	601	53	393	69
Capacity Analysis Module:												
Vol/Sat:	0.27	0.27	0.11	0.31	0.31	0.31	0.16	0.53	0.16	0.46	0.46	0.46
Crit Moves:	****	****	****	****	****	****	****	****	****	****	****	****
Delay/Veh:	12.4	12.4	9.6	12.5	12.5	12.5	11.0	16.1	9.6	15.2	15.2	15.2
Delay 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
AdjDel/Veh:	12.4	12.4	9.6	12.5	12.5	12.5	11.0	16.1	9.6	15.2	15.2	15.2
LOS by Move:	B	B	A	B	B	B	B	C	A	C	C	C
ApproachDel:	11.5			12.5			13.9			15.2		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	11.5			12.5			13.9			15.2		
LOS by Appr:	B			B			B			C		
AllWayAvgQ:	0.3	0.3	0.1	0.4	0.4	0.4	0.2	1.0	0.2	0.8	0.8	0.8

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Roth Road / Harlan Road Existing AM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	0	1	0	0	1	0	0	1	0	0	1	0
Initial Vol:	75	38	52	49	21	68	59	216	71	22	164	29
Major Street Volume:	561											
Minor Approach Volume:	165											
Minor Approach Volume Threshold:	623											

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Unsignalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

1/5/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	88	49	15	102	43	7
Peak Hour Factor	0.80	0.80	0.75	0.75	0.80	0.80
Hourly flow rate (vph)	110	61	20	136	54	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			171		286	110
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			171		286	110
tC, single (s)			4.8		7.4	6.9
tC, 2 stage (s)						
tF (s)			2.9		4.4	3.9
p0 queue free %			98		90	99
cM capacity (veh/h)			1071		531	785
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	110	61	20	136	62	
Volume Left	0	0	20	0	54	
Volume Right	0	61	0	0	9	
cSH	1700	1700	1071	1700	556	
Volume to Capacity	0.06	0.04	0.02	0.08	0.11	
Queue Length 95th (ft)	0	0	1	0	9	
Control Delay (s)	0.0	0.0	8.4	0.0	12.3	
Lane LOS			A		B	
Approach Delay (s)	0.0		1.1		12.3	
Approach LOS					B	
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			17.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

1/5/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
						
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1289	1417	1517	1759	1610	1154
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1289	1417	1517	1759	1610	1154
Volume (vph)	58	37	59	199	124	58
Peak-hour factor, PHF	0.85	0.85	0.75	0.75	0.85	0.85
Adj. Flow (vph)	68	44	79	265	146	68
RTOR Reduction (vph)	0	38	0	0	0	29
Lane Group Flow (vph)	68	6	79	265	146	39
Heavy Vehicles (%)	40%	14%	19%	8%	18%	40%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	7.6	7.6	4.2	39.7	31.5	31.5
Effective Green, g (s)	7.6	7.6	4.2	39.7	31.5	31.5
Actuated g/C Ratio	0.14	0.14	0.08	0.72	0.57	0.57
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	177	195	115	1263	917	657
v/s Ratio Prot	c0.05		c0.05	c0.15	0.09	
v/s Ratio Perm		0.00				0.03
v/c Ratio	0.38	0.03	0.69	0.21	0.16	0.06
Uniform Delay, d1	21.7	20.7	24.9	2.6	5.6	5.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.1	15.7	0.1	0.1	0.0
Delay (s)	23.1	20.7	40.6	2.7	5.7	5.3
Level of Service	C	C	D	A	A	A
Approach Delay (s)	22.2			11.4	5.6	
Approach LOS	C			B	A	
Intersection Summary						
HCM Average Control Delay			11.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.27			
Actuated Cycle Length (s)			55.3		Sum of lost time (s)	8.0
Intersection Capacity Utilization			23.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

1/5/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		0.95	1.00	1.00	1.00
Frt	0.95		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1716		3252	1583	1770	1652
Flt Permitted	0.97		1.00	1.00	0.95	1.00
Satd. Flow (perm)	1716		3252	1583	1770	1652
Volume (vph)	15	9	225	16	5	153
Peak-hour factor, PHF	0.90	0.90	0.75	0.75	0.90	0.90
Adj. Flow (vph)	17	10	300	21	6	170
RTOR Reduction (vph)	9	0	0	5	0	0
Lane Group Flow (vph)	18	0	300	16	6	170
Heavy Vehicles (%)	2%	2%	11%	2%	2%	15%
Turn Type			Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases			2			
Actuated Green, G (s)	5.2		68.5	68.5	2.0	74.5
Effective Green, g (s)	5.2		68.5	68.5	2.0	74.5
Actuated g/C Ratio	0.06		0.78	0.78	0.02	0.85
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	102		2540	1236	40	1403
v/s Ratio Prot	c0.01		0.09		0.00	c0.10
v/s Ratio Perm			0.01			
v/c Ratio	0.17		0.12	0.01	0.15	0.12
Uniform Delay, d1	39.2		2.3	2.1	42.0	1.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8		0.0	0.0	1.7	0.0
Delay (s)	40.0		2.3	2.1	43.8	1.1
Level of Service	D		A	A	D	A
Approach Delay (s)	40.0		2.3			2.6
Approach LOS	D		A			A
Intersection Summary						
HCM Average Control Delay			4.4		HCM Level of Service	A
HCM Volume to Capacity ratio			0.12			
Actuated Cycle Length (s)			87.7		Sum of lost time (s)	8.0
Intersection Capacity Utilization			18.1%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	63	9	389	69	0	0	0	0	241	4	11
Peak Hour Factor	0.75	0.75	0.75	0.95	0.95	0.95	0.25	0.25	0.25	0.70	0.70	0.70
Hourly flow rate (vph)	0	84	12	409	73	0	0	0	0	344	6	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked												
vC, conflicting volume	73			96			1000	982	90	982	988	73
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	73			96			1000	982	90	982	988	73
tC, single (s)	4.2			4.2			7.2	6.6	6.3	*6.5	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			72			100	100	100	0	97	98
cM capacity (veh/h)	1490			1461			163	175	951	210	174	973
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	96	409	73	366								
Volume Left	0	409	0	344								
Volume Right	12	0	0	16								
cSH	1700	1461	1700	217								
Volume to Capacity	0.06	0.28	0.04	1.69								
Queue Length 95th (ft)	0	29	0	607								
Control Delay (s)	0.0	8.4	0.0	368.1								
Lane LOS		A		F								
Approach Delay (s)	0.0	7.2		368.1								
Approach LOS				F								
Intersection Summary												
Average Delay			146.3									
Intersection Capacity Utilization			75.7%	ICU Level of Service						D		
Analysis Period (min)			15									

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	20	284	0	0	446	423	12	3	197	0	0	0
Peak Hour Factor	0.70	0.70	0.70	0.85	0.85	0.85	0.95	0.95	0.95	0.25	0.25	0.25
Hourly flow rate (vph)	29	406	0	0	525	498	13	3	207	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					624							
pX, platoon unblocked	0.68						0.68	0.68		0.68	0.68	0.68
vC, conflicting volume	1022			406			1236	1485	406	1445	1236	774
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1033			406			1346	1710	406	1652	1346	669
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	94			100			84	94	67	100	100	100
cM capacity (veh/h)	444			1121			81	56	632	32	94	306
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	29	406	1022	223								
Volume Left	29	0	0	13								
Volume Right	0	0	498	207								
cSH	444	1700	1700	413								
Volume to Capacity	0.06	0.24	0.60	0.54								
Queue Length 95th (ft)	5	0	0	78								
Control Delay (s)	13.7	0.0	0.0	23.5								
Lane LOS	B			C								
Approach Delay (s)	0.9		0.0	23.5								
Approach LOS				C								
Intersection Summary												
Average Delay			3.4									
Intersection Capacity Utilization		75.7%		ICU Level of Service						D		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.92		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3243		1671	1759	1495	1671	3073		1671	3092	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3243		1671	1759	1495	1671	3073		1671	3092	
Volume (vph)	77	324	80	53	615	50	195	39	45	49	35	35
Peak-hour factor, PHF	0.85	0.85	0.85	0.95	0.95	0.95	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	91	381	94	56	647	53	217	43	50	65	47	47
RTOR Reduction (vph)	0	19	0	0	0	21	0	42	0	0	43	0
Lane Group Flow (vph)	91	456	0	56	647	32	217	51	0	65	51	0
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	7.7	44.2		4.1	40.6	40.6	12.7	13.2		6.7	7.2	
Effective Green, g (s)	7.7	44.2		4.1	40.6	40.6	12.7	13.2		6.7	7.2	
Actuated g/C Ratio	0.09	0.52		0.05	0.48	0.48	0.15	0.16		0.08	0.09	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	153	1702		81	848	721	252	482		133	264	
v/s Ratio Prot	c0.05	0.14		0.03	c0.37		c0.13	0.02		c0.04	0.02	
v/s Ratio Perm						0.02						
v/c Ratio	0.59	0.27		0.69	0.76	0.04	0.86	0.11		0.49	0.19	
Uniform Delay, d1	36.8	11.1		39.4	17.9	11.5	34.9	30.4		37.1	35.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.1	0.4		22.5	6.4	0.1	24.6	0.1		2.8	0.4	
Delay (s)	42.8	11.4		61.9	24.3	11.7	59.5	30.5		39.9	36.2	
Level of Service	D	B		E	C	B	E	C		D	D	
Approach Delay (s)		16.5			26.2			50.8			37.7	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM Average Control Delay			28.4				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			84.2				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			64.1%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & Fifth Street

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.91		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	3426		1736	1662		1736	1827	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1827	1553	1736	3426		1736	1662		1736	1827	1553
Volume (vph)	18	283	13	17	512	49	32	11	17	114	16	56
Peak-hour factor, PHF	0.70	0.70	0.70	0.90	0.90	0.90	0.80	0.80	0.80	0.75	0.75	0.75
Adj. Flow (vph)	26	404	19	19	569	54	40	14	21	152	21	75
RTOR Reduction (vph)	0	0	14	0	10	0	0	14	0	0	0	44
Lane Group Flow (vph)	26	404	5	19	613	0	40	21	0	152	21	31
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	1.9	17.8	17.8	1.9	17.8		2.5	21.6		8.2	27.3	27.3
Effective Green, g (s)	1.9	17.8	17.8	1.9	17.8		2.5	21.6		8.2	27.3	27.3
Actuated g/C Ratio	0.03	0.27	0.27	0.03	0.27		0.04	0.33		0.13	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	50	496	422	50	931		66	548		217	761	647
v/s Ratio Prot	c0.01	c0.22		0.01	0.18		c0.02	0.01		c0.09	0.01	
v/s Ratio Perm			0.00									c0.02
v/c Ratio	0.52	0.81	0.01	0.38	0.66		0.61	0.04		0.70	0.03	0.05
Uniform Delay, d1	31.4	22.3	17.4	31.2	21.2		31.0	14.9		27.5	11.3	11.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	9.4	9.9	0.0	4.8	1.7		14.7	0.1		9.8	0.1	0.1
Delay (s)	40.8	32.2	17.4	36.0	22.8		45.7	15.0		37.2	11.3	11.5
Level of Service	D	C	B	D	C		D	B		D	B	B
Approach Delay (s)		32.1			23.2			31.4			27.3	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			27.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			65.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			35.4%			ICU Level of Service			A			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

1/5/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	352	101	63	512	72	22
Peak Hour Factor	0.80	0.80	0.90	0.90	0.80	0.80
Hourly flow rate (vph)	440	126	70	569	90	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			566		1212	503
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			566		1212	503
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		51	95
cM capacity (veh/h)			996		185	564
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	566	70	569	118		
Volume Left	0	70	0	90		
Volume Right	126	0	0	28		
cSH	1700	996	1700	220		
Volume to Capacity	0.33	0.07	0.33	0.53		
Queue Length 95th (ft)	0	6	0	71		
Control Delay (s)	0.0	8.9	0.0	38.8		
Lane LOS		A		E		
Approach Delay (s)	0.0	1.0		38.8		
Approach LOS				E		
Intersection Summary						
Average Delay			3.9			
Intersection Capacity Utilization			43.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	1798		1736	1797		1736	1827	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1827	1553	1736	1798		1736	1797		1736	1827	1553
Volume (vph)	48	229	96	30	357	42	161	162	20	30	72	68
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.70	0.70	0.70
Adj. Flow (vph)	60	286	120	38	446	52	201	202	25	43	103	97
RTOR Reduction (vph)	0	0	80	0	6	0	0	6	0	0	0	72
Lane Group Flow (vph)	60	286	40	38	492	0	201	221	0	43	103	25
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	3.9	24.3	24.3	2.6	23.0		10.8	26.5		3.3	19.0	19.0
Effective Green, g (s)	3.9	24.3	24.3	2.6	23.0		10.8	26.5		3.3	19.0	19.0
Actuated g/C Ratio	0.05	0.33	0.33	0.04	0.32		0.15	0.36		0.05	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	93	611	519	62	569		258	655		79	477	406
v/s Ratio Prot	c0.03	0.16		0.02	c0.27		c0.12	c0.12		0.02	0.06	
v/s Ratio Perm			0.03									0.02
v/c Ratio	0.65	0.47	0.08	0.61	0.86		0.78	0.34		0.54	0.22	0.06
Uniform Delay, d1	33.7	19.1	16.5	34.6	23.4		29.8	16.7		34.0	21.0	20.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	14.3	2.6	0.3	16.6	16.0		13.8	1.4		7.5	1.0	0.3
Delay (s)	48.1	21.7	16.8	51.2	39.4		43.6	18.1		41.4	22.1	20.5
Level of Service	D	C	B	D	D		D	B		D	C	C
Approach Delay (s)		23.8			40.2			30.1			24.8	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM Average Control Delay			30.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			72.7			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			51.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3471	1553	1736	1827	1553	1736	3180		1736	3373	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3471	1553	1736	1827	1553	1736	3180		1736	3373	
Volume (vph)	21	227	72	172	204	115	118	149	190	32	85	20
Peak-hour factor, PHF	0.75	0.75	0.75	0.70	0.70	0.70	0.75	0.75	0.75	0.60	0.60	0.60
Adj. Flow (vph)	28	303	96	246	291	164	157	199	253	53	142	33
RTOR Reduction (vph)	0	0	21	0	0	45	0	169	0	0	24	0
Lane Group Flow (vph)	28	303	75	246	291	119	157	283	0	53	151	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	2.4	24.4	24.4	12.0	34.0	34.0	8.0	28.0		3.6	23.6	
Effective Green, g (s)	2.4	24.4	24.4	12.0	34.0	34.0	8.0	28.0		3.6	23.6	
Actuated g/C Ratio	0.03	0.29	0.29	0.14	0.40	0.40	0.10	0.33		0.04	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	50	1008	451	248	740	629	165	1060		74	948	
v/s Ratio Prot	0.02	0.09		c0.14	c0.16		c0.09	c0.09		0.03	0.04	
v/s Ratio Perm			0.05			0.08						
v/c Ratio	0.56	0.30	0.17	0.99	0.39	0.19	0.95	0.27		0.72	0.16	
Uniform Delay, d1	40.3	23.2	22.2	36.0	17.7	16.1	37.8	20.5		39.7	22.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.6	0.8	0.8	54.7	1.6	0.7	55.5	0.6		27.9	0.4	
Delay (s)	53.8	23.9	23.0	90.6	19.3	16.8	93.4	21.1		67.6	23.1	
Level of Service	D	C	C	F	B	B	F	C		E	C	
Approach Delay (s)		25.7			43.7			39.7			33.4	
Approach LOS		C			D			D			C	
Intersection Summary												
HCM Average Control Delay			37.4				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			42.7%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 15: SB SR 99 Ramps & Main Street

1/5/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	133	3	54	251	18	32
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	148	3	60	279	20	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	275	199			339	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	275	199			339	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	100			98	
cM capacity (veh/h)	703	842			1220	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	151	339	56			
Volume Left	148	0	20			
Volume Right	3	279	0			
cSH	705	1700	1220			
Volume to Capacity	0.21	0.20	0.02			
Queue Length 95th (ft)	20	0	1			
Control Delay (s)	11.5	0.0	3.0			
Lane LOS	B		A			
Approach Delay (s)	11.5	0.0	3.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.5				
Intersection Capacity Utilization		32.5%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

16: Lathrop Road & Main Street

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	173	196	73	78	209	83	42	49	23	44	27	94
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	192	218	81	87	232	92	47	54	26	49	30	104
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total (vph)	192	299	87	324	127	183						
Volume Left (vph)	192	0	87	0	47	49						
Volume Right (vph)	0	81	0	92	26	104						
Hadj (s)	0.53	-0.16	0.53	-0.16	-0.01	-0.25						
Departure Headway (s)	6.7	6.0	6.8	6.1	6.5	6.2						
Degree Utilization, x	0.36	0.50	0.16	0.55	0.23	0.31						
Capacity (veh/h)	513	578	503	558	482	526						
Control Delay (s)	12.2	13.6	9.9	15.0	11.5	11.9						
Approach Delay (s)	13.0		14.0		11.5	11.9						
Approach LOS	B		B		B	B						
Intersection Summary												
Delay			13.0									
HCM Level of Service			B									
Intersection Capacity Utilization			47.0%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

17: NB SR 99 Ramps & Frontage Road (East)

1/5/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	23	191	208	33	61	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	26	212	231	37	68	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	569	71	73			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	569	71	73			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	79	85			
cM capacity (veh/h)	410	992	1526			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	238	268	73			
Volume Left	26	231	0			
Volume Right	212	0	6			
cSH	861	1526	1700			
Volume to Capacity	0.28	0.15	0.04			
Queue Length 95th (ft)	28	13	0			
Control Delay (s)	10.8	6.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.8	6.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			7.6			
Intersection Capacity Utilization		39.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

18: Lathrop Road & Frontage Road (East)

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	146	76	41	1	107	57	42	38	2	15	16	221
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	162	84	46	1	119	63	47	42	2	17	18	246
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	292	183	91	280								
Volume Left (vph)	162	1	47	17								
Volume Right (vph)	46	63	2	246								
Hadj (s)	0.05	-0.17	0.12	-0.48								
Departure Headway (s)	5.2	5.2	5.7	4.8								
Degree Utilization, x	0.42	0.26	0.15	0.38								
Capacity (veh/h)	647	637	547	685								
Control Delay (s)	12.0	10.0	9.7	10.7								
Approach Delay (s)	12.0	10.0	9.7	10.7								
Approach LOS	B	A	A	B								
Intersection Summary												
Delay			10.9									
HCM Level of Service			B									
Intersection Capacity Utilization			53.1%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

1/5/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	27	32	311	6	7	191
Peak Hour Factor	0.85	0.85	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	32	38	346	7	8	212
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)					1308	
pX, platoon unblocked						
vC, conflicting volume	573	346			352	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	573	346			352	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	95			99	
cM capacity (veh/h)	478	697			1207	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	32	38	346	7	8	212
Volume Left	32	0	0	0	8	0
Volume Right	0	38	0	7	0	0
cSH	478	697	1700	1700	1207	1700
Volume to Capacity	0.07	0.05	0.20	0.00	0.01	0.12
Queue Length 95th (ft)	5	4	0	0	0	0
Control Delay (s)	13.1	10.5	0.0	0.0	8.0	0.0
Lane LOS	B	B			A	
Approach Delay (s)	11.7		0.0		0.3	
Approach LOS	B					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			26.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1736	1726		1736	1827	1553	1736	1827	1553	1736	1780	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1736	1726		1736	1827	1553	1736	1827	1553	1736	1780	
Volume (vph)	20	118	69	83	235	55	94	211	32	28	217	45
Peak-hour factor, PHF	0.85	0.85	0.85	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	24	139	81	92	261	61	111	248	38	31	241	50
RTOR Reduction (vph)	0	28	0	0	0	47	0	0	22	0	8	0
Lane Group Flow (vph)	24	192	0	92	261	14	111	248	16	31	283	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	1.9	10.9		4.5	13.5	13.5	4.9	24.5	24.5	1.9	21.5	
Effective Green, g (s)	1.9	10.9		4.5	13.5	13.5	4.9	24.5	24.5	1.9	21.5	
Actuated g/C Ratio	0.03	0.19		0.08	0.23	0.23	0.08	0.42	0.42	0.03	0.37	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	57	325		135	427	363	147	774	658	57	662	
v/s Ratio Prot	0.01	0.11		c0.05	c0.14		c0.06	c0.14		0.02	c0.16	
v/s Ratio Perm						0.01			0.01			
v/c Ratio	0.42	0.59		0.68	0.61	0.04	0.76	0.32	0.02	0.54	0.43	
Uniform Delay, d1	27.4	21.4		26.0	19.8	17.1	25.9	11.1	9.7	27.5	13.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.0	2.9		13.3	2.6	0.0	19.6	0.2	0.0	10.2	0.4	
Delay (s)	32.4	24.3		39.2	22.4	17.2	45.4	11.3	9.7	37.7	14.0	
Level of Service	C	C		D	C	B	D	B	A	D	B	
Approach Delay (s)		25.1			25.4			20.7			16.3	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay			21.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			57.8			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			48.4%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1504	1792	1524	1318	1696	1302	1641	2928		1752	1696	1455
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1504	1792	1524	1318	1696	1302	1641	2928		1752	1696	1455
Volume (vph)	46	341	52	19	174	58	52	168	27	152	217	56
Peak-hour factor, PHF	0.80	0.80	0.80	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	58	426	65	22	205	68	58	187	30	169	241	62
RTOR Reduction (vph)	0	0	43	0	0	0	0	22	0	0	0	44
Lane Group Flow (vph)	58	426	22	22	205	68	58	195	0	169	241	18
Heavy Vehicles (%)	20%	6%	6%	37%	12%	24%	10%	21%	19%	3%	12%	11%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	3.5	17.9	17.9	0.9	15.3	53.2	3.0	10.5		7.9	15.4	15.4
Effective Green, g (s)	3.5	17.9	17.9	0.9	15.3	53.2	3.0	10.5		7.9	15.4	15.4
Actuated g/C Ratio	0.07	0.34	0.34	0.02	0.29	1.00	0.06	0.20		0.15	0.29	0.29
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	99	603	513	22	488	1302	93	578		260	491	421
v/s Ratio Prot	0.04	c0.24		0.02	c0.12		c0.04	0.07		c0.10	c0.14	
v/s Ratio Perm			0.01			0.05						0.01
v/c Ratio	0.59	0.71	0.04	1.00	0.42	0.05	0.62	0.34		0.65	0.49	0.04
Uniform Delay, d1	24.1	15.4	11.9	26.2	15.4	0.0	24.5	18.4		21.3	15.7	13.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.6	3.8	0.0	191.9	0.6	0.1	12.3	0.3		5.7	0.8	0.0
Delay (s)	32.7	19.1	11.9	218.0	15.9	0.1	36.9	18.7		27.1	16.4	13.6
Level of Service	C	B	B	F	B	A	D	B		C	B	B
Approach Delay (s)		19.7			27.4			22.5			19.9	
Approach LOS		B			C			C			B	
Intersection Summary												
HCM Average Control Delay			21.7			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			53.2			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			49.4%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↱	↑↑					↱	↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	42	4	108	23	0	0	0	0	163	2	10
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.25	0.25	0.25	0.80	0.80	0.80
Hourly flow rate (vph)	0	52	5	135	29	0	0	0	0	204	2	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	29			58			353	354	29	325	356	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	29			58			353	354	29	325	356	14
tC, single (s)	4.3			4.8			7.7	6.7	7.1	*7.0	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.5			3.6	4.1	3.4	3.8	4.1	3.4
p0 queue free %	100			90			100	100	100	63	99	99
cM capacity (veh/h)	1513			1340			502	493	1008	544	491	1030
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	35	22	135	14	14	136	83					
Volume Left	0	0	135	0	0	136	68					
Volume Right	0	5	0	0	0	0	12					
cSH	1700	1700	1340	1700	1700	544	584					
Volume to Capacity	0.02	0.01	0.10	0.01	0.01	0.25	0.14					
Queue Length 95th (ft)	0	0	8	0	0	24	12					
Control Delay (s)	0.0	0.0	8.0	0.0	0.0	13.8	12.2					
Lane LOS			A			B	B					
Approach Delay (s)	0.0		6.6			13.2						
Approach LOS						B						
Intersection Summary												
Average Delay			9.0									
Intersection Capacity Utilization			26.9%	ICU Level of Service				A				
Analysis Period (min)			15									

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

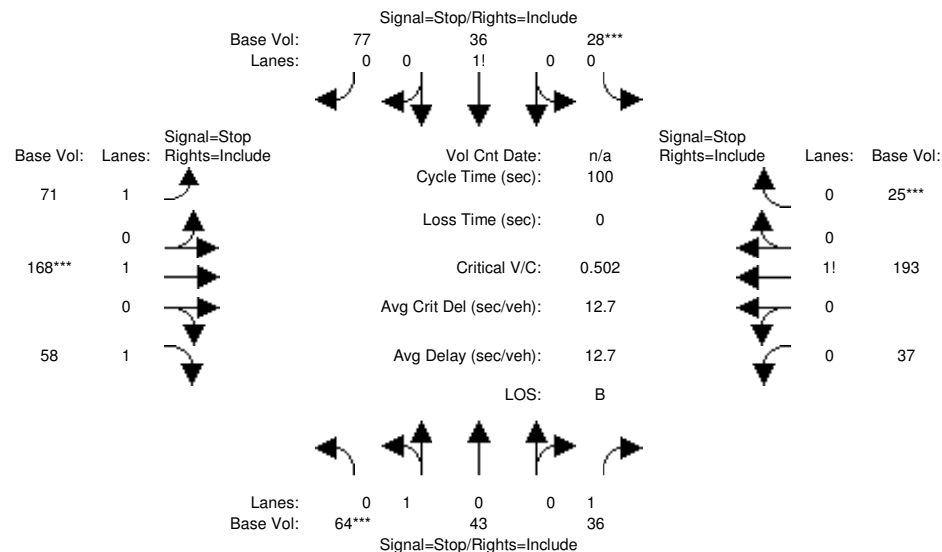
3: Roth Road & NB I-5 Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	28	177	0	0	114	220	17	2	120	0	0	0
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.85	0.85	0.85	0.25	0.25	0.25
Hourly flow rate (vph)	31	197	0	0	120	232	20	2	141	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									18			
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	352			197			319	610	98	398	495	176
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	352			197			319	610	98	398	495	176
tC, single (s)	4.3			4.3			7.7	6.7	7.6	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.6	3.6	4.1	3.4
p0 queue free %	97			100			97	99	83	100	100	100
cM capacity (veh/h)	1135			1303			573	377	845	417	441	807
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1						
Volume Total	31	98	98	80	272	164						
Volume Left	31	0	0	0	0	20						
Volume Right	0	0	0	0	232	141						
cSH	1135	1700	1700	1700	1700	978						
Volume to Capacity	0.03	0.06	0.06	0.05	0.16	0.17						
Queue Length 95th (ft)	2	0	0	0	0	15						
Control Delay (s)	8.3	0.0	0.0	0.0	0.0	10.3						
Lane LOS	A					B						
Approach Delay (s)	1.1			0.0		10.3						
Approach LOS						B						
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			26.9%		ICU Level of Service				A			
Analysis Period (min)			15									

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #2: Roth Road / Harlan Road Existing PM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	64	43	36	28	36	77	71	168	58	37	193	25
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	64	43	36	28	36	77	71	168	58	37	193	25
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
PHF Volume:	71	48	40	31	40	86	79	187	64	39	203	26
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	71	48	40	31	40	86	79	187	64	39	203	26
PCE 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
MLF 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
Final Volume:	71	48	40	31	40	86	79	187	64	39	203	26
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.60	0.40	1.00	0.20	0.25	0.55	1.00	1.00	1.00	0.14	0.76	0.10
Final Sat.:	290	195	559	104	134	287	501	539	601	78	405	52
Capacity Analysis Module:												
Vol/Sat:	0.25	0.25	0.07	0.30	0.30	0.30	0.16	0.35	0.11	0.50	0.50	0.50
Crit Moves:	****	****	****	****	****	****	****	****	****	****	****	****
Delay/Veh:	11.8	11.8	9.1	11.9	11.9	11.9	10.9	12.4	9.1	15.6	15.6	15.6
Delay 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
AdjDel/Veh:	11.8	11.8	9.1	11.9	11.9	11.9	10.9	12.4	9.1	15.6	15.6	15.6
LOS by Move:	B	B	A	B	B	B	B	B	A	C	C	C
ApproachDel:	11.1			11.9			11.4			15.6		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	11.1			11.9			11.4			15.6		
LOS by Appr:	B			B			B			C		
AllWayAvgQ:	0.3	0.3	0.1	0.4	0.4	0.4	0.2	0.5	0.1	0.9	0.9	0.9

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Roth Road / Harlan Road Existing PM
Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Lanes:	0	1	0	0	1	0	1	0	1	0	1	0
Initial Vol:	64	43	36	28	36	77	71	168	58	37	193	25
Major Street Volume:	552											
Minor Approach Volume:	143											
Minor Approach Volume Threshold:	630											

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

1/5/2010

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1327	1380	1612	1727	1827	1170
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1327	1380	1612	1727	1827	1170
Volume (vph)	80	114	65	171	227	66
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.85	0.85
Adj. Flow (vph)	89	127	72	190	267	78
RTOR Reduction (vph)	0	40	0	0	0	38
Lane Group Flow (vph)	89	87	72	190	267	40
Heavy Vehicles (%)	36%	17%	12%	10%	4%	38%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	10.3	10.3	2.9	33.5	26.6	26.6
Effective Green, g (s)	10.3	10.3	2.9	33.5	26.6	26.6
Actuated g/C Ratio	0.20	0.20	0.06	0.65	0.51	0.51
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	264	274	90	1117	938	601
v/s Ratio Prot	c0.07		c0.04	0.11	c0.15	
v/s Ratio Perm		0.06				0.03
v/c Ratio	0.34	0.32	0.80	0.17	0.28	0.07
Uniform Delay, d1	17.8	17.7	24.2	3.6	7.2	6.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.7	38.2	0.1	0.2	0.0
Delay (s)	18.6	18.4	62.4	3.7	7.3	6.4
Level of Service	B	B	E	A	A	A
Approach Delay (s)	18.5			19.8	7.1	
Approach LOS	B			B	A	
Intersection Summary						
HCM Average Control Delay			14.2		HCM Level of Service	B
HCM Volume to Capacity ratio			0.34			
Actuated Cycle Length (s)			51.8		Sum of lost time (s)	12.0
Intersection Capacity Utilization			30.0%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

1/5/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		0.95	1.00	1.00	1.00
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1753		3312	1583	1770	1776
Flt Permitted	0.96		1.00	1.00	0.95	1.00
Satd. Flow (perm)	1753		3312	1583	1770	1776
Volume (vph)	20	3	189	29	8	297
Peak-hour factor, PHF	0.80	0.80	0.90	0.90	0.80	0.80
Adj. Flow (vph)	25	4	210	32	10	371
RTOR Reduction (vph)	4	0	0	7	0	0
Lane Group Flow (vph)	25	0	210	25	10	371
Heavy Vehicles (%)	2%	2%	9%	2%	2%	7%
Turn Type			Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases			2			
Actuated Green, G (s)	4.9		67.6	67.6	1.8	73.4
Effective Green, g (s)	4.9		67.6	67.6	1.8	73.4
Actuated g/C Ratio	0.06		0.78	0.78	0.02	0.85
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	100		2594	1240	37	1511
v/s Ratio Prot	c0.01		0.06		0.01	c0.21
v/s Ratio Perm			0.02			
v/c Ratio	0.25		0.08	0.02	0.27	0.25
Uniform Delay, d1	38.9		2.2	2.1	41.6	1.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3		0.0	0.0	3.9	0.1
Delay (s)	40.3		2.2	2.1	45.5	1.3
Level of Service	D		A	A	D	A
Approach Delay (s)	40.3		2.2			2.5
Approach LOS	D		A			A
Intersection Summary						
HCM Average Control Delay			4.0		HCM Level of Service	A
HCM Volume to Capacity ratio			0.25			
Actuated Cycle Length (s)			86.3		Sum of lost time (s)	8.0
Intersection Capacity Utilization			25.6%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	113	17	194	72	0	0	0	0	418	5	9
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.25	0.25	0.25	0.95	0.95	0.95
Hourly flow rate (vph)	0	133	20	228	85	0	0	0	0	440	5	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked												
vC, conflicting volume	85			153			696	684	143	684	694	85
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	85			153			696	684	143	684	694	85
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			84			100	100	100	0	98	99
cM capacity (veh/h)	1475			1392			297	304	889	310	300	958
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	153	228	85	455								
Volume Left	0	228	0	440								
Volume Right	20	0	0	9								
cSH	1700	1392	1700	314								
Volume to Capacity	0.09	0.16	0.05	1.45								
Queue Length 95th (ft)	0	15	0	613								
Control Delay (s)	0.0	8.1	0.0	249.4								
Lane LOS		A		F								
Approach Delay (s)	0.0	5.9		249.4								
Approach LOS				F								
Intersection Summary												
Average Delay		125.2										
Intersection Capacity Utilization		71.0%		ICU Level of Service		C						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	7	524	0	0	254	280	12	3	426	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.25	0.25	0.25
Hourly flow rate (vph)	7	552	0	0	282	311	13	3	473	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.88						0.88	0.88		0.88	0.88	0.88
vC, conflicting volume	593			552			1004	1160	552	1479	1004	438
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	536			552			1005	1182	552	1547	1005	359
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	99			100			93	98	9	100	100	100
cM capacity (veh/h)	878			989			187	161	522	7	205	589
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	7	552	593	490								
Volume Left	7	0	0	13								
Volume Right	0	0	311	473								
cSH	878	1700	1700	491								
Volume to Capacity	0.01	0.32	0.35	1.00								
Queue Length 95th (ft)	1	0	0	338								
Control Delay (s)	9.1	0.0	0.0	69.4								
Lane LOS	A			F								
Approach Delay (s)	0.1		0.0	69.4								
Approach LOS				F								
Intersection Summary												
Average Delay	20.7											
Intersection Capacity Utilization	71.0%			ICU Level of Service				C				
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.91		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3348		1703	1792	1524	1703	3098		1703	3212	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1703	3348		1703	1792	1524	1703	3098		1703	3212	
Volume (vph)	134	715	90	96	299	53	165	99	150	118	89	54
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.80	0.80	0.80	0.85	0.85	0.85
Adj. Flow (vph)	141	753	95	107	332	59	206	124	188	139	105	64
RTOR Reduction (vph)	0	9	0	0	0	35	0	160	0	0	56	0
Lane Group Flow (vph)	141	839	0	107	332	24	206	152	0	139	113	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	8.6	32.5		7.0	30.9	30.9	11.0	11.2		8.9	9.1	
Effective Green, g (s)	8.6	32.5		7.0	30.9	30.9	11.0	11.2		8.9	9.1	
Actuated g/C Ratio	0.11	0.43		0.09	0.41	0.41	0.15	0.15		0.12	0.12	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	194	1439		158	732	623	248	459		200	387	
v/s Ratio Prot	c0.08	c0.25		0.06	0.19		c0.12	c0.05		0.08	0.04	
v/s Ratio Perm						0.02						
v/c Ratio	0.73	0.58		0.68	0.45	0.04	0.83	0.33		0.69	0.29	
Uniform Delay, d1	32.4	16.4		33.2	16.2	13.4	31.4	28.8		32.0	30.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.7	1.7		10.9	2.0	0.1	20.4	0.4		10.0	0.4	
Delay (s)	45.1	18.1		44.1	18.2	13.5	51.8	29.3		42.1	30.7	
Level of Service	D	B		D	B	B	D	C		D	C	
Approach Delay (s)		22.0			23.3			38.2			35.8	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM Average Control Delay			27.7				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			75.6				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			55.4%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & Fifth Street

1/5/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	→	↱	↰	↱		↰	↱		↰	→	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	3335		1736	1687		1736	1827	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1827	1553	1736	3335		1736	1687		1736	1827	1553
Volume (vph)	55	701	67	31	319	113	35	22	23	95	33	38
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.55	0.55	0.55	0.95	0.95	0.95
Adj. Flow (vph)	58	738	71	33	336	119	64	40	42	100	35	40
RTOR Reduction (vph)	0	0	39	0	46	0	0	32	0	0	0	29
Lane Group Flow (vph)	58	738	32	33	409	0	64	50	0	100	35	11
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	3.7	30.7	30.7	2.0	29.0		3.7	17.0		5.9	19.2	19.2
Effective Green, g (s)	3.7	30.7	30.7	2.0	29.0		3.7	17.0		5.9	19.2	19.2
Actuated g/C Ratio	0.05	0.43	0.43	0.03	0.41		0.05	0.24		0.08	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	90	783	666	48	1351		90	401		143	490	416
v/s Ratio Prot	c0.03	c0.40		0.02	0.12		0.04	c0.03		c0.06	0.02	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.64	0.94	0.05	0.69	0.30		0.71	0.12		0.70	0.07	0.03
Uniform Delay, d1	33.3	19.6	11.9	34.5	14.4		33.4	21.5		32.0	19.5	19.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	14.7	19.5	0.0	33.8	0.1		23.2	0.6		13.9	0.3	0.1
Delay (s)	48.0	39.1	12.0	68.3	14.6		56.6	22.1		45.9	19.8	19.4
Level of Service	D	D	B	E	B		E	C		D	B	B
Approach Delay (s)		37.4			18.2			37.2			34.6	
Approach LOS		D			B			D			C	
Intersection Summary												
HCM Average Control Delay			31.5			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			71.6			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			62.2%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

1/5/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	721	41	13	426	51	38
Peak Hour Factor	0.95	0.95	0.95	0.95	0.80	0.80
Hourly flow rate (vph)	759	43	14	448	64	48
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			802		1256	781
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			802		1256	781
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		65	88
cM capacity (veh/h)			813		184	392
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	802	14	448	111		
Volume Left	0	14	0	64		
Volume Right	43	0	0	48		
cSH	1700	813	1700	238		
Volume to Capacity	0.47	0.02	0.26	0.47		
Queue Length 95th (ft)	0	1	0	57		
Control Delay (s)	0.0	9.5	0.0	32.7		
Lane LOS		A		D		
Approach Delay (s)	0.0	0.3		32.7		
Approach LOS				D		
Intersection Summary						
Average Delay		2.7				
Intersection Capacity Utilization		52.3%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	1801		1736	1746		1736	1827	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1827	1553	1736	1801		1736	1746		1736	1827	1553
Volume (vph)	57	543	151	31	289	31	68	124	52	70	189	74
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.85	0.85	0.85	0.95	0.95	0.95
Adj. Flow (vph)	63	603	168	34	321	34	80	146	61	74	199	78
RTOR Reduction (vph)	0	0	106	0	5	0	0	20	0	0	0	56
Lane Group Flow (vph)	63	603	62	34	350	0	80	187	0	74	199	22
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	3.7	24.8	24.8	2.4	23.5		5.2	20.7		3.1	18.6	18.6
Effective Green, g (s)	3.7	24.8	24.8	2.4	23.5		5.2	20.7		3.1	18.6	18.6
Actuated g/C Ratio	0.06	0.37	0.37	0.04	0.35		0.08	0.31		0.05	0.28	0.28
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	96	676	575	62	632		135	539		80	507	431
v/s Ratio Prot	c0.04	c0.33		0.02	0.19		0.05	0.11		c0.04	c0.11	
v/s Ratio Perm			0.04									0.01
v/c Ratio	0.66	0.89	0.11	0.55	0.55		0.59	0.35		0.93	0.39	0.05
Uniform Delay, d1	31.0	19.8	13.8	31.8	17.5		29.9	17.9		31.8	19.6	17.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	15.0	16.4	0.4	9.6	3.5		6.8	1.8		75.1	2.3	0.2
Delay (s)	46.0	36.3	14.2	41.3	21.0		36.7	19.7		106.9	21.9	17.9
Level of Service	D	D	B	D	C		D	B		F	C	B
Approach Delay (s)		32.6			22.8			24.4			38.9	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			30.5			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			67.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			59.0%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3471	1553	1736	1827	1553	1736	3216		1736	3421	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3471	1553	1736	1827	1553	1736	3216		1736	3421	
Volume (vph)	29	427	122	157	269	53	99	124	120	93	179	19
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.80	0.80	0.80
Adj. Flow (vph)	31	449	128	174	299	59	110	138	133	116	224	24
RTOR Reduction (vph)	0	0	88	0	0	35	0	97	0	0	10	0
Lane Group Flow (vph)	31	449	40	174	299	24	110	174	0	116	238	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	2.3	25.7	25.7	10.3	33.7	33.7	6.8	22.2		7.5	22.9	
Effective Green, g (s)	2.3	25.7	25.7	10.3	33.7	33.7	6.8	22.2		7.5	22.9	
Actuated g/C Ratio	0.03	0.31	0.31	0.13	0.41	0.41	0.08	0.27		0.09	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	49	1092	489	219	754	641	144	874		159	959	
v/s Ratio Prot	0.02	0.13		c0.10	c0.16		0.06	0.05		c0.07	c0.07	
v/s Ratio Perm			0.03			0.02						
v/c Ratio	0.63	0.41	0.08	0.79	0.40	0.04	0.76	0.20		0.73	0.25	
Uniform Delay, d1	39.3	22.0	19.7	34.7	16.9	14.3	36.7	22.9		36.1	22.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	23.7	1.1	0.3	17.8	1.6	0.1	21.1	0.5		15.4	0.6	
Delay (s)	63.0	23.2	20.0	52.4	18.4	14.4	57.7	23.4		51.5	23.4	
Level of Service	E	C	C	D	B	B	E	C		D	C	
Approach Delay (s)		24.6			29.1			33.3			32.3	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			29.1				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			81.7				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			46.3%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 15: SR 99 SB Ramps & Frontage Road (West)

1/5/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	T
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	163	0	34	294	100	211
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	181	0	38	327	111	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	658	201			364	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	658	201			364	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	53	100			91	
cM capacity (veh/h)	389	840			1194	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	181	364	346			
Volume Left	181	0	111			
Volume Right	0	327	0			
cSH	389	1700	1194			
Volume to Capacity	0.47	0.21	0.09			
Queue Length 95th (ft)	60	0	8			
Control Delay (s)	22.0	0.0	3.3			
Lane LOS	C		A			
Approach Delay (s)	22.0	0.0	3.3			
Approach LOS	C					
Intersection Summary						
Average Delay		5.8				
Intersection Capacity Utilization		55.6%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
16: Lathrop Road & Frontage Road (West)

1/5/2010

																			
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR							
Lane Configurations																			
Sign Control	Stop			Stop				Stop			Stop								
Volume (vph)	204	257	85	96	299	66	60	58	26	73	152	149							
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90							
Hourly flow rate (vph)	227	286	94	107	332	73	67	64	29	81	169	166							
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1													
Volume Total (vph)	227	380	107	406	160	416													
Volume Left (vph)	227	0	107	0	67	81													
Volume Right (vph)	0	94	0	73	29	166													
Hadj (s)	0.53	-0.14	0.53	-0.09	0.01	-0.17													
Departure Headway (s)	8.8	8.1	8.9	8.2	9.0	7.6													
Degree Utilization, x	0.56	0.86	0.26	0.92	0.40	0.88													
Capacity (veh/h)	390	435	396	425	373	456													
Control Delay (s)	21.1	42.4	13.8	54.0	17.9	44.9													
Approach Delay (s)	34.4		45.6		17.9	44.9													
Approach LOS	D		E		C	E													
Intersection Summary																			
Delay			38.8																
HCM Level of Service			E																
Intersection Capacity Utilization			63.9%		ICU Level of Service								B						
Analysis Period (min)			15																

HCM Unsignalized Intersection Capacity Analysis

17: SR 99 NB Ramps & Frontage Road (East)

1/5/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	39	221	124	64	99	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	43	246	138	71	110	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	459	113	116			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	459	113	116			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	74	91			
cM capacity (veh/h)	507	940	1473			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	289	209	116			
Volume Left	43	138	0			
Volume Right	246	0	6			
cSH	834	1473	1700			
Volume to Capacity	0.35	0.09	0.07			
Queue Length 95th (ft)	39	8	0			
Control Delay (s)	11.6	5.3	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.6	5.3	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			7.3			
Intersection Capacity Utilization		39.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 18: Lathrop Road & Frontage Road (East)

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	126	146	84	3	130	35	80	27	2	31	38	251
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	140	162	93	3	144	39	89	30	2	34	42	279
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	396	187	121	356								
Volume Left (vph)	140	3	89	34								
Volume Right (vph)	93	39	2	279								
Hadj (s)	-0.04	-0.09	0.17	-0.42								
Departure Headway (s)	5.6	6.0	6.5	5.5								
Degree Utilization, x	0.62	0.31	0.22	0.54								
Capacity (veh/h)	607	528	472	613								
Control Delay (s)	17.4	11.7	11.3	14.6								
Approach Delay (s)	17.4	11.7	11.3	14.6								
Approach LOS	C	B	B	B								
Intersection Summary												
Delay			14.8									
HCM Level of Service			B									
Intersection Capacity Utilization			66.7%	ICU Level of Service		C						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

1/5/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	20	13	231	39	32	339
Peak Hour Factor	0.65	0.65	0.95	0.95	0.90	0.90
Hourly flow rate (vph)	31	20	243	41	36	377
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	691	243			284	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	691	243			284	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	97			97	
cM capacity (veh/h)	399	796			1278	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	31	20	243	41	36	377
Volume Left	31	0	0	0	36	0
Volume Right	0	20	0	41	0	0
cSH	399	796	1700	1700	1278	1700
Volume to Capacity	0.08	0.03	0.14	0.02	0.03	0.22
Queue Length 95th (ft)	6	2	0	0	2	0
Control Delay (s)	14.8	9.6	0.0	0.0	7.9	0.0
Lane LOS	B	A			A	
Approach Delay (s)	12.8		0.0		0.7	
Approach LOS	B					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			28.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

1/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1736	1760		1736	1827	1553	1736	1827	1553	1736	1793	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1736	1760		1736	1827	1553	1736	1827	1553	1736	1793	
Volume (vph)	74	374	120	62	230	57	99	242	146	93	258	36
Peak-hour factor, PHF	0.80	0.80	0.80	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	468	150	73	271	67	110	269	162	103	287	40
RTOR Reduction (vph)	0	15	0	0	0	42	0	0	46	0	6	0
Lane Group Flow (vph)	92	603	0	73	271	25	110	269	116	103	321	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	6.0	27.1		4.2	25.3	25.3	5.6	16.1	16.1	5.6	16.1	
Effective Green, g (s)	6.0	27.1		4.2	25.3	25.3	5.6	16.1	16.1	5.6	16.1	
Actuated g/C Ratio	0.09	0.39		0.06	0.37	0.37	0.08	0.23	0.23	0.08	0.23	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	151	691		106	670	569	141	426	362	141	418	
v/s Ratio Prot	c0.05	c0.34		0.04	0.15		c0.06	0.15		0.06	c0.18	
v/s Ratio Perm						0.02			0.07			
v/c Ratio	0.61	0.87		0.69	0.40	0.04	0.78	0.63	0.32	0.73	0.77	
Uniform Delay, d1	30.4	19.4		31.8	16.2	14.1	31.1	23.8	21.9	31.0	24.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.8	11.8		17.0	0.4	0.0	23.8	3.0	0.5	17.6	8.2	
Delay (s)	37.2	31.1		48.8	16.6	14.1	54.9	26.8	22.4	48.6	32.9	
Level of Service	D	C		D	B	B	D	C	C	D	C	
Approach Delay (s)		31.9			21.9			31.2			36.7	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			30.8				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			69.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			65.0%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Peak Hour Signal Warrants

Major Street **Roth Road**
Minor Street **I-5 SB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **AM**

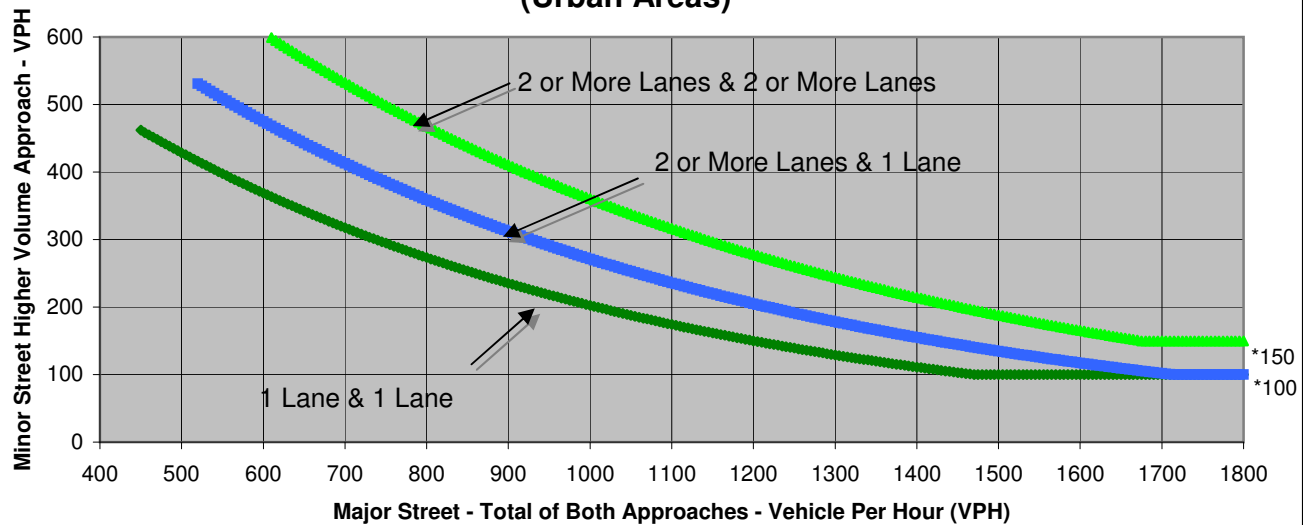
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	183	0	121
Through	0	4	42	27
Right	0	18	4	0
Total	0	205	46	148

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	194	205	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **AM**

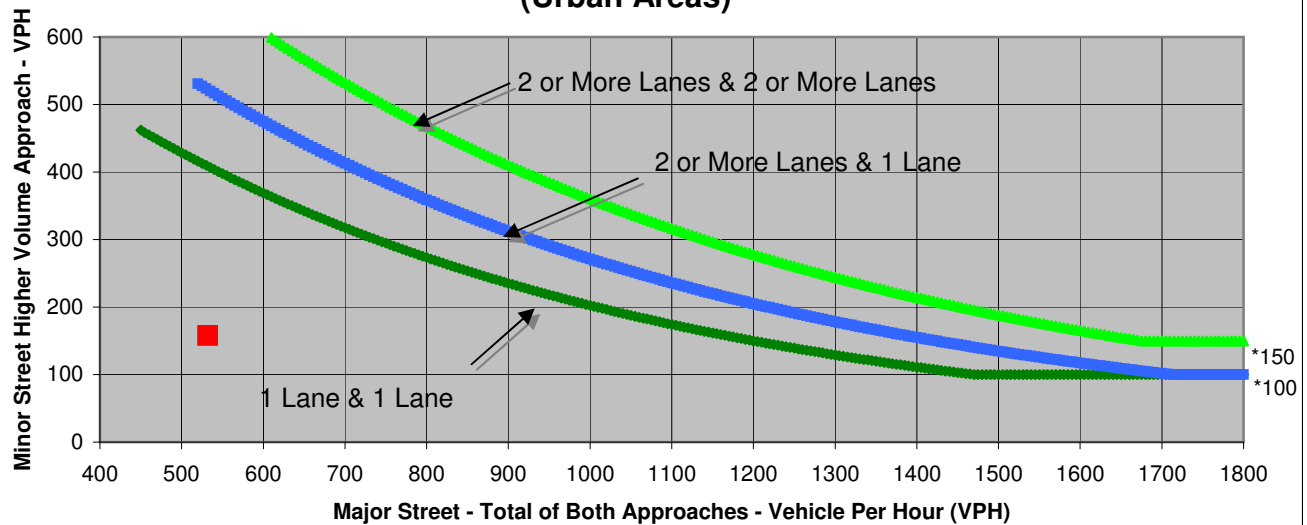
Turn Movement Volumes

	NB	SB	EB	WB
Left	12	0	24	0
Through	1	0	201	136
Right	145	0	0	171
Total	158	0	225	307

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	532	158	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**
Minor Street **Harlan Road**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **AM**

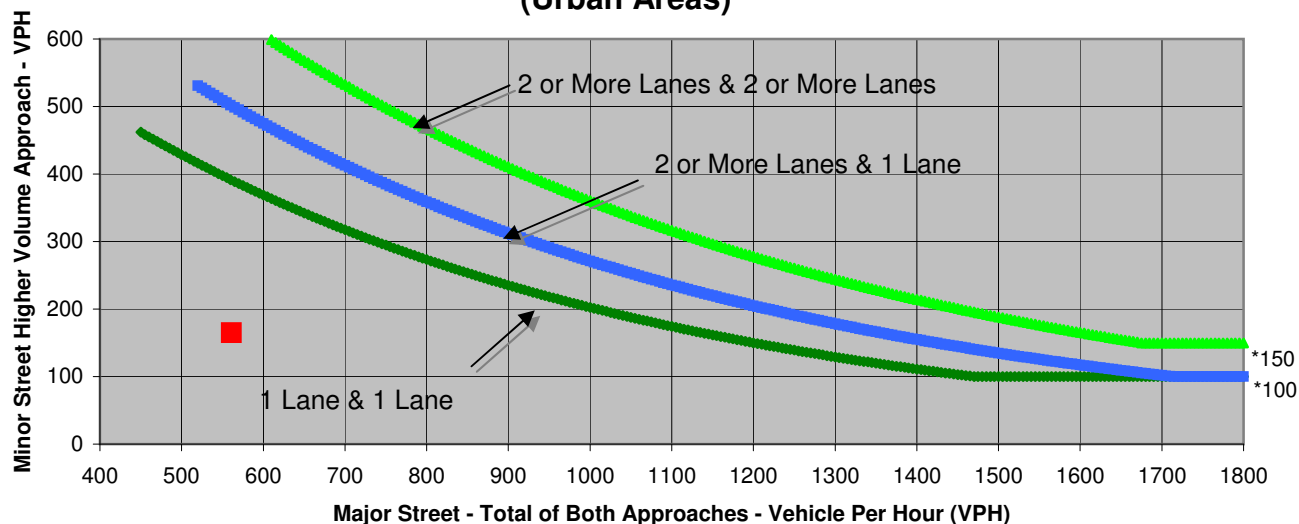
Turn Movement Volumes

	NB	SB	EB	WB
Left	75	49	59	22
Through	38	21	216	164
Right	52	68	71	29
Total	165	138	346	215

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Roth Road	Harlan Road	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	561	165	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street **Roth Road**
 Minor Street **UPRR Driveway**

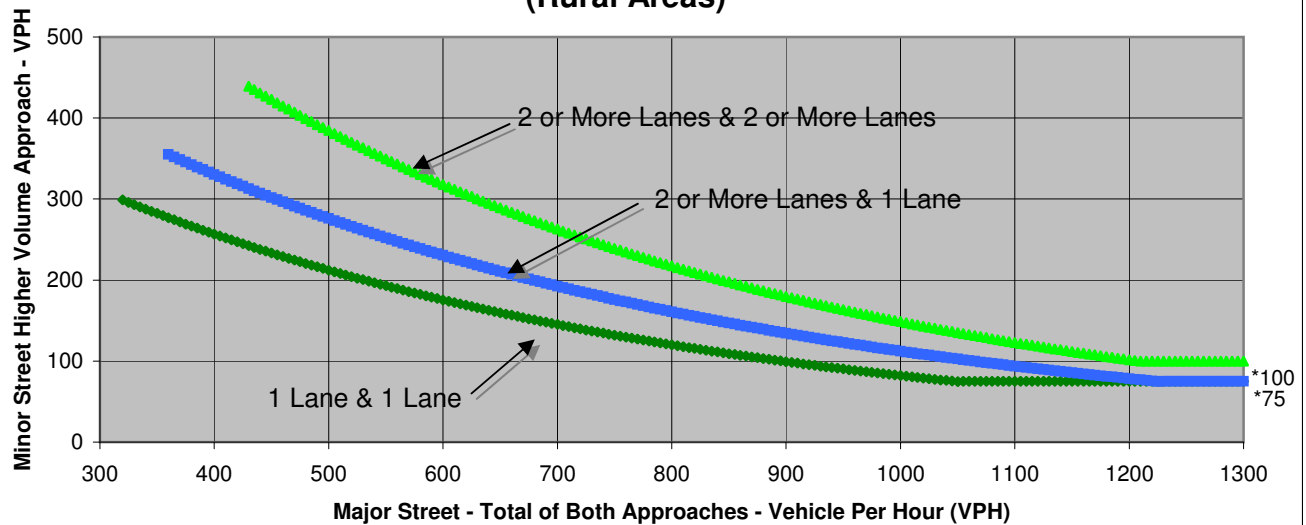
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions**
 Peak Hour **AM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	43	0	0	15
Through	0	0	88	102
Right	7	0	49	0
Total	50	0	137	117

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street UPRR Driveway	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	254	50	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
 Minor Street **I-5 SB Ramps**

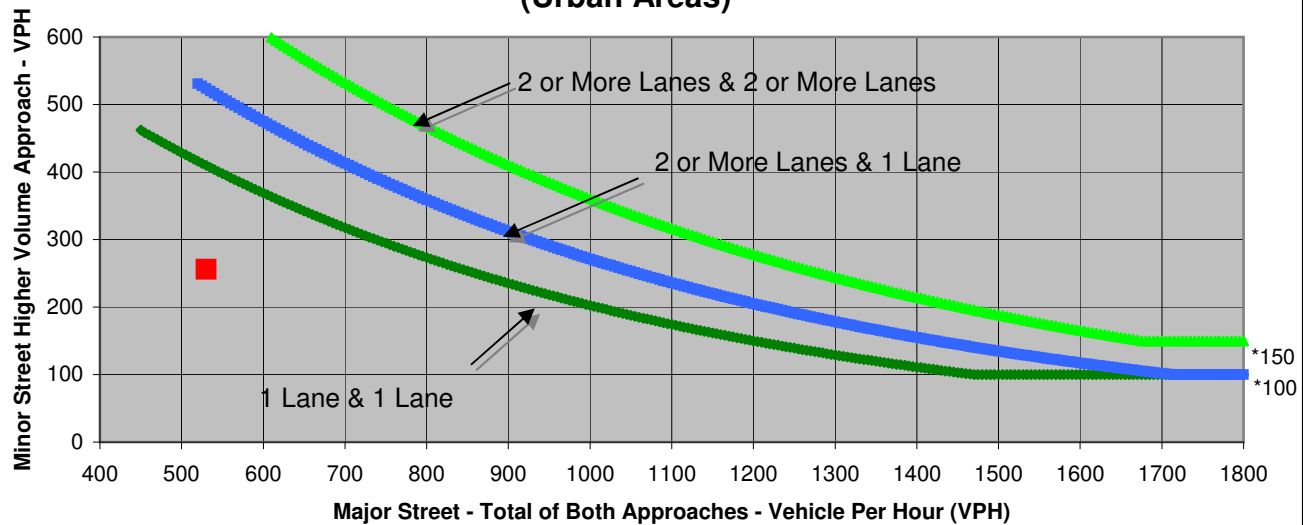
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions**
 Peak Hour **AM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	241	0	389
Through	0	4	63	69
Right	0	11	9	0
Total	0	256	72	458

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	530	256	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions'**
Peak Hour **AM**

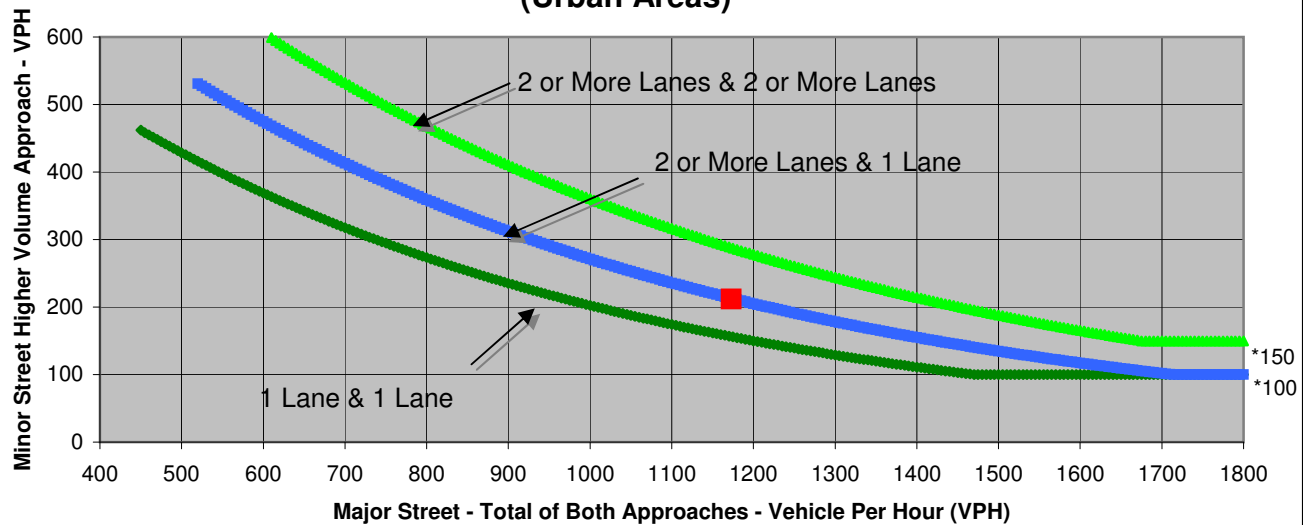
Turn Movement Volumes

	NB	SB	EB	WB
Left	12	0	20	0
Through	3	0	284	423
Right	197	0	0	446
Total	212	0	304	869

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,173	212	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
Minor Street McKinley Avenue

Sheet No 7 of 12

Project Centerpoint Intermodal Center
Scenario Existing Conditions
Peak Hour AM

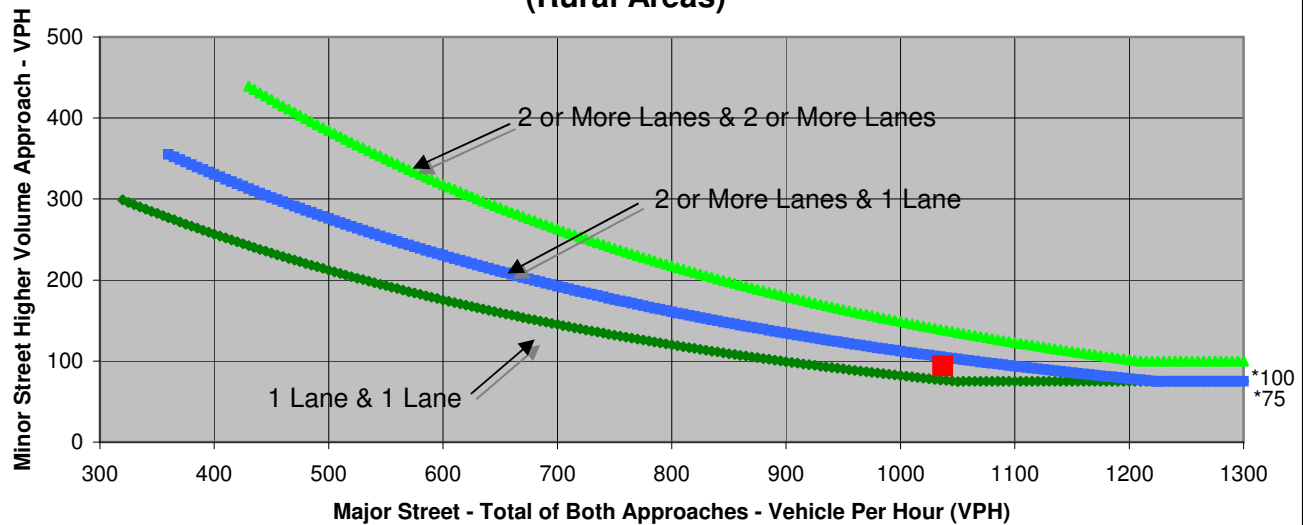
Turn Movement Volumes

	NB	SB	EB	WB
Left	72	0	0	63
Through	0	0	352	521
Right	22	0	101	0
Total	94	0	453	584

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street McKinley Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,037	94	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Frontage Road (West)**
 Minor Street **SR 99 SB Ramps**

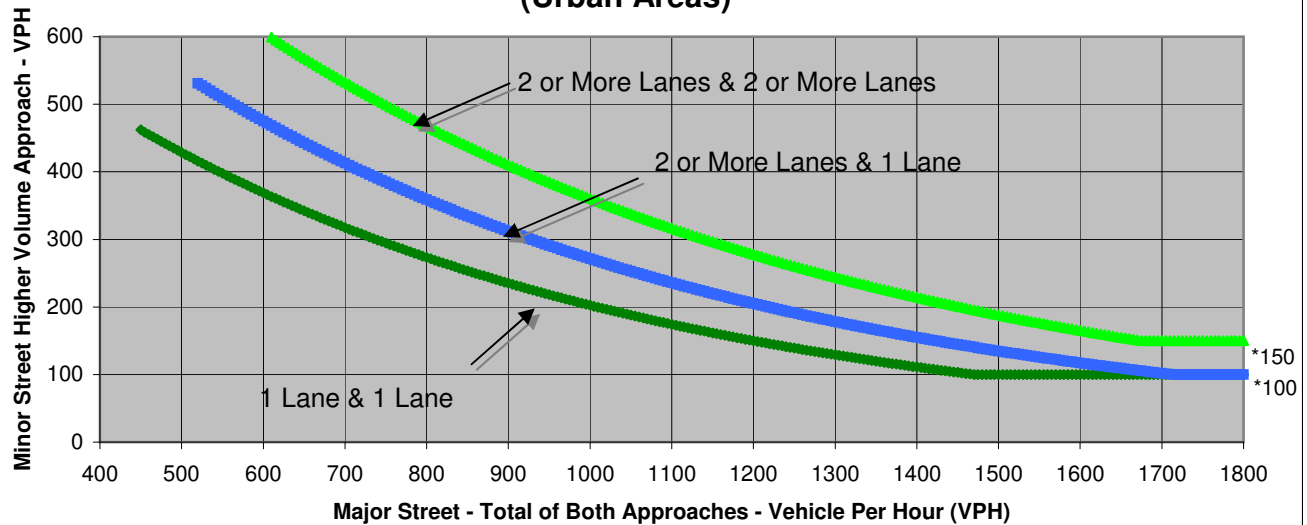
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions**
 Peak Hour **AM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	18	0	133
Through	54	32	0	0
Right	251	0	0	3
Total	305	50	0	136

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Frontage Road (West)	Minor Street SR 99 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	355	136	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
 Minor Street **Frontage Road (West)**

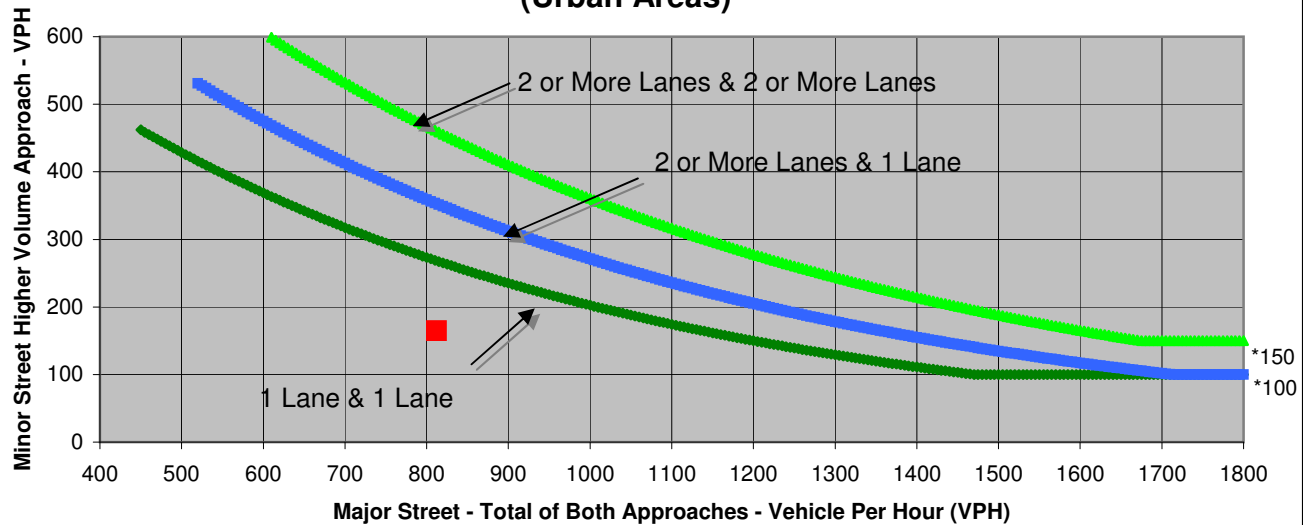
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions**
 Peak Hour **AM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	42	44	173	78
Through	49	27	196	209
Right	23	94	73	83
Total	114	165	442	370

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Lathrop Road	Frontage Road (West)	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	812	165	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street **Frontage Road (East)**
Minor Street **SR 99 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **AM**

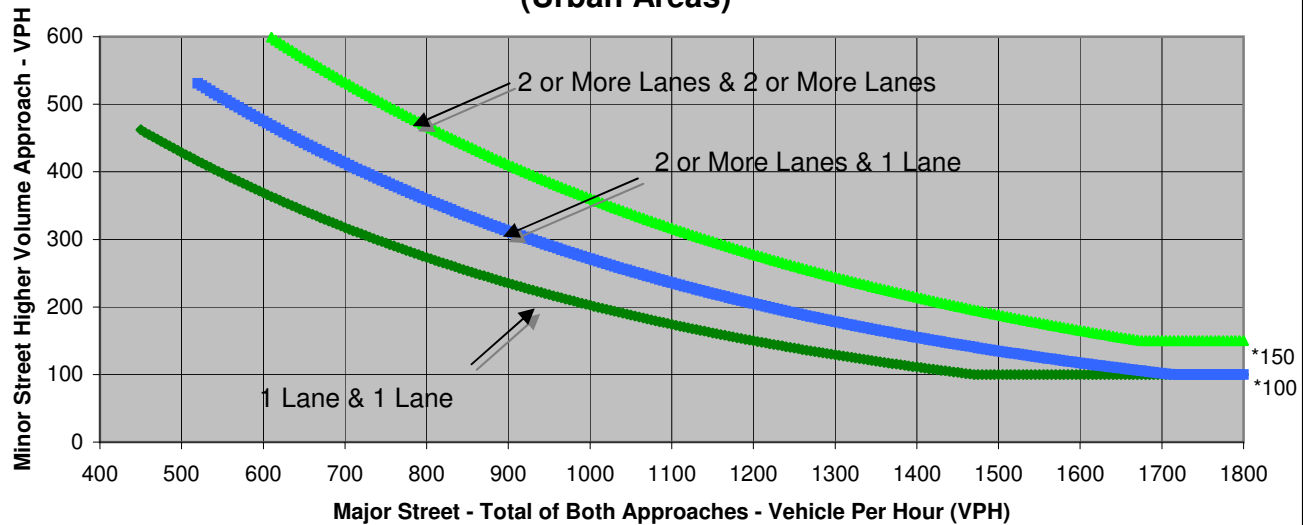
Turn Movement Volumes

	NB	SB	EB	WB
Left	208	0	23	0
Through	33	61	0	0
Right	0	5	191	0
Total	241	66	214	0

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Frontage Road (East)	SR 99 NB Ramps	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	307	214	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Lathrop Road
Minor Street Frontage Road (East)

Sheet No 11 of 12

Project Centerpoint Intermodal Center
Scenario Existing Conditions
Peak Hour AM

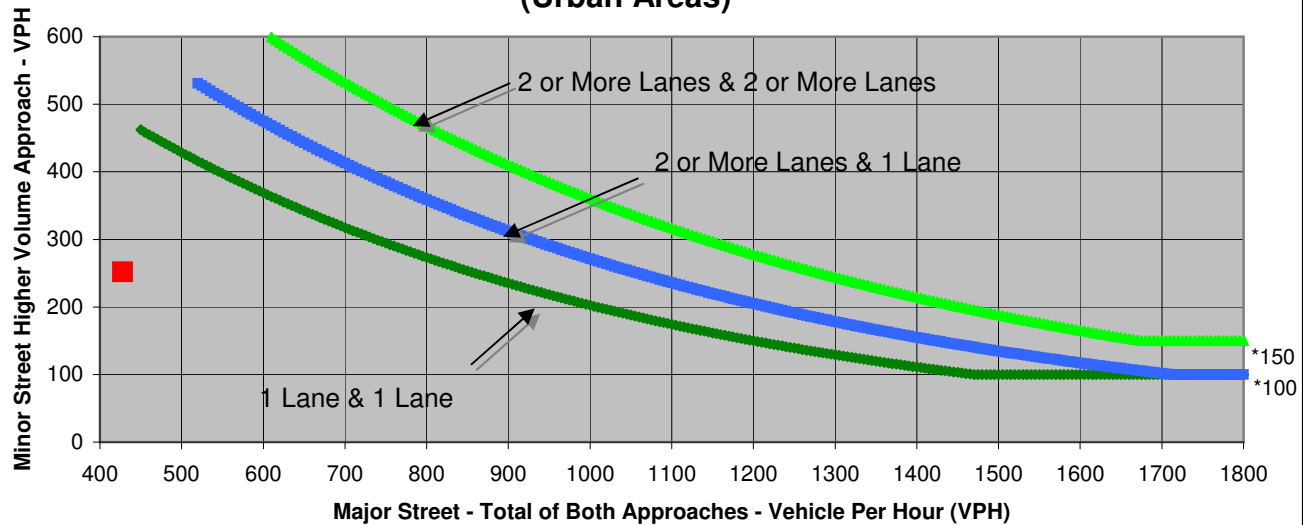
Turn Movement Volumes

	NB	SB	EB	WB
Left	42	15	146	1
Through	38	16	76	107
Right	2	221	41	57
Total	82	252	263	165

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street Frontage Road (East)	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	428	252	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Airport Way**
 Minor Street **Hastings Drive**

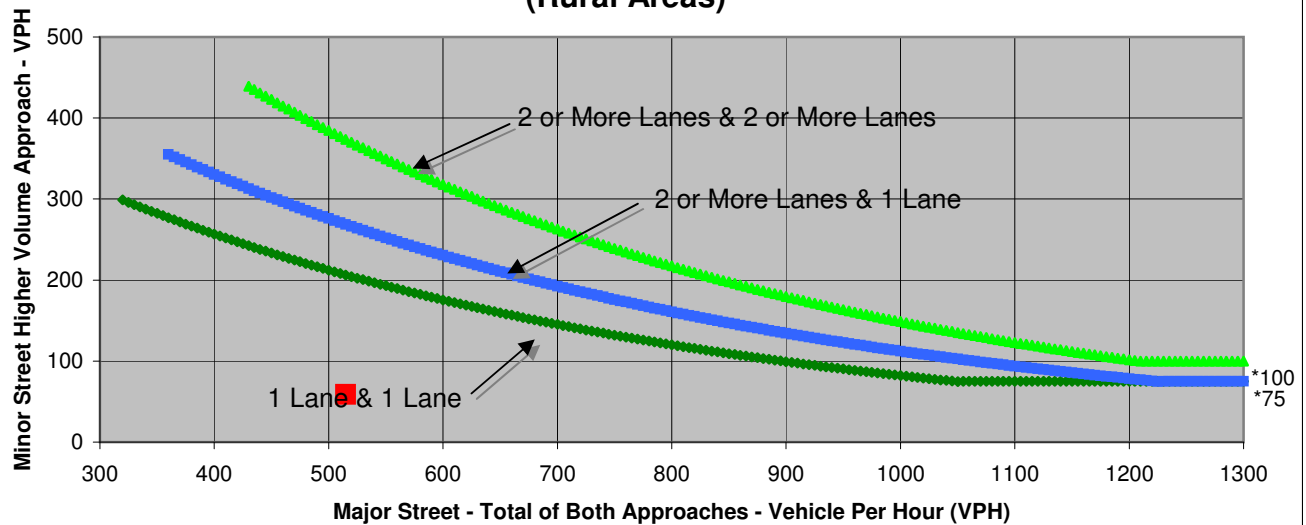
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions**
 Peak Hour **AM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	7	0	27
Through	311	191	0	0
Right	6	0	0	32
Total	317	198	0	59

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Hastings Drive	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	515	59	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street I-5 SB Ramps

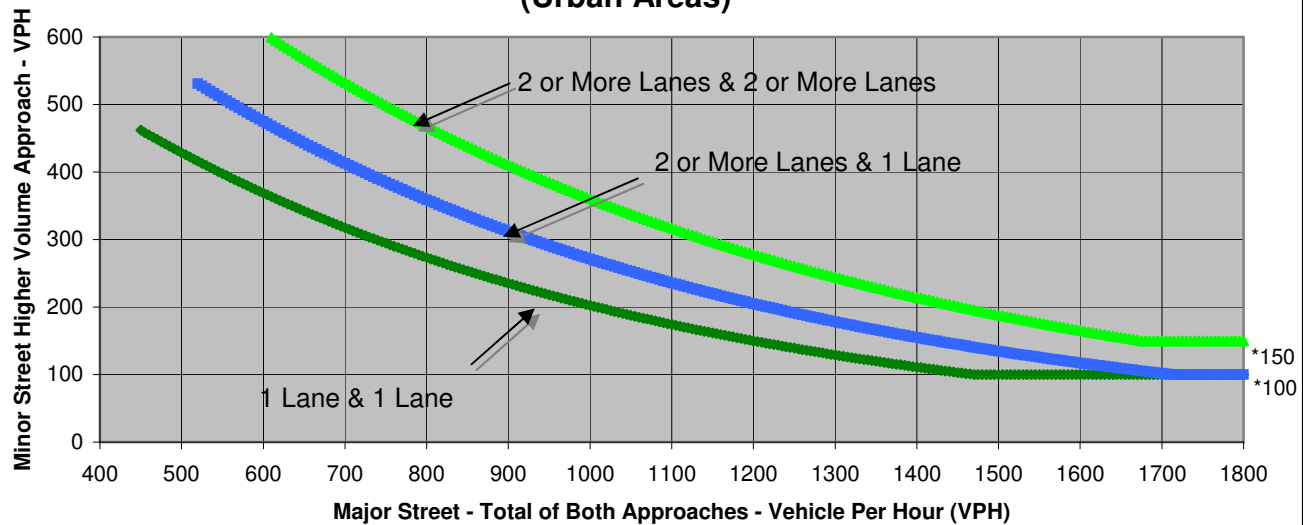
 Project Centerpoint Intermodal Center
 Scenario Existing Conditions
 Peak Hour PM
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	163	0	108
Through	0	2	42	23
Right	0	10	4	0
Total	0	175	46	131

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	177	175	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street I-5 NB Ramps

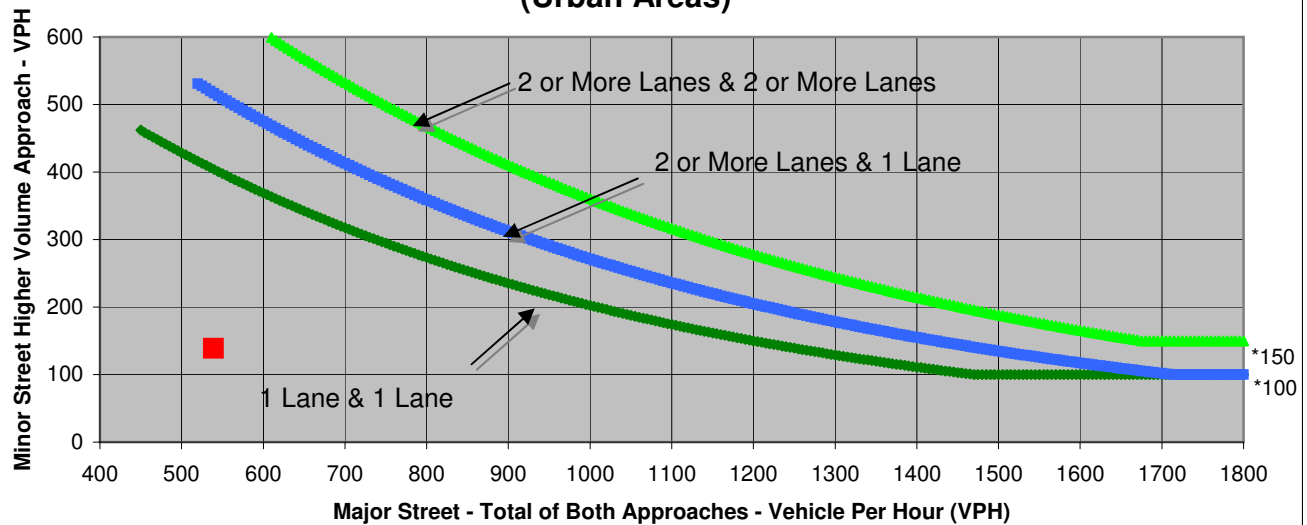
 Project Centerpoint Intermodal Center
 Scenario Existing Conditions
 Peak Hour PM
Turn Movement Volumes

	NB	SB	EB	WB
Left	17	0	28	0
Through	2	0	177	114
Right	120	0	0	220
Total	139	0	205	334

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	539	139	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**
Minor Street **Harlan Road**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **PM**

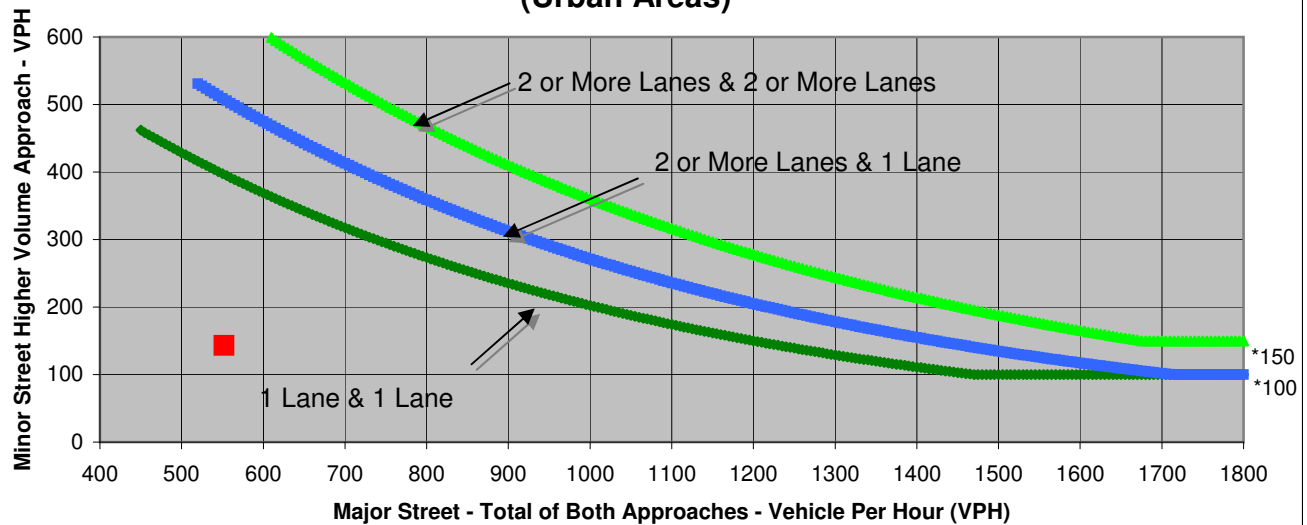
Turn Movement Volumes

	NB	SB	EB	WB
Left	64	28	71	37
Through	43	36	168	193
Right	36	77	58	25
Total	143	141	297	255

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	552	143	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street UPRR Driveway

Sheet No 4 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Conditions
 Peak Hour PM

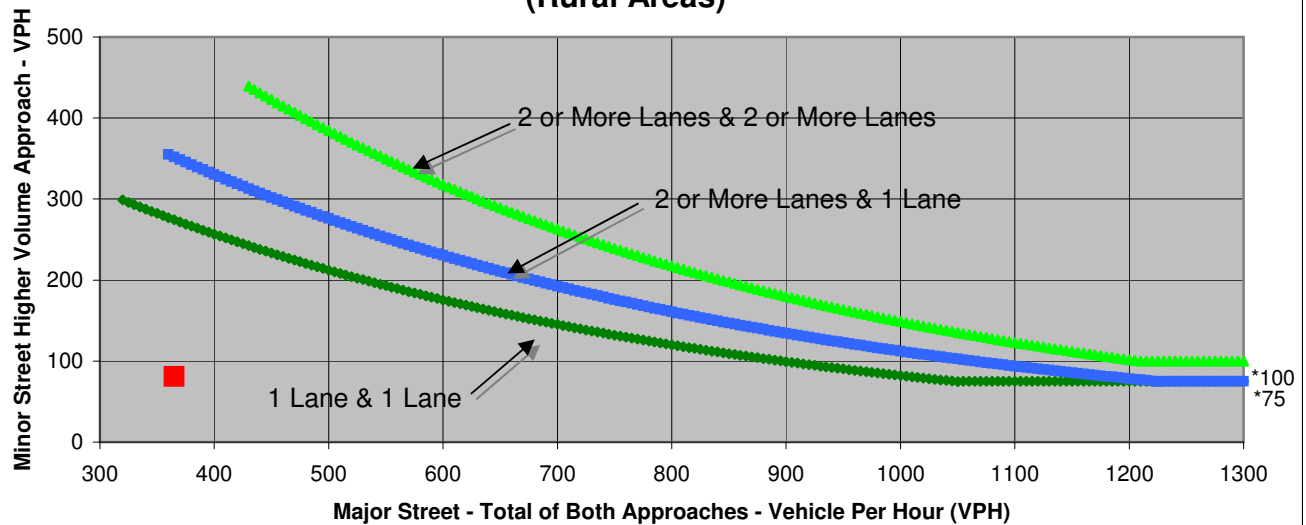
Turn Movement Volumes

	NB	SB	EB	WB
Left	57	0	0	9
Through	0	0	170	122
Right	24	0	64	0
Total	81	0	234	131

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street UPRR Driveway	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	365	81	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
 Minor Street **I-5 SB Ramps**

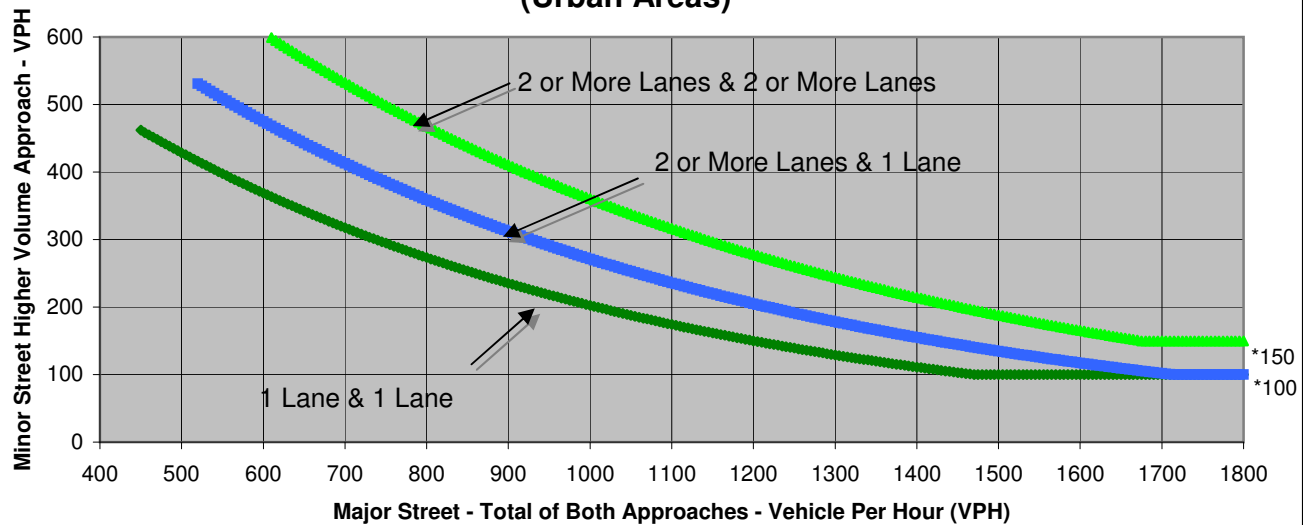
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions**
 Peak Hour **PM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	481	0	194
Through	0	5	113	72
Right	0	9	17	0
Total	0	495	130	266

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	396	495	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
 Minor Street **I-5 NB Ramps**

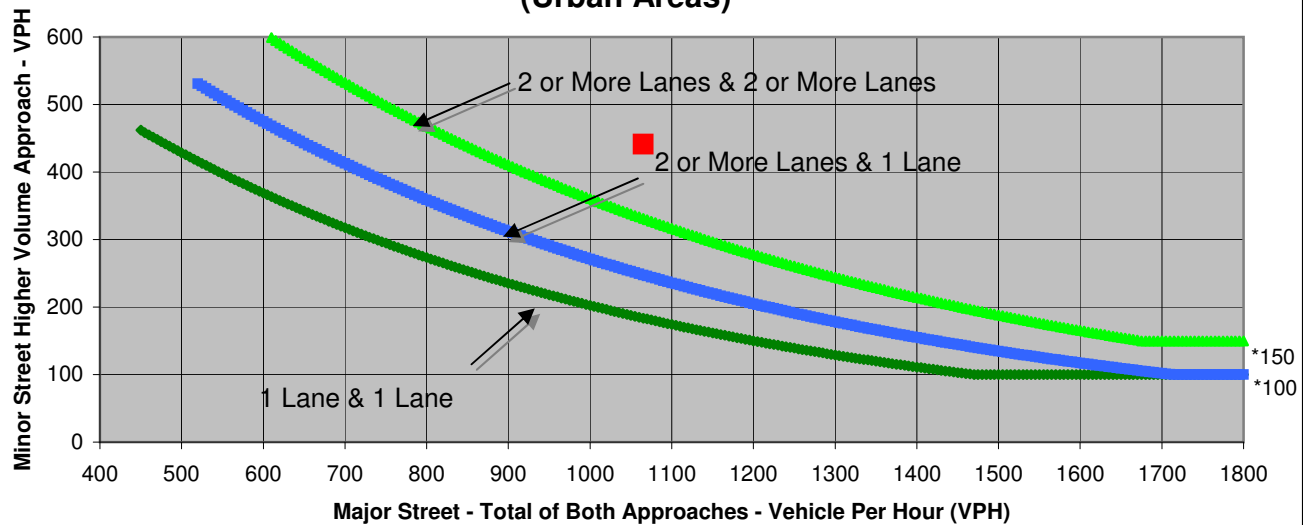
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions'**
 Peak Hour **PM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	12	0	7	0
Through	3	0	524	254
Right	426	0	0	280
Total	441	0	531	534

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,065	441	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
 Minor Street McKinley Avenue

Sheet No 7 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Conditions
 Peak Hour PM

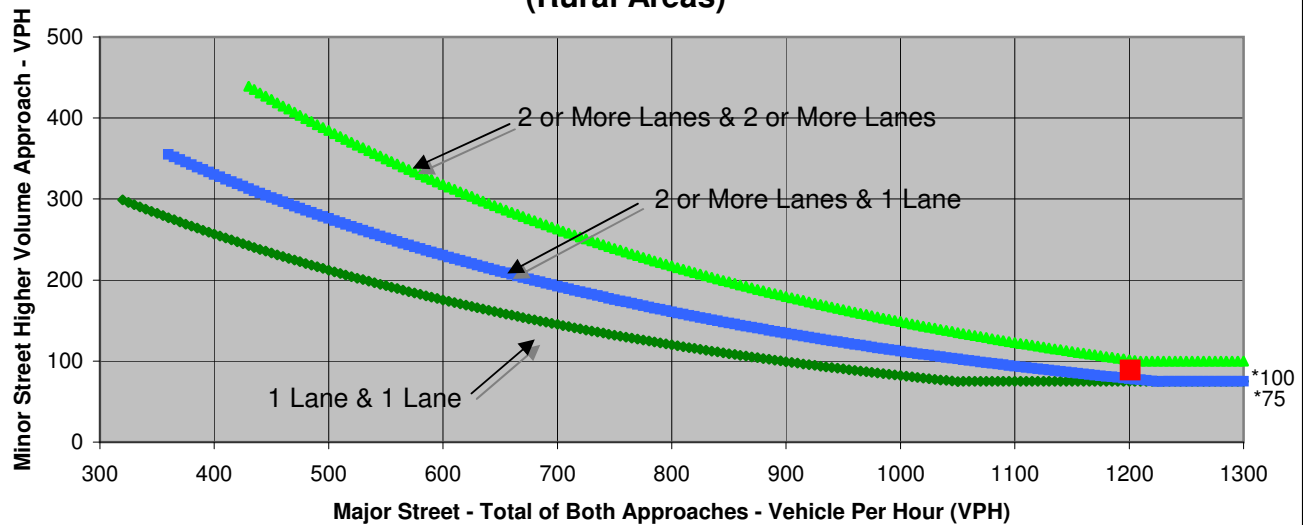
Turn Movement Volumes

	NB	SB	EB	WB
Left	51	0	0	13
Through	0	0	721	426
Right	38	0	41	0
Total	89	0	762	439

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street McKinley Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,201	89	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Frontage Road (West)**
Minor Street **SR 99 SB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **PM**

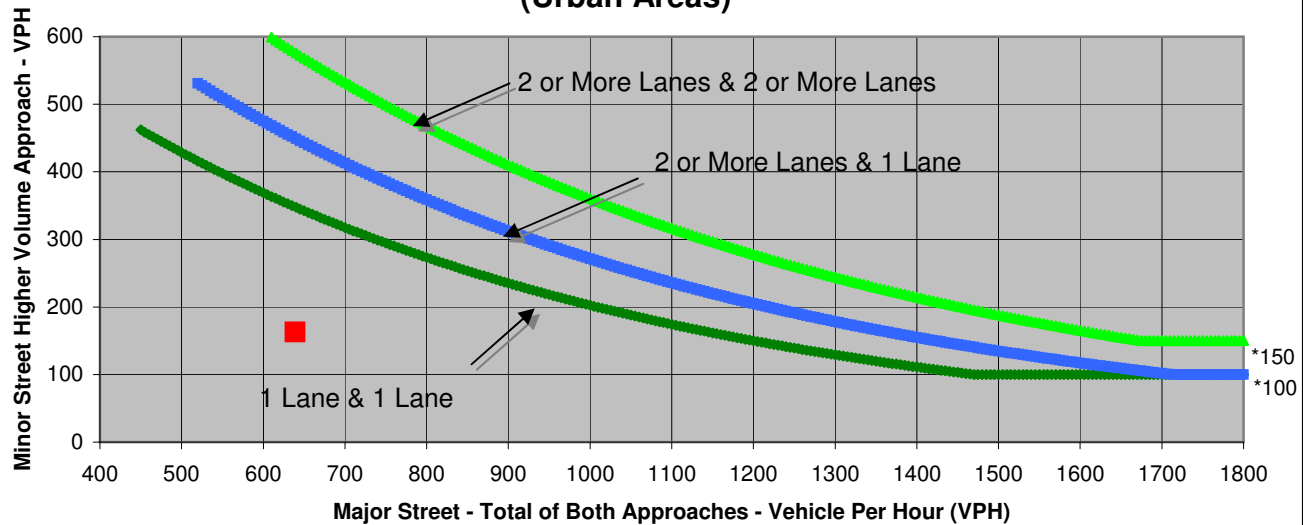
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	100	0	163
Through	34	211	0	0
Right	294	0	0	0
Total	328	311	0	163

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Frontage Road (West)	SR 99 SB Ramps	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	639	163	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **Frontage Road (West)**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **PM**

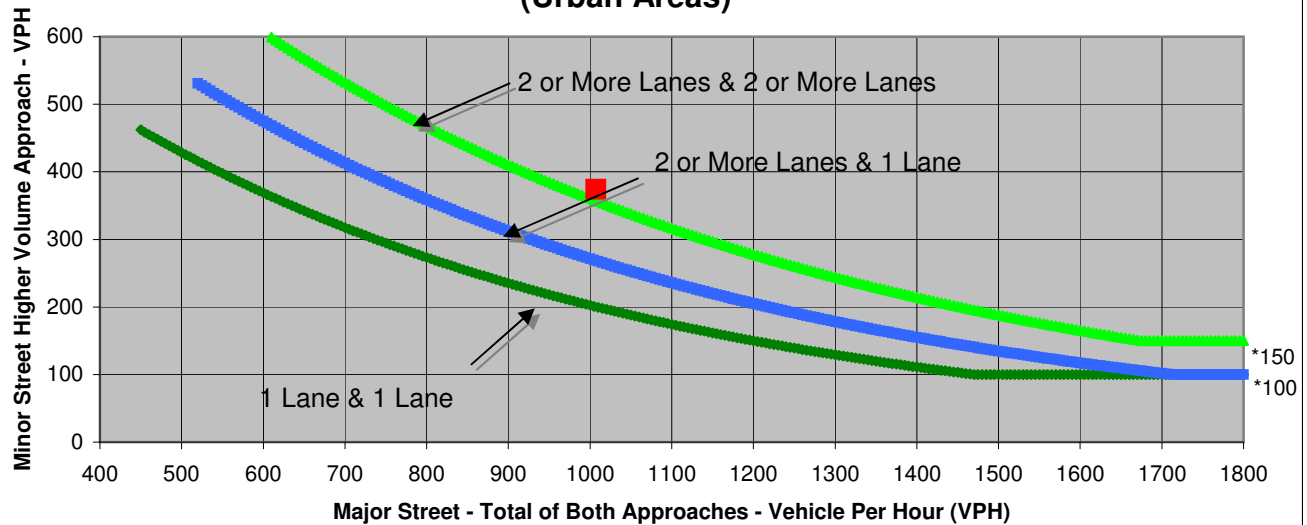
Turn Movement Volumes

	NB	SB	EB	WB
Left	60	73	204	96
Through	58	152	257	299
Right	26	149	85	66
Total	144	374	546	461

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street Frontage Road (West)	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,007	374	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Frontage Road (East)**
Minor Street **SR 99 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Conditions**
Peak Hour **PM**

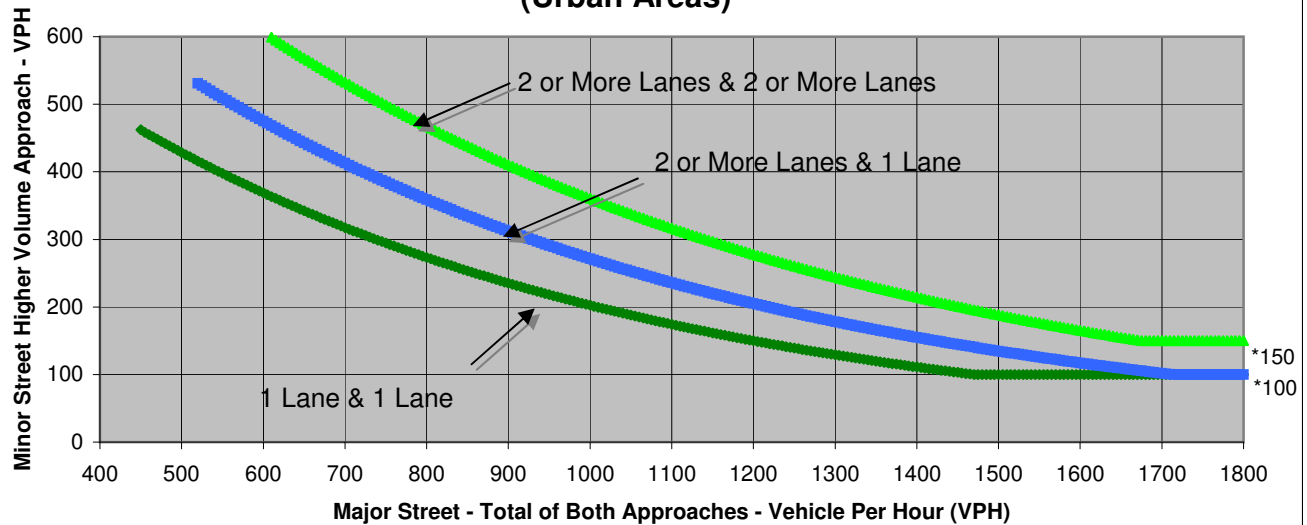
Turn Movement Volumes

	NB	SB	EB	WB
Left	124	0	39	0
Through	64	99	0	0
Right	0	5	221	0
Total	188	104	260	0

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Frontage Road (East)	Minor Street SR 99 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	292	260	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
 Minor Street Frontage Road (East)

Sheet No 11 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Conditions
 Peak Hour PM

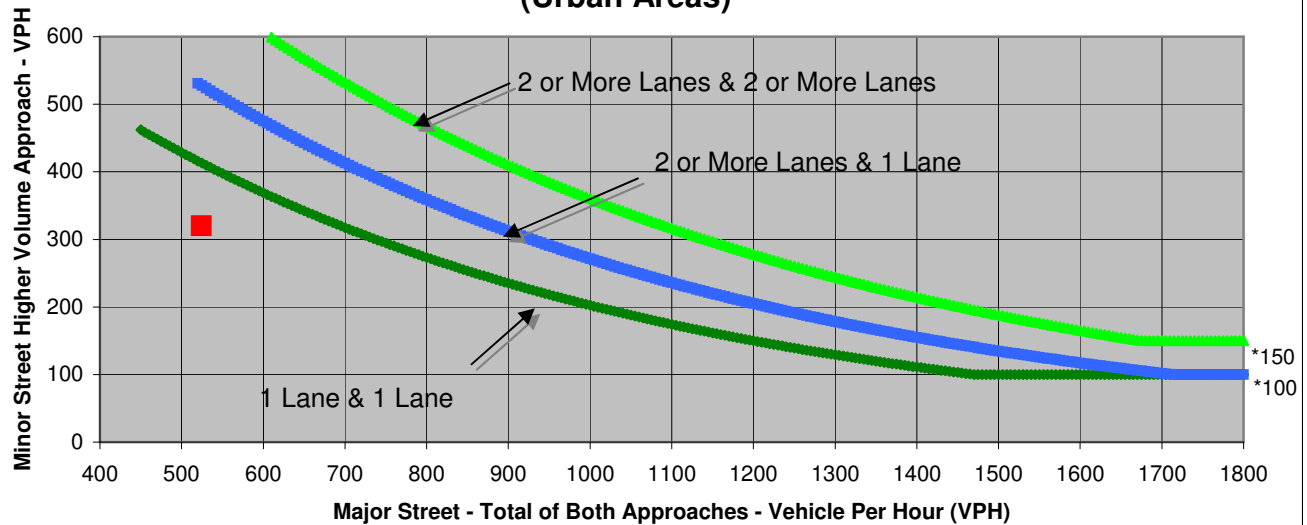
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	31	126	3
Through	27	38	146	130
Right	2	251	84	35
Total	109	320	356	168

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street Frontage Road (East)	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	524	320	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Airport Way**
 Minor Street **Hastings Drive**

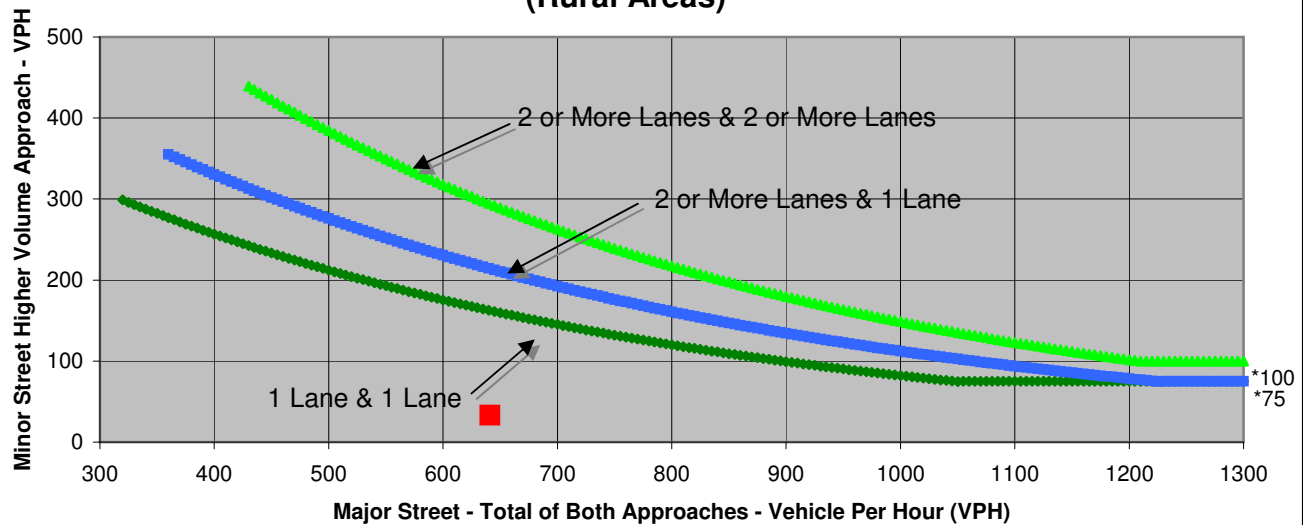
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Conditions**
 Peak Hour **PM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	32	0	20
Through	231	339	0	0
Right	39	0	0	13
Total	270	371	0	33

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Airport Way	Hastings Drive	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	641	33	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Peak Hour Ramp Junction Analysis

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Existing
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information				Freeway Data				Freeway Volume Adjustment										On-Ran	
Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Type
1 I-5 NB	Roth Road	AM	3	65.0	3,441	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,015	Right
2 I-5 SB	Roth Road	AM	3	65.0	3,315	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,868	Right
3 I-5 NB	Roth Road	PM	3	65.0	3,610	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,212	Right
4 I-5 SB	Roth Road	PM	3	65.0	3,567	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,162	Right

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Input Data			On-Ramp Volume Adjustment												
Freeway/ Direction	On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcph)
1 I-5 NB	Roth Road	1	45.0	196	450	0	450	0.9	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	254
2 I-5 SB	Roth Road	1	45.0	129	550	0	550	0.95	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	158
3 I-5 NB	Roth Road	1	45.0	250	450	0	450	0.95	Level			34.0%	0.0%	1.5	1.2	0.85	1.00	308
4 I-5 SB	Roth Road	1	45.0	114	550	0	550	0.85	Level			34.0%	0.0%	1.5	1.2	0.85	1.00	157

**HCM 2000
Merge Ramp Junctions
Capacity Analysis**

General Information

Freeway/ Direction		On-ramp	
1	I-5 NB	Roth Road	
2	I-5 SB	Roth Road	
3	I-5 NB	Roth Road	
4	I-5 SB	Roth Road	

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation						
	Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations				v_{12}
			25-2	25-3	1	2	3	P_{FM}	(pcph)
1	I-5 NB	Roth Road			0.590			0.590	2,369
2	I-5 SB	Roth Road			0.593			0.593	2,293
3	I-5 NB	Roth Road			0.590			0.590	2,485
4	I-5 SB	Roth Road			0.593			0.593	2,467

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
Freeway/ Direction	On-ramp		V_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	V_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $v_{12}/2$?	V_{12a} (pcph)	V_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,015	7,200	No	4,268	7,200	No	1,646	No	No	2,369	2,623	4,600	No	254	2,100	No
2	I-5 SB	Roth Road	3,868	7,200	No	4,026	7,200	No	1,574	No	No	2,293	2,451	4,600	No	158	2,100	No
3	I-5 NB	Roth Road	4,212	7,200	No	4,520	7,200	No	1,726	No	No	2,485	2,793	4,600	No	308	2,100	No
4	I-5 SB	Roth Road	4,162	7,200	No	4,318	7,200	No	1,694	No	No	2,467	2,624	4,600	No	157	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	23.0	C	0.334	57.3	60.9	58.6
2	I-5 SB	Roth Road	21.1	C	0.317	57.7	61.1	59.0
3	I-5 NB	Roth Road	24.3	C	0.344	57.1	60.6	58.4
4	I-5 SB	Roth Road	22.4	C	0.325	57.5	60.7	58.7

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Existing
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information

Freeway Data

Freeway Volume Adjustment

Freeway/ Direction			Analysis Time Period		S _{FF} (mph)	V (vph)	HOV Lane		Grade			Length (mi)	Truck/ Bus %		RV %			Flow Rate		
		Off-ramp			Lanes		HOV Lane?	Volume	PHF	Terrain	%		Bus %	RV %	E _T	E _R	f _{HV}	f _P	v _p (pcph)	
1	I-5 NB	Roth Road	AM		3	65.0	3,599	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,199	
2	I-5 SB	Roth Road	AM		3	65.0	3,520	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,107	
3	I-5 NB	Roth Road	PM		3	65.0	3,749	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,374	
4	I-5 SB	Roth Road	PM		3	65.0	3,742	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,366	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Effective	Off-Ramp Data						Off-Ramp Volume Adjustment											Flow Rate
Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)		Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_p	Flow Rate v_p (pcph)
1	I-5 NB	Roth Road	4,199	Right	1	45.0	158	150		150	0.9	Level			33.0%		1.5	1.2	0.86	1.00	205
2	I-5 SB	Roth Road	4,107	Right	1	45.0	205	150		150	0.8	Level			33.0%		1.5	1.2	0.86	1.00	299
3	I-5 NB	Roth Road	4,374	Right	1	45.0	139	150		150	0.85	Level			34.0%		1.5	1.2	0.85	1.00	191
4	I-5 SB	Roth Road	4,366	Right	1	45.0	175	150		150	0.8	Level			34.0%		1.5	1.2	0.85	1.00	256

**HCM 2000
Diverge Ramp Junctions
Capacity Analysis**

General Information

	Freeway/ Direction	Off-ramp	
1	I-5 NB	Roth Road	
2	I-5 SB	Roth Road	
3	I-5 NB	Roth Road	
4	I-5 SB	Roth Road	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation		
	Freeway/ Direction	Off-ramp	L_{EQ}		v_{12} (pcph)
			25-13	25-14	
1	I-5 NB	Roth Road			0.646 2,783
2	I-5 SB	Roth Road			0.644 2,749
3	I-5 NB	Roth Road			0.642 2,876
4	I-5 SB	Roth Road			0.639 2,882

Technical Appendix B
Existing Plus CIC Project Conditions

Peak Hour Intersection Operation Analysis

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1480	1776	1455	1444	1776	1524	1671	3048		1456	1473	1233
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1480	1776	1455	1444	1776	1524	1671	3048		1456	1473	1233
Volume (vph)	76	152	30	22	286	147	38	214	15	58	135	48
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	160	32	24	318	163	42	238	17	64	150	53
RTOR Reduction (vph)	0	0	21	0	0	0	0	9	0	0	0	39
Lane Group Flow (vph)	80	160	11	24	318	163	42	246	0	64	150	14
Heavy Vehicles (%)	22%	7%	11%	25%	7%	6%	8%	17%	21%	24%	29%	31%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	3.9	17.5	17.5	1.2	14.8	49.7	2.0	10.7		4.3	13.0	13.0
Effective Green, g (s)	3.9	17.5	17.5	1.2	14.8	49.7	2.0	10.7		4.3	13.0	13.0
Actuated g/C Ratio	0.08	0.35	0.35	0.02	0.30	1.00	0.04	0.22		0.09	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	116	625	512	35	529	1524	67	656		126	385	323
v/s Ratio Prot	c0.05	0.09		0.02	c0.18		0.03	c0.08		0.04	c0.10	
v/s Ratio Perm			0.01			c0.11						0.01
v/c Ratio	0.69	0.26	0.02	0.69	0.60	0.11	0.63	0.38		0.51	0.39	0.04
Uniform Delay, d1	22.3	11.5	10.5	24.1	14.9	0.0	23.5	16.6		21.7	15.1	13.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	15.7	0.2	0.0	43.6	1.9	0.1	16.9	0.4		3.2	0.7	0.1
Delay (s)	38.1	11.7	10.5	67.6	16.9	0.1	40.4	17.0		24.9	15.7	13.8
Level of Service	D	B	B	E	B	A	D	B		C	B	B
Approach Delay (s)		19.3			13.9			20.3			17.5	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM Average Control Delay			17.1			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			49.7			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			43.0%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↵	↑↑					↵	↑↓	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	42	4	135	27	0	0	0	0	228	4	18
Peak Hour Factor	0.70	0.70	0.70	0.95	0.95	0.95	0.25	0.25	0.25	0.80	0.80	0.80
Hourly flow rate (vph)	0	60	6	142	28	0	0	0	0	285	5	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	28			66			386	375	33	343	378	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28			66			386	375	33	343	378	14
tC, single (s)	4.3			4.8			7.7	6.7	7.1	8.2	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.5			3.6	4.1	3.4	3.9	4.1	3.4
p0 queue free %	100			89			100	100	100	39	99	98
cM capacity (veh/h)	1513			1329			466	475	1002	470	473	1030
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	40	26	142	14	14	190	122					
Volume Left	0	0	142	0	0	190	95					
Volume Right	0	6	0	0	0	0	22					
cSH	1700	1700	1329	1700	1700	470	522					
Volume to Capacity	0.02	0.02	0.11	0.01	0.01	0.40	0.23					
Queue Length 95th (ft)	0	0	9	0	0	48	23					
Control Delay (s)	0.0	0.0	8.0	0.0	0.0	17.8	14.0					
Lane LOS			A			C	B					
Approach Delay (s)	0.0		6.7			16.3						
Approach LOS						C						
Intersection Summary												
Average Delay			11.4									
Intersection Capacity Utilization			27.8%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

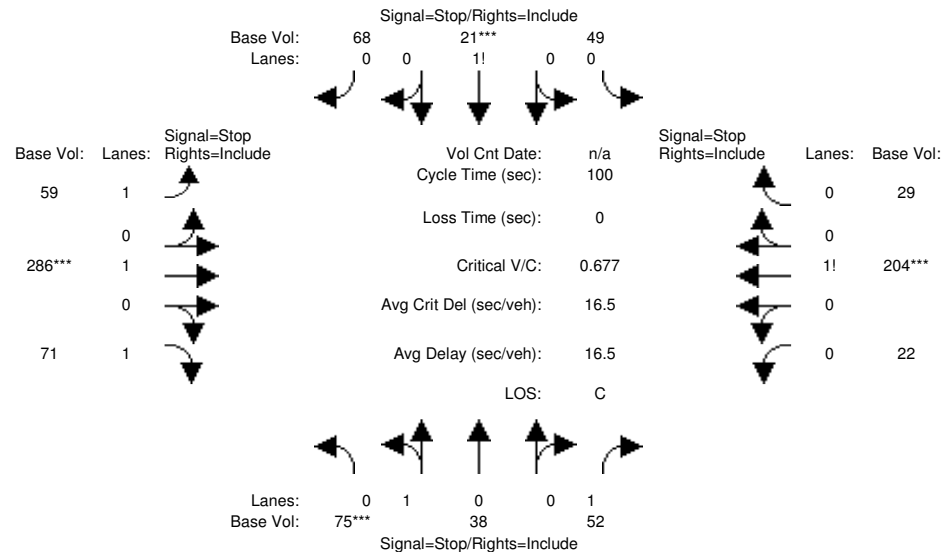
3: Roth Road & NB I-5 Ramps

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	24	246	0	0	150	197	12	1	170	0	0	0
Peak Hour Factor	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.90	0.90	0.25	0.25	0.25
Hourly flow rate (vph)	30	308	0	0	167	219	13	1	189	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									18			
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	386			308			451	753	154	490	644	193
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	386			308			451	753	154	490	644	193
tC, single (s)	4.3			4.3			7.7	6.7	7.6	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.6	3.6	4.1	3.4
p0 queue free %	97			100			97	100	76	100	100	100
cM capacity (veh/h)	1101			1181			459	310	773	324	360	786
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1						
Volume Total	30	154	154	111	274	203						
Volume Left	30	0	0	0	0	13						
Volume Right	0	0	0	0	219	189						
cSH	1101	1700	1700	1700	1700	832						
Volume to Capacity	0.03	0.09	0.09	0.07	0.16	0.24						
Queue Length 95th (ft)	2	0	0	0	0	24						
Control Delay (s)	8.4	0.0	0.0	0.0	0.0	11.3						
Lane LOS	A					B						
Approach Delay (s)	0.7			0.0		11.3						
Approach LOS						B						
Intersection Summary												
Average Delay			2.8									
Intersection Capacity Utilization			27.8%		ICU Level of Service				A			
Analysis Period (min)			15									

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #3: Roth Road / Harlan Road Existing Plus Project AM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0

Volume Module:

Base Vol:	75	38	52	49	21	68	59	286	71	22	204	29
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	75	38	52	49	21	68	59	286	71	22	204	29
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.80	0.80	0.80	0.90	0.90	0.90
PHF Volume:	83	42	58	54	23	76	74	358	89	24	227	32
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	83	42	58	54	23	76	74	358	89	24	227	32
PCE 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
MLF 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
Final Volume:	83	42	58	54	23	76	74	358	89	24	227	32

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.66	0.34	1.00	0.36	0.15	0.49	1.00	1.00	1.00	0.09	0.80	0.11
Final Sat.:	294	149	507	167	72	232	490	528	586	43	403	57

Capacity Analysis Module:

Vol/Sat:	0.28	0.28	0.11	0.33	0.33	0.33	0.15	0.68	0.15	0.56	0.56	0.56
Crit Moves:	***			***			***			***		
Delay/Veh:	13.0	13.0	10.0	13.2	13.2	13.2	11.2	21.8	9.7	18.1	18.1	18.1
Delay 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
AdjDel/Veh:	13.0	13.0	10.0	13.2	13.2	13.2	11.2	21.8	9.7	18.1	18.1	18.1
LOS by Move:	B	B	B	B	B	B	B	C	A	C	C	C
ApproachDel:	12.1			13.2			18.2			18.1		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	12.1			13.2			18.2			18.1		
LOS by Appr:	B			B			C			C		
AllWayAvgQ:	0.3	0.3	0.1	0.4	0.4	0.4	0.2	1.8	0.2	1.1	1.1	1.1

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #3 Roth Road / Harlan Road Existing Plus Project AM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

HCM Unsignalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

6/29/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	158	44	13	142	40	6
Peak Hour Factor	0.85	0.85	0.75	0.75	0.80	0.80
Hourly flow rate (vph)	186	52	17	189	50	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			238		410	186
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			238		410	186
tC, single (s)			4.8		7.4	6.9
tC, 2 stage (s)						
tF (s)			2.9		4.4	3.9
p0 queue free %			98		89	99
cM capacity (veh/h)			1005		443	707
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	186	52	17	189	58	
Volume Left	0	0	17	0	50	
Volume Right	0	52	0	0	8	
cSH	1700	1700	1005	1700	465	
Volume to Capacity	0.11	0.03	0.02	0.11	0.12	
Queue Length 95th (ft)	0	0	1	0	10	
Control Delay (s)	0.0	0.0	8.6	0.0	13.8	
Lane LOS			A		B	
Approach Delay (s)	0.0		0.7		13.8	
Approach LOS					B	
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			20.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

6/29/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
						
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1289	1242	1467	1727	1583	1122
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1289	1242	1467	1727	1583	1122
Volume (vph)	61	46	67	205	135	63
Peak-hour factor, PHF	0.85	0.85	0.75	0.75	0.85	0.85
Adj. Flow (vph)	72	54	89	273	159	74
RTOR Reduction (vph)	0	46	0	0	0	35
Lane Group Flow (vph)	72	8	89	273	159	39
Heavy Vehicles (%)	40%	30%	23%	10%	20%	44%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	8.2	8.2	6.4	40.3	29.9	29.9
Effective Green, g (s)	8.2	8.2	6.4	40.3	29.9	29.9
Actuated g/C Ratio	0.15	0.15	0.11	0.71	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	187	180	166	1232	838	594
v/s Ratio Prot	c0.06		c0.06	c0.16	0.10	
v/s Ratio Perm		0.01				0.03
v/c Ratio	0.39	0.04	0.54	0.22	0.19	0.07
Uniform Delay, d1	21.9	20.8	23.6	2.8	7.0	6.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	0.1	3.3	0.1	0.1	0.0
Delay (s)	23.2	20.9	27.0	2.8	7.1	6.5
Level of Service	C	C	C	A	A	A
Approach Delay (s)	22.2			8.8	6.9	
Approach LOS	C			A	A	
Intersection Summary						
HCM Average Control Delay			10.5		HCM Level of Service	B
HCM Volume to Capacity ratio			0.28			
Actuated Cycle Length (s)			56.5		Sum of lost time (s)	8.0
Intersection Capacity Utilization			24.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	1.00	
Frt		0.87			0.95		1.00	0.99		1.00	1.00	
Flt Protected		1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1177			1725		1271	3008		1770	1516	
Flt Permitted		1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1177			1725		1271	3008		1770	1516	
Volume (vph)	1	1	21	15	2	9	37	289	16	5	190	2
Peak-hour factor, PHF	0.70	0.70	0.70	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	1	1	30	17	2	10	44	340	19	6	211	2
RTOR Reduction (vph)	0	28	0	0	9	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	20	0	44	357	0	6	213	0
Heavy Vehicles (%)	42%	2%	42%	2%	2%	2%	42%	20%	2%	2%	25%	42%
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		5.0			5.0		5.4	51.7		1.0	47.3	
Effective Green, g (s)		5.0			5.0		5.4	51.7		1.0	47.3	
Actuated g/C Ratio		0.06			0.06		0.07	0.66		0.01	0.60	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		75			110		87	1976		22	911	
v/s Ratio Prot		c0.00			c0.01		c0.03	0.12		0.00	c0.14	
v/s Ratio Perm												
v/c Ratio		0.05			0.18		0.51	0.18		0.27	0.23	
Uniform Delay, d1		34.6			34.9		35.4	5.3		38.5	7.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.8		4.6	0.0		6.6	0.1	
Delay (s)		34.9			35.7		39.9	5.3		45.1	7.4	
Level of Service		C			D		D	A		D	A	
Approach Delay (s)		34.9			35.7			9.1			8.5	
Approach LOS		C			D			A			A	
Intersection Summary												
HCM Average Control Delay		11.2					HCM Level of Service			B		
HCM Volume to Capacity ratio		0.24										
Actuated Cycle Length (s)		78.7					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		31.6%					ICU Level of Service		A			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	65	9	399	70	0	0	0	0	243	4	11
Peak Hour Factor	0.75	0.75	0.75	0.95	0.95	0.95	0.25	0.25	0.25	0.70	0.70	0.70
Hourly flow rate (vph)	0	87	12	420	74	0	0	0	0	347	6	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked												
vC, conflicting volume	74			99			1025	1006	93	1006	1012	74
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	74			99			1025	1006	93	1006	1012	74
tC, single (s)	4.2			4.2			7.2	6.6	6.3	*6.5	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			71			100	100	100	0	97	98
cM capacity (veh/h)	1489			1457			155	167	948	201	166	972
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	99	420	74	369								
Volume Left	0	420	0	347								
Volume Right	12	0	0	16								
cSH	1700	1457	1700	208								
Volume to Capacity	0.06	0.29	0.04	1.78								
Queue Length 95th (ft)	0	30	0	638								
Control Delay (s)	0.0	8.5	0.0	407.4								
Lane LOS		A		F								
Approach Delay (s)	0.0	7.2		407.4								
Approach LOS				F								
Intersection Summary												
Average Delay		160.0										
Intersection Capacity Utilization		77.4%		ICU Level of Service				D				
Analysis Period (min)		15										

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free				Stop		Stop	
Grade	0%				0%				0%		0%	
Volume (veh/h)	20	288	0	0	457	424	12	3	215	0	0	0
Peak Hour Factor	0.70	0.70	0.70	0.85	0.85	0.85	0.95	0.95	0.95	0.25	0.25	0.25
Hourly flow rate (vph)	29	411	0	0	538	499	13	3	226	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.68							0.68	0.68			0.68
vC, conflicting volume	1036			411				1256	1505	411	1484	1256
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1053			411				1374	1739	411	1707	1374
tC, single (s)	4.2			4.2				7.2	6.6	6.3	7.2	6.6
tC, 2 stage (s)												
tF (s)	2.3			2.3				3.6	4.1	3.4	3.6	4.1
p0 queue free %	93			100				84	94	64	100	100
cM capacity (veh/h)	436			1116				77	54	628	28	90
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	29	411	1036	242								
Volume Left	29	0	0	13								
Volume Right	0	0	499	226								
cSH	436	1700	1700	416								
Volume to Capacity	0.07	0.24	0.61	0.58								
Queue Length 95th (ft)	5	0	0	90								
Control Delay (s)	13.8	0.0	0.0	25.0								
Lane LOS	B			D								
Approach Delay (s)	0.9	0.0		25.0								
Approach LOS				D								
Intersection Summary												
Average Delay			3.8									
Intersection Capacity Utilization	77.4%		ICU Level of Service		D							
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.92		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3248		1671	1759	1495	1671	3063		1671	3092	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3248		1671	1759	1495	1671	3063		1671	3092	
Volume (vph)	77	346	80	55	627	51	195	39	49	51	35	35
Peak-hour factor, PHF	0.87	0.87	0.87	0.95	0.95	0.95	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	89	398	92	58	660	54	217	43	54	68	47	47
RTOR Reduction (vph)	0	18	0	0	0	20	0	45	0	0	43	0
Lane Group Flow (vph)	89	472	0	58	660	34	217	52	0	68	51	0
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	5.6	43.1		4.1	41.6	41.6	12.7	13.2		6.6	7.1	
Effective Green, g (s)	5.6	43.1		4.1	41.6	41.6	12.7	13.2		6.6	7.1	
Actuated g/C Ratio	0.07	0.52		0.05	0.50	0.50	0.15	0.16		0.08	0.09	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	113	1687		83	882	749	256	487		133	264	
v/s Ratio Prot	c0.05	0.15		0.03	c0.38		c0.13	0.02		0.04	c0.02	
v/s Ratio Perm						0.02						
v/c Ratio	0.79	0.28		0.70	0.75	0.05	0.85	0.11		0.51	0.19	
Uniform Delay, d1	38.1	11.2		38.8	16.5	10.6	34.2	29.9		36.7	35.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	29.4	0.4		22.6	5.8	0.1	22.0	0.1		3.3	0.4	
Delay (s)	67.6	11.6		61.4	22.3	10.7	56.2	29.9		39.9	35.6	
Level of Service	E	B		E	C	B	E	C		D	D	
Approach Delay (s)		20.2			24.4			48.1			37.5	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM Average Control Delay			28.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			83.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			64.7%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & Fifth Street

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.91		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1792	1553	1736	3367		1736	1662		1736	1827	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1792	1553	1736	3367		1736	1662		1736	1827	1553
Volume (vph)	18	310	13	17	528	50	32	11	17	116	16	56
Peak-hour factor, PHF	0.75	0.75	0.75	0.90	0.90	0.90	0.80	0.80	0.80	0.75	0.75	0.75
Adj. Flow (vph)	24	413	17	19	587	56	40	14	21	155	21	75
RTOR Reduction (vph)	0	0	12	0	10	0	0	14	0	0	0	44
Lane Group Flow (vph)	24	413	5	19	633	0	40	21	0	155	21	31
Heavy Vehicles (%)	4%	6%	4%	4%	6%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	1.9	18.4	18.4	1.9	18.4		2.5	21.7		8.2	27.4	27.4
Effective Green, g (s)	1.9	18.4	18.4	1.9	18.4		2.5	21.7		8.2	27.4	27.4
Actuated g/C Ratio	0.03	0.28	0.28	0.03	0.28		0.04	0.33		0.12	0.41	0.41
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	50	498	432	50	936		66	545		215	756	643
v/s Ratio Prot	c0.01	c0.23		0.01	0.19		c0.02	0.01		c0.09	0.01	
v/s Ratio Perm			0.00									c0.02
v/c Ratio	0.48	0.83	0.01	0.38	0.68		0.61	0.04		0.72	0.03	0.05
Uniform Delay, d1	31.7	22.4	17.3	31.6	21.3		31.4	15.1		27.9	11.5	11.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.1	10.9	0.0	4.8	1.9		14.7	0.1		11.3	0.1	0.1
Delay (s)	38.8	33.4	17.3	36.3	23.2		46.1	15.3		39.2	11.6	11.7
Level of Service	D	C	B	D	C		D	B		D	B	B
Approach Delay (s)		33.1			23.6			31.7			28.7	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			27.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			66.2			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			36.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

6/29/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	381	101	65	529	72	26
Peak Hour Factor	0.85	0.85	0.90	0.90	0.80	0.80
Hourly flow rate (vph)	448	119	72	588	90	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			567		1240	508
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			567		1240	508
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		49	94
cM capacity (veh/h)			995		178	561
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	567	72	588	122		
Volume Left	0	72	0	90		
Volume Right	119	0	0	32		
cSH	1700	995	1700	217		
Volume to Capacity	0.33	0.07	0.35	0.56		
Queue Length 95th (ft)	0	6	0	77		
Control Delay (s)	0.0	8.9	0.0	41.1		
Lane LOS		A		E		
Approach Delay (s)	0.0	1.0		41.1		
Approach LOS				E		
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization			45.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1517	1827	1553	1736	1721		1736	1712		1504	1712	1442
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1517	1827	1553	1736	1721		1736	1712		1504	1712	1442
Volume (vph)	81	229	96	30	357	81	161	191	20	52	89	87
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.80	0.80	0.80	0.70	0.70	0.70
Adj. Flow (vph)	99	279	117	37	435	99	201	239	25	74	127	124
RTOR Reduction (vph)	0	0	73	0	10	0	0	4	0	0	0	96
Lane Group Flow (vph)	99	279	44	37	524	0	201	260	0	74	127	28
Heavy Vehicles (%)	19%	4%	4%	4%	4%	22%	4%	10%	4%	20%	11%	12%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	6.9	30.7	30.7	5.2	29.0		11.3	20.9		8.5	18.1	18.1
Effective Green, g (s)	6.9	30.7	30.7	5.2	29.0		11.3	20.9		8.5	18.1	18.1
Actuated g/C Ratio	0.08	0.38	0.38	0.06	0.36		0.14	0.26		0.10	0.22	0.22
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	129	690	586	111	614		241	440		157	381	321
v/s Ratio Prot	c0.07	0.15		0.02	c0.30		c0.12	c0.15		c0.05	0.07	
v/s Ratio Perm			0.03									0.02
v/c Ratio	0.77	0.40	0.08	0.33	0.85		0.83	0.59		0.47	0.33	0.09
Uniform Delay, d1	36.4	18.6	16.2	36.4	24.2		34.1	26.4		34.3	26.5	25.0
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	23.5	1.8	0.3	1.8	14.0		21.3	5.7		2.2	2.3	0.5
Delay (s)	59.9	20.3	16.5	38.2	38.2		55.4	32.2		36.5	28.9	25.6
Level of Service	E	C	B	D	D		E	C		D	C	C
Approach Delay (s)		27.3			38.2			42.2			29.4	
Approach LOS		C			D			D			C	
Intersection Summary												
HCM Average Control Delay			34.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			81.3			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			56.1%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3343	1553	1736	1759	1553	1736	3180		1736	3364	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3343	1553	1736	1759	1553	1736	3180		1736	3364	
Volume (vph)	22	244	75	172	233	115	124	149	190	32	85	22
Peak-hour factor, PHF	0.75	0.75	0.75	0.70	0.70	0.70	0.75	0.75	0.75	0.60	0.60	0.60
Adj. Flow (vph)	29	325	100	246	333	164	165	199	253	53	142	37
RTOR Reduction (vph)	0	0	21	0	0	45	0	169	0	0	27	0
Lane Group Flow (vph)	29	325	79	246	333	119	165	283	0	53	152	0
Heavy Vehicles (%)	4%	8%	4%	4%	8%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	2.4	24.4	24.4	12.0	34.0	34.0	8.0	28.0		3.6	23.6	
Effective Green, g (s)	2.4	24.4	24.4	12.0	34.0	34.0	8.0	28.0		3.6	23.6	
Actuated g/C Ratio	0.03	0.29	0.29	0.14	0.40	0.40	0.10	0.33		0.04	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	50	971	451	248	712	629	165	1060		74	945	
v/s Ratio Prot	0.02	0.10		c0.14	c0.19		c0.10	c0.09		0.03	0.05	
v/s Ratio Perm			0.05			0.08						
v/c Ratio	0.58	0.33	0.17	0.99	0.47	0.19	1.00	0.27		0.72	0.16	
Uniform Delay, d1	40.3	23.4	22.3	36.0	18.4	16.1	38.0	20.5		39.7	22.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.3	0.9	0.8	54.7	2.2	0.7	70.1	0.6		27.9	0.4	
Delay (s)	55.6	24.4	23.1	90.6	20.6	16.8	108.1	21.1		67.6	23.1	
Level of Service	E	C	C	F	C	B	F	C		E	C	
Approach Delay (s)		26.1			42.9			44.4			33.3	
Approach LOS		C			D			D			C	
Intersection Summary												
HCM Average Control Delay			38.5				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			43.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

15: SB SR 99 Ramps & Main Street

6/29/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	137	3	54	263	18	32
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	152	3	60	292	20	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	282	206			352	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	282	206			352	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	100			98	
cM capacity (veh/h)	697	834			1207	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	156	352	56			
Volume Left	152	0	20			
Volume Right	3	292	0			
cSH	699	1700	1207			
Volume to Capacity	0.22	0.21	0.02			
Queue Length 95th (ft)	21	0	1			
Control Delay (s)	11.6	0.0	3.0			
Lane LOS	B		A			
Approach Delay (s)	11.6	0.0	3.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.5				
Intersection Capacity Utilization		33.5%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

16: Lathrop Road & Main Street

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	185	199	73	78	232	83	42	49	23	44	27	98
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	206	221	81	87	258	92	47	54	26	49	30	109
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total (vph)	206	302	87	350	127	188						
Volume Left (vph)	206	0	87	0	47	49						
Volume Right (vph)	0	81	0	92	26	109						
Hadj (s)	0.60	-0.15	0.53	-0.10	-0.01	-0.26						
Departure Headway (s)	6.8	6.1	6.9	6.2	6.7	6.3						
Degree Utilization, x	0.39	0.51	0.17	0.61	0.24	0.33						
Capacity (veh/h)	502	570	498	548	470	516						
Control Delay (s)	13.0	14.1	10.0	17.2	11.8	12.3						
Approach Delay (s)	13.6		15.7		11.8	12.3						
Approach LOS	B		C		B	B						
Intersection Summary												
Delay			14.0									
HCM Level of Service			B									
Intersection Capacity Utilization			49.1%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

17: NB SR 99 Ramps & Frontage Road (East)

6/29/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	23	212	210	33	61	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	26	236	233	37	68	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	574	71	73			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	574	71	73			
tC, single (s)	6.4	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	94	76	85			
cM capacity (veh/h)	407	981	1526			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	261	270	73			
Volume Left	26	233	0			
Volume Right	236	0	6			
cSH	862	1526	1700			
Volume to Capacity	0.30	0.15	0.04			
Queue Length 95th (ft)	32	13	0			
Control Delay (s)	11.0	6.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.0	6.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			7.8			
Intersection Capacity Utilization	41.1%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

18: Lathrop Road & Frontage Road (East)

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	148	77	41	1	109	57	42	38	2	15	16	242
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	164	86	46	1	121	63	47	42	2	17	18	269
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	296	186	91	303								
Volume Left (vph)	164	1	47	17								
Volume Right (vph)	46	63	2	269								
Hadj (s)	0.05	-0.17	0.12	-0.43								
Departure Headway (s)	5.3	5.3	5.8	4.9								
Degree Utilization, x	0.44	0.27	0.15	0.42								
Capacity (veh/h)	636	623	536	675								
Control Delay (s)	12.3	10.2	9.8	11.4								
Approach Delay (s)	12.3	10.2	9.8	11.4								
Approach LOS	B	B	A	B								
Intersection Summary												
Delay			11.3									
HCM Level of Service			B									
Intersection Capacity Utilization			54.1%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

6/29/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	27	34	338	6	8	207
Peak Hour Factor	0.85	0.85	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	32	40	376	7	9	230
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)					1308	
pX, platoon unblocked						
vC, conflicting volume	623	376			382	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	623	376			382	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	94			99	
cM capacity (veh/h)	446	671			1176	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	32	40	376	7	9	230
Volume Left	32	0	0	0	9	0
Volume Right	0	40	0	7	0	0
cSH	446	671	1700	1700	1176	1700
Volume to Capacity	0.07	0.06	0.22	0.00	0.01	0.14
Queue Length 95th (ft)	6	5	0	0	1	0
Control Delay (s)	13.7	10.7	0.0	0.0	8.1	0.0
Lane LOS	B	B			A	
Approach Delay (s)	12.0		0.0		0.3	
Approach LOS	B					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			27.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1671	1726		1736	1827	1495	1736	1759	1553	1671	1714	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1671	1726		1736	1827	1495	1736	1759	1553	1671	1714	
Volume (vph)	24	118	69	83	235	59	94	231	32	30	229	47
Peak-hour factor, PHF	0.85	0.85	0.85	0.90	0.90	0.90	0.85	0.85	0.85	0.90	0.90	0.90
Adj. Flow (vph)	28	139	81	92	261	66	111	272	38	33	254	52
RTOR Reduction (vph)	0	28	0	0	0	51	0	0	22	0	8	0
Lane Group Flow (vph)	28	192	0	92	261	15	111	272	16	33	298	0
Heavy Vehicles (%)	8%	4%	4%	4%	4%	8%	4%	8%	4%	8%	8%	8%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	2.0	10.9		4.3	13.2	13.2	4.7	25.3	25.3	2.0	22.6	
Effective Green, g (s)	2.0	10.9		4.3	13.2	13.2	4.7	25.3	25.3	2.0	22.6	
Actuated g/C Ratio	0.03	0.19		0.07	0.23	0.23	0.08	0.43	0.43	0.03	0.39	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	57	322		128	412	337	139	761	672	57	662	
v/s Ratio Prot	0.02	0.11		c0.05	c0.14		c0.06	c0.15		0.02	c0.17	
v/s Ratio Perm						0.01			0.01			
v/c Ratio	0.49	0.60		0.72	0.63	0.04	0.80	0.36	0.02	0.58	0.45	
Uniform Delay, d1	27.8	21.8		26.5	20.5	17.7	26.4	11.1	9.5	27.8	13.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.5	3.0		17.5	3.2	0.1	26.5	0.3	0.0	13.5	0.5	
Delay (s)	34.3	24.8		44.0	23.6	17.8	52.9	11.4	9.5	41.3	13.8	
Level of Service	C	C		D	C	B	D	B	A	D	B	
Approach Delay (s)		25.8			27.2			22.2			16.5	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay			22.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			58.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			49.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1504	1792	1524	1318	1696	1302	1641	2928		1752	1696	1455
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1504	1792	1524	1318	1696	1302	1641	2928		1752	1696	1455
Volume (vph)	46	341	54	21	174	58	55	184	30	152	229	56
Peak-hour factor, PHF	0.80	0.80	0.80	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	58	426	68	25	205	68	61	204	33	169	254	62
RTOR Reduction (vph)	0	0	47	0	0	0	0	20	0	0	0	44
Lane Group Flow (vph)	58	426	21	25	205	68	61	217	0	169	254	18
Heavy Vehicles (%)	20%	6%	6%	37%	12%	24%	10%	21%	19%	3%	12%	11%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	3.5	16.8	16.8	1.9	15.2	53.7	3.0	13.1		5.9	16.0	16.0
Effective Green, g (s)	3.5	16.8	16.8	1.9	15.2	53.7	3.0	13.1		5.9	16.0	16.0
Actuated g/C Ratio	0.07	0.31	0.31	0.04	0.28	1.00	0.06	0.24		0.11	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	98	561	477	47	480	1302	92	714		192	505	434
v/s Ratio Prot	0.04	c0.24		0.02	c0.12		0.04	0.07		c0.10	c0.15	
v/s Ratio Perm			0.01			0.05						0.01
v/c Ratio	0.59	0.76	0.04	0.53	0.43	0.05	0.66	0.30		0.88	0.50	0.04
Uniform Delay, d1	24.4	16.6	12.9	25.5	15.7	0.0	24.9	16.6		23.6	15.6	13.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	9.2	5.9	0.0	11.1	0.6	0.1	16.5	0.2		34.1	0.8	0.0
Delay (s)	33.6	22.5	12.9	36.5	16.3	0.1	41.4	16.8		57.6	16.4	13.4
Level of Service	C	C	B	D	B	A	D	B		E	B	B
Approach Delay (s)		22.5			14.3			21.8			30.4	
Approach LOS		C			B			C			C	
Intersection Summary												
HCM Average Control Delay			23.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			53.7			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			50.0%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↱	↑↑					↱	↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	42	4	142	23	0	0	0	0	210	2	10
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.25	0.25	0.25	0.80	0.80	0.80
Hourly flow rate (vph)	0	52	5	178	29	0	0	0	0	262	2	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	29			58			438	439	29	410	441	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	29			58			438	439	29	410	441	14
tC, single (s)	4.1			4.8			7.7	6.7	7.1	*7.0	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.2			2.5			3.6	4.1	3.4	3.8	4.1	3.4
p0 queue free %	100			87			100	100	100	44	99	99
cM capacity (veh/h)	1583			1346			424	424	1008	470	423	1030
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	35	22	178	14	14	175	102					
Volume Left	0	0	178	0	0	175	88					
Volume Right	0	5	0	0	0	0	12					
cSH	1700	1700	1346	1700	1700	470	502					
Volume to Capacity	0.02	0.01	0.13	0.01	0.01	0.37	0.20					
Queue Length 95th (ft)	0	0	11	0	0	43	19					
Control Delay (s)	0.0	0.0	8.1	0.0	0.0	17.1	14.0					
Lane LOS			A			C	B					
Approach Delay (s)	0.0		7.0			16.0						
Approach LOS						C						
Intersection Summary												
Average Delay			10.8									
Intersection Capacity Utilization			29.8%	ICU Level of Service				A				
Analysis Period (min)			15									

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

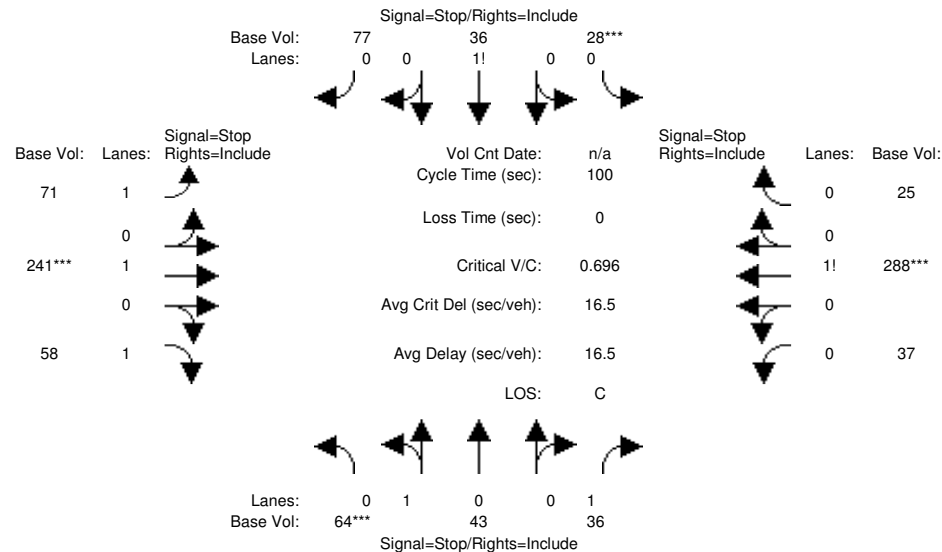
3: Roth Road & NB I-5 Ramps

6/29/2010

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		 			 								
Sign Control	Free			Free			Stop			Stop			
Grade	0%			0%			0%			0%			
Volume (veh/h)	28	224	0	0	148	281	17	2	146	0	0	0	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.85	0.85	0.85	0.25	0.25	0.25	
Hourly flow rate (vph)	31	249	0	0	156	296	20	2	172	0	0	0	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)									18				
Median type									None	None			
Median storage veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	452				249			389	763	124	492	615	226
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	452				249			389	763	124	492	615	226
tC, single (s)	4.3				4.3			7.7	6.7	7.6	7.7	6.7	7.1
tC, 2 stage (s)													
tF (s)	2.3				2.3			3.6	4.1	3.6	3.6	4.1	3.4
p0 queue free %	97				100			96	99	79	100	100	100
cM capacity (veh/h)	1038				1244			509	305	813	336	373	747
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1							
Volume Total	31	124	124	104	348	194							
Volume Left	31	0	0	0	0	20							
Volume Right	0	0	0	0	296	172							
cSH	1038	1700	1700	1700	1700	918							
Volume to Capacity	0.03	0.07	0.07	0.06	0.20	0.21							
Queue Length 95th (ft)	2	0	0	0	0	20							
Control Delay (s)	8.6	0.0	0.0	0.0	0.0	10.9							
Lane LOS	A					B							
Approach Delay (s)	1.0				0.0	10.9							
Approach LOS						B							
Intersection Summary													
Average Delay				2.6									
Intersection Capacity Utilization				29.8%	ICU Level of Service				A				
Analysis Period (min)				15									

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #4: Roth Road / Harlan Road Existing Plus Project PM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0

Volume Module:

Base Vol:	64	43	36	28	36	77	71	241	58	37	288	25
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	64	43	36	28	36	77	71	241	58	37	288	25
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
PHF Volume:	71	48	40	31	40	86	79	268	64	39	303	26
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	71	48	40	31	40	86	79	268	64	39	303	26
PCE 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
MLF 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
Final Volume:	71	48	40	31	40	86	79	268	64	39	303	26

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.60	0.40	1.00	0.20	0.25	0.55	1.00	1.00	1.00	0.11	0.82	0.07
Final Sat.:	265	178	506	95	122	261	491	528	587	56	435	38

Capacity Analysis Module:

Vol/Sat:	0.27	0.27	0.08	0.33	0.33	0.33	0.16	0.51	0.11	0.70	0.70	0.70
Crit Moves:	***			***			***			***		
Delay/Veh:	12.7	12.7	9.7	13.0	13.0	13.0	11.2	15.7	9.3	22.9	22.9	22.9
Delay 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
AdjDel/Veh:	12.7	12.7	9.7	13.0	13.0	13.0	11.2	15.7	9.3	22.9	22.9	22.9
LOS by Move:	B	B	A	B	B	B	B	C	A	C	C	C
ApproachDel:	12.0			13.0			13.8			22.9		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	12.0			13.0			13.8			22.9		
LOS by Appr:	B			B			B			C		
AllWayAvgQ:	0.3	0.3	0.1	0.4	0.4	0.4	0.2	0.9	0.1	1.9	1.9	1.9

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #4 Roth Road / Harlan Road Existing Plus Project PM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

HCM Unsignalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

6/29/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	243	59	8	218	50	22
Peak Hour Factor	0.90	0.90	0.95	0.95	0.85	0.85
Hourly flow rate (vph)	270	66	8	229	59	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			336		516	270
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			336		516	270
tC, single (s)			5.0		7.3	7.0
tC, 2 stage (s)						
tF (s)			3.0		4.3	4.0
p0 queue free %			99		85	96
cM capacity (veh/h)			864		386	609
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	270	66	8	229	85	
Volume Left	0	0	8	0	59	
Volume Right	0	66	0	0	26	
cSH	1700	1700	864	1700	434	
Volume to Capacity	0.16	0.04	0.01	0.13	0.19	
Queue Length 95th (ft)	0	0	1	0	18	
Control Delay (s)	0.0	0.0	9.2	0.0	15.3	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.3		15.3	
Approach LOS					C	
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			23.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

6/29/2010

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1327	1324	1456	1696	1792	1137
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1327	1324	1456	1696	1792	1137
Volume (vph)	86	127	79	186	238	71
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.85	0.85
Adj. Flow (vph)	96	141	88	207	280	84
RTOR Reduction (vph)	0	40	0	0	0	43
Lane Group Flow (vph)	96	101	88	207	280	41
Heavy Vehicles (%)	36%	22%	24%	12%	6%	42%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	11.1	11.1	4.0	34.3	26.3	26.3
Effective Green, g (s)	11.1	11.1	4.0	34.3	26.3	26.3
Actuated g/C Ratio	0.21	0.21	0.07	0.64	0.49	0.49
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	276	275	109	1089	883	560
v/s Ratio Prot	0.07		c0.06	0.12	c0.16	
v/s Ratio Perm		c0.08				0.04
v/c Ratio	0.35	0.37	0.81	0.19	0.32	0.07
Uniform Delay, d1	18.1	18.1	24.3	3.9	8.1	7.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.8	33.8	0.1	0.2	0.1
Delay (s)	18.8	19.0	58.2	4.0	8.4	7.2
Level of Service	B	B	E	A	A	A
Approach Delay (s)	18.9			20.1	8.1	
Approach LOS	B			C	A	
Intersection Summary						
HCM Average Control Delay			14.9		HCM Level of Service	B
HCM Volume to Capacity ratio			0.38			
Actuated Cycle Length (s)			53.4		Sum of lost time (s)	12.0
Intersection Capacity Utilization			31.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	1.00	
Frt		0.88			0.98		1.00	0.98		1.00	1.00	
Flt Protected		1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1304			1759		1399	3127		1770	1595	
Flt Permitted		1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1304			1759		1399	3127		1770	1595	
Volume (vph)	3	3	51	20	2	3	39	256	29	8	384	2
Peak-hour factor, PHF	0.92	0.92	0.92	0.80	0.80	0.80	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	3	55	25	2	4	42	278	32	9	417	2
RTOR Reduction (vph)	0	52	0	0	4	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	9	0	0	27	0	42	305	0	9	419	0
Heavy Vehicles (%)	29%	2%	29%	2%	2%	2%	29%	15%	2%	2%	19%	29%
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		4.8			4.7		4.7	53.3		1.0	49.6	
Effective Green, g (s)		4.8			4.7		4.7	53.3		1.0	49.6	
Actuated g/C Ratio		0.06			0.06		0.06	0.67		0.01	0.62	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		78			104		82	2089		22	991	
v/s Ratio Prot		c0.01			c0.02		c0.03	0.10		0.01	c0.26	
v/s Ratio Perm												
v/c Ratio		0.12			0.26		0.51	0.15		0.41	0.42	
Uniform Delay, d1		35.5			35.9		36.4	4.9		39.1	7.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			1.3		5.3	0.0		11.9	0.3	
Delay (s)		36.2			37.2		41.7	4.9		51.0	8.0	
Level of Service		D			D		D	A		D	A	
Approach Delay (s)		36.2			37.2			9.3			8.9	
Approach LOS		D			D			A			A	
Intersection Summary												
HCM Average Control Delay		12.0					HCM Level of Service			B		
HCM Volume to Capacity ratio		0.39										
Actuated Cycle Length (s)		79.8					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		41.7%					ICU Level of Service		A			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	115	17	218	75	0	0	0	0	420	5	9
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.25	0.25	0.25	0.95	0.95	0.95
Hourly flow rate (vph)	0	135	20	256	88	0	0	0	0	442	5	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh												
Upstream signal (ft)	1175											
pX, platoon unblocked												
vC, conflicting volume	88			155			759	746	145	746	756	88
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88			155			759	746	145	746	756	88
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			82			100	100	100	0	98	99
cM capacity (veh/h)	1470			1389			265	273	886	276	269	954
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	155	256	88	457								
Volume Left	0	256	0	442								
Volume Right	20	0	0	9								
cSH	1700	1389	1700	280								
Volume to Capacity	0.09	0.18	0.05	1.63								
Queue Length 95th (ft)	0	17	0	704								
Control Delay (s)	0.0	8.2	0.0	331.4								
Lane LOS		A		F								
Approach Delay (s)	0.0	6.1		331.4								
Approach LOS				F								
Intersection Summary												
Average Delay	160.4											
Intersection Capacity Utilization	73.7%			ICU Level of Service				D				
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	7	528	0	0	281	283	12	3	444	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.25	0.25	0.25
Hourly flow rate (vph)	7	556	0	0	312	314	13	3	493	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.86						0.86	0.86		0.86	0.86	0.86
vC, conflicting volume	627			556			1040	1197	556	1535	1040	469
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	565			556			1047	1230	556	1624	1047	381
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	99			100			92	98	5	100	100	100
cM capacity (veh/h)	838			985			171	147	519	3	189	560
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	7	556	627	510								
Volume Left	7	0	0	13								
Volume Right	0	0	314	493								
cSH	838	1700	1700	486								
Volume to Capacity	0.01	0.33	0.37	1.05								
Queue Length 95th (ft)	1	0	0	386								
Control Delay (s)	9.3	0.0	0.0	84.0								
Lane LOS	A			F								
Approach Delay (s)	0.1		0.0	84.0								
Approach LOS				F								
Intersection Summary												
Average Delay	25.3											
Intersection Capacity Utilization	73.7%			ICU Level of Service				D				
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.91		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3288		1671	1759	1495	1671	3038		1671	3153	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3288		1671	1759	1495	1671	3038		1671	3153	
Volume (vph)	134	737	90	101	329	56	165	99	154	120	89	54
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.80	0.80	0.80	0.85	0.85	0.85
Adj. Flow (vph)	141	776	95	112	366	62	206	124	192	141	105	64
RTOR Reduction (vph)	0	9	0	0	0	36	0	165	0	0	56	0
Lane Group Flow (vph)	141	862	0	112	366	26	206	151	0	141	113	0
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	8.4	33.3		7.1	32.0	32.0	10.9	10.9		9.2	9.2	
Effective Green, g (s)	8.4	33.3		7.1	32.0	32.0	10.9	10.9		9.2	9.2	
Actuated g/C Ratio	0.11	0.44		0.09	0.42	0.42	0.14	0.14		0.12	0.12	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	183	1431		155	736	625	238	433		201	379	
v/s Ratio Prot	c0.08	c0.26		0.07	0.21		c0.12	c0.05		0.08	0.04	
v/s Ratio Perm						0.02						
v/c Ratio	0.77	0.60		0.72	0.50	0.04	0.87	0.35		0.70	0.30	
Uniform Delay, d1	33.1	16.5		33.7	16.3	13.2	32.1	29.6		32.3	30.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	17.9	1.9		15.3	2.4	0.1	26.3	0.5		10.5	0.4	
Delay (s)	51.1	18.4		49.0	18.7	13.3	58.4	30.1		42.9	31.1	
Level of Service	D	B		D	B	B	E	C		D	C	
Approach Delay (s)		23.0			24.4			41.3			36.5	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM Average Control Delay			29.1				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			76.5				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			56.5%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & 5th Street

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1810	1553	1736	3319		1736	1687		1736	1827	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1810	1553	1736	3319		1736	1687		1736	1827	1553
Volume (vph)	55	729	67	31	356	116	35	22	23	97	33	38
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.55	0.55	0.55	0.95	0.95	0.95
Adj. Flow (vph)	58	767	71	33	375	122	64	40	42	102	35	40
RTOR Reduction (vph)	0	0	37	0	39	0	0	33	0	0	0	30
Lane Group Flow (vph)	58	767	34	33	458	0	64	49	0	102	35	10
Heavy Vehicles (%)	4%	5%	4%	4%	5%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	3.8	32.7	32.7	2.1	31.0		3.8	16.6		6.0	18.8	18.8
Effective Green, g (s)	3.8	32.7	32.7	2.1	31.0		3.8	16.6		6.0	18.8	18.8
Actuated g/C Ratio	0.05	0.45	0.45	0.03	0.42		0.05	0.23		0.08	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	90	806	692	50	1402		90	382		142	468	398
v/s Ratio Prot	c0.03	c0.42		0.02	0.14		c0.04	c0.03		c0.06	0.02	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.64	0.95	0.05	0.66	0.33		0.71	0.13		0.72	0.07	0.03
Uniform Delay, d1	34.1	19.6	11.5	35.3	14.2		34.3	22.6		32.9	20.7	20.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	14.7	20.7	0.0	28.1	0.1		23.2	0.7		15.9	0.3	0.1
Delay (s)	48.9	40.3	11.6	63.4	14.3		57.4	23.3		48.8	21.0	20.6
Level of Service	D	D	B	E	B		E	C		D	C	C
Approach Delay (s)		38.6			17.4			38.3			36.9	
Approach LOS		D			B			D			D	
Intersection Summary												
HCM Average Control Delay			32.0			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			73.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			63.7%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

6/29/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	751	41	18	466	51	42
Peak Hour Factor	0.95	0.95	0.95	0.95	0.80	0.80
Hourly flow rate (vph)	791	43	19	491	64	52
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			834		1341	812
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			834		1341	812
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		61	86
cM capacity (veh/h)			791		162	376
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	834	19	491	116		
Volume Left	0	19	0	64		
Volume Right	43	0	0	52		
cSH	1700	791	1700	218		
Volume to Capacity	0.49	0.02	0.29	0.53		
Queue Length 95th (ft)	0	2	0	70		
Control Delay (s)	0.0	9.7	0.0	38.8		
Lane LOS		A		E		
Approach Delay (s)	0.0	0.4		38.8		
Approach LOS				E		
Intersection Summary						
Average Delay		3.2				
Intersection Capacity Utilization		54.1%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1583	1827	1553	1736	1726		1736	1674		1570	1759	1429
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1583	1827	1553	1736	1726		1736	1674		1570	1759	1429
Volume (vph)	92	543	151	31	289	72	68	154	52	123	229	119
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.85	0.85	0.85	0.95	0.95	0.95
Adj. Flow (vph)	102	603	168	34	321	80	80	181	61	129	241	125
RTOR Reduction (vph)	0	0	103	0	11	0	0	15	0	0	0	92
Lane Group Flow (vph)	102	603	65	34	390	0	80	227	0	129	241	33
Heavy Vehicles (%)	14%	4%	4%	4%	4%	18%	4%	11%	4%	15%	8%	13%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	6.9	31.2	31.2	4.1	28.4		7.5	19.1		9.7	21.3	21.3
Effective Green, g (s)	6.9	31.2	31.2	4.1	28.4		7.5	19.1		9.7	21.3	21.3
Actuated g/C Ratio	0.09	0.39	0.39	0.05	0.35		0.09	0.24		0.12	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	136	712	605	89	612		163	399		190	468	380
v/s Ratio Prot	c0.06	c0.33		0.02	0.23		0.05	c0.14		c0.08	0.14	
v/s Ratio Perm			0.04									0.02
v/c Ratio	0.75	0.85	0.11	0.38	0.64		0.49	0.57		0.68	0.51	0.09
Uniform Delay, d1	35.8	22.3	15.6	36.8	21.6		34.5	26.9		33.7	25.0	22.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	20.5	11.9	0.4	2.7	5.0		2.3	5.8		9.3	4.0	0.5
Delay (s)	56.2	34.2	15.9	39.5	26.6		36.8	32.6		43.0	29.0	22.5
Level of Service	E	C	B	D	C		D	C		D	C	C
Approach Delay (s)		33.3			27.6			33.7			31.0	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			31.6			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			80.1			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			63.3%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3343	1553	1736	1759	1553	1736	3216		1736	3417	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3343	1553	1736	1759	1553	1736	3216		1736	3417	
Volume (vph)	32	467	130	157	299	53	105	124	120	93	179	21
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.80	0.80	0.80
Adj. Flow (vph)	34	492	137	174	332	59	117	138	133	116	224	26
RTOR Reduction (vph)	0	0	89	0	0	36	0	97	0	0	11	0
Lane Group Flow (vph)	34	492	48	174	332	23	117	174	0	116	239	0
Heavy Vehicles (%)	4%	8%	4%	4%	8%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	3.4	24.9	24.9	10.3	31.8	31.8	6.9	22.2		7.5	22.8	
Effective Green, g (s)	3.4	24.9	24.9	10.3	31.8	31.8	6.9	22.2		7.5	22.8	
Actuated g/C Ratio	0.04	0.31	0.31	0.13	0.39	0.39	0.09	0.27		0.09	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	73	1029	478	221	691	610	148	883		161	963	
v/s Ratio Prot	0.02	0.15		c0.10	c0.19		c0.07	0.05		0.07	c0.07	
v/s Ratio Perm			0.03			0.01						
v/c Ratio	0.47	0.48	0.10	0.79	0.48	0.04	0.79	0.20		0.72	0.25	
Uniform Delay, d1	37.9	22.7	20.0	34.2	18.4	15.1	36.3	22.5		35.7	22.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.6	1.6	0.4	16.7	2.4	0.1	24.3	0.5		14.7	0.6	
Delay (s)	42.5	24.3	20.4	51.0	20.8	15.2	60.6	23.0		50.3	23.1	
Level of Service	D	C	C	D	C	B	E	C		D	C	
Approach Delay (s)		24.4			29.5			34.3			31.7	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			29.2				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			80.9				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			47.4%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

15: SR 99 SB Ramps & Frontage Road (West)

6/29/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	R
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	167	0	34	323	100	211
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	186	0	38	359	111	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	674	217			397	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	674	217			397	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	51	100			90	
cM capacity (veh/h)	380	823			1162	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	186	397	346			
Volume Left	186	0	111			
Volume Right	0	359	0			
cSH	380	1700	1162			
Volume to Capacity	0.49	0.23	0.10			
Queue Length 95th (ft)	65	0	8			
Control Delay (s)	23.2	0.0	3.3			
Lane LOS	C		A			
Approach Delay (s)	23.2	0.0	3.3			
Approach LOS	C					
Intersection Summary						
Average Delay		5.9				
Intersection Capacity Utilization		57.6%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
16: Lathrop Road & Frontage Road (West)

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	233	265	85	96	323	66	60	58	26	73	152	153
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	259	294	94	107	359	73	67	64	29	81	169	170
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total (vph)	259	389	107	432	160	420						
Volume Left (vph)	259	0	107	0	67	81						
Volume Right (vph)	0	94	0	73	29	170						
Hadj (s)	0.60	-0.14	0.53	-0.03	0.01	-0.17						
Departure Headway (s)	8.9	8.1	9.0	8.4	9.1	7.7						
Degree Utilization, x	0.64	0.88	0.27	1.01	0.40	0.90						
Capacity (veh/h)	393	438	395	432	372	462						
Control Delay (s)	25.1	45.8	14.0	74.3	18.1	47.9						
Approach Delay (s)	37.5		62.4		18.1	47.9						
Approach LOS	E		F		C	E						
Intersection Summary												
Delay			45.8									
HCM Level of Service			E									
Intersection Capacity Utilization			67.0%	ICU Level of Service		C						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

17: SR 99 NB Ramps & Frontage Road (East)

6/29/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	39	243	129	64	99	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	43	270	143	71	110	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	471	113	116			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	471	113	116			
tC, single (s)	6.4	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	91	71	90			
cM capacity (veh/h)	498	929	1473			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	313	214	116			
Volume Left	43	143	0			
Volume Right	270	0	6			
cSH	830	1473	1700			
Volume to Capacity	0.38	0.10	0.07			
Queue Length 95th (ft)	44	8	0			
Control Delay (s)	11.9	5.4	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.9	5.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			7.6			
Intersection Capacity Utilization			41.0%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: Lathrop Road & Frontage Road (East)

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	131	149	84	3	132	35	80	27	2	31	38	273
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	146	166	93	3	147	39	89	30	2	34	42	303
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	404	189	121	380								
Volume Left (vph)	146	3	89	34								
Volume Right (vph)	93	39	2	303								
Hadj (s)	-0.03	-0.09	0.17	-0.37								
Departure Headway (s)	5.8	6.1	6.7	5.6								
Degree Utilization, x	0.65	0.32	0.22	0.59								
Capacity (veh/h)	595	514	455	604								
Control Delay (s)	18.8	12.0	11.6	16.3								
Approach Delay (s)	18.8	12.0	11.6	16.3								
Approach LOS	C	B	B	C								
Intersection Summary												
Delay				15.9								
HCM Level of Service				C								
Intersection Capacity Utilization				68.4%	ICU Level of Service	C						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

6/29/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	20	15	259	39	35	376
Peak Hour Factor	0.65	0.65	0.95	0.95	0.90	0.90
Hourly flow rate (vph)	31	23	273	41	39	418
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	768	273			314	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	768	273			314	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	97			97	
cM capacity (veh/h)	358	766			1247	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	31	23	273	41	39	418
Volume Left	31	0	0	0	39	0
Volume Right	0	23	0	41	0	0
cSH	358	766	1700	1700	1247	1700
Volume to Capacity	0.09	0.03	0.16	0.02	0.03	0.25
Queue Length 95th (ft)	7	2	0	0	2	0
Control Delay (s)	16.0	9.8	0.0	0.0	8.0	0.0
Lane LOS	C	A			A	
Approach Delay (s)	13.4		0.0		0.7	
Approach LOS	B					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			30.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

6/29/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1671	1760		1736	1827	1495	1736	1759	1553	1671	1726	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1671	1760		1736	1827	1495	1736	1759	1553	1671	1726	
Volume (vph)	78	374	120	62	230	61	99	262	146	98	285	41
Peak-hour factor, PHF	0.80	0.80	0.80	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	98	468	150	73	271	72	110	291	162	109	317	46
RTOR Reduction (vph)	0	15	0	0	0	46	0	0	45	0	6	0
Lane Group Flow (vph)	98	603	0	73	271	26	110	291	117	109	357	0
Heavy Vehicles (%)	8%	4%	4%	4%	4%	8%	4%	8%	4%	8%	8%	8%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	6.2	27.1		4.2	25.1	25.1	5.6	17.5	17.5	5.6	17.5	
Effective Green, g (s)	6.2	27.1		4.2	25.1	25.1	5.6	17.5	17.5	5.6	17.5	
Actuated g/C Ratio	0.09	0.38		0.06	0.36	0.36	0.08	0.25	0.25	0.08	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	147	678		104	651	533	138	437	386	133	429	
v/s Ratio Prot	c0.06	c0.34		0.04	0.15		0.06	0.17		c0.07	c0.21	
v/s Ratio Perm						0.02			0.08			
v/c Ratio	0.67	0.89		0.70	0.42	0.05	0.80	0.67	0.30	0.82	0.83	
Uniform Delay, d1	31.1	20.3		32.5	17.1	14.8	31.8	23.8	21.5	31.9	25.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.9	13.6		19.2	0.4	0.0	26.5	3.8	0.4	31.0	12.9	
Delay (s)	42.0	33.8		51.7	17.5	14.9	58.3	27.6	21.9	62.9	38.0	
Level of Service	D	C		D	B	B	E	C	C	E	D	
Approach Delay (s)		35.0			23.1			32.0			43.7	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			33.8				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			70.4				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			66.7%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Peak Hour Signal Warrants

Major Street Roth Road
Minor Street I-5 SB Ramps

Sheet No 1 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

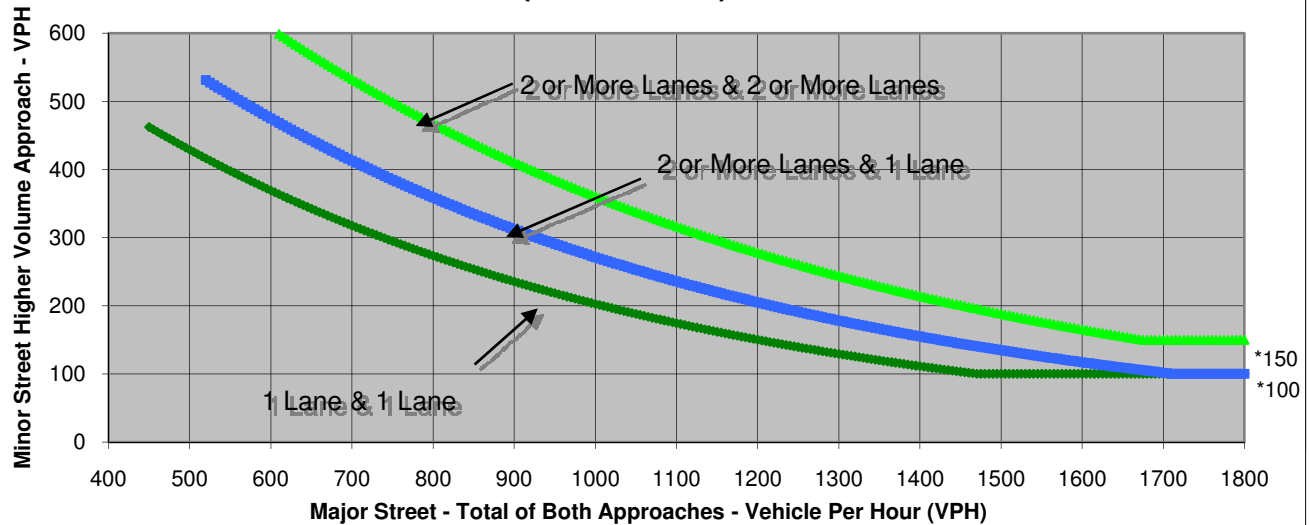
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	228	0	135
Through	0	4	42	27
Right	0	18	4	0
Total	0	250	46	162

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	208	250	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
Minor Street I-5 NB Ramps

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

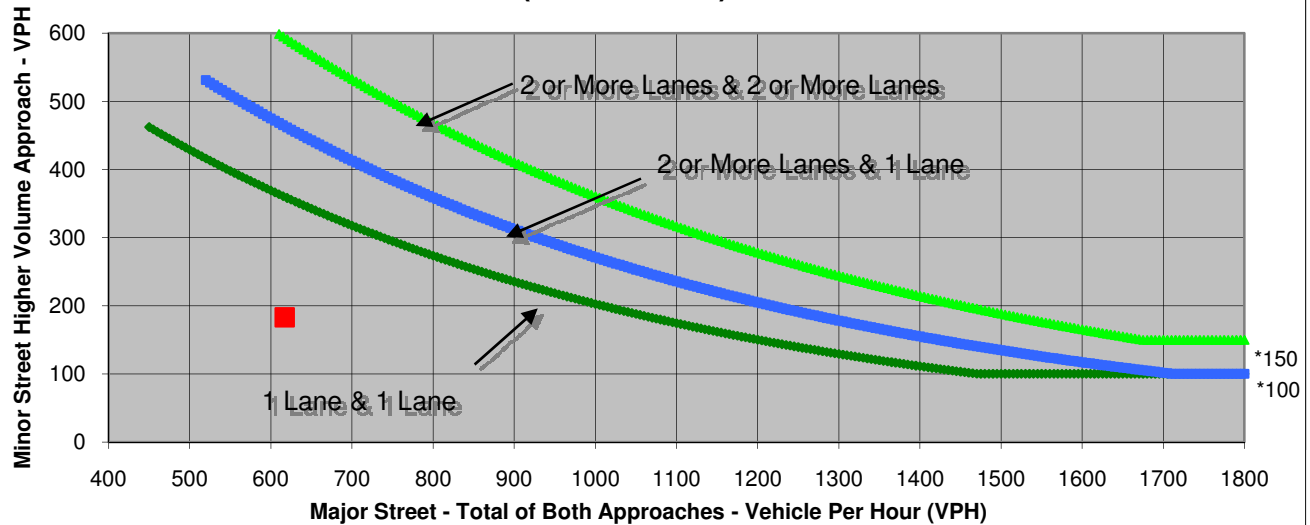
Turn Movement Volumes

	NB	SB	EB	WB
Left	12	0	24	0
Through	1	0	246	150
Right	170	0	0	197
Total	183	0	270	347

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	617	183	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**

 Minor Street **Harlan Road**

 Project **Centerpoint Intermodal Center**

 Scenario **Existing Plus Project Conditions**

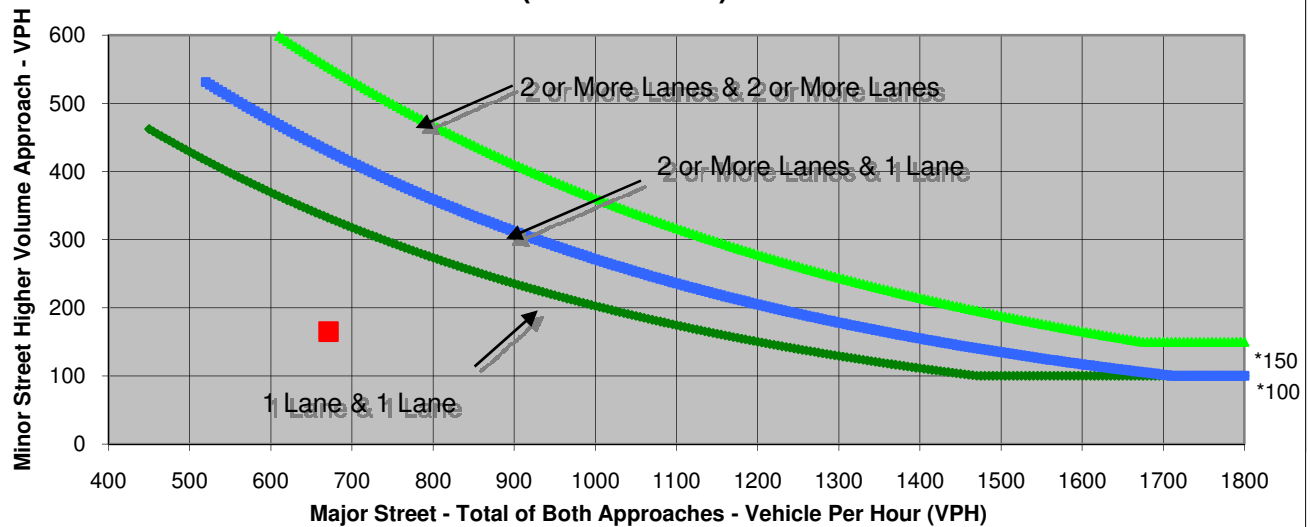
 Peak Hour **AM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	75	49	59	22
Through	38	21	286	204
Right	52	68	71	29
Total	165	138	416	255

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	671	165	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
Minor Street UPRR Driveway

Sheet No 4 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

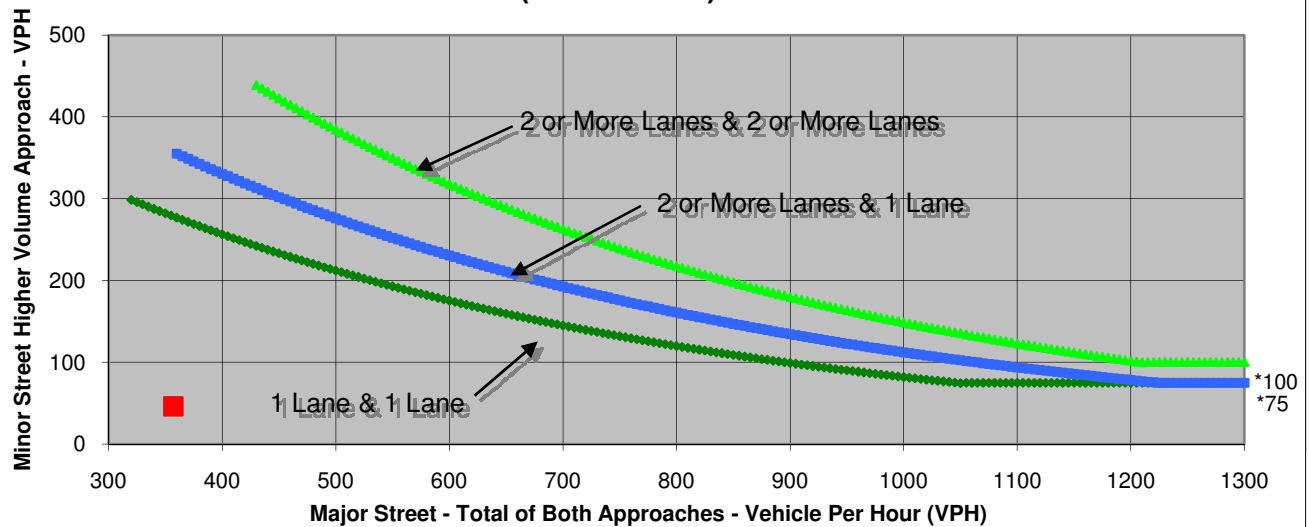
Turn Movement Volumes

	NB	SB	EB	WB
Left	40	0	0	13
Through	0	0	158	142
Right	6	0	44	0
Total	46	0	202	155

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street UPRR Driveway	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	357	46	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
 Minor Street I-5 SB Ramps

Sheet No 5 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Plus Project Conditions
 Peak Hour AM

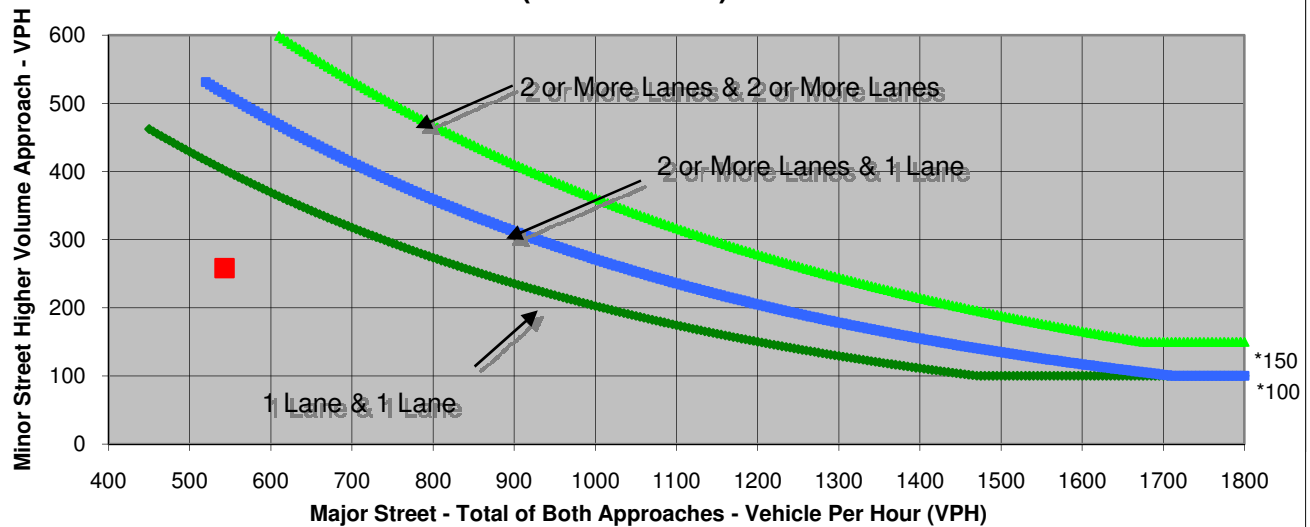
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	243	0	399
Through	0	4	65	70
Right	0	11	9	0
Total	0	258	74	469

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	543	258	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
Minor Street I-5 NB Ramps

Sheet No 6 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

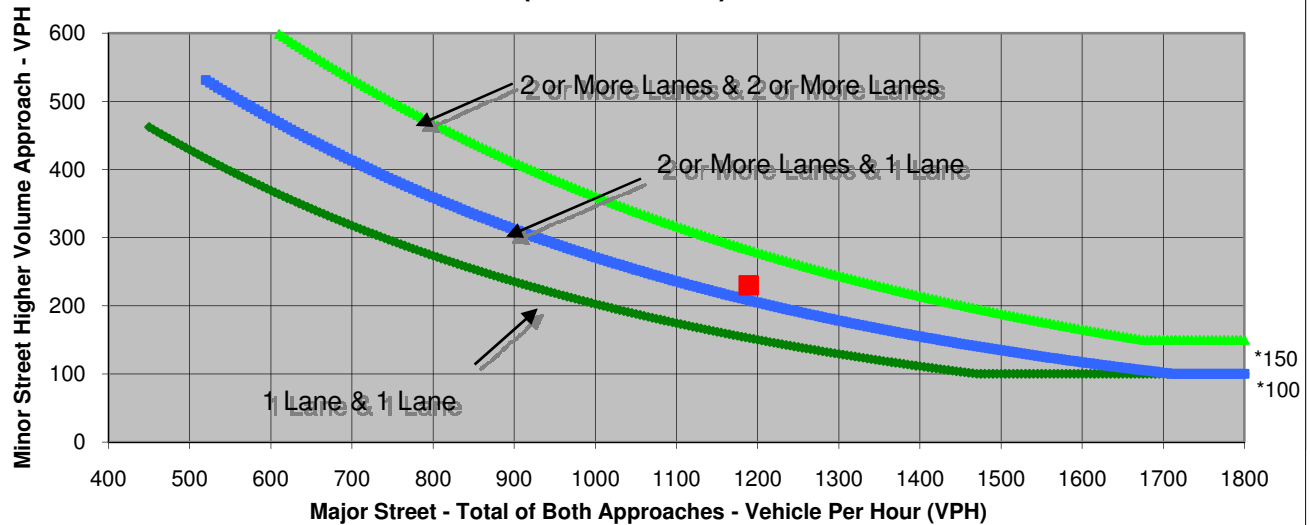
Turn Movement Volumes

	NB	SB	EB	WB
Left	12	0	20	0
Through	3	0	288	457
Right	215	0	0	424
Total	230	0	308	881

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,189	230	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
 Minor Street McKinley Avenue

Sheet No 7 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Plus Project Conditions
 Peak Hour AM

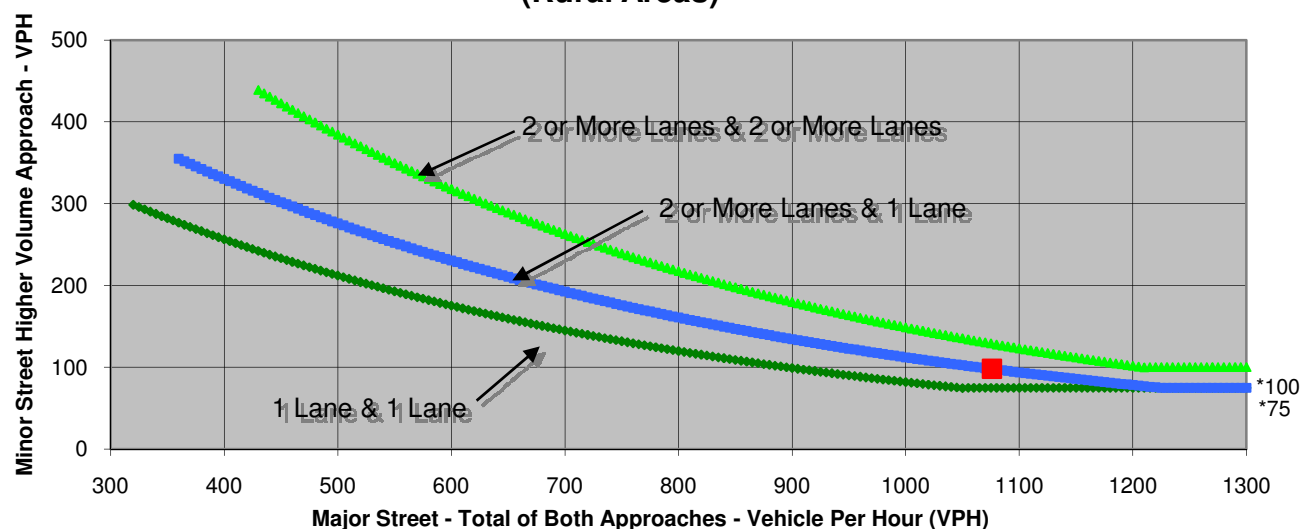
Turn Movement Volumes

	NB	SB	EB	WB
Left	72	0	0	65
Through	0	0	381	529
Right	26	0	101	0
Total	98	0	482	594

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Lathrop Road	McKinley Avenue	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,076	98	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Frontage Road (West)
Minor Street SR 99 SB Ramps

Sheet No 8 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

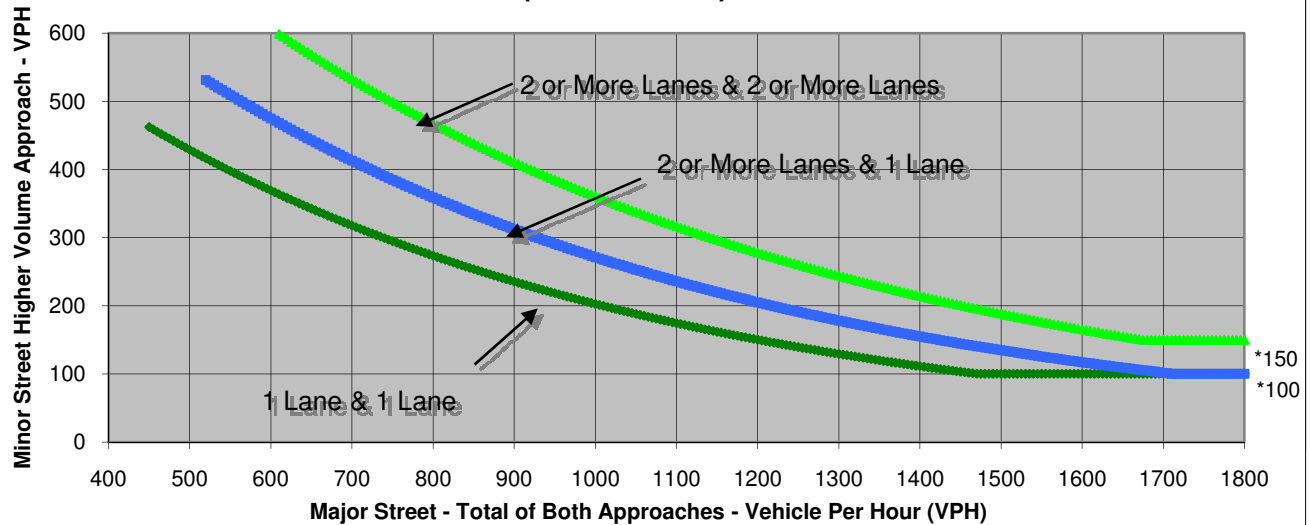
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	18	0	137
Through	54	32	0	0
Right	263	0	0	3
Total	317	50	0	140

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Frontage Road (West)	Minor Street SR 99 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	367	140	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
Minor Street Frontage Road (West)

Sheet No 9 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

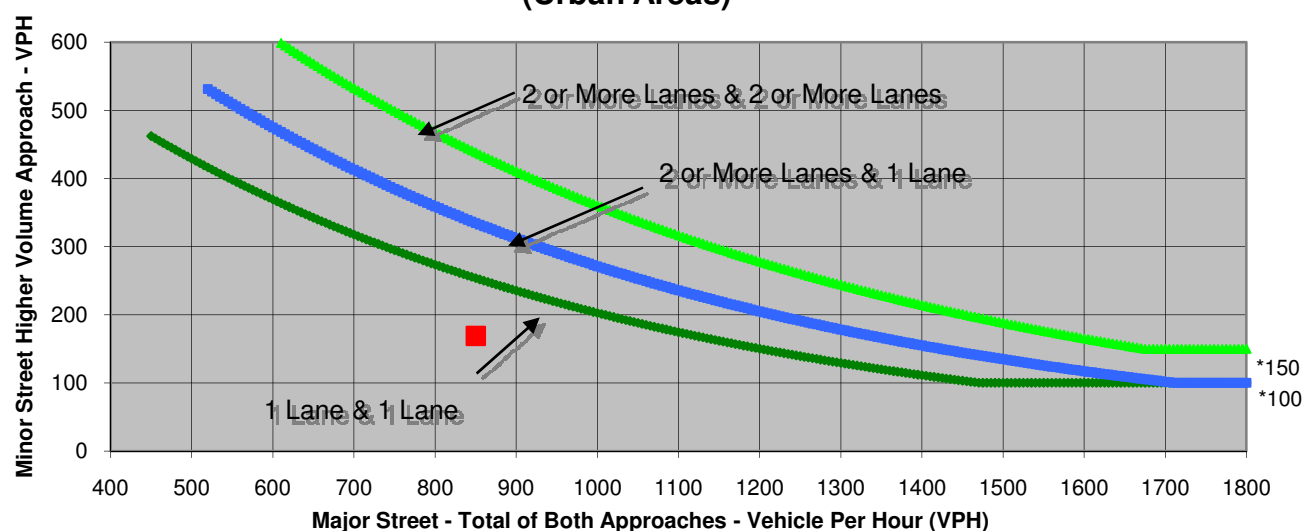
Turn Movement Volumes

	NB	SB	EB	WB
Left	42	44	185	78
Through	49	27	199	232
Right	23	98	73	83
Total	114	169	457	393

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Lathrop Road	Frontage Road (West)	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	850	169	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Frontage Road (East)
Minor Street SR 99 NB Ramps

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

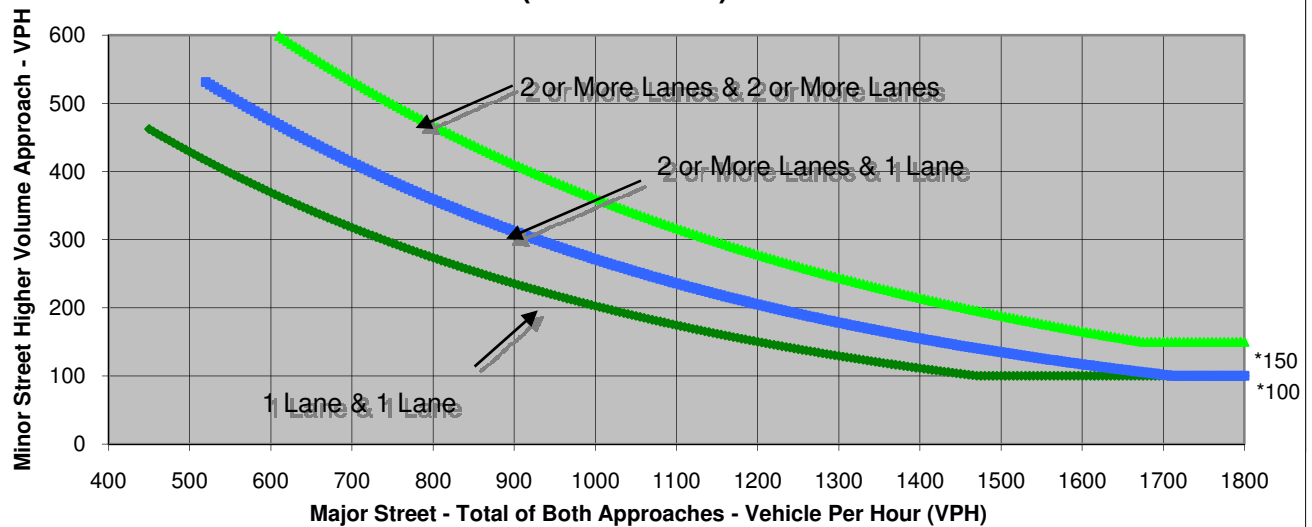
Turn Movement Volumes

	NB	SB	EB	WB
Left	210	0	23	0
Through	33	61	0	0
Right	0	5	212	0
Total	243	66	235	0

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: California Manual on Uniform Traffic Control Devices, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Frontage Road (East)	SR 99 NB Ramps	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	309	235	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Lathrop Road
Minor Street Frontage Road (East)

Sheet No 11 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

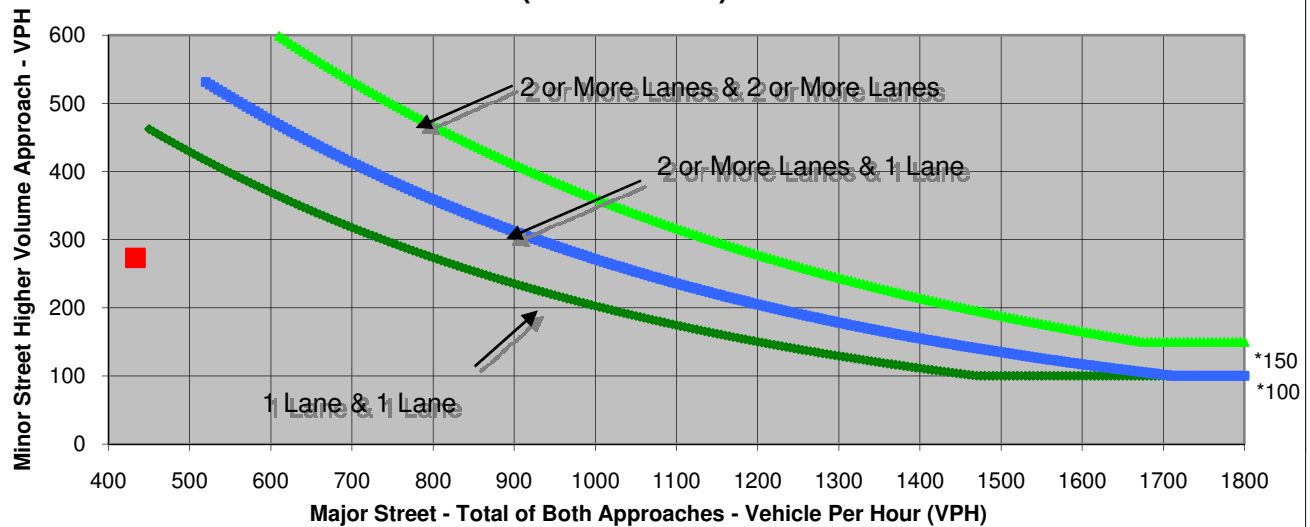
Turn Movement Volumes

	NB	SB	EB	WB
Left	42	15	148	1
Through	38	16	77	109
Right	2	242	41	57
Total	82	273	266	167

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street Frontage Road (East)	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	433	273	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Airport Way
Minor Street Hastings Drive

Sheet No 12 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour AM

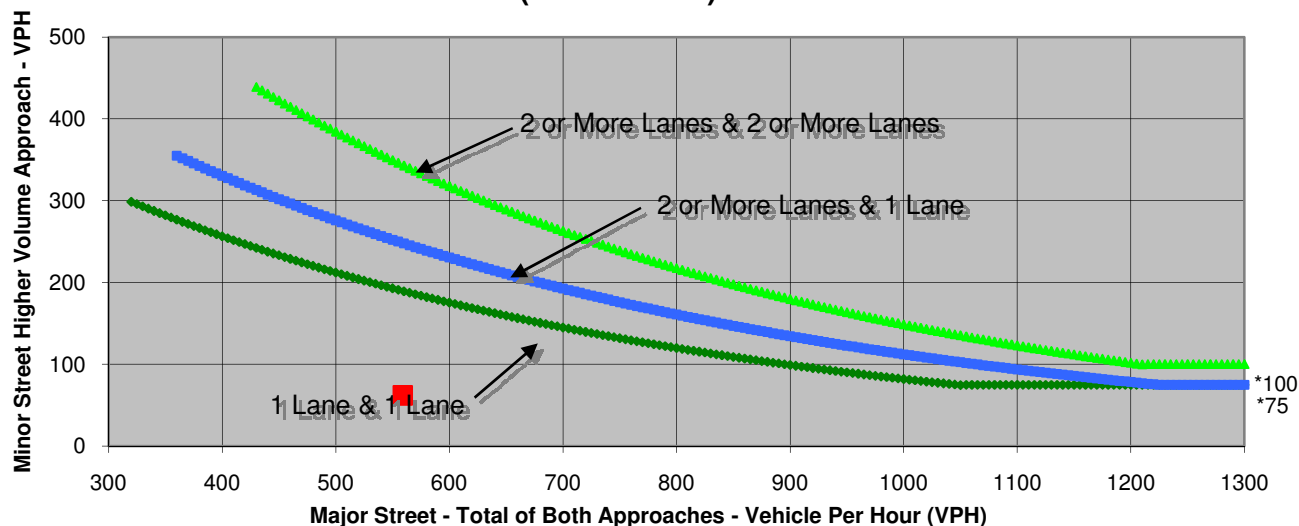
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	8	0	27
Through	338	207	0	0
Right	6	0	0	35
Total	344	215	0	62

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Airport Way	Hastings Drive	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	559	62	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Roth Road
Minor Street I-5 SB Ramps

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour PM

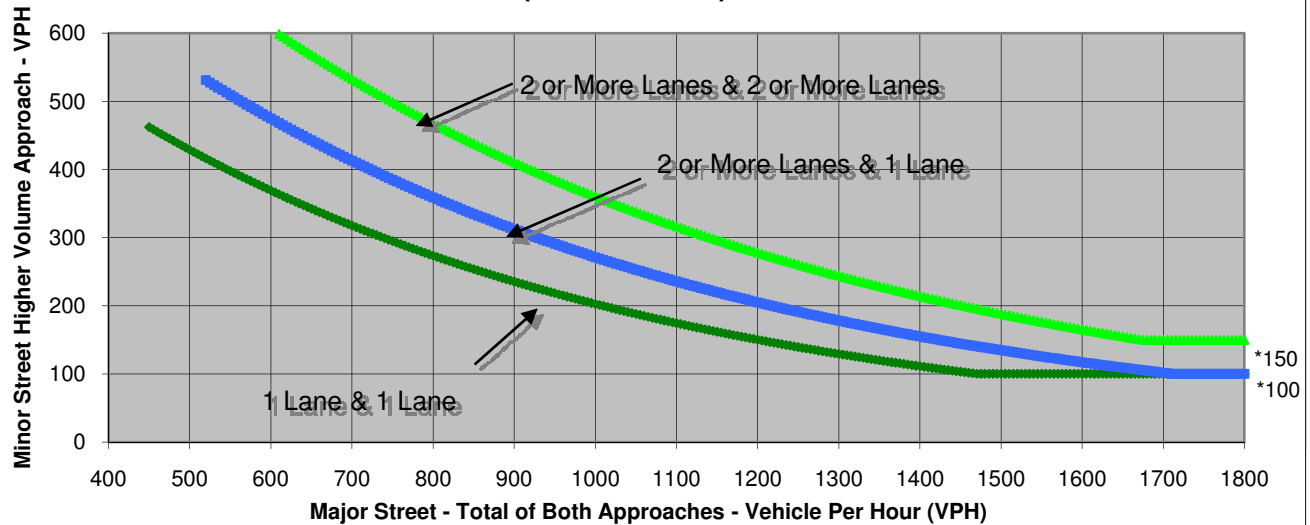
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	210	0	142
Through	0	2	42	23
Right	0	10	4	0
Total	0	222	46	165

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	211	222	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Plus Project Conditions**
Peak Hour **PM**

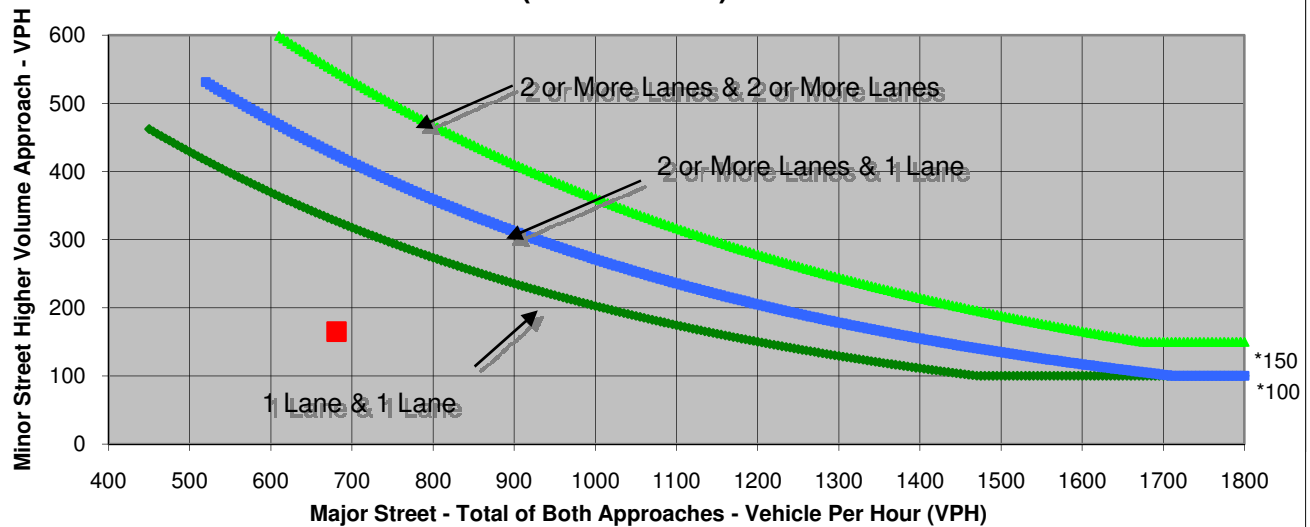
Turn Movement Volumes

	NB	SB	EB	WB
Left	17	0	28	0
Through	2	0	224	148
Right	146	0	0	281
Total	165	0	252	429

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	681	165	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**
Minor Street **Harlan Road**

Project **Centerpoint Intermodal Center**
Scenario **Existing Plus Project Conditions**
Peak Hour **PM**

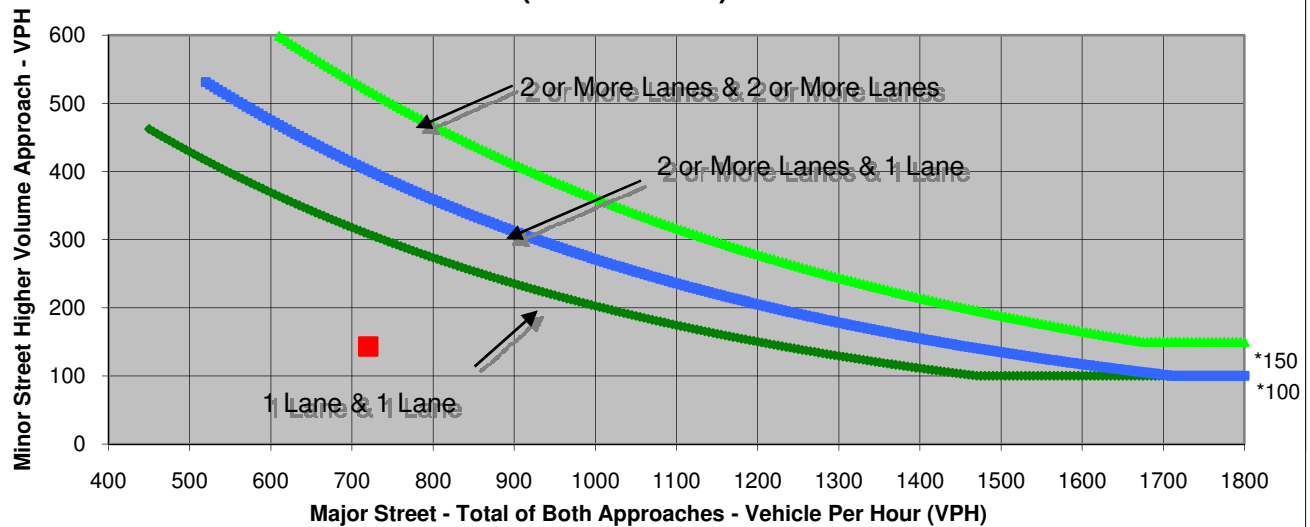
Turn Movement Volumes

	NB	SB	EB	WB
Left	64	28	71	37
Through	43	36	241	288
Right	36	77	58	25
Total	143	141	370	350

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	720	143	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
Minor Street UPRR Driveway

Sheet No 4 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour PM

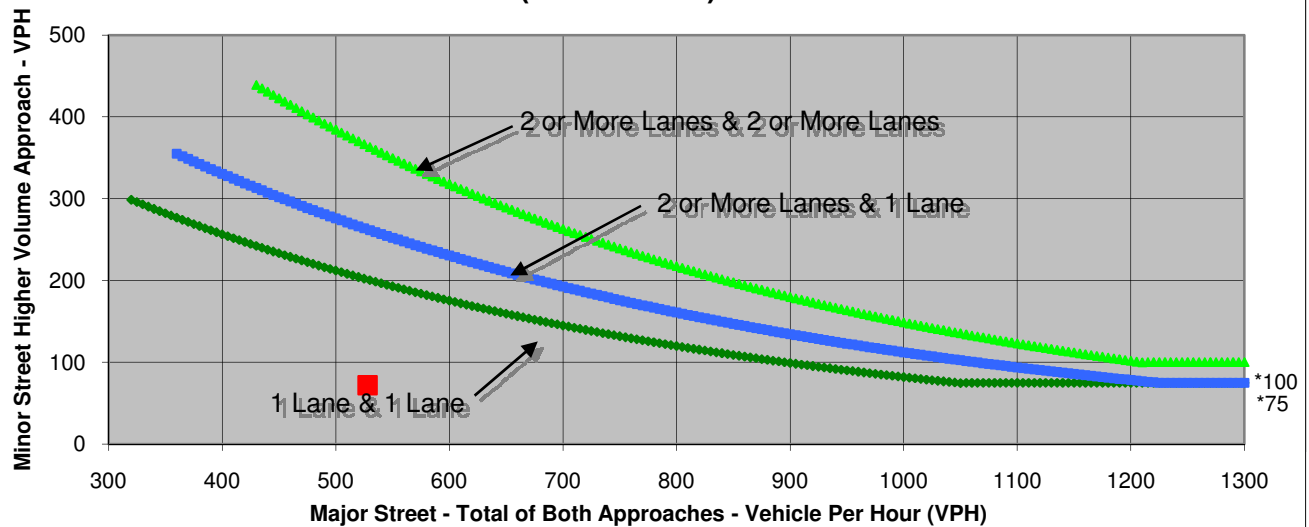
Turn Movement Volumes

	NB	SB	EB	WB
Left	50	0	0	8
Through	0	0	243	218
Right	22	0	59	0
Total	72	0	302	226

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street UPRR Driveway	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	528	72	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
 Minor Street I-5 SB Ramps

Sheet No 5 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Plus Project Conditions
 Peak Hour PM

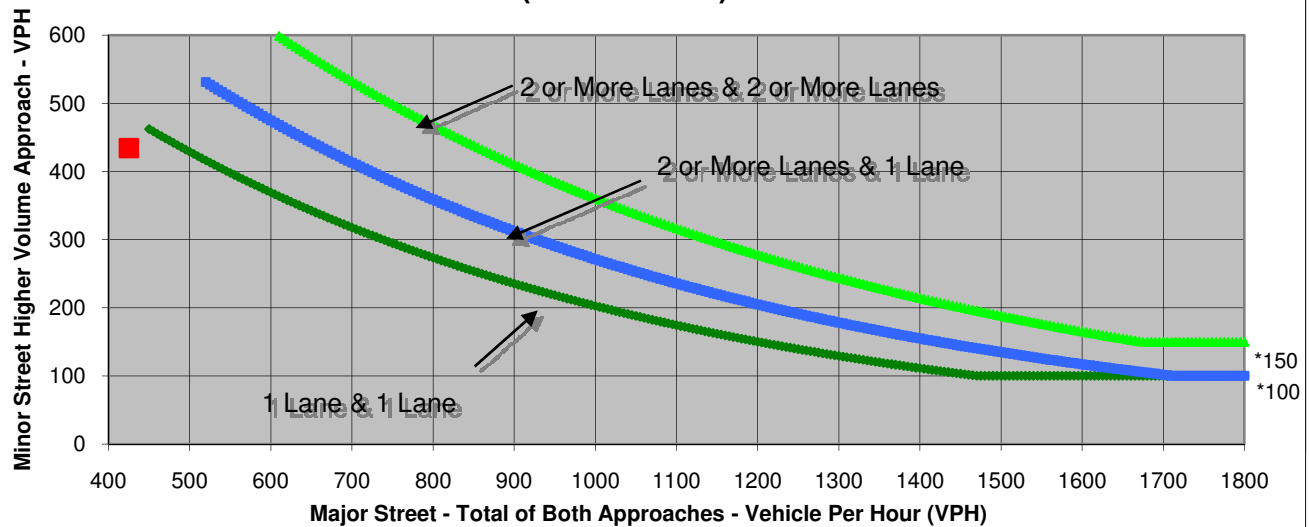
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	420	0	218
Through	0	5	115	75
Right	0	9	17	0
Total	0	434	132	293

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	425	434	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Existing Plus Project Conditions**
Peak Hour **PM**

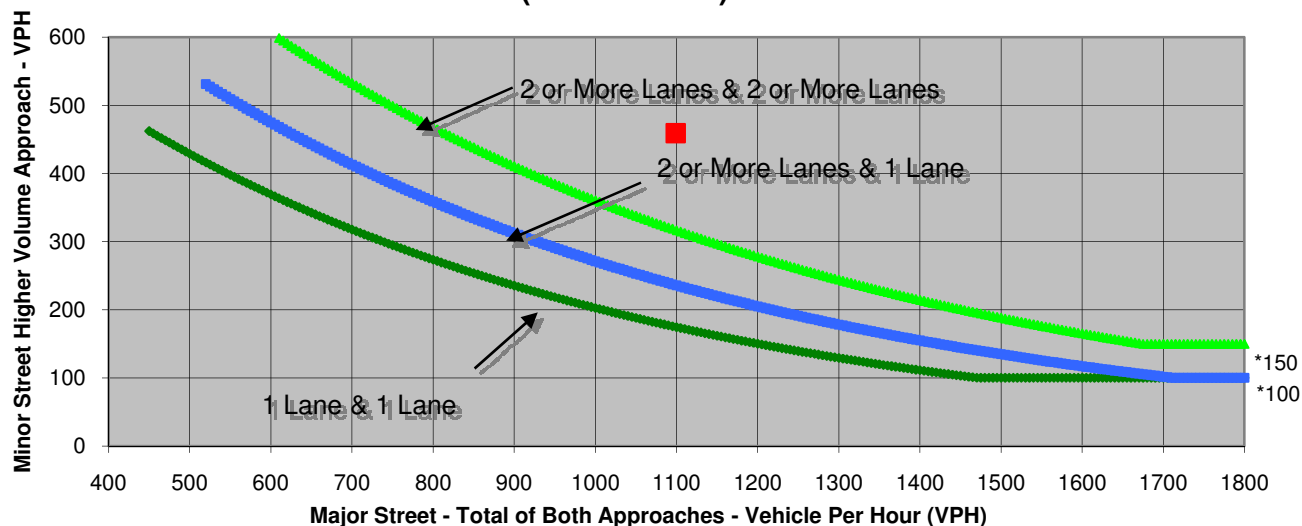
Turn Movement Volumes

	NB	SB	EB	WB
Left	12	0	7	0
Through	3	0	528	281
Right	444	0	0	283
Total	459	0	535	564

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Lathrop Road	I-5 NB Ramps	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,099	459	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Lathrop Road
Minor Street McKinley Avenue

Sheet No 7 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour PM

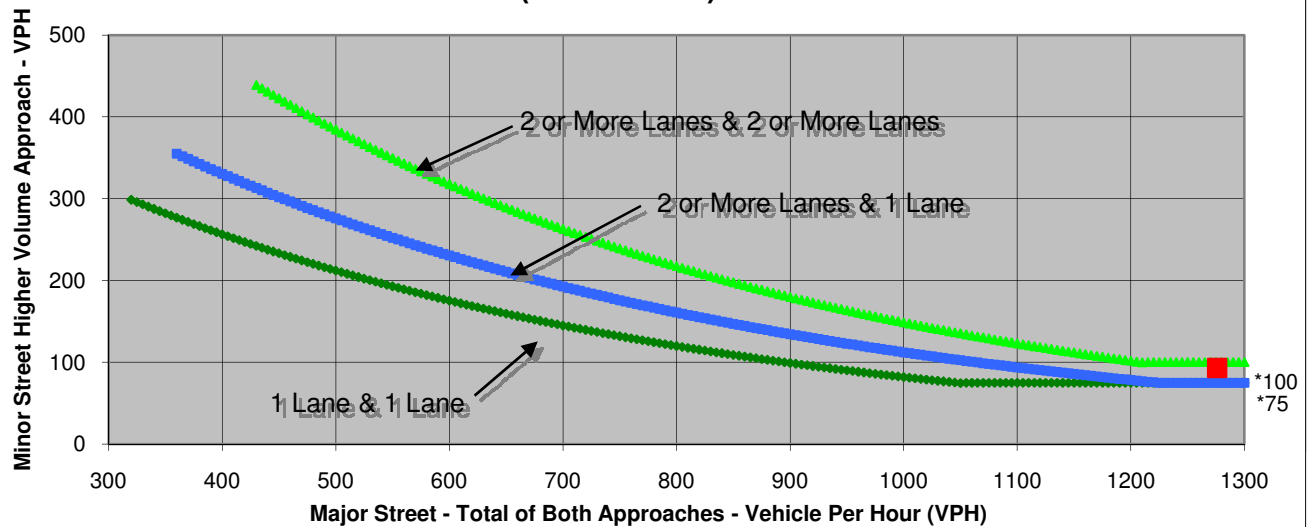
Turn Movement Volumes

	NB	SB	EB	WB
Left	51	0	0	18
Through	0	0	751	466
Right	42	0	41	0
Total	93	0	792	484

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street McKinley Avenue	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,276	93	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Frontage Road (West)**
 Minor Street **SR 99 SB Ramps**

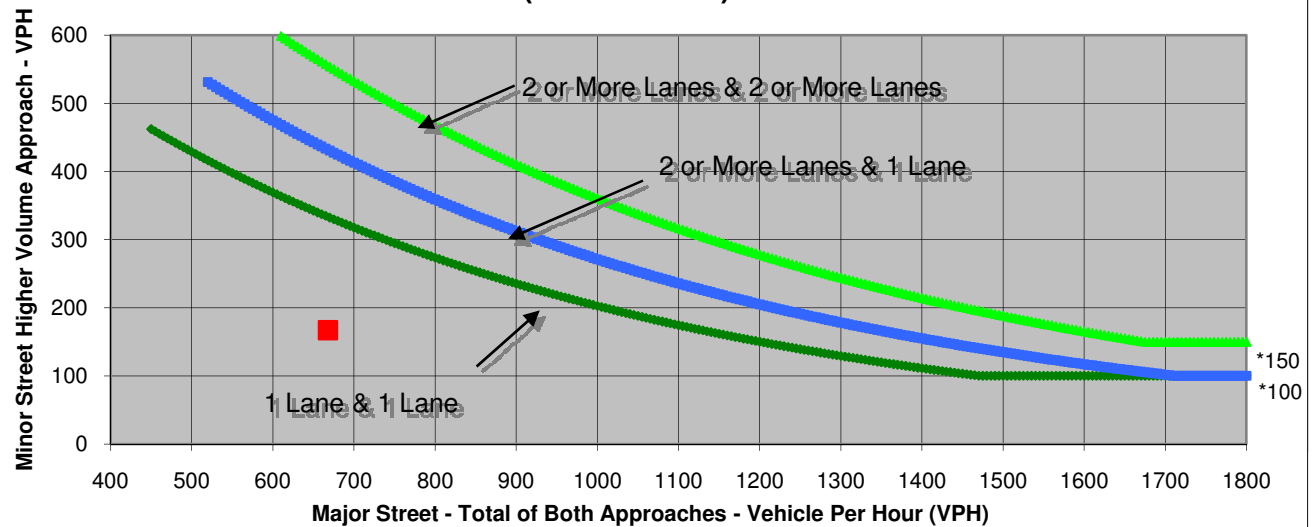
 Project **Centerpoint Intermodal Center**
 Scenario **Existing Plus Project Conditions**
 Peak Hour **PM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	100	0	167
Through	34	211	0	0
Right	323	0	0	0
Total	357	311	0	167

Major Street Direction

x	North/South
	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Frontage Road (West)	SR 99 SB Ramps	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	668	167	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **Frontage Road (West)**

Project **Centerpoint Intermodal Center**
Scenario **Existing Plus Project Conditions**
Peak Hour **PM**

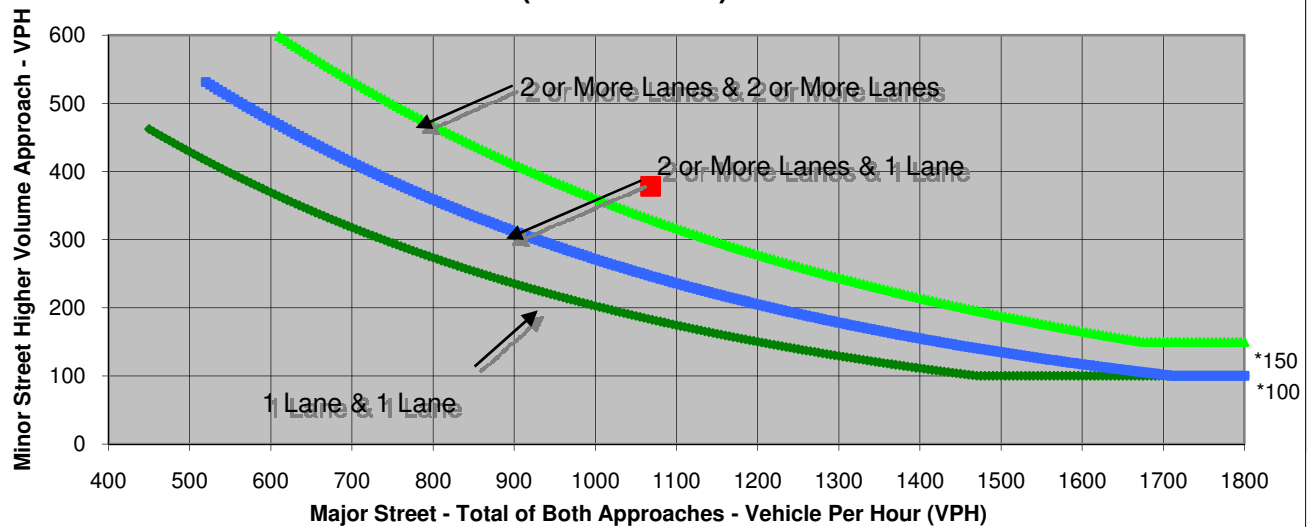
Turn Movement Volumes

	NB	SB	EB	WB
Left	60	73	233	96
Through	58	152	265	323
Right	26	153	85	66
Total	144	378	583	485

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street Frontage Road (West)	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,068	378	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Frontage Road (East)
Minor Street SR 99 NB Ramps

Sheet No 10 of 12

Project Centerpoint Intermodal Center
Scenario Existing Plus Project Conditions
Peak Hour PM

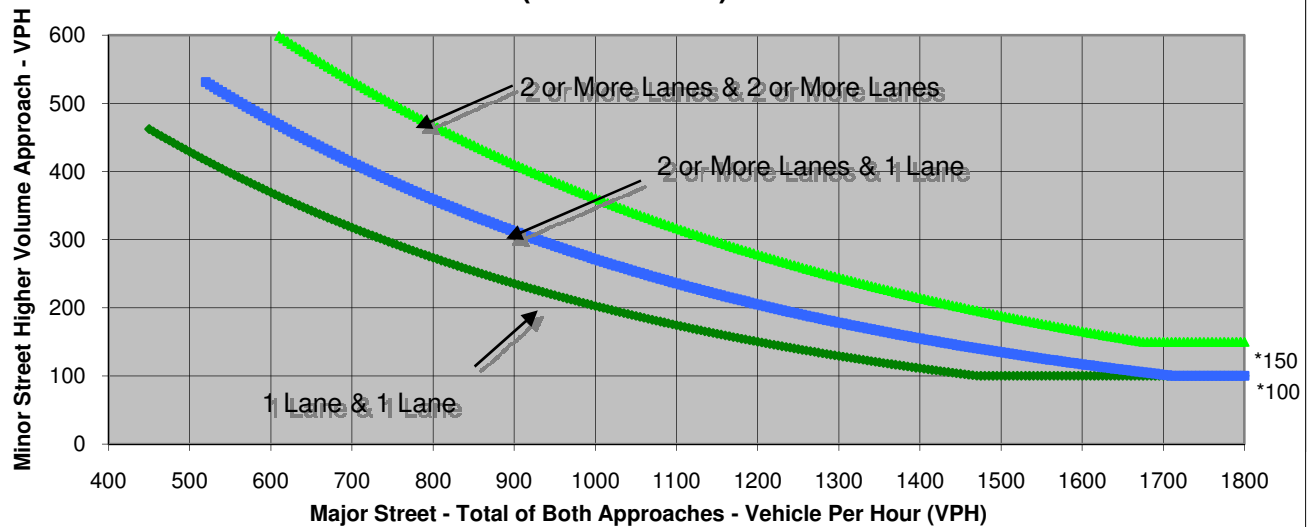
Turn Movement Volumes

	NB	SB	EB	WB
Left	129	0	39	0
Through	64	99	0	0
Right	0	5	243	0
Total	193	104	282	0

Major Street Direction

x	North/South
	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Frontage Road (East)	Minor Street SR 99 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	297	282	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
 Minor Street Frontage Road (East)

Sheet No 11 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Plus Project Conditions
 Peak Hour PM

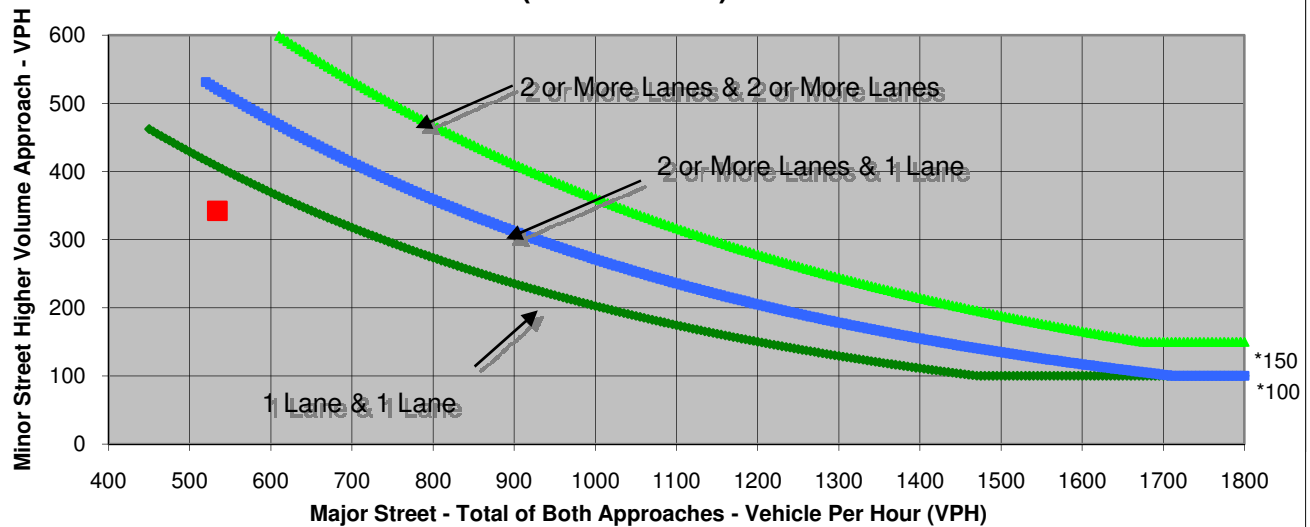
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	31	131	3
Through	27	38	149	132
Right	2	273	84	35
Total	109	342	364	170

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street Frontage Road (East)	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	534	342	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Airport Way
 Minor Street Hastings Drive

Sheet No 12 of 12

Project Centerpoint Intermodal Center
 Scenario Existing Plus Project Conditions
 Peak Hour PM

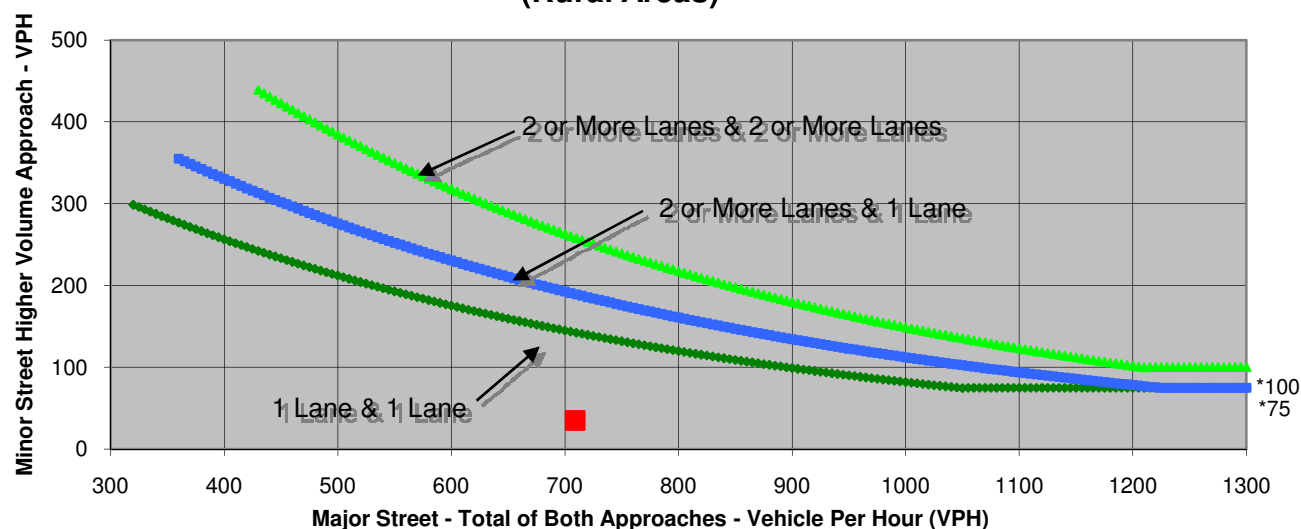
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	35	0	20
Through	259	376	0	0
Right	39	0	0	15
Total	298	411	0	35

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Airport Way	Hastings Drive	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	709	35	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Peak Hour Ramp Junction Analysis

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Existing Plus CIC
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information				Freeway Data				Freeway Volume Adjustment										On-Ramp	
Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane		PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Type
1	I-5 NB	Roth Road	AM	3	65.0	3,442	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,016	Right
2	I-5 SB	Roth Road	AM	3	65.0	3,317	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,870	Right
3	I-5 NB	Roth Road	PM	3	65.0	3,613	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,215	Right
4	I-5 SB	Roth Road	PM	3	65.0	3,569	No	0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,164	Right

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Input Data						On-Ramp Volume Adjustment										
Freeway/ Direction	On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	
1 I-5 NB	Roth Road	1	45.0	222	450	0	450	0.9	Level			34.0%	0.0%	1.5	1.2	0.85	1.00	289	
2 I-5 SB	Roth Road	1	45.0	143	550	0	550	0.95	Level			34.0%	0.0%	1.5	1.2	0.85	1.00	176	
3 I-5 NB	Roth Road	1	45.0	311	450	0	450	0.95	Level			31.0%	0.0%	1.5	1.2	0.87	1.00	378	
4 I-5 SB	Roth Road	1	45.0	148	550	0	550	0.85	Level			31.0%	0.0%	1.5	1.2	0.87	1.00	201	
									</										

**HCM 2000
Merge Ramp Junctions
Capacity Analysis**

General Information

Freeway/ Direction		On-ramp	
1	I-5 NB	Roth Road	
2	I-5 SB	Roth Road	
3	I-5 NB	Roth Road	
4	I-5 SB	Roth Road	

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation						
	Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			P_{FM}	v_{12} (pcph)
			25-2	25-3	1	2	3		
1	I-5 NB	Roth Road			0.590			0.590	2,370
2	I-5 SB	Roth Road			0.593			0.593	2,294
3	I-5 NB	Roth Road			0.590			0.590	2,487
4	I-5 SB	Roth Road			0.593			0.593	2,469

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
Freeway/ Direction	On-ramp		V_{FI} (pcph)	Max V_{FI} (pcph)	LOS F?	V_{FO} (pcph)	Max V_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $V_{12}/2$?	V_{12a} (pcph)	V_{R12a} (pcph)	Max V_{R12a} (pcph)	LOS F?	V_R (pcph)	Max V_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,016	7,200	No	4,304	7,200	No	1,646	No	No	2,370	2,658	4,600	No	289	2,100	No
2	I-5 SB	Roth Road	3,870	7,200	No	4,046	7,200	No	1,575	No	No	2,294	2,471	4,600	No	176	2,100	No
3	I-5 NB	Roth Road	4,215	7,200	No	4,593	7,200	No	1,728	No	No	2,487	2,865	4,600	No	378	2,100	No
4	I-5 SB	Roth Road	4,164	7,200	No	4,365	7,200	No	1,695	No	No	2,469	2,670	4,600	No	201	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	23.3	C	0.336	57.3	60.9	58.6
2	I-5 SB	Roth Road	21.2	C	0.318	57.7	61.1	59.0
3	I-5 NB	Roth Road	24.8	C	0.349	57.0	60.6	58.3
4	I-5 SB	Roth Road	22.8	C	0.328	57.5	60.7	58.7

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Existing Plus CIC
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information

Freeway Data

Freeway Volume Adjustment

Freeway/ Direction			Analysis Time Period	S _{FF} (mph)	V (vph)	HOV Lane					Grade %	Length (mi)	Truck/ Bus %		RV %		E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)
		Off-ramp		Lanes			HOV Lane?	Volume	PHF	Terrain											
1	I-5 NB	Roth Road	AM	3	65.0	3,625	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00		4,229	
2	I-5 SB	Roth Road	AM	3	65.0	3,567	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00		4,162	
3	I-5 NB	Roth Road	PM	3	65.0	3,778	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00		4,408	
4	I-5 SB	Roth Road	PM	3	65.0	3,791	No		0.9	Level			10.0%	0.0%	1.5	1.2	0.95	1.00		4,423	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Effective	Off-Ramp Data						Off-Ramp Volume Adjustment											Flow Rate
Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)		Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_p	Flow Rate v_p (pcph)
1	I-5 NB	Roth Road	4,229	Right	1	45.0	183	150		150	0.9	Level			34.0%		1.5	1.2	0.85	1.00	238
2	I-5 SB	Roth Road	4,162	Right	1	45.0	250	150		150	0.8	Level			34.0%		1.5	1.2	0.85	1.00	366
3	I-5 NB	Roth Road	4,408	Right	1	45.0	165	150		150	0.85	Level			31.0%		1.5	1.2	0.87	1.00	224
4	I-5 SB	Roth Road	4,423	Right	1	45.0	222	150		150	0.8	Level			31.0%		1.5	1.2	0.87	1.00	321

**HCM 2000
Diverge Ramp Junctions
Capacity Analysis**

General Information

	Freeway/ Direction	Off-ramp
1	I-5 NB	Roth Road
2	I-5 SB	Roth Road
3	I-5 NB	Roth Road
4	I-5 SB	Roth Road

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation			
	Freeway/ Direction	Off-ramp	L_{EQ}		P_{FD}	v_{12} (pcph)
			25-13	25-14		
1	I-5 NB	Roth Road			0.643	2,806
2	I-5 SB	Roth Road			0.639	2,792
3	I-5 NB	Roth Road			0.639	2,900
4	I-5 SB	Roth Road			0.635	2,924

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks														
Freeway/ Direction	Off-ramp		V_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $v_{12}/2$?	V_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,229	7,200	No	1,424	No	No	2,806	4,400	No	3,991	7,200	No	238	2,100	No
2	I-5 SB	Roth Road	4,162	7,200	No	1,370	No	No	2,792	4,400	No	3,796	7,200	No	366	2,100	No
3	I-5 NB	Roth Road	4,408	7,200	No	1,508	No	No	2,900	4,400	No	4,183	7,200	No	224	2,100	No
4	I-5 SB	Roth Road	4,423	7,200	No	1,499	No	No	2,924	4,400	No	4,102	7,200	No	321	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results	Speed Estimation				
	Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	27.0	C	0.319	57.7	69.7	61.2
2	I-5 SB	Roth Road	26.9	C	0.331	57.4	69.9	61.0
3	I-5 NB	Roth Road	27.8	C	0.318	57.7	69.3	61.2
4	I-5 SB	Roth Road	28.1	D	0.327	57.5	69.4	61.0

Technical Appendix C
Cumulative No Project Conditions

Peak Hour Intersection Operation Analysis

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1570	1792	1468	1570	1792	1524	1703	3128		1641	1652	1404
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1570	1792	1468	1570	1792	1524	1703	3128		1641	1652	1404
Volume (vph)	90	230	40	50	290	150	80	590	120	200	270	60
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	95	242	42	56	322	167	87	641	130	222	300	67
RTOR Reduction (vph)	0	0	30	0	0	0	0	14	0	0	0	41
Lane Group Flow (vph)	95	242	12	56	322	167	87	757	0	222	300	26
Heavy Vehicles (%)	15%	6%	10%	15%	6%	6%	6%	13%	10%	10%	15%	15%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	7.5	25.3	25.3	4.5	22.3	86.0	7.1	27.2		13.0	33.1	33.1
Effective Green, g (s)	7.5	25.3	25.3	4.5	22.3	86.0	7.1	27.2		13.0	33.1	33.1
Actuated g/C Ratio	0.09	0.29	0.29	0.05	0.26	1.00	0.08	0.32		0.15	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	137	527	432	82	465	1524	141	989		248	636	540
v/s Ratio Prot	c0.06	0.14		0.04	c0.18		0.05	c0.24		c0.14	0.18	
v/s Ratio Perm			0.01			c0.11						0.02
v/c Ratio	0.69	0.46	0.03	0.68	0.69	0.11	0.62	0.77		0.90	0.47	0.05
Uniform Delay, d1	38.1	24.8	21.6	40.0	28.8	0.0	38.1	26.5		35.8	19.9	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	14.1	0.6	0.0	20.9	4.4	0.1	7.8	3.6		30.9	0.6	0.0
Delay (s)	52.3	25.4	21.6	61.0	33.2	0.1	45.9	30.1		66.7	20.4	16.6
Level of Service	D	C	C	E	C	A	D	C		E	C	B
Approach Delay (s)		31.7			25.9			31.7			37.4	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			31.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			86.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			64.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↱	↑↑					↱	↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	110	10	220	40	0	0	0	0	380	10	340
Peak Hour Factor	0.80	0.80	0.80	0.95	0.95	0.95	0.25	0.25	0.25	0.92	0.92	0.92
Hourly flow rate (vph)	0	138	12	232	42	0	0	0	0	413	11	370
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	42			150			1003	649	75	574	655	21
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	42			150			1003	649	75	574	655	21
tC, single (s)	4.2			4.7			7.5	6.5	6.9	8.1	6.6	7.0
tC, 2 stage (s)												
tF (s)	2.3			2.5			3.5	4.0	3.3	3.8	4.1	3.4
p0 queue free %	100			81			100	100	100	0	96	64
cM capacity (veh/h)	1536			1235			105	315	971	294	305	1038
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	92	58	232	21	21	275	518					
Volume Left	0	0	232	0	0	275	138					
Volume Right	0	12	0	0	0	0	370					
cSH	1700	1700	1235	1700	1700	294	603					
Volume to Capacity	0.05	0.03	0.19	0.01	0.01	0.94	0.86					
Queue Length 95th (ft)	0	0	17	0	0	226	240					
Control Delay (s)	0.0	0.0	8.6	0.0	0.0	76.1	36.9					
Lane LOS			A			F	E					
Approach Delay (s)	0.0		7.3			50.5						
Approach LOS						F						
Intersection Summary												
Average Delay			34.6									
Intersection Capacity Utilization			46.8%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

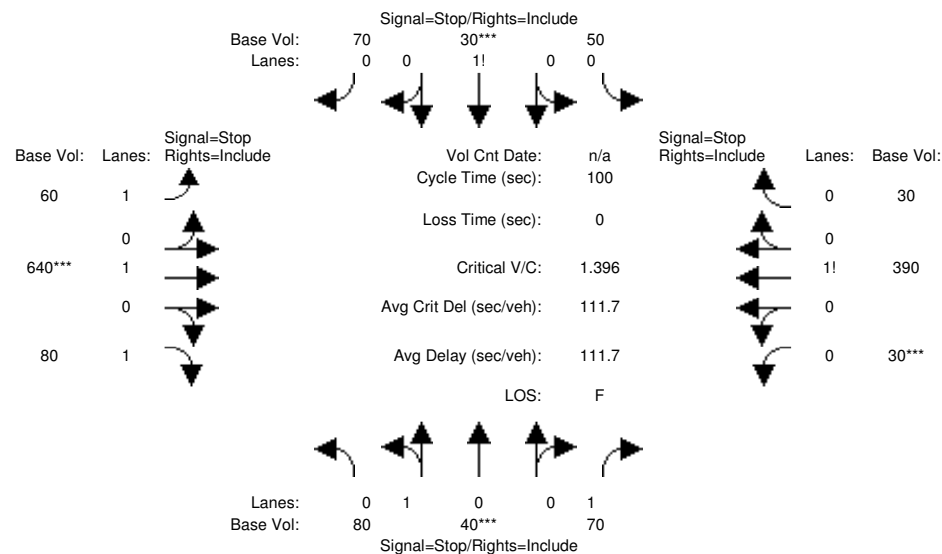
3: Roth Road & NB I-5 Ramps

7/14/2010

																			
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR							
Lane Configurations																			
Sign Control	Free			Free			Stop			Stop									
Grade	0%			0%			0%			0%									
Volume (veh/h)	90	400	0	0	240	300	20	10	380	0	0	0							
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.25	0.25	0.25							
Hourly flow rate (vph)	100	444	0	0	261	326	22	11	413	0	0	0							
Pedestrians																			
Lane Width (ft)																			
Walking Speed (ft/s)																			
Percent Blockage																			
Right turn flare (veh)									18										
Median type									None	None									
Median storage veh																			
Upstream signal (ft)																			
pX, platoon unblocked																			
vC, conflicting volume	587			444			775	1231	222	852	1068	293							
vC1, stage 1 conf vol																			
vC2, stage 2 conf vol																			
vCu, unblocked vol	587			444			775	1231	222	852	1068	293							
tC, single (s)	4.2			4.1			7.6	6.6	7.5	7.5	6.5	6.9							
tC, 2 stage (s)																			
tF (s)	2.3			2.2			3.6	4.1	3.6	3.5	4.0	3.3							
p0 queue free %	90			100			92	93	41	100	100	100							
cM capacity (veh/h)	957			1112			258	153	697	90	197	703							
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1													
Volume Total	100	222	222	174	413	446													
Volume Left	100	0	0	0	0	22													
Volume Right	0	0	0	0	326	413													
cSH	957	1700	1700	1700	1700	752													
Volume to Capacity	0.10	0.13	0.13	0.10	0.24	0.59													
Queue Length 95th (ft)	9	0	0	0	0	99													
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	17.9													
Lane LOS	A					C													
Approach Delay (s)	1.7			0.0			17.9												
Approach LOS							C												
Intersection Summary																			
Average Delay				5.6															
Intersection Capacity Utilization				46.8%	ICU Level of Service				A										
Analysis Period (min)				15															

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #1: Roth Road / Harlan Road Cumulative No Project AM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Volume Module:												
Base Vol:	80	40	70	50	30	70	60	640	80	30	390	30
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	80	40	70	50	30	70	60	640	80	30	390	30
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95	0.92	0.92	0.92
PHF Volume:	89	44	78	56	33	78	63	674	84	33	424	33
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	89	44	78	56	33	78	63	674	84	33	424	33
PCE 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
MLF 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
Final Volume:	89	44	78	56	33	78	63	674	84	33	424	33

Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.67	0.33	1.00	0.33	0.20	0.47	1.00	1.00	1.00	0.07	0.86	0.07
Final Sat.:	271	136	460	141	84	197	451	482	531	32	410	32

Capacity Analysis Module:												
Vol/Sat:	0.33	0.33	0.17	0.40	0.40	0.40	0.14	1.40	0.16	1.03	1.03	1.03
Crit Moves:	***	***	***	***	***	***	***	***	***	***	***	***
Delay/Veh:	15.6	15.6	11.9	16.7	16.7	16.7	12.0	212	10.7	78.3	78.3	78.3
Delay 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
AdjDel/Veh:	15.6	15.6	11.9	16.7	16.7	16.7	12.0	212	10.7	78.3	78.3	78.3
LOS by Move:	C	C	B	C	C	C	B	F	B	F	F	F
ApproachDel:	14.2	14.2	14.2	16.7	16.7	16.7	175.8	175.8	175.8	78.3	78.3	78.3
Delay 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
ApprAdjDel:	14.2	14.2	14.2	16.7	16.7	16.7	175.8	175.8	175.8	78.3	78.3	78.3
LOS by Appr:	B	B	B	C	C	C	F	F	F	F	F	F
AllWayAvgQ:	0.5	0.5	0.2	0.6	0.6	0.6	0.2	27.0	0.2	8.9	8.9	8.9

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Roth Road / Harlan Road Cumulative No Project AM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign	Stop Sign
Lanes:	0	1	0	0	1	0	0	1	0	0	1	0
Initial Vol:	80	40	70	50	30	70	60	640	80	30	390	30
Major Street Volume:	1230											
Minor Approach Volume:	190											
Minor Approach Volume Threshold:	285											

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Signalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	1.00	1.00	0.95	1.00	0.96	
Satd. Flow (prot)	1532	824	1043	1570	922	
Flt Permitted	1.00	1.00	0.95	1.00	0.96	
Satd. Flow (perm)	1532	824	1043	1570	922	
Volume (vph)	240	150	50	330	130	30
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.90	0.90
Adj. Flow (vph)	261	163	54	359	144	33
RTOR Reduction (vph)	0	122	0	0	13	0
Lane Group Flow (vph)	261	41	54	359	164	0
Heavy Vehicles (%)	24%	96%	73%	21%	98%	71%
Turn Type	Perm		Prot			
Protected Phases	4		3	8	2	
Permitted Phases	4					
Actuated Green, G (s)	10.0	10.0	2.1	16.1	15.8	
Effective Green, g (s)	10.0	10.0	2.1	16.1	15.8	
Actuated g/C Ratio	0.25	0.25	0.05	0.40	0.40	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	384	207	55	634	365	
v/s Ratio Prot	0.17		c0.05	c0.23	c0.18	
v/s Ratio Perm		0.05				
v/c Ratio	0.68	0.20	0.98	0.57	0.45	
Uniform Delay, d1	13.5	11.8	18.9	9.2	8.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.7	0.5	114.3	1.2	0.9	
Delay (s)	18.2	12.3	133.2	10.4	9.7	
Level of Service	B	B	F	B	A	
Approach Delay (s)	15.9			26.4	9.7	
Approach LOS	B			C	A	
Intersection Summary						
HCM Average Control Delay			19.1	HCM Level of Service		B
HCM Volume to Capacity ratio			0.51			
Actuated Cycle Length (s)			39.9	Sum of lost time (s)		8.0
Intersection Capacity Utilization			35.0%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

7/14/2010

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1308	1468	1570	1792	1652	1196
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1308	1468	1570	1792	1652	1196
Volume (vph)	210	60	120	580	200	260
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.92	0.92
Adj. Flow (vph)	233	67	126	611	217	283
RTOR Reduction (vph)	0	51	0	0	0	164
Lane Group Flow (vph)	233	16	126	611	217	119
Heavy Vehicles (%)	38%	10%	15%	6%	15%	35%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	11.7	11.7	5.3	30.3	21.0	21.0
Effective Green, g (s)	11.7	11.7	5.3	30.3	21.0	21.0
Actuated g/C Ratio	0.23	0.23	0.11	0.61	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	306	344	166	1086	694	502
v/s Ratio Prot	c0.18		c0.08	c0.34	0.13	
v/s Ratio Perm		0.01				0.10
v/c Ratio	0.76	0.05	0.76	0.56	0.31	0.24
Uniform Delay, d1	17.8	14.8	21.7	5.9	9.7	9.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.7	0.1	17.9	0.7	0.3	0.2
Delay (s)	28.5	14.9	39.6	6.6	9.9	9.6
Level of Service	C	B	D	A	A	A
Approach Delay (s)	25.5			12.2	9.7	
Approach LOS	C			B	A	
Intersection Summary						
HCM Average Control Delay			14.0		HCM Level of Service	B
HCM Volume to Capacity ratio			0.62			
Actuated Cycle Length (s)			50.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			48.8%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	T	L	R
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		0.95	1.00	1.00	1.00
Frt	0.95		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1716		3312	1583	1770	1727
Flt Permitted	0.97		1.00	1.00	0.95	1.00
Satd. Flow (perm)	1716		3312	1583	1770	1727
Volume (vph)	260	150	820	90	60	560
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.92	0.92
Adj. Flow (vph)	289	167	863	95	65	609
RTOR Reduction (vph)	30	0	0	57	0	0
Lane Group Flow (vph)	426	0	863	38	65	609
Heavy Vehicles (%)	2%	2%	9%	2%	2%	10%
Turn Type			Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases			2			
Actuated Green, G (s)	17.7		21.3	21.3	2.8	28.1
Effective Green, g (s)	17.7		21.3	21.3	2.8	28.1
Actuated g/C Ratio	0.33		0.40	0.40	0.05	0.52
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	565		1311	627	92	902
v/s Ratio Prot	c0.25		0.26		0.04	c0.35
v/s Ratio Perm			0.02			
v/c Ratio	0.75		0.66	0.06	0.71	0.68
Uniform Delay, d1	16.1		13.3	10.1	25.1	9.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.7		1.2	0.0	21.8	2.0
Delay (s)	21.8		14.5	10.1	46.9	11.5
Level of Service	C		B	B	D	B
Approach Delay (s)	21.8		14.0			14.9
Approach LOS	C		B			B
Intersection Summary						
HCM Average Control Delay			16.0		HCM Level of Service	B
HCM Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			53.8		Sum of lost time (s)	8.0
Intersection Capacity Utilization			59.7%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	960	440	440	1490	0	0	0	0	290	10	1020
Peak Hour Factor	0.95	0.95	0.95	0.98	0.98	0.98	0.25	0.25	0.25	0.95	0.95	0.95
Hourly flow rate (vph)	0	1011	463	449	1520	0	0	0	0	305	11	1074
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None				None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked	0.52						0.52	0.52		0.52	0.52	0.52
vC, conflicting volume	1520			1474			4739	3660	1242	3660	3892	1520
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1995			1474			8149	6086	1242	6086	6529	1995
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			1			0	100	100	0	0	0
cM capacity (veh/h)	149			454			0	0	212	0	0	39
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	1474	449	1520	1389								
Volume Left	0	449	0	305								
Volume Right	463	0	0	1074								
cSH	1700	454	1700	0								
Volume to Capacity	0.87	0.99	0.89	Err								
Queue Length 95th (ft)	0	316	0	Err								
Control Delay (s)	0.0	69.7	0.0	Err								
Lane LOS		F		F								
Approach Delay (s)	0.0	15.9		Err								
Approach LOS				F								
Intersection Summary												
Average Delay		2881.4										
Intersection Capacity Utilization		315.6%		ICU Level of Service						H		
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free				Stop		Stop	
Grade	0%				0%				0%		0%	
Volume (veh/h)	550	700	0	0	1300	580	630	10	360	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.98	0.98	0.98	0.95	0.95	0.95	0.25	0.25	0.25
Hourly flow rate (vph)	579	737	0	0	1327	592	663	11	379	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.41							0.41	0.41			0.41
vC, conflicting volume	1918			737				3517	3813	737	3901	3517
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3249			737				7164	7888	737	8105	7164
tC, single (s)	4.1			4.1				7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0
p0 queue free %	0			100				0	0	9	0	0
cM capacity (veh/h)	37			864				0	0	417	0	0
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	579	737	1918	1053								
Volume Left	579	0	0	663								
Volume Right	0	0	592	379								
cSH	37	1700	1700	0								
Volume to Capacity	15.70	0.43	1.13	Err								
Queue Length 95th (ft)	Err	0	0	Err								
Control Delay (s)	6822.3	0.0	0.0	Err								
Lane LOS	F			F								
Approach Delay (s)	3001.8		0.0	Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			315.6%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.92		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3450		1752	1845	1568	1752	3210		1752	3129	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3450		1752	1845	1568	1752	3210		1752	3129	
Volume (vph)	110	850	100	60	1550	60	230	40	50	60	40	100
Peak-hour factor, PHF	0.95	0.95	0.95	0.98	0.98	0.98	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	116	895	105	61	1582	61	256	44	56	80	53	133
RTOR Reduction (vph)	0	7	0	0	0	8	0	49	0	0	104	0
Lane Group Flow (vph)	116	993	0	61	1582	53	256	51	0	80	82	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	7.8	68.8		7.1	68.1	68.1	12.0	13.5		8.5	10.0	
Effective Green, g (s)	7.8	68.8		7.1	68.1	68.1	12.0	13.5		8.5	10.0	
Actuated g/C Ratio	0.07	0.60		0.06	0.60	0.60	0.11	0.12		0.07	0.09	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	120	2084		109	1103	937	185	380		131	275	
v/s Ratio Prot	c0.07	0.29		0.03	c0.86		c0.15	c0.02		0.05	c0.03	
v/s Ratio Perm						0.03						
v/c Ratio	0.97	0.48		0.56	1.43	0.06	1.38	0.13		0.61	0.30	
Uniform Delay, d1	52.9	12.5		51.9	22.9	9.5	51.0	45.0		51.1	48.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	71.0	0.8		6.1	200.7	0.1	202.6	0.2		8.2	0.6	
Delay (s)	123.9	13.3		58.0	223.6	9.6	253.6	45.1		59.3	49.3	
Level of Service	F	B		E	F	A	F	D		E	D	
Approach Delay (s)		24.8			210.0			195.0			52.3	
Approach LOS		C			F			F			D	
Intersection Summary												
HCM Average Control Delay		136.2				HCM Level of Service		F				
HCM Volume to Capacity ratio		1.25										
Actuated Cycle Length (s)		113.9				Sum of lost time (s)		16.0				
Intersection Capacity Utilization		118.1%				ICU Level of Service		H				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & Fifth Street

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.90		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3483		1752	1660		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3483		1752	1660		1752	1845	1568
Volume (vph)	20	760	20	20	1170	50	40	20	40	130	20	60
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	22	826	22	21	1232	53	50	25	50	162	25	75
RTOR Reduction (vph)	0	0	14	0	3	0	0	34	0	0	0	47
Lane Group Flow (vph)	22	826	8	21	1282	0	50	41	0	162	25	28
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	2.2	33.1	33.1	2.2	33.1		3.5	27.8		9.0	33.3	33.3
Effective Green, g (s)	2.2	33.1	33.1	2.2	33.1		3.5	27.8		9.0	33.3	33.3
Actuated g/C Ratio	0.02	0.38	0.38	0.02	0.38		0.04	0.32		0.10	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	44	1317	589	44	1309		70	524		179	697	593
v/s Ratio Prot	c0.01	0.24		0.01	c0.37		c0.03	c0.02		c0.09	0.01	
v/s Ratio Perm			0.01									0.02
v/c Ratio	0.50	0.63	0.01	0.48	0.98		0.71	0.08		0.91	0.04	0.05
Uniform Delay, d1	42.4	22.5	17.3	42.4	27.2		41.8	21.2		39.1	17.3	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.7	0.9	0.0	7.9	19.8		29.1	0.3		41.1	0.1	0.2
Delay (s)	51.1	23.4	17.3	50.3	47.0		70.9	21.4		80.2	17.4	17.5
Level of Service	D	C	B	D	D		E	C		F	B	B
Approach Delay (s)		23.9			47.0			41.2			56.2	
Approach LOS		C			D			D			E	
Intersection Summary												
HCM Average Control Delay			39.8			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			88.1			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			54.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	↵
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3439		1752	3505	1752	1568
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3439		1752	3505	1752	1568
Volume (vph)	830	120	80	1120	110	40
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.80	0.80
Adj. Flow (vph)	902	130	84	1179	138	50
RTOR Reduction (vph)	12	0	0	0	0	41
Lane Group Flow (vph)	1020	0	84	1179	138	9
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Turn Type			Prot			Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	36.2		5.2	45.4	11.1	11.1
Effective Green, g (s)	36.2		5.2	45.4	11.1	11.1
Actuated g/C Ratio	0.56		0.08	0.70	0.17	0.17
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1930		141	2467	302	270
v/s Ratio Prot	c0.30		0.05	c0.34	c0.08	
v/s Ratio Perm						0.01
v/c Ratio	0.53		0.60	0.48	0.46	0.03
Uniform Delay, d1	8.8		28.6	4.3	24.0	22.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		6.6	0.1	1.1	0.0
Delay (s)	9.1		35.2	4.4	25.1	22.3
Level of Service	A		D	A	C	C
Approach Delay (s)	9.1			6.5	24.3	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			8.9		HCM Level of Service	A
HCM Volume to Capacity ratio			0.52			
Actuated Cycle Length (s)			64.5		Sum of lost time (s)	12.0
Intersection Capacity Utilization			47.3%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	1845	1568	1752	1763		1752	1800		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	1845	1568	1752	1763		1752	1800		1752	1845	1568
Volume (vph)	160	440	160	110	640	270	170	520	100	40	400	440
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	174	478	174	120	696	293	189	578	111	44	444	489
RTOR Reduction (vph)	0	0	106	0	13	0	0	5	0	0	0	197
Lane Group Flow (vph)	174	478	68	120	976	0	189	684	0	44	444	292
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	10.0	47.0	47.0	15.0	52.0		13.0	38.0		4.8	29.8	29.8
Effective Green, g (s)	10.0	47.0	47.0	15.0	52.0		13.0	38.0		4.8	29.8	29.8
Actuated g/C Ratio	0.08	0.39	0.39	0.12	0.43		0.11	0.31		0.04	0.25	0.25
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	145	718	610	218	759		189	566		70	455	387
v/s Ratio Prot	c0.10	0.26		0.07	c0.55		0.11	c0.38		0.03	c0.24	
v/s Ratio Perm			0.04									0.19
v/c Ratio	1.20	0.67	0.11	0.55	1.29		1.00	1.21		0.63	0.98	0.75
Uniform Delay, d1	55.4	30.4	23.6	49.7	34.4		53.9	41.4		57.1	45.1	42.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	138.4	4.8	0.4	3.0	138.8		65.5	109.3		16.3	36.6	12.8
Delay (s)	193.8	35.3	23.9	52.7	173.2		119.4	150.7		73.5	81.7	54.9
Level of Service	F	D	C	D	F		F	F		E	F	D
Approach Delay (s)		66.3			160.2			143.9			67.9	
Approach LOS		E			F			F			E	
Intersection Summary												
HCM Average Control Delay			112.2			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.21									
Actuated Cycle Length (s)			120.8			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			109.1%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3505	1568	1752	1845	1568	1752	3271		1752	3399	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3505	1568	1752	1845	1568	1752	3271		1752	3399	
Volume (vph)	170	420	70	180	660	220	150	250	200	400	360	90
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	189	467	78	196	717	239	176	294	235	435	391	98
RTOR Reduction (vph)	0	0	53	0	0	108	0	125	0	0	18	0
Lane Group Flow (vph)	189	467	25	196	717	131	176	404	0	435	471	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	12.0	37.4	37.4	17.6	43.0	43.0	16.1	18.5		27.0	29.4	
Effective Green, g (s)	12.0	37.4	37.4	17.6	43.0	43.0	16.1	18.5		27.0	29.4	
Actuated g/C Ratio	0.10	0.32	0.32	0.15	0.37	0.37	0.14	0.16		0.23	0.25	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	180	1125	503	265	681	579	242	519		406	858	
v/s Ratio Prot	c0.11	0.13		0.11	c0.39		0.10	c0.12		c0.25	0.14	
v/s Ratio Perm			0.02			0.08						
v/c Ratio	1.05	0.42	0.05	0.74	1.05	0.23	0.73	0.78		1.07	0.55	
Uniform Delay, d1	52.2	31.0	27.3	47.3	36.8	25.3	48.1	47.0		44.8	37.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	80.9	0.2	0.0	10.3	49.2	0.2	10.4	7.2		65.0	0.7	
Delay (s)	133.2	31.2	27.3	57.6	86.0	25.5	58.5	54.2		109.8	38.5	
Level of Service	F	C	C	E	F	C	E	D		F	D	
Approach Delay (s)		57.1			68.6			55.3			72.1	
Approach LOS		E			E			E			E	
Intersection Summary												
HCM Average Control Delay			64.4				HCM Level of Service			E		
HCM Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			116.5				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			93.0%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Lathrop Road & SR 99 SB Ramps

7/14/2010

												
Movement	EBT	EBR	EBR2	WBL	WBT	WBR	NBL	NBR	NBR2	SBL2	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑	↑↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.88		0.97	0.95	1.00	1.00	0.88	1.00	1.00	0.95	0.88
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Flt Permitted	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Volume (vph)	690	590	70	80	970	80	100	620	130	20	300	270
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	726	621	74	84	1021	84	109	674	141	22	333	300
RTOR Reduction (vph)	0	9	0	0	0	41	0	0	98	0	0	79
Lane Group Flow (vph)	726	686	0	84	1021	43	109	674	43	22	333	221
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Prot		Perm	Prot	custom	custom	Prot		Perm
Protected Phases	4			3	8		5			1	6	
Permitted Phases		4				8		2	2			6
Actuated Green, G (s)	32.5	32.5		4.8	41.3	41.3	6.0	24.3	24.3	2.4	20.7	20.7
Effective Green, g (s)	32.5	32.5		4.8	41.3	41.3	6.0	24.3	24.3	2.4	20.7	20.7
Actuated g/C Ratio	0.41	0.41		0.06	0.52	0.52	0.08	0.30	0.30	0.03	0.26	0.26
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1438	1132		206	1827	817	133	847	481	53	916	721
v/s Ratio Prot	0.21			0.02	c0.29		c0.06			0.01	0.09	
v/s Ratio Perm		c0.25				0.03		c0.24	0.03			0.08
v/c Ratio	0.50	0.61		0.41	0.56	0.05	0.82	0.80	0.09	0.42	0.36	0.31
Uniform Delay, d1	17.7	18.7		36.2	13.2	9.6	36.5	25.6	19.9	38.1	24.3	23.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	2.4		1.3	1.2	0.1	31.0	5.2	0.1	5.2	0.2	0.2
Delay (s)	19.0	21.1		37.5	14.4	9.7	67.4	30.8	20.0	43.3	24.5	24.1
Level of Service	B	C		D	B	A	E	C	C	D	C	C
Approach Delay (s)	20.0				15.7						25.0	
Approach LOS	C				B						C	
Intersection Summary												
HCM Average Control Delay		22.5										
HCM Volume to Capacity ratio		0.72										
Actuated Cycle Length (s)		80.0										
Intersection Capacity Utilization		54.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

17: Lathrop Road & SR 99 NB Ramps

7/14/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3433	1583
Volume (vph)	320	1010	180	290	840	70
Peak-hour factor, PHF	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	337	1063	212	341	913	76
RTOR Reduction (vph)	0	0	0	0	0	52
Lane Group Flow (vph)	337	1063	212	341	913	24
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Turn Type		Free	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	26.4	75.0	12.5	42.9	24.1	24.1
Effective Green, g (s)	26.4	75.0	12.5	42.9	24.1	24.1
Actuated g/C Ratio	0.35	1.00	0.17	0.57	0.32	0.32
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1246	1583	295	2024	1103	509
v/s Ratio Prot	0.10		0.12	0.10	c0.27	
v/s Ratio Perm		c0.67				0.02
v/c Ratio	0.27	0.67	0.72	0.17	0.83	0.05
Uniform Delay, d1	17.4	0.0	29.6	7.6	23.5	17.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	2.3	8.1	0.2	5.2	0.0
Delay (s)	17.9	2.3	37.7	7.8	28.8	17.6
Level of Service	B	A	D	A	C	B
Approach Delay (s)	6.1			19.3	27.9	
Approach LOS	A			B	C	
Intersection Summary						
HCM Average Control Delay			15.9		HCM Level of Service	B
HCM Volume to Capacity ratio			0.72			
Actuated Cycle Length (s)			75.0		Sum of lost time (s)	4.0
Intersection Capacity Utilization			52.8%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

7/14/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	30	35	755	10	10	660
Peak Hour Factor	0.85	0.85	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	35	41	795	11	11	695
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)					1308	
pX, platoon unblocked	0.78					
vC, conflicting volume	1511	795			805	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1657	795			805	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	57	89			99	
cM capacity (veh/h)	82	386			815	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	35	41	795	11	11	695
Volume Left	35	0	0	0	11	0
Volume Right	0	41	0	11	0	0
cSH	82	386	1700	1700	815	1700
Volume to Capacity	0.43	0.11	0.47	0.01	0.01	0.41
Queue Length 95th (ft)	44	9	0	0	1	0
Control Delay (s)	78.5	15.4	0.0	0.0	9.5	0.0
Lane LOS	F	C			A	
Approach Delay (s)	44.5		0.0		0.1	
Approach LOS	E					
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization			49.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1752	1759		1752	1845	1568	1752	1845	1568	1752	1806	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1752	1759		1752	1845	1568	1752	1845	1568	1752	1806	
Volume (vph)	110	200	90	200	540	150	160	590	50	50	550	90
Peak-hour factor, PHF	0.87	0.87	0.87	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	126	230	103	217	587	163	174	641	54	54	598	98
RTOR Reduction (vph)	0	14	0	0	0	108	0	0	30	0	5	0
Lane Group Flow (vph)	126	319	0	217	587	55	174	641	24	54	691	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	9.0	29.4		17.6	38.0	38.0	12.0	53.0	53.0	4.8	45.8	
Effective Green, g (s)	9.0	29.4		17.6	38.0	38.0	12.0	53.0	53.0	4.8	45.8	
Actuated g/C Ratio	0.07	0.24		0.15	0.31	0.31	0.10	0.44	0.44	0.04	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	131	428		255	580	493	174	809	688	70	685	
v/s Ratio Prot	0.07	0.18		c0.12	c0.32		c0.10	0.35		0.03	c0.38	
v/s Ratio Perm						0.03			0.02			
v/c Ratio	0.96	0.75		0.85	1.01	0.11	1.00	0.79	0.03	0.77	1.01	
Uniform Delay, d1	55.7	42.3		50.3	41.4	29.4	54.4	29.2	19.3	57.5	37.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	66.5	6.9		22.8	40.4	0.1	68.2	5.3	0.0	39.9	36.6	
Delay (s)	122.2	49.2		73.2	81.8	29.5	122.6	34.5	19.3	97.4	74.1	
Level of Service	F	D		E	F	C	F	C	B	F	E	
Approach Delay (s)		69.2			71.1			51.2			75.8	
Approach LOS		E			E			D			E	
Intersection Summary												
HCM Average Control Delay		66.3										
HCM Volume to Capacity ratio		1.01										
Actuated Cycle Length (s)		120.8										
Intersection Capacity Utilization		91.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1570	1792	1538	1641	1792	1524	1703	3130		1703	1792	1468
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1570	1792	1538	1641	1792	1524	1703	3130		1703	1792	1468
Volume (vph)	60	350	100	180	390	120	70	360	100	160	550	70
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	389	111	196	424	130	76	391	109	174	598	76
RTOR Reduction (vph)	0	0	57	0	0	0	0	26	0	0	0	46
Lane Group Flow (vph)	67	389	54	196	424	130	76	474	0	174	598	30
Heavy Vehicles (%)	15%	6%	5%	10%	6%	6%	6%	12%	10%	6%	6%	10%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	6.1	25.5	25.5	14.3	33.7	101.5	6.1	34.5		11.2	39.6	39.6
Effective Green, g (s)	6.1	25.5	25.5	14.3	33.7	101.5	6.1	34.5		11.2	39.6	39.6
Actuated g/C Ratio	0.06	0.25	0.25	0.14	0.33	1.00	0.06	0.34		0.11	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	94	450	386	231	595	1524	102	1064		188	699	573
v/s Ratio Prot	0.04	c0.22		c0.12	0.24		0.04	0.15		c0.10	c0.33	
v/s Ratio Perm			0.04			0.09						0.02
v/c Ratio	0.71	0.86	0.14	0.85	0.71	0.09	0.75	0.45		0.93	0.86	0.05
Uniform Delay, d1	46.8	36.3	29.5	42.5	29.7	0.0	46.9	26.1		44.7	28.3	19.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	22.4	15.7	0.2	24.0	4.0	0.1	25.2	0.3		44.5	10.0	0.0
Delay (s)	69.3	52.1	29.7	66.6	33.7	0.1	72.1	26.4		89.3	38.4	19.3
Level of Service	E	D	C	E	C	A	E	C		F	D	B
Approach Delay (s)		49.7			36.5			32.4			47.1	
Approach LOS		D			D			C			D	
Intersection Summary												
HCM Average Control Delay			41.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			101.5			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			74.6%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	520	10	350	30	0	0	0	0	300	10	120
Peak Hour Factor	0.92	0.92	0.92	0.90	0.90	0.90	0.25	0.25	0.25	0.90	0.90	0.90
Hourly flow rate (vph)	0	565	11	389	33	0	0	0	0	333	11	133
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None				None	
Median storage veh												
Upstream signal (ft)					454							
pX, platoon unblocked												
vC, conflicting volume	33			576			1504	1382	288	1094	1387	17
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	33			576			1504	1382	288	1094	1387	17
tC, single (s)	4.1			4.8			7.5	6.5	6.9	8.2	6.6	7.0
tC, 2 stage (s)												
tF (s)	2.2			2.5			3.5	4.0	3.3	3.8	4.1	3.4
p0 queue free %	100			52			100	100	100	0	84	87
cM capacity (veh/h)	1577			808			40	74	709	83	71	1045
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	377	199	389	17	17	222	256					
Volume Left	0	0	389	0	0	222	111					
Volume Right	0	11	0	0	0	0	133					
cSH	1700	1700	808	1700	1700	83	157					
Volume to Capacity	0.22	0.12	0.48	0.01	0.01	2.68	1.62					
Queue Length 95th (ft)	0	0	66	0	0	533	442					
Control Delay (s)	0.0	0.0	13.5	0.0	0.0	868.6	359.4					
Lane LOS			B			F	F					
Approach Delay (s)	0.0		12.5			596.2						
Approach LOS						F						
Intersection Summary												
Average Delay			196.6									
Intersection Capacity Utilization			61.9%			ICU Level of Service				B		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

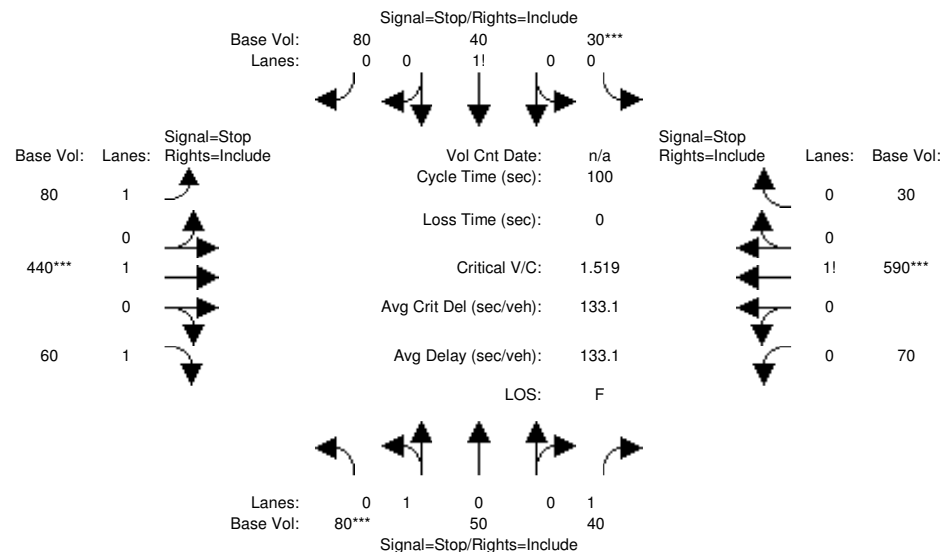
3: Roth Road & NB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	470	350	0	0	360	390	20	10	230	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90	0.25	0.25	0.25
Hourly flow rate (vph)	511	380	0	0	391	424	22	11	256	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									18			
Median type									None	None		
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	815			380			1598	2217	190	1821	2005	408
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	815			380			1598	2217	190	1821	2005	408
tC, single (s)	4.2			4.1			7.5	6.5	7.5	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.6	3.5	4.0	3.3
p0 queue free %	35			100			35	27	65	100	100	100
cM capacity (veh/h)	789			1175			34	15	739	7	21	593
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1						
Volume Total	511	190	190	261	554	289						
Volume Left	511	0	0	0	0	22						
Volume Right	0	0	0	0	424	256						
cSH	789	1700	1700	1700	1700	241						
Volume to Capacity	0.65	0.11	0.11	0.15	0.33	1.20						
Queue Length 95th (ft)	121	0	0	0	0	345						
Control Delay (s)	17.5	0.0	0.0	0.0	0.0	62.5						
Lane LOS	C					F						
Approach Delay (s)	10.1			0.0			62.5					
Approach LOS							F					
Intersection Summary												
Average Delay				13.5								
Intersection Capacity Utilization				61.9%	ICU Level of Service				B			
Analysis Period (min)				15								

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #2: Roth Road / Harlan Road Cumulative No Project PM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0

Volume Module:												
Base Vol:	80	50	40	30	40	80	80	440	60	70	590	30
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	80	50	40	30	40	80	80	440	60	70	590	30
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	89	56	44	33	44	89	84	463	63	74	621	32
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	89	56	44	33	44	89	84	463	63	74	621	32
PCE 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
MLF 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
FinalVolume:	89	56	44	33	44	89	84	463	63	74	621	32

Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.62	0.38	1.00	0.20	0.27	0.53	1.00	1.00	1.00	0.10	0.86	0.04
Final Sat.:	251	157	460	86	114	228	454	486	535	49	409	21

Capacity Analysis Module:														
Vol/Sat:	0.35	0.35	0.10		0.39	0.39	0.39	0.19	0.95		0.12	1.52	1.52	1.52
Crit Moves:	****				****				****				****	
Delay/Veh:	15.9	15.9	11.1		16.2	16.2	16.2	12.4	56.5		10.3	264.3	264	264.3
Delay 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
AdjDel/Veh:	15.9	15.9	11.1		16.2	16.2	16.2	12.4	56.5		10.3	264.3	264	264.3
LOS by Move:	C	C	B		C	C	C	B	F		B	F	F	F
ApproachDel:	14.8				16.2			45.7					264.3	
Delay Adj:	1.00				1.00			1.00					1.00	
ApprAdjDel:	14.8				16.2			45.7					264.3	
LOS by Appr:	B				C			E					F	
AllWayAvgQ:	0.5	0.5	0.1		0.6	0.6	0.6	0.2	6.3		0.1	33.7	33.7	33.7

Note: Queue reported is the number of cars per

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Roth Road / Harlan Road Cumulative No Project PM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Lanes:	0	1	0	0	1	0	0	0	1	0	1	0	0	1	0	
Initial Vol:	80	0	50	40	30	40	80		80	440	60		70	590	30	
Major Street Volume:					1270											
Minor Approach Volume:					170											
Minor Approach Volume Threshold:					271											

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Signalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (prot)	1681	820	955	1583	927	
Flt Permitted	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (perm)	1681	820	955	1583	927	
Volume (vph)	390	200	30	290	180	80
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.90	0.90
Adj. Flow (vph)	424	217	32	305	200	89
RTOR Reduction (vph)	0	144	0	0	27	0
Lane Group Flow (vph)	424	73	32	305	262	0
Heavy Vehicles (%)	13%	97%	89%	20%	93%	83%
Turn Type	Perm		Prot			
Protected Phases	4		3	8	2	
Permitted Phases		4				
Actuated Green, G (s)	15.4	15.4	1.8	21.2	16.5	
Effective Green, g (s)	15.4	15.4	1.8	21.2	16.5	
Actuated g/C Ratio	0.34	0.34	0.04	0.46	0.36	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	566	276	38	734	335	
v/s Ratio Prot	c0.25		c0.03	0.19	c0.28	
v/s Ratio Perm		0.09				
v/c Ratio	0.75	0.26	0.84	0.42	0.78	
Uniform Delay, d1	13.4	11.0	21.8	8.1	13.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.4	0.5	85.4	0.4	11.2	
Delay (s)	18.8	11.5	107.2	8.5	24.2	
Level of Service	B	B	F	A	C	
Approach Delay (s)	16.4			17.9	24.2	
Approach LOS	B			B	C	
Intersection Summary						
HCM Average Control Delay			18.6		HCM Level of Service	B
HCM Volume to Capacity ratio			0.77			
Actuated Cycle Length (s)			45.7		Sum of lost time (s)	12.0
Intersection Capacity Utilization			46.5%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

7/14/2010

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1357	1468	1641	1792	1827	1223
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1357	1468	1641	1792	1827	1223
Volume (vph)	220	250	100	390	540	220
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	237	269	108	419	581	237
RTOR Reduction (vph)	0	38	0	0	0	132
Lane Group Flow (vph)	237	231	108	419	581	105
Heavy Vehicles (%)	33%	10%	10%	6%	4%	32%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	12.8	12.8	4.5	31.9	23.4	23.4
Effective Green, g (s)	12.8	12.8	4.5	31.9	23.4	23.4
Actuated g/C Ratio	0.24	0.24	0.09	0.61	0.44	0.44
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	330	357	140	1085	811	543
v/s Ratio Prot	c0.17		c0.07	0.23	c0.32	
v/s Ratio Perm		0.16				0.09
v/c Ratio	0.72	0.65	0.77	0.39	0.72	0.19
Uniform Delay, d1	18.3	17.9	23.6	5.4	11.9	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.3	4.0	22.7	0.2	3.0	0.2
Delay (s)	25.6	21.9	46.3	5.6	15.0	9.1
Level of Service	C	C	D	A	B	A
Approach Delay (s)	23.6			13.9	13.3	
Approach LOS	C			B	B	
Intersection Summary						
HCM Average Control Delay			16.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.72			
Actuated Cycle Length (s)			52.7		Sum of lost time (s)	12.0
Intersection Capacity Utilization			56.1%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		0.95	1.00	1.00	1.00
Frt	0.97		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1741		3406	1583	1770	1792
Flt Permitted	0.96		1.00	1.00	0.95	1.00
Satd. Flow (perm)	1741		3406	1583	1770	1792
Volume (vph)	150	40	790	230	160	990
Peak-hour factor, PHF	0.85	0.85	0.95	0.95	0.95	0.95
Adj. Flow (vph)	176	47	832	242	168	1042
RTOR Reduction (vph)	14	0	0	125	0	0
Lane Group Flow (vph)	209	0	832	117	168	1042
Heavy Vehicles (%)	2%	2%	6%	2%	2%	6%
Turn Type			Perm		Prot	
Protected Phases	8		2		1	6
Permitted Phases			2			
Actuated Green, G (s)	12.5		31.5	31.5	9.3	44.8
Effective Green, g (s)	12.5		31.5	31.5	9.3	44.8
Actuated g/C Ratio	0.19		0.48	0.48	0.14	0.69
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	333		1643	764	252	1229
v/s Ratio Prot	c0.12		0.24		0.09	c0.58
v/s Ratio Perm			0.07			
v/c Ratio	0.63		0.51	0.15	0.67	0.85
Uniform Delay, d1	24.3		11.6	9.4	26.5	7.7
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7		0.2	0.1	6.5	5.6
Delay (s)	27.9		11.8	9.5	33.0	13.3
Level of Service	C		B	A	C	B
Approach Delay (s)	27.9		11.3			16.0
Approach LOS	C		B			B
Intersection Summary						
HCM Average Control Delay			15.1		HCM Level of Service	B
HCM Volume to Capacity ratio			0.80			
Actuated Cycle Length (s)			65.3		Sum of lost time (s)	8.0
Intersection Capacity Utilization			69.5%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	1610	990	320	1160	0	0	0	0	510	10	750
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.25	0.98	0.98	0.98
Hourly flow rate (vph)	0	1643	1010	327	1184	0	0	0	0	520	10	765
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked												
vC, conflicting volume	1184			2653			4755	3985	2148	3985	4490	1184
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1184			2653			4755	3985	2148	3985	4490	1184
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			0			0	0	100	0	0	0
cM capacity (veh/h)	586			157			0	0	61	0	0	229
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	2653	327	1184	1296								
Volume Left	0	327	0	520								
Volume Right	1010	0	0	765								
cSH	1700	157	1700	0								
Volume to Capacity	1.56	2.08	0.70	Err								
Queue Length 95th (ft)	0	648	0	Err								
Control Delay (s)	0.0	555.6	0.0	Err								
Lane LOS		F		F								
Approach Delay (s)	0.0	120.1		Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization		360.6%		ICU Level of Service		H						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free			Stop			Stop	
Grade	0%				0%			0%			0%	
Volume (veh/h)	850	1270	0	0	940	360	540	10	670	0	0	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.25
Hourly flow rate (vph)	867	1296	0	0	959	367	551	10	684	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.49						0.49	0.49		0.49	0.49	0.49
vC, conflicting volume	1327			1296			4173	4357	1296	4862	4173	1143
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1671			1296			7523	7901	1296	8939	7523	1294
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	0			100			0	0	0	0	0	100
cM capacity (veh/h)	185			531			0	0	197	0	0	96
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	867	1296	1327	1245								
Volume Left	867	0	0	551								
Volume Right	0	0	367	684								
cSH	185	1700	1700	0								
Volume to Capacity	4.68	0.76	0.78	Err								
Queue Length 95th (ft)	Err	0	0	Err								
Control Delay (s)	1702.8	0.0	0.0	Err								
Lane LOS	F			F								
Approach Delay (s)	682.7		0.0	Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			360.6%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.91		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3456		1752	1845	1568	1752	3181		1752	3216	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3456		1752	1845	1568	1752	3181		1752	3216	
Volume (vph)	230	1550	160	100	1000	60	190	100	160	120	90	110
Peak-hour factor, PHF	0.98	0.98	0.98	0.94	0.94	0.94	0.82	0.82	0.82	0.85	0.85	0.85
Adj. Flow (vph)	235	1582	163	106	1064	64	232	122	195	141	106	129
RTOR Reduction (vph)	0	6	0	0	0	12	0	136	0	0	117	0
Lane Group Flow (vph)	235	1739	0	106	1064	52	232	181	0	141	118	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	14.0	65.1		8.0	59.1	59.1	14.0	12.5		12.1	10.6	
Effective Green, g (s)	14.0	65.1		8.0	59.1	59.1	14.0	12.5		12.1	10.6	
Actuated g/C Ratio	0.12	0.57		0.07	0.52	0.52	0.12	0.11		0.11	0.09	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	216	1979		123	959	815	216	350		186	300	
v/s Ratio Prot	c0.13	0.50		0.06	c0.58		c0.13	c0.06		0.08	0.04	
v/s Ratio Perm						0.03						
v/c Ratio	1.09	0.88		0.86	1.11	0.06	1.07	0.52		0.76	0.39	
Uniform Delay, d1	49.9	20.9		52.3	27.3	13.6	49.9	47.7		49.4	48.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	86.7	5.9		42.2	63.9	0.2	82.3	1.3		16.1	0.9	
Delay (s)	136.5	26.8		94.5	91.2	13.7	132.1	49.0		65.5	49.4	
Level of Service	F	C		F	F	B	F	D		E	D	
Approach Delay (s)		39.9			87.5			84.2			55.4	
Approach LOS		D			F			F			E	
Intersection Summary												
HCM Average Control Delay		61.4					HCM Level of Service			E		
HCM Volume to Capacity ratio		1.00										
Actuated Cycle Length (s)		113.7					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		95.3%					ICU Level of Service		F			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & 5th Street

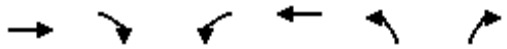
7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3435		1752	1706		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3435		1752	1706		1752	1845	1568
Volume (vph)	60	1350	70	40	840	130	40	30	30	100	40	40
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	61	1378	71	43	913	141	50	38	38	125	50	50
RTOR Reduction (vph)	0	0	35	0	14	0	0	27	0	0	0	33
Lane Group Flow (vph)	61	1378	36	43	1040	0	50	49	0	125	50	17
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	4.7	35.9	35.9	3.5	34.7		3.5	26.1		8.7	31.3	31.3
Effective Green, g (s)	4.7	35.9	35.9	3.5	34.7		3.5	26.1		8.7	31.3	31.3
Actuated g/C Ratio	0.05	0.40	0.40	0.04	0.38		0.04	0.29		0.10	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	91	1395	624	68	1321		68	494		169	640	544
v/s Ratio Prot	c0.03	c0.39		0.02	0.30		c0.03	c0.03		c0.07	0.03	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.67	0.99	0.06	0.63	0.79		0.74	0.10		0.74	0.08	0.03
Uniform Delay, d1	42.0	26.9	16.7	42.7	24.5		42.9	23.4		39.6	19.8	19.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	17.7	21.0	0.0	17.6	3.2		33.4	0.4		15.5	0.2	0.1
Delay (s)	59.7	47.9	16.8	60.3	27.7		76.3	23.8		55.2	20.0	19.6
Level of Service	E	D	B	E	C		E	C		E	C	B
Approach Delay (s)		46.9			29.0			44.7			39.5	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			39.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.2			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			62.9%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3467		1752	3505	1752	1568
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3467		1752	3505	1752	1568
Volume (vph)	1290	100	20	950	90	30
Peak-hour factor, PHF	0.98	0.98	0.95	0.95	0.85	0.85
Adj. Flow (vph)	1316	102	21	1000	106	35
RTOR Reduction (vph)	5	0	0	0	0	30
Lane Group Flow (vph)	1413	0	21	1000	106	5
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Turn Type			Prot		Perm	
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	48.8		1.2	54.0	11.2	11.2
Effective Green, g (s)	48.8		1.2	54.0	11.2	11.2
Actuated g/C Ratio	0.67		0.02	0.74	0.15	0.15
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2311		29	2586	268	240
v/s Ratio Prot	c0.41		0.01	c0.29	c0.06	
v/s Ratio Perm						0.00
v/c Ratio	0.61		0.72	0.39	0.40	0.02
Uniform Delay, d1	6.9		35.8	3.5	27.9	26.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5		61.8	0.1	1.0	0.0
Delay (s)	7.4		97.6	3.6	28.9	26.4
Level of Service	A		F	A	C	C
Approach Delay (s)	7.4			5.6	28.3	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			7.8		HCM Level of Service	A
HCM Volume to Capacity ratio			0.58			
Actuated Cycle Length (s)			73.2		Sum of lost time (s)	12.0
Intersection Capacity Utilization			50.5%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	1845	1568	1752	1825		1752	1782		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	1845	1568	1752	1825		1752	1782		1752	1845	1568
Volume (vph)	470	810	150	120	510	40	80	550	160	220	580	280
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	495	853	158	130	554	43	87	598	174	232	611	295
RTOR Reduction (vph)	0	0	61	0	2	0	0	9	0	0	0	192
Lane Group Flow (vph)	495	853	97	130	595	0	87	763	0	232	611	103
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	23.0	47.0	47.0	8.0	32.0		7.0	37.0		12.0	42.0	42.0
Effective Green, g (s)	23.0	47.0	47.0	8.0	32.0		7.0	37.0		12.0	42.0	42.0
Actuated g/C Ratio	0.19	0.39	0.39	0.07	0.27		0.06	0.31		0.10	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	336	723	614	117	487		102	549		175	646	549
v/s Ratio Prot	c0.28	c0.46		0.07	0.33		0.05	c0.43		c0.13	0.33	
v/s Ratio Perm			0.06									0.07
v/c Ratio	1.47	1.18	0.16	1.11	1.22		0.85	1.39		1.33	0.95	0.19
Uniform Delay, d1	48.5	36.5	23.7	56.0	44.0		56.0	41.5		54.0	37.9	27.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	228.5	94.8	0.6	116.2	117.0		45.9	186.4		180.6	24.3	0.8
Delay (s)	277.0	131.3	24.2	172.2	161.0		101.9	227.9		234.6	62.2	27.9
Level of Service	F	F	C	F	F		F	F		F	E	C
Approach Delay (s)		168.0			163.0			215.2			88.5	
Approach LOS		F			F			F			F	
Intersection Summary												
HCM Average Control Delay			155.3			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.31									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			119.5%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3505	1568	1752	1845	1568	1752	3405		1752	3363	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3505	1568	1752	1845	1568	1752	3405		1752	3363	
Volume (vph)	110	840	150	160	480	360	130	550	130	240	380	140
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	116	884	158	168	505	379	141	598	141	267	422	156
RTOR Reduction (vph)	0	0	72	0	0	244	0	17	0	0	30	0
Lane Group Flow (vph)	116	884	86	168	505	135	141	722	0	267	548	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	8.1	32.7	32.7	13.3	37.9	37.9	11.0	26.9		19.4	35.3	
Effective Green, g (s)	8.1	32.7	32.7	13.3	37.9	37.9	11.0	26.9		19.4	35.3	
Actuated g/C Ratio	0.07	0.30	0.30	0.12	0.35	0.35	0.10	0.25		0.18	0.33	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	131	1058	473	215	646	549	178	846		314	1096	
v/s Ratio Prot	0.07	0.25		c0.10	c0.27		0.08	c0.21		c0.15	0.16	
v/s Ratio Perm			0.05			0.09						
v/c Ratio	0.89	0.84	0.18	0.78	0.78	0.25	0.79	0.85		0.85	0.50	
Uniform Delay, d1	49.6	35.3	27.9	46.1	31.5	25.0	47.5	38.8		43.0	29.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	45.6	5.8	0.2	16.7	6.1	0.2	21.0	8.4		19.2	0.4	
Delay (s)	95.2	41.1	28.1	62.8	37.6	25.3	68.5	47.2		62.3	29.8	
Level of Service	F	D	C	E	D	C	E	D		E	C	
Approach Delay (s)		44.8			37.2			50.6			40.0	
Approach LOS		D			D			D			D	
Intersection Summary												
HCM Average Control Delay			43.0				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			108.3				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			78.1%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Lathrop Road & SR 99 SB Ramps

7/14/2010

												
Movement	EBT	EBR	EBR2	WBL	WBT	WBR	NBL	NBR	NBR2	SBL2	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑	↑↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.88		0.97	0.95	1.00	1.00	0.88	1.00	1.00	0.95	0.88
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Flt Permitted	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Volume (vph)	580	720	90	120	940	30	80	450	110	10	660	440
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.95	0.95
Adj. Flow (vph)	611	758	95	126	989	32	87	489	120	11	695	463
RTOR Reduction (vph)	0	9	0	0	0	17	0	0	77	0	0	94
Lane Group Flow (vph)	611	844	0	126	989	15	87	489	43	11	695	369
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Prot		Perm	Prot	custom	custom	Prot		Perm
Protected Phases	4			3	8		5			1	6	
Permitted Phases		4				8		2	2			6
Actuated Green, G (s)	29.6	29.6		4.8	38.4	38.4	4.8	28.4	28.4	1.2	24.8	24.8
Effective Green, g (s)	29.6	29.6		4.8	38.4	38.4	4.8	28.4	28.4	1.2	24.8	24.8
Actuated g/C Ratio	0.37	0.37		0.06	0.48	0.48	0.06	0.35	0.35	0.01	0.31	0.31
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1309	1031		206	1699	760	106	989	562	27	1097	864
v/s Ratio Prot	0.17			0.04	c0.28		c0.05			0.01	c0.20	
v/s Ratio Perm		c0.30				0.01		c0.18	0.03			0.13
v/c Ratio	0.47	0.82		0.61	0.58	0.02	0.82	0.49	0.08	0.41	0.63	0.43
Uniform Delay, d1	19.2	22.8		36.7	15.0	10.9	37.2	20.2	17.1	39.0	23.7	22.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	7.2		5.3	1.5	0.0	37.7	0.4	0.1	9.7	1.2	0.3
Delay (s)	20.4	30.0		42.0	16.5	11.0	74.9	20.6	17.2	48.8	24.9	22.3
Level of Service	C	C		D	B	B	E	C	B	D	C	C
Approach Delay (s)	26.0				19.1						24.1	
Approach LOS	C				B						C	
Intersection Summary												
HCM Average Control Delay			23.9				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)		20.0			
Intersection Capacity Utilization			60.0%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

17: Lathrop Road & SR 99 NB Ramps

7/14/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3433	1583
Volume (vph)	320	720	70	370	720	240
Peak-hour factor, PHF	0.92	0.92	0.90	0.90	0.92	0.92
Adj. Flow (vph)	348	783	78	411	783	261
RTOR Reduction (vph)	0	0	0	0	0	185
Lane Group Flow (vph)	348	783	78	411	783	76
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Turn Type		Free	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	32.7	75.0	8.5	45.2	21.8	21.8
Effective Green, g (s)	32.7	75.0	8.5	45.2	21.8	21.8
Actuated g/C Ratio	0.44	1.00	0.11	0.60	0.29	0.29
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1543	1583	201	2133	998	460
v/s Ratio Prot	0.10		0.04	0.12	c0.23	
v/s Ratio Perm		c0.49				0.05
v/c Ratio	0.23	0.49	0.39	0.19	0.78	0.16
Uniform Delay, d1	13.2	0.0	30.8	6.7	24.4	19.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.1	1.2	0.2	4.1	0.2
Delay (s)	13.6	1.1	32.1	6.9	28.6	20.0
Level of Service	B	A	C	A	C	B
Approach Delay (s)	4.9			10.9	26.4	
Approach LOS	A			B	C	
Intersection Summary						
HCM Average Control Delay			14.5		HCM Level of Service	B
HCM Volume to Capacity ratio			0.58			
Actuated Cycle Length (s)			75.0		Sum of lost time (s)	4.0
Intersection Capacity Utilization			43.3%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

7/14/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	30	20	770	70	30	820
Peak Hour Factor	0.70	0.70	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	43	29	811	74	32	863
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1737	811			884	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1737	811			884	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	53	92			96	
cM capacity (veh/h)	92	378			761	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	43	29	811	74	32	863
Volume Left	43	0	0	0	32	0
Volume Right	0	29	0	74	0	0
cSH	92	378	1700	1700	761	1700
Volume to Capacity	0.47	0.08	0.48	0.04	0.04	0.51
Queue Length 95th (ft)	50	6	0	0	3	0
Control Delay (s)	75.0	15.3	0.0	0.0	9.9	0.0
Lane LOS	F	C			A	
Approach Delay (s)	51.1		0.0		0.4	
Approach LOS	F					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			53.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1752	1777		1752	1845	1568	1752	1845	1568	1752	1792	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1752	1777		1752	1845	1568	1752	1845	1568	1752	1792	
Volume (vph)	130	740	240	120	450	120	180	580	280	210	600	140
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	137	779	253	130	489	130	196	630	304	221	632	147
RTOR Reduction (vph)	0	10	0	0	0	84	0	0	41	0	7	0
Lane Group Flow (vph)	137	1022	0	130	489	46	196	630	263	221	772	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	12.3	47.0		8.0	42.7	42.7	10.0	38.0	38.0	11.0	39.0	
Effective Green, g (s)	12.3	47.0		8.0	42.7	42.7	10.0	38.0	38.0	11.0	39.0	
Actuated g/C Ratio	0.10	0.39		0.07	0.36	0.36	0.08	0.32	0.32	0.09	0.32	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	180	696		117	657	558	146	584	497	161	582	
v/s Ratio Prot	0.08	c0.58		c0.07	0.27		0.11	0.34		c0.13	c0.43	
v/s Ratio Perm						0.03			0.17			
v/c Ratio	0.76	1.47		1.11	0.74	0.08	1.34	1.08	0.53	1.37	1.33	
Uniform Delay, d1	52.4	36.5		56.0	33.9	25.7	55.0	41.0	33.7	54.5	40.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.1	218.8		116.2	4.6	0.1	192.7	60.3	1.0	201.9	158.7	
Delay (s)	69.6	255.3		172.2	38.4	25.7	247.7	101.3	34.7	256.4	199.2	
Level of Service	E	F		F	D	C	F	F	C	F	F	
Approach Delay (s)		233.5			59.4			108.8			211.9	
Approach LOS		F			E			F			F	
Intersection Summary												
HCM Average Control Delay		161.1					HCM Level of Service		F			
HCM Volume to Capacity ratio		1.34										
Actuated Cycle Length (s)		120.0					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		123.6%					ICU Level of Service		H			
Analysis Period (min)		15										
c Critical Lane Group												

Peak Hour Signal Warrants

Major Street Roth Road
Minor Street I-5 SB Ramps

Sheet No 1 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour AM

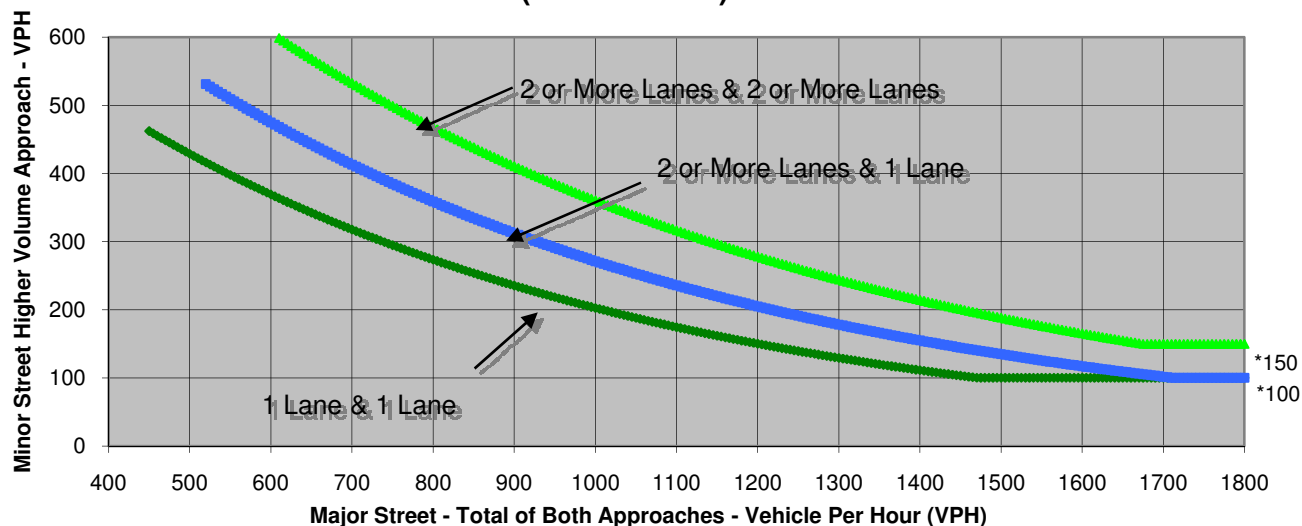
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	380	0	220
Through	0	10	110	40
Right	0	340	10	0
Total	0	730	120	260

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Roth Road	I-5 SB Ramps	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	380	730	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Roth Road
Minor Street I-5 NB Ramps

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour AM

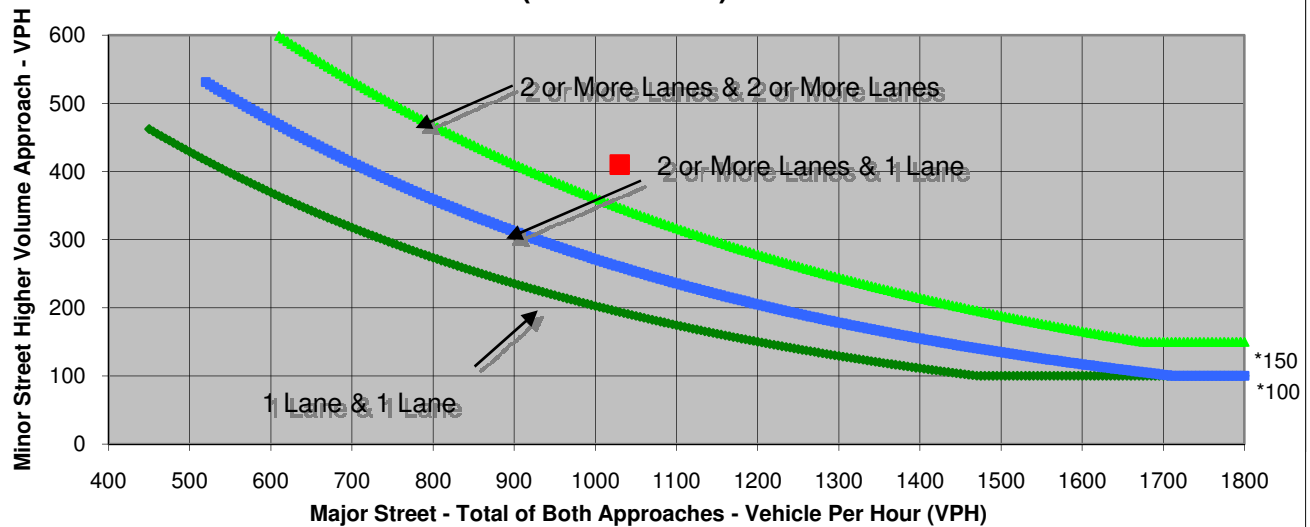
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	0	90	0
Through	10	0	400	240
Right	380	0	0	300
Total	410	0	490	540

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,030	410	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street Harlan Road

Sheet No 3 of 7

Project Centerpoint Intermodal Center
 Scenario Cumulative Conditions
 Peak Hour AM

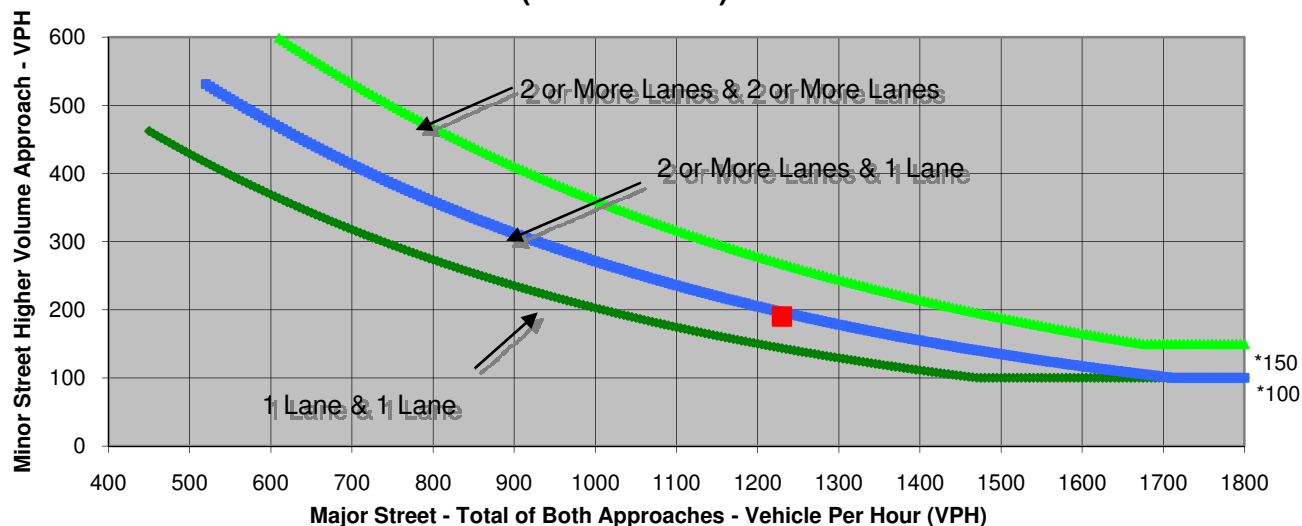
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	50	60	30
Through	40	30	640	390
Right	70	70	80	30
Total	190	150	780	450

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Roth Road	Harlan Road	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,230	190	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Roth Road
Minor Street UPRR Driveway

Sheet No 4 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour AM

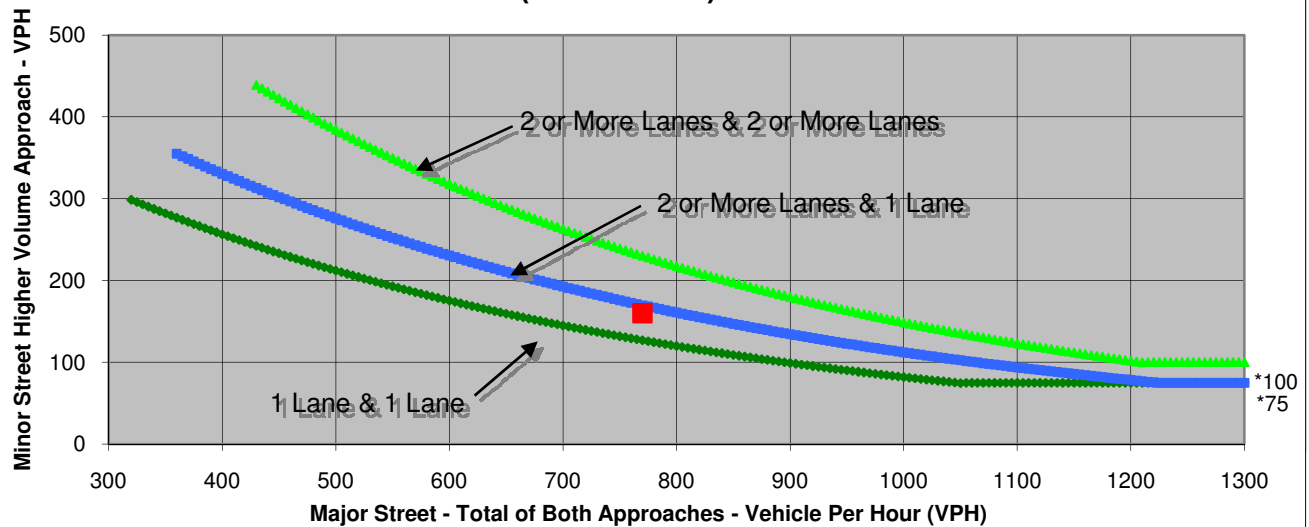
Turn Movement Volumes

	NB	SB	EB	WB
Left	130	0	0	50
Through	0	0	240	330
Right	30	0	150	0
Total	160	0	390	380

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street UPRR Driveway	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	770	160	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
Minor Street I-5 SB Ramps

Sheet No 5 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour AM

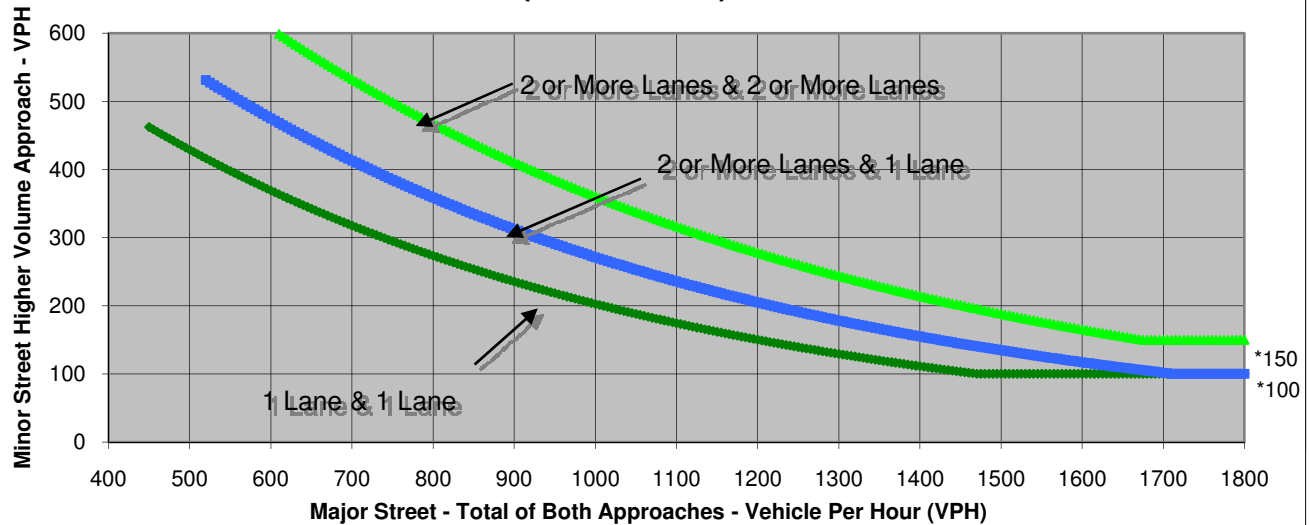
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	290	0	440
Through	0	10	960	1,490
Right	0	1,020	440	0
Total	0	1,320	1,400	1,930

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,330	1,320	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Conditions**
Peak Hour **AM**

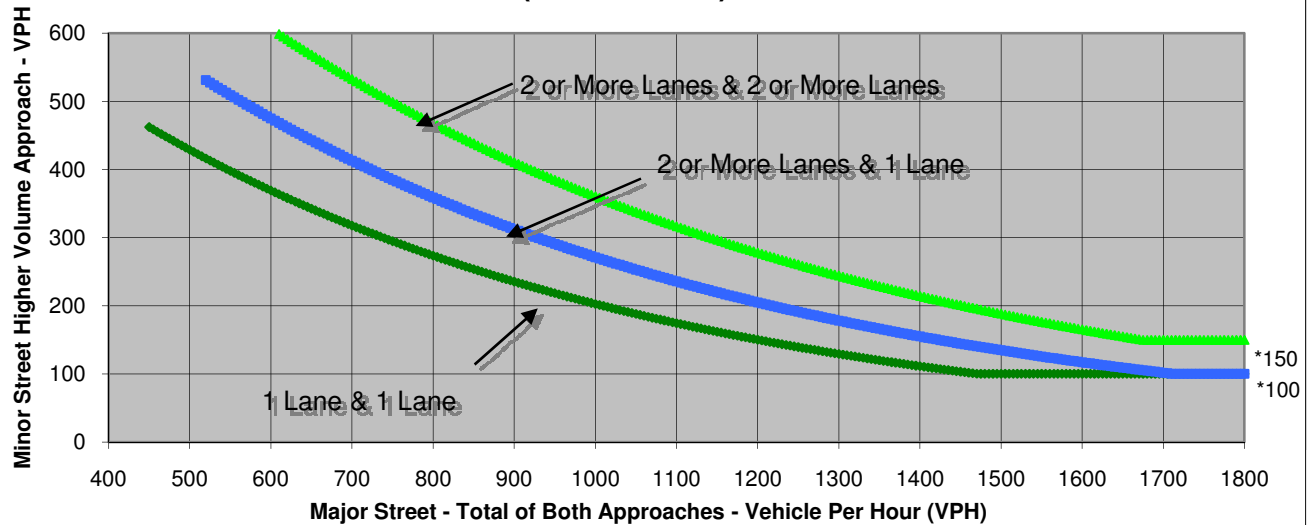
Turn Movement Volumes

	NB	SB	EB	WB
Left	630	0	550	0
Through	10	0	700	1,300
Right	360	0	0	580
Total	1,000	0	1,250	1,880

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Lathrop Road	I-5 NB Ramps	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,130	1,000	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Airport Way
Minor Street Hastings Drive

Sheet No 7 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour AM

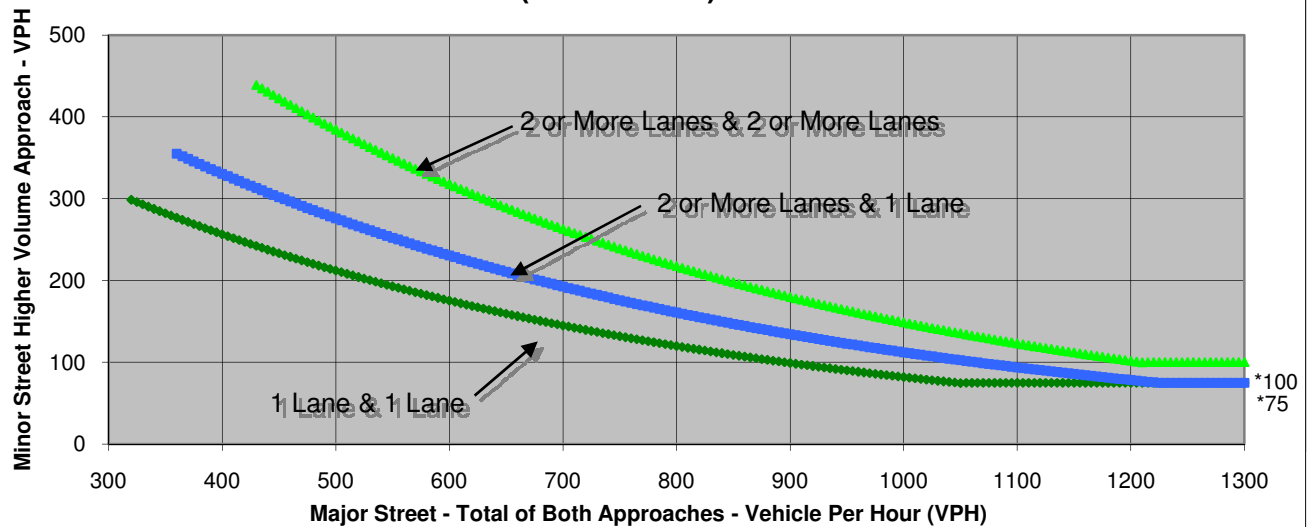
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	10	0	30
Through	755	660	0	0
Right	10	0	0	35
Total	765	670	0	65

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Hastings Drive	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,435	65	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
Minor Street I-5 SB Ramps

Sheet No 1 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour PM

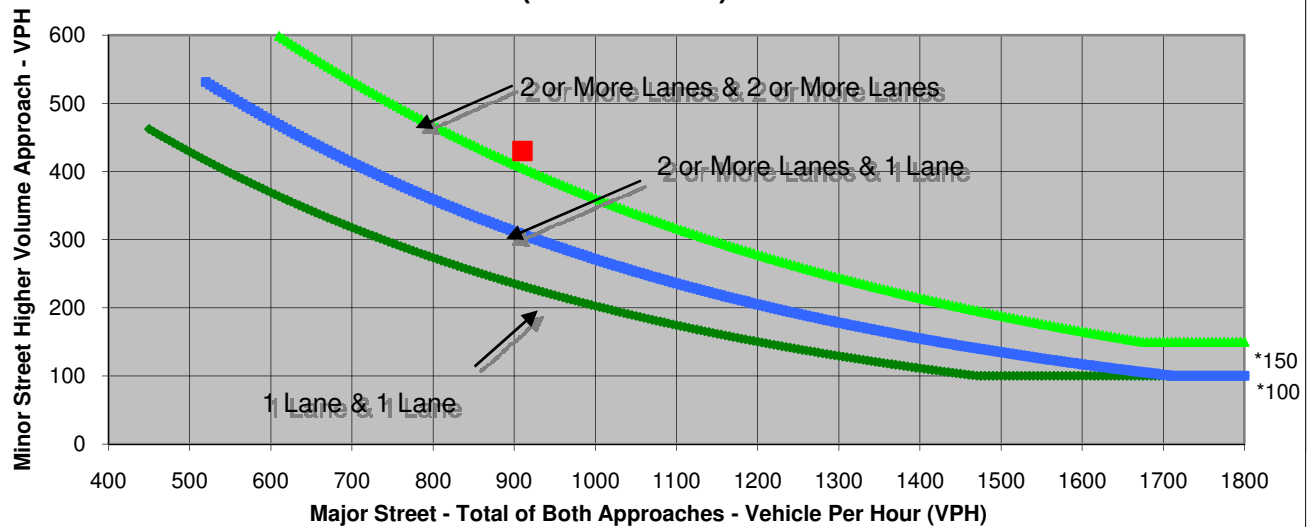
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	300	0	350
Through	0	10	520	30
Right	0	120	10	0
Total	0	430	530	380

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	910	430	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street I-5 NB Ramps

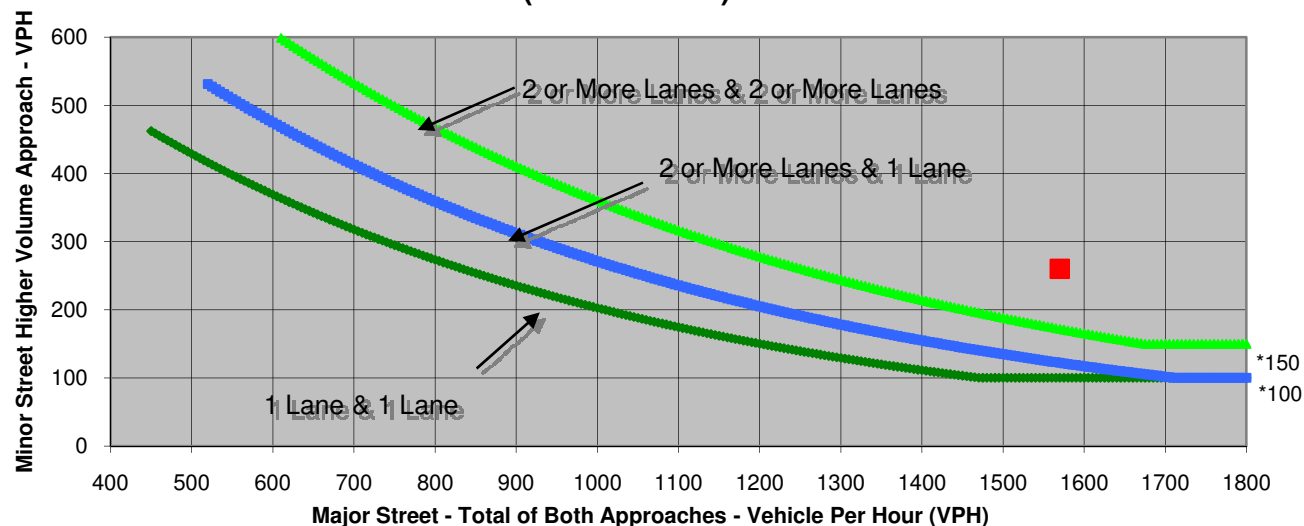
 Project Centerpoint Intermodal Center
 Scenario Cumulative Conditions
 Peak Hour PM
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	0	470	0
Through	10	0	350	360
Right	230	0	0	390
Total	260	0	820	750

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Roth Road	I-5 NB Ramps	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,570	260	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Roth Road
Minor Street Harlan Road

Sheet No 3 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour PM

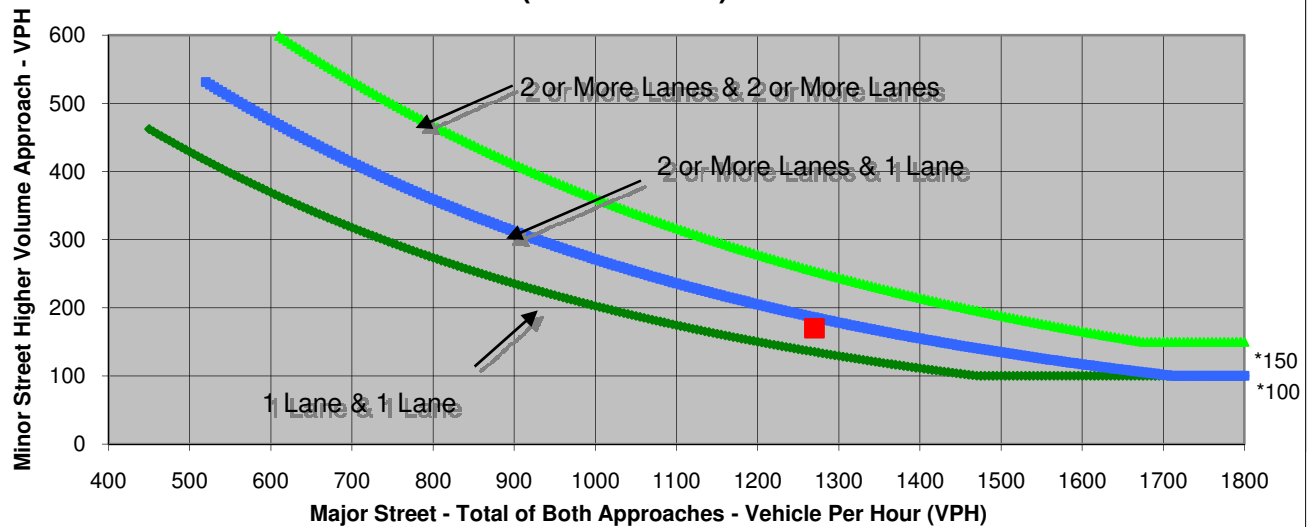
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	30	80	70
Through	50	40	440	590
Right	40	80	60	30
Total	170	150	580	690

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,270	170	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
Minor Street UPRR Driveway

Sheet No 4 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour PM

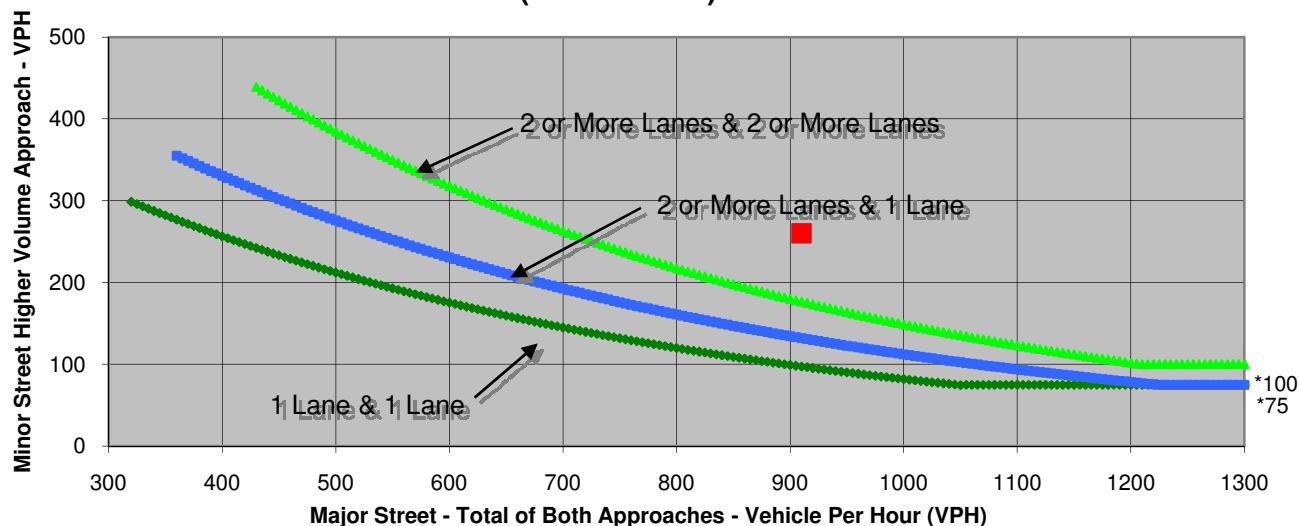
Turn Movement Volumes

	NB	SB	EB	WB
Left	180	0	0	30
Through	0	0	390	290
Right	80	0	200	0
Total	260	0	590	320

Major Street Direction

	North/South
x	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Roth Road	UPRR Driveway	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	910	260	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street **Lathrop Road**
Minor Street **I-5 SB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Conditions**
Peak Hour **PM**

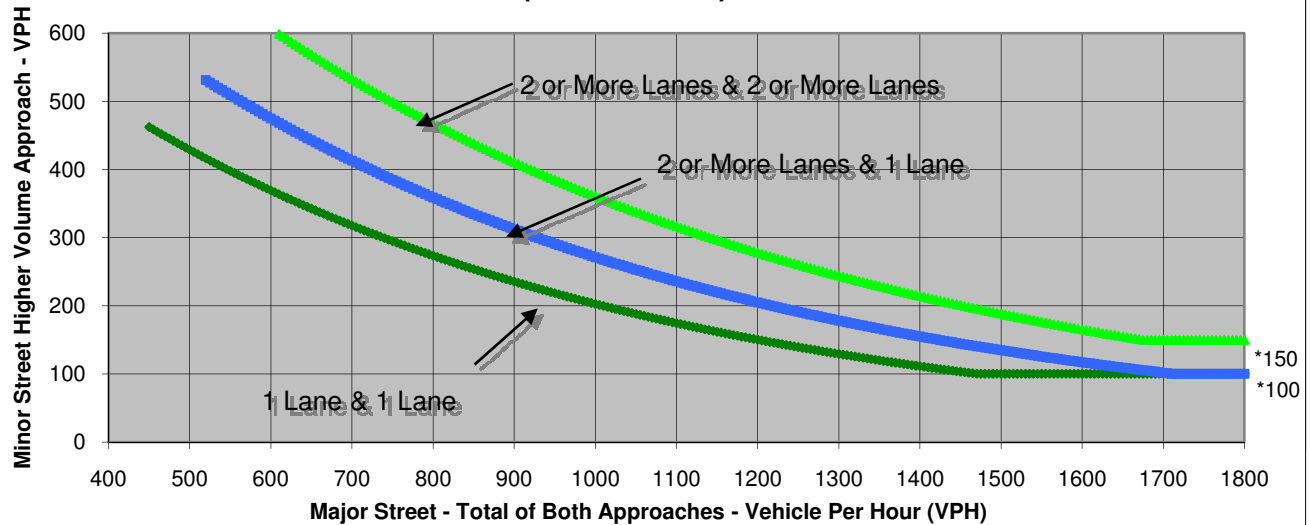
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	510	0	320
Through	0	10	1,610	1,160
Right	0	750	990	0
Total	0	1,270	2,600	1,480

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Lathrop Road	I-5 SB Ramps	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	4,080	1,270	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Lathrop Road
Minor Street I-5 NB Ramps

Sheet No 6 of 7

Project Centerpoint Intermodal Center
Scenario Cumulative Conditions
Peak Hour PM

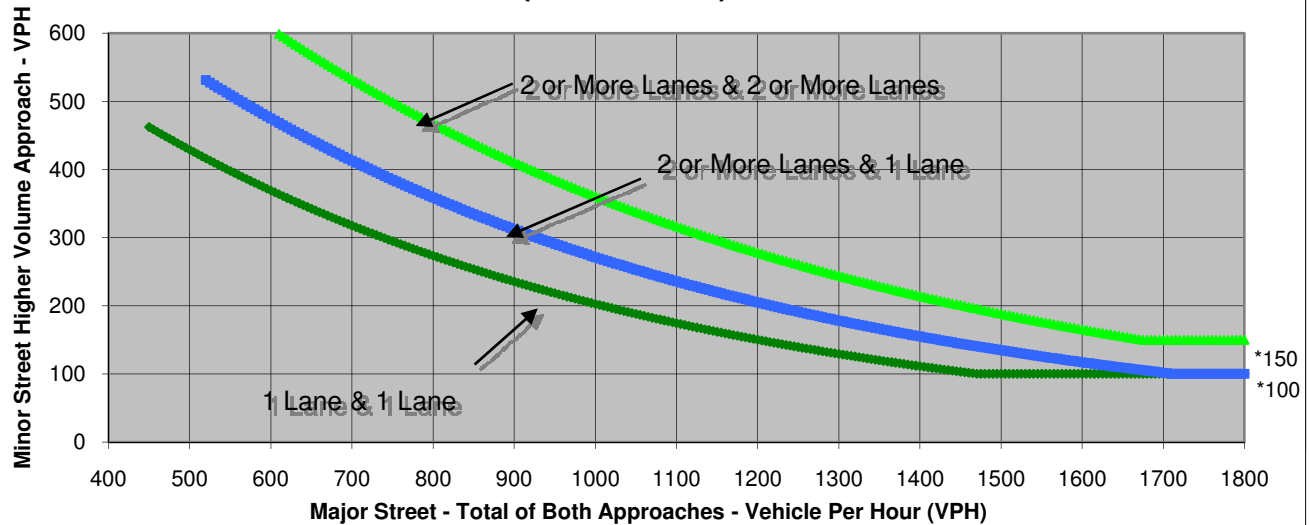
Turn Movement Volumes

	NB	SB	EB	WB
Left	540	0	850	0
Through	10	0	1,270	940
Right	670	0	0	360
Total	1,220	0	2,120	1,300

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,420	1,220	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Airport Way
 Minor Street Hastings Drive

Sheet No 7 of 7

Project Centerpoint Intermodal Center
 Scenario Cumulative Conditions
 Peak Hour PM

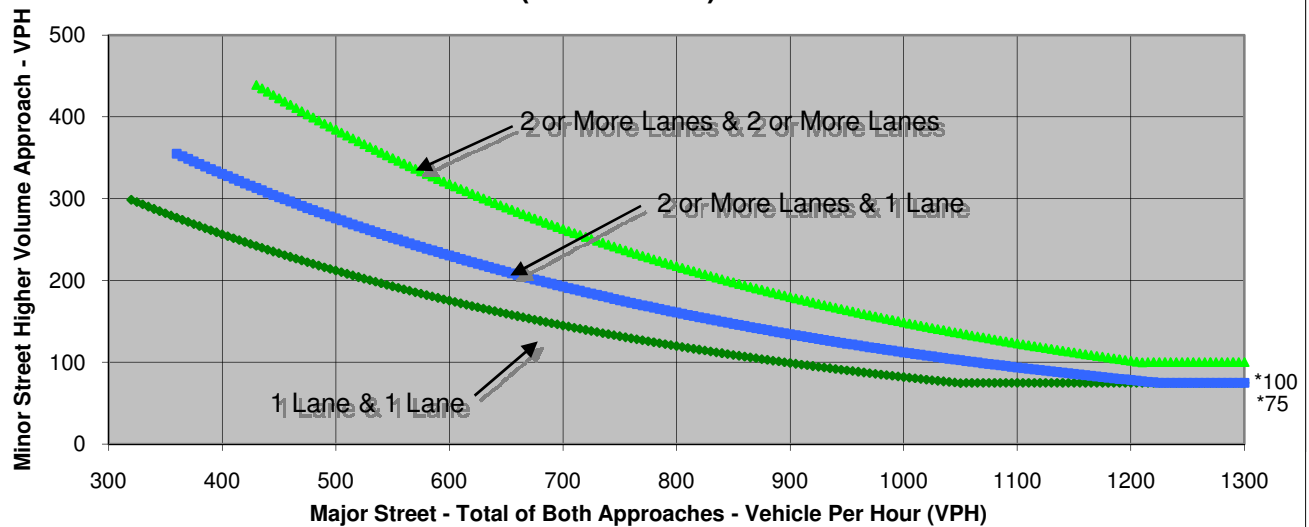
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	30	0	30
Through	770	820	0	0
Right	70	0	0	20
Total	840	850	0	50

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Hastings Drive	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,690	50	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Peak Hour Ramp Junction Analysis

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative No Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information				Freeway Data				Freeway Volume Adjustment										On-Ran	
Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Type
1 I-5 NB	Roth Road	AM	4	65.0	4,170	Yes	330	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,383	Right
2 I-5 SB	Roth Road	AM	4	65.0	5,360	Yes	1070	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,896	Right
3 I-5 NB	Roth Road	PM	4	65.0	5,870	Yes	1170	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	5,364	Right
4 I-5 SB	Roth Road	PM	4	65.0	4,590	Yes	370	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,816	Right

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Input Data			On-Ramp Volume Adjustment													
Freeway/ Direction	On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	
1 I-5 NB	Roth Road	1	45.0	400	450	0	450	0.92	Level			32.0%	0.0%	1.5	1.2	0.86	1.00	504	
2 I-5 SB	Roth Road	1	45.0	240	550	0	550	0.95	Level			32.0%	0.0%	1.5	1.2	0.86	1.00	293	
3 I-5 NB	Roth Road	1	45.0	870	450	0	450	0.92	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	1,102	
4 I-5 SB	Roth Road	1	45.0	370	550	0	550	0.9	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	479	

**HCM 2000
Merge Ramp Junctions
Capacity Analysis**

General Information

Freeway/ Direction		On-ramp	
1	I-5 NB	Roth Road	
2	I-5 SB	Roth Road	
3	I-5 NB	Roth Road	
4	I-5 SB	Roth Road	

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation						
Freeway/ Direction			L_{EQ}		P_{FM} Equations				v_{12}
		On-ramp	25-2	25-3	1	2	3	P_{FM}	(pcph)
1	I-5 NB	Roth Road			0.590			0.590	2,586
2	I-5 SB	Roth Road			0.593			0.593	2,903
3	I-5 NB	Roth Road			0.590			0.590	3,165
4	I-5 SB	Roth Road			0.593			0.593	2,856

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
Freeway/ Direction	On-ramp		V_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	V_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} > 1.5 $\cdot v_{12}/2$?	v_{12a} (pcph)	v_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,383	7,200	No	4,887	7,200	No	1,796	No	No	2,586	3,091	4,600	No	504	2,100	No
2	I-5 SB	Roth Road	4,896	7,200	No	5,189	7,200	No	1,993	No	No	2,903	3,196	4,600	No	293	2,100	No
3	I-5 NB	Roth Road	5,364	7,200	No	6,466	7,200	No	2,199	No	No	3,165	4,267	4,600	No	1,102	2,100	No
4	I-5 SB	Roth Road	4,816	7,200	No	5,295	7,200	No	1,961	No	No	2,856	3,335	4,600	No	479	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	26.5	C	0.366	56.6	60.3	57.9
2	I-5 SB	Roth Road	26.8	C	0.367	56.6	59.6	57.7
3	I-5 NB	Roth Road	35.4	E	0.559	52.2	58.9	54.3
4	I-5 SB	Roth Road	27.8	C	0.381	56.2	59.7	57.5

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative No Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information

Freeway Data

Freeway Volume Adjustment

Freeway/ Direction			Analysis Time Period		S _{FF} (mph)	V (vph)	HOV Lane		Grade			Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)
Lanes	Off-ramp						HOV Lane?	Volume	PHF	Terrain	%								
1	I-5 NB	Roth Road	AM	4	65.0	4,580	Yes	370	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	4,805	
2	I-5 SB	Roth Road	AM	4	65.0	6,090	Yes	1220	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	5,558	
3	I-5 NB	Roth Road	PM	4	65.0	6,130	Yes	1230	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	5,592	
4	I-5 SB	Roth Road	PM	4	65.0	5,020	Yes	400	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	5,273	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Effective	Off-Ramp Data						Off-Ramp Volume Adjustment											Flow Rate
Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)		Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_p	Flow Rate v_p (pcph)
1	I-5 NB	Roth Road	4,805	Right	1	45.0	410	150		150	0.92	Level			32.0%		1.5	1.2	0.86	1.00	517
2	I-5 SB	Roth Road	5,558	Right	1	45.0	730	150		150	0.92	Level			32.0%		1.5	1.2	0.86	1.00	920
3	I-5 NB	Roth Road	5,592	Right	1	45.0	260	150		150	0.9	Level			33.0%		1.5	1.2	0.86	1.00	337
4	I-5 SB	Roth Road	5,273	Right	1	45.0	430	150		150	0.9	Level			33.0%		1.5	1.2	0.86	1.00	557

HCM 2000

Diverge Ramp Junctions

Capacity Analysis

General Information

	Freeway/ Direction	Off-ramp
1	I-5 NB	Roth Road
2	I-5 SB	Roth Road
3	I-5 NB	Roth Road
4	I-5 SB	Roth Road

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation		
	Freeway/ Direction	Off-ramp	L_{EQ}		v_{12} (pcph)
			25-13	25-14	
1	I-5 NB	Roth Road			0.616 3,159
2	I-5 SB	Roth Road			0.579 3,604
3	I-5 NB	Roth Road			0.605 3,515
4	I-5 SB	Roth Road			0.603 3,398

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks														
Freeway/ Direction	Off-ramp		V_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $v_{12}/2$?	V_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,805	7,200	No	1,646	No	No	3,159	4,400	No	4,288	7,200	No	517	2,100	No
2	I-5 SB	Roth Road	5,558	7,200	No	1,954	No	No	3,604	4,400	No	4,638	7,200	No	920	2,100	No
3	I-5 NB	Roth Road	5,592	7,200	No	2,078	No	No	3,515	4,400	No	5,256	7,200	No	337	2,100	No
4	I-5 SB	Roth Road	5,273	7,200	No	1,874	No	No	3,398	4,400	No	4,716	7,200	No	557	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	30.1	D	0.345	57.1	68.8	60.6
2	I-5 SB	Roth Road	33.9	D	0.381	56.2	67.6	59.8
3	I-5 NB	Roth Road	33.1	D	0.328	57.4	67.1	60.7
4	I-5 SB	Roth Road	32.1	D	0.348	57.0	67.9	60.4

Technical Appendix D

Cumulative Plus CIC Project Conditions and

Cumulative Plus Master Plan Buildout Conditions

Peak Hour Intersection Operation Analysis

Cumulative Plus CIC Project Conditions

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1570	1792	1468	1570	1792	1524	1703	3105		1641	1638	1404
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1570	1792	1468	1570	1792	1524	1703	3105		1641	1638	1404
Volume (vph)	90	230	42	52	290	150	81	596	121	200	281	60
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	95	242	44	58	322	167	88	648	132	222	312	67
RTOR Reduction (vph)	0	0	31	0	0	0	0	14	0	0	0	41
Lane Group Flow (vph)	95	242	13	58	322	167	88	766	0	222	312	26
Heavy Vehicles (%)	15%	6%	10%	15%	6%	6%	6%	14%	10%	10%	16%	15%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	7.5	25.4	25.4	4.5	22.4	86.8	7.4	27.8		13.1	33.5	33.5
Effective Green, g (s)	7.5	25.4	25.4	4.5	22.4	86.8	7.4	27.8		13.1	33.5	33.5
Actuated g/C Ratio	0.09	0.29	0.29	0.05	0.26	1.00	0.09	0.32		0.15	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	136	524	430	81	462	1524	145	994		248	632	542
v/s Ratio Prot	c0.06	0.14		0.04	c0.18		0.05	c0.25		c0.14	0.19	
v/s Ratio Perm			0.01			c0.11						0.02
v/c Ratio	0.70	0.46	0.03	0.72	0.70	0.11	0.61	0.77		0.90	0.49	0.05
Uniform Delay, d1	38.6	25.1	21.9	40.5	29.1	0.0	38.3	26.6		36.2	20.2	16.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	14.5	0.6	0.0	25.8	4.5	0.1	7.0	3.7		30.9	0.6	0.0
Delay (s)	53.1	25.8	21.9	66.3	33.7	0.1	45.3	30.4		67.0	20.8	16.7
Level of Service	D	C	C	E	C	A	D	C		E	C	B
Approach Delay (s)		32.1			26.9			31.9			37.4	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			32.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			86.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			65.0%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	110	10	233	40	0	0	0	0	422	10	340
Peak Hour Factor	0.80	0.80	0.80	0.95	0.95	0.95	0.25	0.25	0.25	0.94	0.94	0.94
Hourly flow rate (vph)	0	138	12	245	42	0	0	0	0	449	11	362
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	42			150			1022	676	75	601	683	21
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	42			150			1022	676	75	601	683	21
tC, single (s)	4.2			4.8			7.5	6.5	6.9	8.2	6.6	7.0
tC, 2 stage (s)												
tF (s)	2.3			2.6			3.5	4.0	3.3	3.8	4.1	3.4
p0 queue free %	100			80			100	100	100	0	96	65
cM capacity (veh/h)	1536			1218			102	298	971	275	289	1038
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	92	58	245	21	21	299	522					
Volume Left	0	0	245	0	0	299	150					
Volume Right	0	12	0	0	0	0	362					
cSH	1700	1700	1218	1700	1700	275	562					
Volume to Capacity	0.05	0.03	0.20	0.01	0.01	1.09	0.93					
Queue Length 95th (ft)	0	0	19	0	0	305	293					
Control Delay (s)	0.0	0.0	8.7	0.0	0.0	120.3	49.6					
Lane LOS			A			F	E					
Approach Delay (s)	0.0		7.4			75.3						
Approach LOS						F						
Intersection Summary												
Average Delay			50.9									
Intersection Capacity Utilization			48.6%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

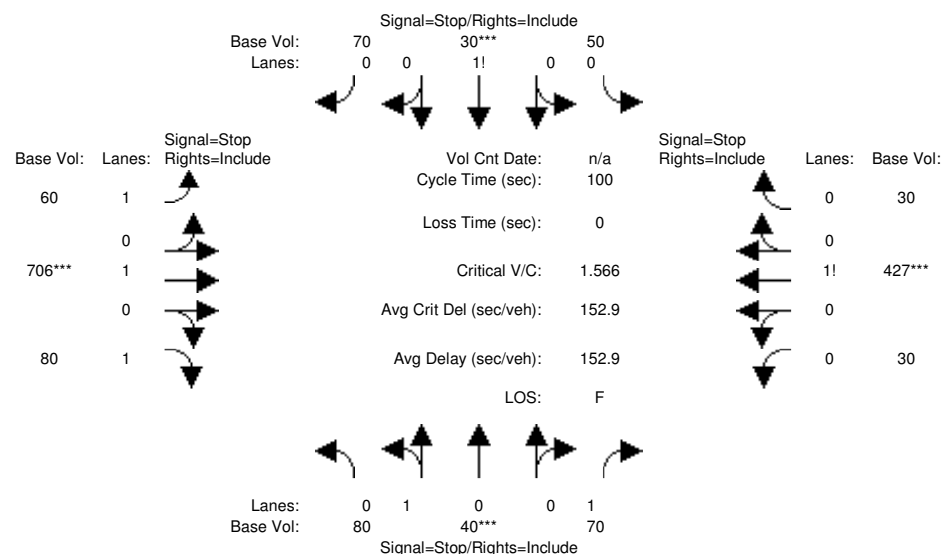
3: Roth Road & NB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	90	442	0	0	253	324	20	10	404	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.25	0.25	0.25
Hourly flow rate (vph)	98	480	0	0	272	348	22	11	434	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									18			
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	620			480			812	1297	240	887	1122	310
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	620			480			812	1297	240	887	1122	310
tC, single (s)	4.2			4.1			7.6	6.6	7.5	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.1	3.6	3.5	4.0	3.3
p0 queue free %	89			100			91	92	36	100	100	100
cM capacity (veh/h)	929			1078			242	139	677	74	183	686
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1						
Volume Total	98	240	240	181	439	467						
Volume Left	98	0	0	0	0	22						
Volume Right	0	0	0	0	348	434						
cSH	929	1700	1700	1700	1700	727						
Volume to Capacity	0.11	0.14	0.14	0.11	0.26	0.64						
Queue Length 95th (ft)	9	0	0	0	0	117						
Control Delay (s)	9.3	0.0	0.0	0.0	0.0	19.8						
Lane LOS	A					C						
Approach Delay (s)	1.6			0.0		19.8						
Approach LOS						C						
Intersection Summary												
Average Delay			6.1									
Intersection Capacity Utilization			48.6%		ICU Level of Service				A			
Analysis Period (min)			15									

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #3: Roth Road / Harlan Road Cumulative + CIC AM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0

Volume Module:

Base Vol:	80	40	70	50	30	70	60	706	80	30	427	30
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	80	40	70	50	30	70	60	706	80	30	427	30
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.92	0.92	0.92
PHF Volume:	89	44	78	56	33	78	65	759	86	33	464	33
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	89	44	78	56	33	78	65	759	86	33	464	33
PCE 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
MLF 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
Final Volume:	89	44	78	56	33	78	65	759	86	33	464	33

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.67	0.33	1.00	0.33	0.20	0.47	1.00	1.00	1.00	0.06	0.88	0.06
Final Sat.:	271	135	460	141	84	197	453	485	533	29	416	29

Capacity Analysis Module:

Vol/Sat:	0.33	0.33	0.17	0.40	0.40	0.40	0.14	1.57	0.16	1.11	1.11	1.11
Crit Moves:	****			****			****			****		
Delay/Veh:	15.6	15.6	11.9	16.7	16.7	16.7	11.9	284	10.7	103.2	103	103.2
Delay 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
AdjDel/Veh:	15.6	15.6	11.9	16.7	16.7	16.7	11.9	284	10.7	103.2	103	103.2
LOS by Move:	C	C	B	C	C	C	B	F	B	F	F	F
ApproachDel:	14.2			16.7			238.9			103.2		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	14.2			16.7			238.9			103.2		
LOS by Appr:	B			C			F			F		
AllWayAvgQ:	0.5	0.5	0.2	0.6	0.6	0.6	0.2	36.9	0.2	12.2	12.2	12.2

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #3 Roth Road / Harlan Road Cumulative + CIC AM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

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-----|-----|-----|-----|-----|
Control:      Stop Sign      Stop Sign      Stop Sign      Stop Sign
Lanes:         0 1 0 0 1      0 0 1! 0 0      1 0 1 0 1      0 0 1! 0 0
Initial Vol:   80  40   70    50  30   70    60  706   80    30  427   30
-----|-----|-----|-----|-----|
Major Street Volume:                1333
Minor Approach Volume:                190
Minor Approach Volume Threshold: 250
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SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Signalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	1.00	1.00	0.95	1.00	0.96	
Satd. Flow (prot)	1496	824	1043	1545	922	
Flt Permitted	1.00	1.00	0.95	1.00	0.96	
Satd. Flow (perm)	1496	824	1043	1545	922	
Volume (vph)	306	140	46	367	124	28
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.90	0.90
Adj. Flow (vph)	329	151	49	395	138	31
RTOR Reduction (vph)	0	99	0	0	15	0
Lane Group Flow (vph)	329	52	49	395	154	0
Heavy Vehicles (%)	27%	96%	73%	23%	98%	71%
Turn Type	Perm		Prot			
Protected Phases	4		3	8	2	
Permitted Phases		4				
Actuated Green, G (s)	13.6	13.6	1.9	19.5	12.2	
Effective Green, g (s)	13.6	13.6	1.9	19.5	12.2	
Actuated g/C Ratio	0.34	0.34	0.05	0.49	0.31	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	512	282	50	759	283	
v/s Ratio Prot	c0.22		c0.05	0.26	c0.17	
v/s Ratio Perm		0.06				
v/c Ratio	0.64	0.18	0.98	0.52	0.54	
Uniform Delay, d1	11.0	9.2	18.9	6.9	11.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.8	0.3	118.5	0.6	2.1	
Delay (s)	13.8	9.5	137.4	7.6	13.6	
Level of Service	B	A	F	A	B	
Approach Delay (s)	12.4			21.9	13.6	
Approach LOS	B			C	B	
Intersection Summary						
HCM Average Control Delay			16.4		HCM Level of Service	B
HCM Volume to Capacity ratio			0.62			
Actuated Cycle Length (s)			39.7		Sum of lost time (s)	12.0
Intersection Capacity Utilization			38.0%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

7/14/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
						
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1308	1346	1530	1792	1638	1196
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1308	1346	1530	1792	1638	1196
Volume (vph)	212	69	127	586	210	264
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.92	0.92
Adj. Flow (vph)	236	77	134	617	228	287
RTOR Reduction (vph)	0	59	0	0	0	165
Lane Group Flow (vph)	236	18	134	617	228	122
Heavy Vehicles (%)	38%	20%	18%	6%	16%	35%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	11.6	11.6	5.3	30.6	21.3	21.3
Effective Green, g (s)	11.6	11.6	5.3	30.6	21.3	21.3
Actuated g/C Ratio	0.23	0.23	0.11	0.61	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	302	311	162	1092	695	507
v/s Ratio Prot	c0.18		c0.09	c0.34	0.14	
v/s Ratio Perm		0.01				0.10
v/c Ratio	0.78	0.06	0.83	0.57	0.33	0.24
Uniform Delay, d1	18.1	15.0	22.0	5.8	9.7	9.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.3	0.1	27.9	0.7	0.3	0.2
Delay (s)	30.5	15.1	49.9	6.5	9.9	9.5
Level of Service	C	B	D	A	A	A
Approach Delay (s)	26.7			14.2	9.7	
Approach LOS	C			B	A	
Intersection Summary						
HCM Average Control Delay			15.2		HCM Level of Service	B
HCM Volume to Capacity ratio			0.64			
Actuated Cycle Length (s)			50.2		Sum of lost time (s)	8.0
Intersection Capacity Utilization			49.3%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	1.00	
Frt		0.88			0.95		1.00	0.99		1.00	1.00	
Flt Protected		1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1203			1717		1308	3258		1770	1710	
Flt Permitted		1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1203			1717		1308	3258		1770	1710	
Volume (vph)	1	1	20	260	2	150	35	880	90	60	594	2
Peak-hour factor, PHF	0.87	0.87	0.87	0.90	0.90	0.90	0.97	0.97	0.97	0.95	0.95	0.95
Adj. Flow (vph)	1	1	23	289	2	167	36	907	93	63	625	2
RTOR Reduction (vph)	0	22	0	0	18	0	0	7	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	440	0	36	993	0	63	627	0
Heavy Vehicles (%)	38%	38%	38%	2%	2%	2%	38%	10%	2%	2%	11%	38%
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		2.5			26.4		3.0	34.7		4.5	36.2	
Effective Green, g (s)		2.5			26.4		3.0	34.7		4.5	36.2	
Actuated g/C Ratio		0.03			0.31		0.04	0.41		0.05	0.43	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		36			539		47	1344		95	736	
v/s Ratio Prot		c0.00			c0.26		0.03	c0.30		0.04	c0.37	
v/s Ratio Perm												
v/c Ratio		0.07			0.82		0.77	0.74		0.66	0.85	
Uniform Delay, d1		39.7			26.6		40.2	20.9		39.1	21.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9			9.3		52.3	2.2		16.1	9.4	
Delay (s)		40.6			35.9		92.5	23.0		55.1	30.9	
Level of Service		D			D		F	C		E	C	
Approach Delay (s)		40.6			35.9			25.4			33.1	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay		30.2					HCM Level of Service			C		
HCM Volume to Capacity ratio		0.79										
Actuated Cycle Length (s)		84.1					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		75.1%					ICU Level of Service		D			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	962	440	449	1491	0	0	0	0	292	10	1020
Peak Hour Factor	0.95	0.95	0.95	0.98	0.98	0.98	0.25	0.25	0.25	0.95	0.95	0.95
Hourly flow rate (vph)	0	1013	463	458	1521	0	0	0	0	307	11	1074
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked	0.52						0.52	0.52		0.52	0.52	0.52
vC, conflicting volume	1521			1476			4761	3682	1244	3682	3914	1521
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1999			1476			8205	6138	1244	6138	6582	1999
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			0			0	0	100	0	0	0
cM capacity (veh/h)	148			453			0	0	211	0	0	39
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	1476	458	1521	1392								
Volume Left	0	458	0	307								
Volume Right	463	0	0	1074								
cSH	1700	453	1700	0								
Volume to Capacity	0.87	1.01	0.89	Err								
Queue Length 95th (ft)	0	335	0	Err								
Control Delay (s)	0.0	75.4	0.0	Err								
Lane LOS		F		F								
Approach Delay (s)	0.0	17.4		Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization		317.4%		ICU Level of Service						H		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free				Stop		Stop	
Grade	0%				0%				0%		0%	
Volume (veh/h)	550	704	0	0	1310	581	630	10	376	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.98	0.98	0.98	0.95	0.95	0.95	0.25	0.25	0.25
Hourly flow rate (vph)	579	741	0	0	1337	593	663	11	396	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.41							0.41	0.41			0.41
vC, conflicting volume	1930			741				3532	3829	741	3933	3532
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3273			741				7193	7917	741	8173	7193
tC, single (s)	4.1			4.1				7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0
p0 queue free %	0			100				0	0	5	0	0
cM capacity (veh/h)	36			861				0	0	415	0	0
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	579	741	1930	1069								
Volume Left	579	0	0	663								
Volume Right	0	0	593	396								
cSH	36	1700	1700	0								
Volume to Capacity	16.05	0.44	1.14	Err								
Queue Length 95th (ft)	Err	0	0	Err								
Control Delay (s)	6981.9	0.0	0.0	Err								
Lane LOS	F			F								
Approach Delay (s)	3062.2	0.0		Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization	317.4%		ICU Level of Service				H					
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.91		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3451		1752	1845	1568	1752	3202		1752	3129	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3451		1752	1845	1568	1752	3202		1752	3129	
Volume (vph)	110	870	100	62	1561	61	230	40	54	62	40	100
Peak-hour factor, PHF	0.95	0.95	0.95	0.98	0.98	0.98	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	116	916	105	63	1593	62	256	44	60	83	53	133
RTOR Reduction (vph)	0	6	0	0	0	8	0	53	0	0	103	0
Lane Group Flow (vph)	116	1015	0	63	1593	54	256	51	0	83	83	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	7.8	68.8		7.1	68.1	68.1	12.0	13.5		8.6	10.1	
Effective Green, g (s)	7.8	68.8		7.1	68.1	68.1	12.0	13.5		8.6	10.1	
Actuated g/C Ratio	0.07	0.60		0.06	0.60	0.60	0.11	0.12		0.08	0.09	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	120	2083		109	1102	937	184	379		132	277	
v/s Ratio Prot	c0.07	0.29		0.04	c0.86		c0.15	c0.02		0.05	c0.03	
v/s Ratio Perm						0.03						
v/c Ratio	0.97	0.49		0.58	1.45	0.06	1.39	0.13		0.63	0.30	
Uniform Delay, d1	53.0	12.7		52.0	23.0	9.6	51.0	45.0		51.2	48.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	71.0	0.8		7.2	205.7	0.1	205.8	0.2		9.0	0.6	
Delay (s)	124.0	13.5		59.2	228.6	9.7	256.8	45.2		60.2	49.2	
Level of Service	F	B		E	F	A	F	D		E	D	
Approach Delay (s)		24.8			214.5			195.7			52.6	
Approach LOS		C			F			F			D	
Intersection Summary												
HCM Average Control Delay		138.1				HCM Level of Service		F				
HCM Volume to Capacity ratio		1.26										
Actuated Cycle Length (s)		114.0				Sum of lost time (s)		16.0				
Intersection Capacity Utilization		118.5%				ICU Level of Service		H				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & Fifth Street

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.90		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3483		1752	1660		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3483		1752	1660		1752	1845	1568
Volume (vph)	20	785	20	20	1184	51	40	20	40	132	20	60
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	22	853	22	21	1246	54	50	25	50	165	25	75
RTOR Reduction (vph)	0	0	14	0	3	0	0	34	0	0	0	47
Lane Group Flow (vph)	22	853	8	21	1297	0	50	41	0	165	25	28
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	2.2	33.1	33.1	2.2	33.1		3.5	27.8		9.0	33.3	33.3
Effective Green, g (s)	2.2	33.1	33.1	2.2	33.1		3.5	27.8		9.0	33.3	33.3
Actuated g/C Ratio	0.02	0.38	0.38	0.02	0.38		0.04	0.32		0.10	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	44	1317	589	44	1309		70	524		179	697	593
v/s Ratio Prot	c0.01	0.24		0.01	c0.37		c0.03	c0.02		c0.09	0.01	
v/s Ratio Perm			0.01									0.02
v/c Ratio	0.50	0.65	0.01	0.48	0.99		0.71	0.08		0.92	0.04	0.05
Uniform Delay, d1	42.4	22.7	17.3	42.4	27.3		41.8	21.2		39.2	17.3	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.7	1.1	0.0	7.9	22.6		29.1	0.3		45.2	0.1	0.2
Delay (s)	51.1	23.8	17.3	50.3	49.9		70.9	21.4		84.4	17.4	17.5
Level of Service	D	C	B	D	D		E	C		F	B	B
Approach Delay (s)		24.3			49.9			41.2			59.2	
Approach LOS		C			D			D			E	
Intersection Summary												
HCM Average Control Delay			41.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			88.1			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			55.0%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	↵
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3440		1752	3505	1752	1568
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3440		1752	3505	1752	1568
Volume (vph)	857	120	82	1135	110	44
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.80	0.80
Adj. Flow (vph)	932	130	86	1195	138	55
RTOR Reduction (vph)	11	0	0	0	0	46
Lane Group Flow (vph)	1051	0	86	1195	138	9
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Turn Type			Prot			Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	36.2		5.2	45.4	11.0	11.0
Effective Green, g (s)	36.2		5.2	45.4	11.0	11.0
Actuated g/C Ratio	0.56		0.08	0.70	0.17	0.17
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1934		141	2471	299	268
v/s Ratio Prot	c0.31		0.05	c0.34	c0.08	
v/s Ratio Perm						0.01
v/c Ratio	0.54		0.61	0.48	0.46	0.04
Uniform Delay, d1	8.9		28.6	4.3	24.0	22.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		7.3	0.1	1.1	0.1
Delay (s)	9.2		35.9	4.4	25.2	22.3
Level of Service	A		D	A	C	C
Approach Delay (s)	9.2			6.5	24.4	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			9.0		HCM Level of Service	A
HCM Volume to Capacity ratio			0.53			
Actuated Cycle Length (s)			64.4		Sum of lost time (s)	12.0
Intersection Capacity Utilization			48.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1641	1845	1568	1752	1723		1752	1759		1530	1810	1538
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1641	1845	1568	1752	1723		1752	1759		1530	1810	1538
Volume (vph)	191	440	160	110	640	306	170	547	100	61	415	458
Peak-hour factor, PHF	0.93	0.93	0.93	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	205	473	172	117	681	326	185	595	109	66	451	498
RTOR Reduction (vph)	0	0	103	0	14	0	0	6	0	0	0	211
Lane Group Flow (vph)	205	473	69	117	993	0	185	698	0	66	451	287
Heavy Vehicles (%)	10%	3%	3%	3%	3%	9%	3%	6%	3%	18%	5%	5%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	11.0	48.0	48.0	15.0	52.0		12.0	35.0		6.0	29.0	29.0
Effective Green, g (s)	11.0	48.0	48.0	15.0	52.0		12.0	35.0		6.0	29.0	29.0
Actuated g/C Ratio	0.09	0.40	0.40	0.12	0.43		0.10	0.29		0.05	0.24	0.24
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	150	738	627	219	747		175	513		77	437	372
v/s Ratio Prot	c0.12	0.26		0.07	c0.58		0.11	c0.40		0.04	c0.25	
v/s Ratio Perm			0.04									0.19
v/c Ratio	1.37	0.64	0.11	0.53	1.33		1.06	1.36		0.86	1.03	0.77
Uniform Delay, d1	54.5	29.0	22.6	49.2	34.0		54.0	42.5		56.6	45.5	42.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	201.6	4.2	0.4	2.5	157.3		84.0	174.9		56.7	51.5	14.4
Delay (s)	256.1	33.3	22.9	51.7	191.3		138.0	217.4		113.2	97.0	56.8
Level of Service	F	C	C	D	F		F	F		F	F	E
Approach Delay (s)		84.9			176.7			200.8			78.3	
Approach LOS		F			F			F			E	
Intersection Summary												
HCM Average Control Delay			136.4			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.30									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			114.5%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	1810	1568	1752	3271		1752	3398	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	1810	1568	1752	3271		1752	3398	
Volume (vph)	171	435	73	180	687	220	155	250	200	400	360	92
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	190	483	81	196	747	239	182	294	235	435	391	100
RTOR Reduction (vph)	0	0	54	0	0	104	0	125	0	0	18	0
Lane Group Flow (vph)	190	483	27	196	747	135	182	404	0	435	473	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	11.0	38.4	38.4	17.6	45.0	45.0	16.6	18.5		26.0	27.9	
Effective Green, g (s)	11.0	38.4	38.4	17.6	45.0	45.0	16.6	18.5		26.0	27.9	
Actuated g/C Ratio	0.09	0.33	0.33	0.15	0.39	0.39	0.14	0.16		0.22	0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	165	1133	517	265	699	606	250	519		391	814	
v/s Ratio Prot	c0.11	0.14		0.11	c0.41		0.10	c0.12		c0.25	0.14	
v/s Ratio Perm			0.02			0.09						
v/c Ratio	1.15	0.43	0.05	0.74	1.07	0.22	0.73	0.78		1.11	0.58	
Uniform Delay, d1	52.8	30.5	26.6	47.3	35.8	24.0	47.8	47.0		45.2	39.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	116.6	0.3	0.0	10.3	53.9	0.2	10.1	7.2		79.6	1.1	
Delay (s)	169.4	30.7	26.7	57.6	89.6	24.2	57.9	54.2		124.8	40.2	
Level of Service	F	C	C	E	F	C	E	D		F	D	
Approach Delay (s)		65.2			71.1			55.2			80.0	
Approach LOS		E			E			E			E	
Intersection Summary												
HCM Average Control Delay			69.0				HCM Level of Service			E		
HCM Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			116.5				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			94.5%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Lathrop Road & SR 99 SB Ramps

7/14/2010

	→	↗	↘	↖	←	↖	↗	↘	↖	↗	↓	↘
Movement	EBT	EBR	EBR2	WBL	WBT	WBR	NBL	NBR	NBR2	SBL2	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑	↑↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.88		0.97	0.95	1.00	1.00	0.88	1.00	1.00	0.95	0.88
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Flt Permitted	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Volume (vph)	693	601	70	80	992	80	100	620	130	20	300	274
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	729	633	74	84	1044	84	109	674	141	22	333	304
RTOR Reduction (vph)	0	8	0	0	0	41	0	0	98	0	0	75
Lane Group Flow (vph)	729	699	0	84	1044	43	109	674	43	22	333	229
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Prot			Perm		Prot custom		Prot	Perm
Protected Phases	4			3	8			5			1	6
Permitted Phases		4				8		2	2			6
Actuated Green, G (s)	32.5	32.5		4.8	41.3	41.3	6.0	24.3	24.3	2.4	20.7	20.7
Effective Green, g (s)	32.5	32.5		4.8	41.3	41.3	6.0	24.3	24.3	2.4	20.7	20.7
Actuated g/C Ratio	0.41	0.41		0.06	0.52	0.52	0.08	0.30	0.30	0.03	0.26	0.26
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1438	1132		206	1827	817	133	847	481	53	916	721
v/s Ratio Prot	0.21			0.02	c0.29		c0.06			0.01	0.09	
v/s Ratio Perm		c0.25				0.03		c0.24	0.03			0.08
v/c Ratio	0.51	0.62		0.41	0.57	0.05	0.82	0.80	0.09	0.42	0.36	0.32
Uniform Delay, d1	17.8	18.8		36.2	13.3	9.6	36.5	25.6	19.9	38.1	24.3	23.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	2.5		1.3	1.3	0.1	31.0	5.2	0.1	5.2	0.2	0.3
Delay (s)	19.0	21.3		37.5	14.6	9.7	67.4	30.8	20.0	43.3	24.5	24.2
Level of Service	B	C		D	B	A	E	C	C	D	C	C
Approach Delay (s)	20.2				15.8						25.0	
Approach LOS	C				B						C	
Intersection Summary												
HCM Average Control Delay		22.6		HCM Level of Service				C				
HCM Volume to Capacity ratio		0.72										
Actuated Cycle Length (s)		80.0		Sum of lost time (s)				16.0				
Intersection Capacity Utilization		54.2%		ICU Level of Service				A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

17: Lathrop Road & SR 99 NB Ramps

7/14/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3433	1583
Volume (vph)	321	1012	180	292	860	70
Peak-hour factor, PHF	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	338	1065	212	344	935	76
RTOR Reduction (vph)	0	0	0	0	0	51
Lane Group Flow (vph)	338	1065	212	344	935	25
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Turn Type		Free	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	26.2	75.0	12.5	42.7	24.3	24.3
Effective Green, g (s)	26.2	75.0	12.5	42.7	24.3	24.3
Actuated g/C Ratio	0.35	1.00	0.17	0.57	0.32	0.32
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1236	1583	295	2015	1112	513
v/s Ratio Prot	0.10		0.12	0.10	c0.27	
v/s Ratio Perm		c0.67				0.02
v/c Ratio	0.27	0.67	0.72	0.17	0.84	0.05
Uniform Delay, d1	17.6	0.0	29.6	7.7	23.6	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	2.3	8.1	0.2	5.9	0.0
Delay (s)	18.1	2.3	37.7	7.9	29.4	17.4
Level of Service	B	A	D	A	C	B
Approach Delay (s)	6.1			19.3	28.5	
Approach LOS	A			B	C	
Intersection Summary						
HCM Average Control Delay			16.2		HCM Level of Service	B
HCM Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			75.0		Sum of lost time (s)	4.0
Intersection Capacity Utilization			53.4%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

7/14/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	30	37	780	10	11	674
Peak Hour Factor	0.85	0.85	0.96	0.96	0.95	0.95
Hourly flow rate (vph)	35	44	812	10	12	709
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)					1308	
pX, platoon unblocked	0.77					
vC, conflicting volume	1545	812			823	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1706	812			823	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	54	88			99	
cM capacity (veh/h)	76	377			794	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	35	44	812	10	12	709
Volume Left	35	0	0	0	12	0
Volume Right	0	44	0	10	0	0
cSH	76	377	1700	1700	794	1700
Volume to Capacity	0.46	0.12	0.48	0.01	0.01	0.42
Queue Length 95th (ft)	47	10	0	0	1	0
Control Delay (s)	88.1	15.8	0.0	0.0	9.6	0.0
Lane LOS	F	C			A	
Approach Delay (s)	48.2		0.0		0.2	
Approach LOS	E					
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			51.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1752	1759		1752	1845	1568	1752	1845	1568	1752	1806	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1752	1759		1752	1845	1568	1752	1845	1568	1752	1806	
Volume (vph)	114	200	90	200	540	154	160	608	50	52	560	92
Peak-hour factor, PHF	0.87	0.87	0.87	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	131	230	103	217	587	167	174	661	54	56	602	99
RTOR Reduction (vph)	0	13	0	0	0	111	0	0	30	0	5	0
Lane Group Flow (vph)	131	320	0	217	587	56	174	661	24	56	696	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	9.0	28.4		17.6	37.0	37.0	12.0	54.0	54.0	4.8	46.8	
Effective Green, g (s)	9.0	28.4		17.6	37.0	37.0	12.0	54.0	54.0	4.8	46.8	
Actuated g/C Ratio	0.07	0.24		0.15	0.31	0.31	0.10	0.45	0.45	0.04	0.39	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	131	414		255	565	480	174	825	701	70	700	
v/s Ratio Prot	c0.07	0.18		0.12	c0.32		c0.10	0.36		0.03	c0.39	
v/s Ratio Perm						0.04			0.02			
v/c Ratio	1.00	0.77		0.85	1.04	0.12	1.00	0.80	0.03	0.80	0.99	
Uniform Delay, d1	55.9	43.2		50.3	41.9	30.1	54.4	28.8	18.8	57.5	36.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	78.6	8.7		22.8	48.3	0.1	68.2	5.6	0.0	46.2	32.4	
Delay (s)	134.5	51.9		73.2	90.2	30.3	122.6	34.4	18.8	103.7	69.3	
Level of Service	F	D		E	F	C	F	C	B	F	E	
Approach Delay (s)		75.2			76.1			50.7			71.8	
Approach LOS		E			E			D			E	
Intersection Summary												
HCM Average Control Delay			67.6			HCM Level of Service				E		
HCM Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			120.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			92.0%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1570	1792	1538	1641	1792	1524	1703	3110		1703	1776	1468
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1570	1792	1538	1641	1792	1524	1703	3110		1703	1776	1468
Volume (vph)	60	350	102	182	390	120	72	375	102	160	561	70
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	389	113	198	424	130	78	408	111	174	610	76
RTOR Reduction (vph)	0	0	62	0	0	0	0	20	0	0	0	48
Lane Group Flow (vph)	67	389	51	198	424	130	78	499	0	174	610	28
Heavy Vehicles (%)	15%	6%	5%	10%	6%	6%	6%	13%	10%	6%	7%	10%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	5.7	25.4	25.4	17.4	37.1	102.5	5.7	31.3		12.4	38.0	38.0
Effective Green, g (s)	5.7	25.4	25.4	17.4	37.1	102.5	5.7	31.3		12.4	38.0	38.0
Actuated g/C Ratio	0.06	0.25	0.25	0.17	0.36	1.00	0.06	0.31		0.12	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	87	444	381	279	649	1524	95	950		206	658	544
v/s Ratio Prot	0.04	c0.22		0.12	c0.24		0.05	0.16		c0.10	c0.34	
v/s Ratio Perm			0.03			0.09						0.02
v/c Ratio	0.77	0.88	0.13	0.71	0.65	0.09	0.82	0.53		0.84	0.93	0.05
Uniform Delay, d1	47.8	37.0	30.0	40.2	27.3	0.0	47.9	29.5		44.1	30.9	20.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	33.4	17.3	0.2	8.0	2.4	0.1	41.0	0.5		25.8	19.1	0.0
Delay (s)	81.2	54.4	30.2	48.2	29.7	0.1	88.9	30.0		69.9	50.1	20.7
Level of Service	F	D	C	D	C	A	F	C		E	D	C
Approach Delay (s)		52.7			29.4			37.7			51.5	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			42.8			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			102.5			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			75.4%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↱	↑↑					↱	↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	520	10	382	30	0	0	0	0	344	10	120
Peak Hour Factor	0.92	0.92	0.92	0.91	0.91	0.91	0.25	0.25	0.25	0.92	0.92	0.92
Hourly flow rate (vph)	0	565	11	420	33	0	0	0	0	374	11	130
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	33			576			1563	1443	288	1155	1449	16
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	33			576			1563	1443	288	1155	1449	16
tC, single (s)	4.1			4.8			7.5	6.5	6.9	8.2	6.6	7.0
tC, 2 stage (s)												
tF (s)	2.2			2.5			3.5	4.0	3.3	3.8	4.1	3.4
p0 queue free %	100			48			100	100	100	0	82	88
cM capacity (veh/h)	1577			808			34	63	709	70	60	1046
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	377	199	420	16	16	249	266					
Volume Left	0	0	420	0	0	249	125					
Volume Right	0	11	0	0	0	0	130					
cSH	1700	1700	808	1700	1700	70	128					
Volume to Capacity	0.22	0.12	0.52	0.01	0.01	3.55	2.08					
Queue Length 95th (ft)	0	0	76	0	0	Err	546					
Control Delay (s)	0.0	0.0	14.2	0.0	0.0	Err	567.9					
Lane LOS			B			F	F					
Approach Delay (s)	0.0		13.1			5130.9						
Approach LOS						F						
Intersection Summary												
Average Delay			1715.9									
Intersection Capacity Utilization			64.6%	ICU Level of Service				C				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

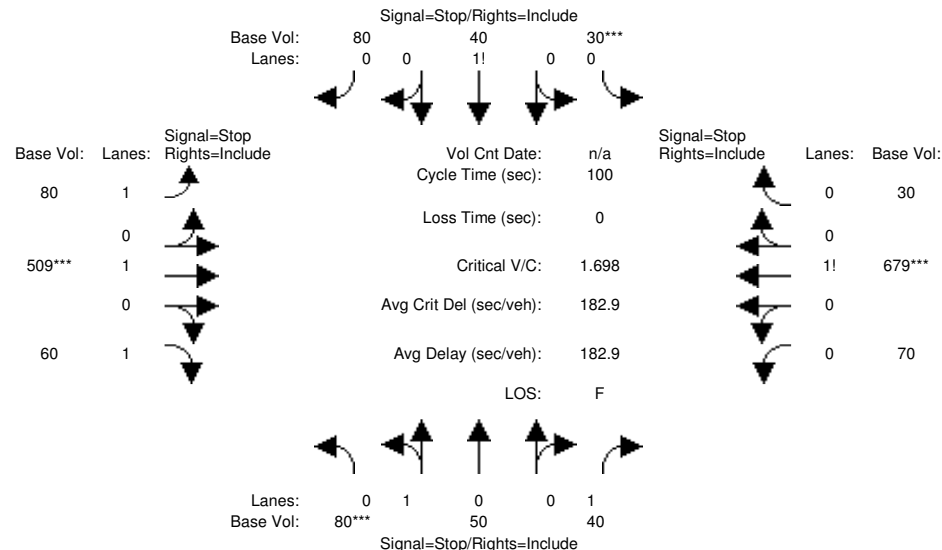
3: Roth Road & NB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	470	394	0	0	392	447	20	10	255	0	0	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.91	0.91	0.91	0.25	0.25	0.25
Hourly flow rate (vph)	500	419	0	0	417	476	22	11	280	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									18			
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	893			419			1628	2312	210	1870	2074	446
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	893			419			1628	2312	210	1870	2074	446
tC, single (s)	4.2			4.1			7.5	6.5	7.5	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.6	3.5	4.0	3.3
p0 queue free %	32			100			28	9	61	100	100	100
cM capacity (veh/h)	737			1136			31	12	716	3	17	560
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1						
Volume Total	500	210	210	278	615	313						
Volume Left	500	0	0	0	0	22						
Volume Right	0	0	0	0	476	280						
cSH	737	1700	1700	1700	1700	232						
Volume to Capacity	0.68	0.12	0.12	0.16	0.36	1.35						
Queue Length 95th (ft)	134	0	0	0	0	426						
Control Delay (s)	19.6	0.0	0.0	0.0	0.0	68.8						
Lane LOS	C					F						
Approach Delay (s)	10.6			0.0		68.8						
Approach LOS						F						
Intersection Summary												
Average Delay			14.7									
Intersection Capacity Utilization			64.6%		ICU Level of Service				C			
Analysis Period (min)			15									

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #4: Roth Road / Harlan Road Cumulative + CIC PM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0

Volume Module:

Base Vol:	80	50	40	30	40	80	80	509	60	70	679	30
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	80	50	40	30	40	80	80	509	60	70	679	30
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.96	0.96	0.96
PHF Volume:	89	56	44	33	44	89	86	547	65	73	707	31
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	89	56	44	33	44	89	86	547	65	73	707	31
PCE 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
MLF 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
Final Volume:	89	56	44	33	44	89	86	547	65	73	707	31

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.62	0.38	1.00	0.20	0.27	0.53	1.00	1.00	1.00	0.09	0.87	0.04
Final Sat.:	251	157	460	86	114	228	457	489	539	43	417	18

Capacity Analysis Module:

Vol/Sat:	0.35	0.35	0.10	0.39	0.39	0.39	0.19	1.12	0.12	1.70	1.70	1.70
Crit Moves:	***			***			***			***		
Delay/Veh:	16.0	16.0	11.2	16.4	16.4	16.4	12.4	103	10.3	341.8	342	341.8
Delay 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
AdjDel/Veh:	16.0	16.0	11.2	16.4	16.4	16.4	12.4	103	10.3	341.8	342	341.8
LOS by Move:	C	C	B	C	C	C	B	F	B	F	F	F
ApproachDel:	14.9			16.4			83.4			341.8		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	14.9			16.4			83.4			341.8		
LOS by Appr:	B			C			F			F		
AllWayAvgQ:	0.5	0.5	0.1	0.6	0.6	0.6	0.2	12.7	0.1	44.0	44.0	44.0

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #4 Roth Road / Harlan Road Cumulative + CIC PM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

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-----|-----|-----|-----|-----|
Control:      Stop Sign      Stop Sign      Stop Sign      Stop Sign
Lanes:        0  1  0  0  1    0  0  1! 0  0    1  0  1  0  1    0  0  1! 0  0
Initial Vol:   80   50   40    30  40   80    80  509   60    70  679   30
-----|-----|-----|-----|-----|
Major Street Volume:                1428
Minor Approach Volume:                170
Minor Approach Volume Threshold: 221
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SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Signalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (prot)	1652	820	955	1583	927	
Flt Permitted	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (perm)	1652	820	955	1583	927	
Volume (vph)	458	190	28	379	167	76
Peak-hour factor, PHF	0.93	0.93	0.96	0.96	0.90	0.90
Adj. Flow (vph)	492	204	29	395	186	84
RTOR Reduction (vph)	0	127	0	0	29	0
Lane Group Flow (vph)	492	77	29	395	241	0
Heavy Vehicles (%)	15%	97%	89%	20%	93%	83%
Turn Type	Perm		Prot			
Protected Phases	4		3	8	2	
Permitted Phases	4					
Actuated Green, G (s)	17.8	17.8	1.8	23.6	15.7	
Effective Green, g (s)	17.8	17.8	1.8	23.6	15.7	
Actuated g/C Ratio	0.38	0.38	0.04	0.50	0.33	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	622	309	36	790	308	
v/s Ratio Prot	c0.30		0.03	c0.25	c0.26	
v/s Ratio Perm		0.09				
v/c Ratio	0.79	0.25	0.81	0.50	0.78	
Uniform Delay, d1	13.1	10.1	22.6	7.9	14.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.8	0.4	75.6	0.5	12.2	
Delay (s)	19.9	10.6	98.2	8.4	26.5	
Level of Service	B	B	F	A	C	
Approach Delay (s)	17.2			14.5	26.5	
Approach LOS	B			B	C	
Intersection Summary						
HCM Average Control Delay	18.2		HCM Level of Service		B	
HCM Volume to Capacity ratio	0.79					
Actuated Cycle Length (s)	47.3		Sum of lost time (s)		12.0	
Intersection Capacity Utilization	44.7%		ICU Level of Service		A	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

7/14/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
						
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1357	1442	1597	1776	1810	1223
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1357	1442	1597	1776	1810	1223
Volume (vph)	226	262	113	404	551	225
Peak-hour factor, PHF	0.93	0.93	0.94	0.94	0.94	0.94
Adj. Flow (vph)	243	282	120	430	586	239
RTOR Reduction (vph)	0	38	0	0	0	135
Lane Group Flow (vph)	243	244	120	430	586	104
Heavy Vehicles (%)	33%	12%	13%	7%	5%	32%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	13.1	13.1	5.2	32.6	23.4	23.4
Effective Green, g (s)	13.1	13.1	5.2	32.6	23.4	23.4
Actuated g/C Ratio	0.24	0.24	0.10	0.61	0.44	0.44
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	331	352	155	1078	789	533
v/s Ratio Prot	c0.18		c0.08	0.24	c0.32	
v/s Ratio Perm		0.17				0.09
v/c Ratio	0.73	0.69	0.77	0.40	0.74	0.20
Uniform Delay, d1	18.7	18.5	23.7	5.5	12.6	9.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.2	5.8	21.0	0.2	3.8	0.2
Delay (s)	26.9	24.3	44.7	5.7	16.4	9.5
Level of Service	C	C	D	A	B	A
Approach Delay (s)	25.5			14.2	14.4	
Approach LOS	C			B	B	
Intersection Summary						
HCM Average Control Delay			17.4		HCM Level of Service	B
HCM Volume to Capacity ratio			0.74			
Actuated Cycle Length (s)			53.7		Sum of lost time (s)	12.0
Intersection Capacity Utilization			57.8%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	1.00	
Frt		0.88			0.97		1.00	0.97		1.00	1.00	
Flt Protected		1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1340			1742		1456	3299		1770	1775	
Flt Permitted		1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1340			1742		1456	3299		1770	1775	
Volume (vph)	3	2	47	150	2	40	36	853	230	160	1072	2
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	3	2	51	176	2	47	38	889	240	167	1117	2
RTOR Reduction (vph)	0	48	0	0	8	0	0	18	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	217	0	38	1111	0	167	1119	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	24%	7%	2%	2%	7%	24%
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		5.6			16.3		3.3	54.3		13.1	64.1	
Effective Green, g (s)		5.6			16.3		3.3	54.3		13.1	64.1	
Actuated g/C Ratio		0.05			0.15		0.03	0.52		0.12	0.61	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		71			270		46	1701		220	1081	
v/s Ratio Prot		c0.01			c0.12		0.03	c0.34		0.09	c0.63	
v/s Ratio Perm												
v/c Ratio		0.11			0.81		0.83	0.65		0.76	1.04	
Uniform Delay, d1		47.5			43.0		50.7	18.6		44.6	20.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			15.9		69.9	0.9		13.9	36.9	
Delay (s)		48.2			58.8		120.6	19.5		58.5	57.5	
Level of Service		D			E		F	B		E	E	
Approach Delay (s)		48.2			58.8			22.8			57.6	
Approach LOS		D			E			C			E	
Intersection Summary												
HCM Average Control Delay		42.7					HCM Level of Service			D		
HCM Volume to Capacity ratio		0.90										
Actuated Cycle Length (s)		105.3					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		87.4%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	1612	990	342	1163	0	0	0	0	512	10	750
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.25	0.98	0.98	0.98
Hourly flow rate (vph)	0	1645	1010	349	1187	0	0	0	0	522	10	765
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked												
vC, conflicting volume	1187			2655			4805	4035	2150	4035	4540	1187
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1187			2655			4805	4035	2150	4035	4540	1187
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			0			0	0	100	0	0	0
cM capacity (veh/h)	585			157			0	0	60	0	0	229
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	2655	349	1187	1298								
Volume Left	0	349	0	522								
Volume Right	1010	0	0	765								
cSH	1700	157	1700	0								
Volume to Capacity	1.56	2.23	0.70	Err								
Queue Length 95th (ft)	0	716	0	Err								
Control Delay (s)	0.0	620.2	0.0	Err								
Lane LOS		F		F								
Approach Delay (s)	0.0	140.9		Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization		363.3%		ICU Level of Service		H						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free			Stop			Stop	
Grade	0%				0%			0%			0%	
Volume (veh/h)	850	1274	0	0	965	362	540	10	687	0	0	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.25
Hourly flow rate (vph)	867	1300	0	0	985	369	551	10	701	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.49						0.49	0.49		0.49	0.49	0.49
vC, conflicting volume	1354			1300			4204	4389	1300	4910	4204	1169
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1726			1300			7574	7953	1300	9023	7574	1348
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	0			100			0	0	0	0	0	100
cM capacity (veh/h)	177			530			0	0	196	0	0	90
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	867	1300	1354	1262								
Volume Left	867	0	0	551								
Volume Right	0	0	369	701								
cSH	177	1700	1700	0								
Volume to Capacity	4.90	0.76	0.80	Err								
Queue Length 95th (ft)	Err	0	0	Err								
Control Delay (s)	1806.8	0.0	0.0	Err								
Lane LOS	F			F								
Approach Delay (s)	723.1		0.0	Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			363.3%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.91		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3456		1752	1845	1568	1752	3178		1752	3216	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3456		1752	1845	1568	1752	3178		1752	3216	
Volume (vph)	230	1571	160	105	1027	62	190	100	164	122	90	110
Peak-hour factor, PHF	0.98	0.98	0.98	0.96	0.96	0.96	0.82	0.82	0.82	0.85	0.85	0.85
Adj. Flow (vph)	235	1603	163	109	1070	65	232	122	200	144	106	129
RTOR Reduction (vph)	0	6	0	0	0	12	0	134	0	0	117	0
Lane Group Flow (vph)	235	1760	0	109	1070	53	232	188	0	144	118	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	14.0	65.1		8.0	59.1	59.1	14.0	12.6		12.2	10.8	
Effective Green, g (s)	14.0	65.1		8.0	59.1	59.1	14.0	12.6		12.2	10.8	
Actuated g/C Ratio	0.12	0.57		0.07	0.52	0.52	0.12	0.11		0.11	0.09	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	215	1975		123	957	814	215	352		188	305	
v/s Ratio Prot	c0.13	0.51		0.06	c0.58		c0.13	c0.06		0.08	0.04	
v/s Ratio Perm						0.03						
v/c Ratio	1.09	0.89		0.89	1.12	0.07	1.08	0.53		0.77	0.39	
Uniform Delay, d1	50.0	21.3		52.5	27.4	13.6	50.0	47.9		49.5	48.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	88.4	6.6		47.7	67.2	0.2	84.0	1.6		16.9	0.8	
Delay (s)	138.4	27.9		100.2	94.6	13.8	133.9	49.4		66.3	49.3	
Level of Service	F	C		F	F	B	F	D		E	D	
Approach Delay (s)		40.9			90.9			84.8			55.7	
Approach LOS		D			F			F			E	
Intersection Summary												
HCM Average Control Delay			62.9				HCM Level of Service			E		
HCM Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			113.9				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			96.7%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & 5th Street

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3436		1752	1706		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3436		1752	1706		1752	1845	1568
Volume (vph)	60	1377	70	40	875	132	40	30	30	102	40	40
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	61	1405	71	43	951	143	50	38	38	128	50	50
RTOR Reduction (vph)	0	0	34	0	14	0	0	27	0	0	0	33
Lane Group Flow (vph)	61	1405	37	43	1080	0	50	49	0	128	50	17
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	4.7	36.1	36.1	3.5	34.9		3.5	26.1		8.7	31.3	31.3
Effective Green, g (s)	4.7	36.1	36.1	3.5	34.9		3.5	26.1		8.7	31.3	31.3
Actuated g/C Ratio	0.05	0.40	0.40	0.04	0.39		0.04	0.29		0.10	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	91	1400	626	68	1327		68	493		169	639	543
v/s Ratio Prot	c0.03	c0.40		0.02	0.31		c0.03	c0.03		c0.07	0.03	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.67	1.00	0.06	0.63	0.81		0.74	0.10		0.76	0.08	0.03
Uniform Delay, d1	42.1	27.2	16.7	42.8	24.8		43.0	23.5		39.8	19.9	19.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	17.7	24.9	0.0	17.6	4.0		33.4	0.4		17.5	0.2	0.1
Delay (s)	59.8	52.1	16.7	60.4	28.8		76.4	23.9		57.3	20.1	19.6
Level of Service	E	D	B	E	C		E	C		E	C	B
Approach Delay (s)		50.7			30.0			44.8			40.9	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			42.0			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			90.4			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			63.7%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	↵
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3468		1752	3505	1752	1568
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3468		1752	3505	1752	1568
Volume (vph)	1319	100	25	987	90	34
Peak-hour factor, PHF	0.98	0.98	0.95	0.95	0.85	0.85
Adj. Flow (vph)	1346	102	26	1039	106	40
RTOR Reduction (vph)	5	0	0	0	0	34
Lane Group Flow (vph)	1443	0	26	1039	106	6
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Turn Type			Prot			Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	48.2		2.7	54.9	11.2	11.2
Effective Green, g (s)	48.2		2.7	54.9	11.2	11.2
Actuated g/C Ratio	0.65		0.04	0.74	0.15	0.15
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2256		64	2597	265	237
v/s Ratio Prot	c0.42		0.01	c0.30	c0.06	
v/s Ratio Perm						0.00
v/c Ratio	0.64		0.41	0.40	0.40	0.03
Uniform Delay, d1	7.8		34.9	3.5	28.4	26.8
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6		4.2	0.1	1.0	0.0
Delay (s)	8.4		39.1	3.6	29.4	26.8
Level of Service	A		D	A	C	C
Approach Delay (s)	8.4			4.5	28.7	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			7.9		HCM Level of Service	A
HCM Volume to Capacity ratio			0.60			
Actuated Cycle Length (s)			74.1		Sum of lost time (s)	12.0
Intersection Capacity Utilization			51.3%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1845	1568	1752	1783		1752	1758		1671	1810	1524
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1719	1845	1568	1752	1783		1752	1758		1671	1810	1524
Volume (vph)	502	810	150	120	510	78	80	579	160	270	617	322
Peak-hour factor, PHF	0.96	0.96	0.96	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96
Adj. Flow (vph)	523	844	156	129	548	84	85	616	170	281	643	335
RTOR Reduction (vph)	0	0	61	0	4	0	0	8	0	0	0	212
Lane Group Flow (vph)	523	844	95	129	628	0	85	778	0	281	643	123
Heavy Vehicles (%)	5%	3%	3%	3%	3%	14%	3%	5%	3%	8%	5%	6%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	22.0	47.0	47.0	7.0	32.0		6.0	36.0		14.0	44.0	44.0
Effective Green, g (s)	22.0	47.0	47.0	7.0	32.0		6.0	36.0		14.0	44.0	44.0
Actuated g/C Ratio	0.18	0.39	0.39	0.06	0.27		0.05	0.30		0.12	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	315	723	614	102	475		88	527		195	664	559
v/s Ratio Prot	c0.30	0.46		0.07	c0.35		0.05	c0.44		c0.17	0.36	
v/s Ratio Perm			0.06									0.08
v/c Ratio	1.66	1.17	0.15	1.26	1.32		0.97	1.48		1.44	0.97	0.22
Uniform Delay, d1	49.0	36.5	23.6	56.5	44.0		56.9	42.0		53.0	37.3	26.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	310.9	89.9	0.5	176.1	158.8		83.9	224.1		225.1	28.0	0.9
Delay (s)	359.9	126.4	24.2	232.6	202.8		140.8	266.1		278.1	65.3	27.1
Level of Service	F	F	C	F	F		F	F		F	E	C
Approach Delay (s)		196.1			207.8			253.9			102.6	
Approach LOS		F			F			F			F	
Intersection Summary												
HCM Average Control Delay		182.9					HCM Level of Service			F		
HCM Volume to Capacity ratio		1.46										
Actuated Cycle Length (s)		120.0					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		127.9%					ICU Level of Service		H			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	1810	1568	1752	3405		1752	3362	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	1810	1568	1752	3405		1752	3362	
Volume (vph)	112	877	157	160	509	360	136	550	130	240	380	142
Peak-hour factor, PHF	0.96	0.96	0.96	0.95	0.95	0.95	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	117	914	164	168	536	379	148	598	141	267	422	158
RTOR Reduction (vph)	0	0	72	0	0	227	0	17	0	0	32	0
Lane Group Flow (vph)	117	914	92	168	536	152	148	722	0	267	548	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	8.1	33.8	33.8	13.4	39.1	39.1	13.7	26.0		19.7	32.0	
Effective Green, g (s)	8.1	33.8	33.8	13.4	39.1	39.1	13.7	26.0		19.7	32.0	
Actuated g/C Ratio	0.07	0.31	0.31	0.12	0.36	0.36	0.13	0.24		0.18	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	130	1067	487	216	650	563	220	813		317	988	
v/s Ratio Prot	0.07	0.27		c0.10	c0.30		0.08	c0.21		c0.15	0.16	
v/s Ratio Perm			0.06			0.10						
v/c Ratio	0.90	0.86	0.19	0.78	0.82	0.27	0.67	0.89		0.84	0.55	
Uniform Delay, d1	50.0	35.3	27.5	46.3	31.8	24.8	45.5	40.0		43.1	32.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	49.7	6.9	0.2	16.0	8.4	0.3	7.9	11.6		18.0	0.7	
Delay (s)	99.7	42.2	27.7	62.3	40.2	25.0	53.3	51.6		61.1	33.1	
Level of Service	F	D	C	E	D	C	D	D		E	C	
Approach Delay (s)		45.8			38.3			51.9			41.9	
Approach LOS		D			D			D			D	
Intersection Summary												
HCM Average Control Delay			44.3				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			108.9				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			79.1%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Lathrop Road & SR 99 SB Ramps

7/14/2010

												
Movement	EBT	EBR	EBR2	WBL	WBT	WBR	NBL	NBR	NBR2	SBL2	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑	↑↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.88		0.97	0.95	1.00	1.00	0.88	1.00	1.00	0.95	0.88
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Flt Permitted	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Volume (vph)	587	747	90	120	963	30	80	450	110	10	660	444
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.95	0.95
Adj. Flow (vph)	618	786	95	126	1014	32	87	489	120	11	695	467
RTOR Reduction (vph)	0	9	0	0	0	17	0	0	77	0	0	90
Lane Group Flow (vph)	618	872	0	126	1014	15	87	489	43	11	695	377
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Prot		Perm	Prot	custom	custom	Prot		Perm
Protected Phases	4			3	8		5			1	6	
Permitted Phases		4				8		2	2			6
Actuated Green, G (s)	29.6	29.6		4.8	38.4	38.4	4.8	28.4	28.4	1.2	24.8	24.8
Effective Green, g (s)	29.6	29.6		4.8	38.4	38.4	4.8	28.4	28.4	1.2	24.8	24.8
Actuated g/C Ratio	0.37	0.37		0.06	0.48	0.48	0.06	0.35	0.35	0.01	0.31	0.31
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1309	1031		206	1699	760	106	989	562	27	1097	864
v/s Ratio Prot	0.17			0.04	c0.29		c0.05			0.01	c0.20	
v/s Ratio Perm		c0.31				0.01		c0.18	0.03			0.14
v/c Ratio	0.47	0.85		0.61	0.60	0.02	0.82	0.49	0.08	0.41	0.63	0.44
Uniform Delay, d1	19.2	23.1		36.7	15.2	10.9	37.2	20.2	17.1	39.0	23.7	22.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	8.5		5.3	1.6	0.0	37.7	0.4	0.1	9.7	1.2	0.4
Delay (s)	20.5	31.6		42.0	16.7	11.0	74.9	20.6	17.2	48.8	24.9	22.4
Level of Service	C	C		D	B	B	E	C	B	D	C	C
Approach Delay (s)	27.0				19.3						24.1	
Approach LOS	C				B						C	
Intersection Summary												
HCM Average Control Delay			24.2				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			20.0		
Intersection Capacity Utilization			60.9%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

17: Lathrop Road & SR 99 NB Ramps

7/14/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3433	1583
Volume (vph)	322	725	70	372	741	240
Peak-hour factor, PHF	0.92	0.92	0.90	0.90	0.93	0.93
Adj. Flow (vph)	350	788	78	413	797	258
RTOR Reduction (vph)	0	0	0	0	0	182
Lane Group Flow (vph)	350	788	78	413	797	76
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Turn Type		Free	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	32.5	75.0	8.5	45.0	22.0	22.0
Effective Green, g (s)	32.5	75.0	8.5	45.0	22.0	22.0
Actuated g/C Ratio	0.43	1.00	0.11	0.60	0.29	0.29
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1534	1583	201	2123	1007	464
v/s Ratio Prot	0.10		0.04	0.12	c0.23	
v/s Ratio Perm		c0.50				0.05
v/c Ratio	0.23	0.50	0.39	0.19	0.79	0.16
Uniform Delay, d1	13.4	0.0	30.8	6.8	24.4	19.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.1	1.2	0.2	4.3	0.2
Delay (s)	13.7	1.1	32.1	7.0	28.7	19.8
Level of Service	B	A	C	A	C	B
Approach Delay (s)	5.0			11.0	26.5	
Approach LOS	A			B	C	
Intersection Summary						
HCM Average Control Delay			14.6		HCM Level of Service	B
HCM Volume to Capacity ratio			0.59			
Actuated Cycle Length (s)			75.0		Sum of lost time (s)	4.0
Intersection Capacity Utilization			43.9%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

7/14/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	30	22	797	70	32	855
Peak Hour Factor	0.75	0.75	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	40	29	830	73	33	891
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1788	830			903	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1788	830			903	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	53	92			96	
cM capacity (veh/h)	85	370			745	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	40	29	830	73	33	891
Volume Left	40	0	0	0	33	0
Volume Right	0	29	0	73	0	0
cSH	85	370	1700	1700	745	1700
Volume to Capacity	0.47	0.08	0.49	0.04	0.04	0.52
Queue Length 95th (ft)	49	6	0	0	4	0
Control Delay (s)	79.9	15.6	0.0	0.0	10.1	0.0
Lane LOS	F	C			B	
Approach Delay (s)	52.7		0.0		0.4	
Approach LOS	F					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			55.0%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1752	1777		1752	1845	1568	1752	1845	1568	1752	1792	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1752	1777		1752	1845	1568	1752	1845	1568	1752	1792	
Volume (vph)	134	740	240	120	450	124	180	599	280	215	625	145
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	141	779	253	130	489	135	194	644	301	226	658	153
RTOR Reduction (vph)	0	10	0	0	0	87	0	0	41	0	7	0
Lane Group Flow (vph)	141	1022	0	130	489	48	194	644	260	226	804	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	12.4	47.0		8.0	42.6	42.6	10.0	38.0	38.0	11.0	39.0	
Effective Green, g (s)	12.4	47.0		8.0	42.6	42.6	10.0	38.0	38.0	11.0	39.0	
Actuated g/C Ratio	0.10	0.39		0.07	0.36	0.36	0.08	0.32	0.32	0.09	0.32	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	181	696		117	655	557	146	584	497	161	582	
v/s Ratio Prot	0.08	c0.58		c0.07	0.27		0.11	0.35		c0.13	c0.45	
v/s Ratio Perm						0.03			0.17			
v/c Ratio	0.78	1.47		1.11	0.75	0.09	1.33	1.10	0.52	1.40	1.38	
Uniform Delay, d1	52.5	36.5		56.0	34.0	25.7	55.0	41.0	33.6	54.5	40.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	18.8	218.8		116.2	4.6	0.1	187.3	68.5	1.0	214.6	182.4	
Delay (s)	71.3	255.3		172.2	38.6	25.8	242.3	109.5	34.6	269.1	222.9	
Level of Service	E	F		F	D	C	F	F	C	F	F	
Approach Delay (s)		233.1			59.3			112.3			233.0	
Approach LOS		F			E			F			F	
Intersection Summary												
HCM Average Control Delay			167.6				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.36									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			125.2%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

Peak Hour Intersection Operation Analysis
Cumulative Plus Master Plan Buildout Conditions

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1570	1792	1468	1570	1792	1524	1703	3105		1641	1638	1404
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1570	1792	1468	1570	1792	1524	1703	3105		1641	1638	1404
Volume (vph)	90	230	45	55	290	150	83	606	123	200	300	60
Peak-hour factor, PHF	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	95	242	47	61	322	167	90	659	134	222	333	67
RTOR Reduction (vph)	0	0	33	0	0	0	0	14	0	0	0	41
Lane Group Flow (vph)	95	242	14	61	322	167	90	779	0	222	333	26
Heavy Vehicles (%)	15%	6%	10%	15%	6%	6%	6%	14%	10%	10%	16%	15%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	7.5	25.4	25.4	4.5	22.4	87.2	7.2	28.2		13.1	34.1	34.1
Effective Green, g (s)	7.5	25.4	25.4	4.5	22.4	87.2	7.2	28.2		13.1	34.1	34.1
Actuated g/C Ratio	0.09	0.29	0.29	0.05	0.26	1.00	0.08	0.32		0.15	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	135	522	428	81	460	1524	141	1004		247	641	549
v/s Ratio Prot	c0.06	0.14		0.04	c0.18		0.05	c0.25		c0.14	0.20	
v/s Ratio Perm			0.01			c0.11						0.02
v/c Ratio	0.70	0.46	0.03	0.75	0.70	0.11	0.64	0.78		0.90	0.52	0.05
Uniform Delay, d1	38.8	25.3	22.1	40.8	29.4	0.0	38.7	26.6		36.4	20.3	16.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	15.3	0.7	0.0	32.1	4.6	0.1	9.1	3.8		31.5	0.7	0.0
Delay (s)	54.1	26.0	22.1	72.9	34.0	0.1	47.9	30.5		67.9	21.0	16.5
Level of Service	D	C	C	E	C	A	D	C		E	C	B
Approach Delay (s)		32.5			28.0			32.2			37.3	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			32.6			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			87.2			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			65.3%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	110	10	249	40	0	0	0	0	461	10	340
Peak Hour Factor	0.80	0.80	0.80	0.95	0.95	0.95	0.25	0.25	0.25	0.94	0.94	0.94
Hourly flow rate (vph)	0	138	12	262	42	0	0	0	0	490	11	362
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	42			150			1056	710	75	635	716	21
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	42			150			1056	710	75	635	716	21
tC, single (s)	4.2			4.7			7.5	6.5	6.9	8.1	6.6	7.0
tC, 2 stage (s)												
tF (s)	2.3			2.5			3.5	4.0	3.3	3.8	4.1	3.4
p0 queue free %	100			79			100	100	100	0	96	65
cM capacity (veh/h)	1536			1235			95	281	971	258	273	1038
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	92	58	262	21	21	327	536					
Volume Left	0	0	262	0	0	327	163					
Volume Right	0	12	0	0	0	0	362					
cSH	1700	1700	1235	1700	1700	258	525					
Volume to Capacity	0.05	0.03	0.21	0.01	0.01	1.27	1.02					
Queue Length 95th (ft)	0	0	20	0	0	405	372					
Control Delay (s)	0.0	0.0	8.7	0.0	0.0	187.1	73.0					
Lane LOS			A			F	F					
Approach Delay (s)	0.0		7.5			116.3						
Approach LOS						F						
Intersection Summary												
Average Delay			77.9									
Intersection Capacity Utilization			50.6%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

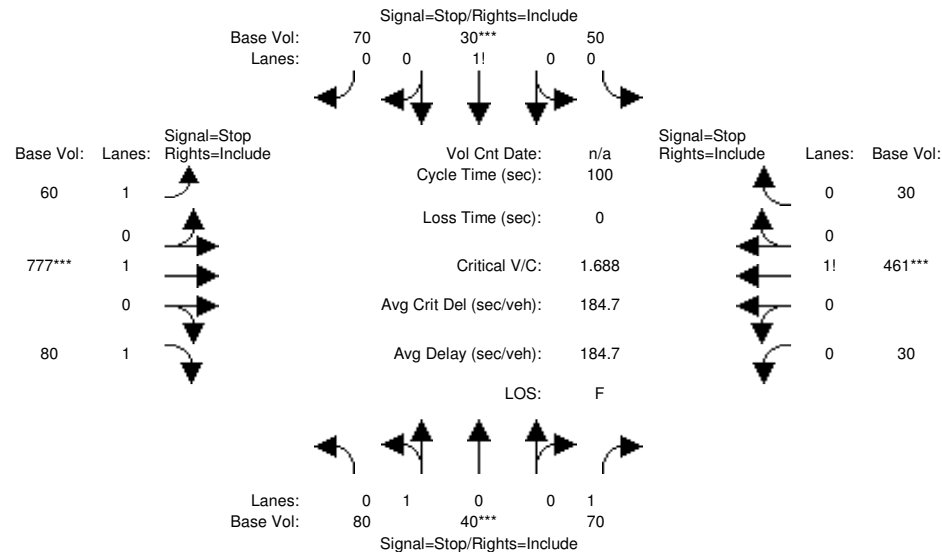
3: Roth Road & NB I-5 Ramps

7/14/2010

															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations															
Sign Control	Free			Free			Stop			Stop					
Grade	0%			0%			0%			0%					
Volume (veh/h)	90	481	0	0	269	342	20	10	436	0	0	0			
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.94	0.94	0.94	0.25	0.25	0.25			
Hourly flow rate (vph)	97	517	0	0	286	364	21	11	464	0	0	0			
Pedestrians															
Lane Width (ft)															
Walking Speed (ft/s)															
Percent Blockage															
Right turn flare (veh)									18						
Median type	None								None						
Median storage veh)															
Upstream signal (ft)															
pX, platoon unblocked															
vC, conflicting volume	650				517			854	1361	259	926	1179	325		
vC1, stage 1 conf vol															
vC2, stage 2 conf vol															
vCu, unblocked vol	650				517			854	1361	259	926	1179	325		
tC, single (s)	4.2				4.1			7.6	6.6	7.5	7.5	6.5	6.9		
tC, 2 stage (s)															
tF (s)	2.3				2.2			3.6	4.1	3.6	3.5	4.0	3.3		
p0 queue free %	89				100			91	92	29	100	100	100		
cM capacity (veh/h)	905				1045			226	127	657	57	169	671		
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1									
Volume Total	97	259	259	191	459	496									
Volume Left	97	0	0	0	0	21									
Volume Right	0	0	0	0	364	464									
cSH	905	1700	1700	1700	1700	702									
Volume to Capacity	0.11	0.15	0.15	0.11	0.27	0.71									
Queue Length 95th (ft)	9	0	0	0	0	147									
Control Delay (s)	9.5	0.0	0.0	0.0	0.0	22.8									
Lane LOS	A						C								
Approach Delay (s)	1.5				0.0	22.8									
Approach LOS							C								
Intersection Summary															
Average Delay				7.0											
Intersection Capacity Utilization				50.6%		ICU Level of Service				A					
Analysis Period (min)				15											

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #5: Roth Road / Harlan Road Cumulative + MPB AM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0

Volume Module:

Base Vol:	80	40	70	50	30	70	60	777	80	30	461	30
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	80	40	70	50	30	70	60	777	80	30	461	30
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95	0.94	0.94	0.94
PHF Volume:	89	44	78	56	33	78	63	818	84	32	490	32
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	89	44	78	56	33	78	63	818	84	32	490	32
PCE 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
MLF 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
Final Volume:	89	44	78	56	33	78	63	818	84	32	490	32

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.67	0.33	1.00	0.33	0.20	0.47	1.00	1.00	1.00	0.06	0.88	0.06
Final Sat.:	271	136	460	141	84	197	453	485	533	27	420	27

Capacity Analysis Module:

Vol/Sat:	0.33	0.33	0.17	0.40	0.40	0.40	0.14	1.69	0.16	1.17	1.17	1.17
Crit Moves:	****			****			****			****		
Delay/Veh:	15.6	15.6	11.9	16.7	16.7	16.7	11.9	337	10.7	121.7	122	121.7
Delay 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
AdjDel/Veh:	15.6	15.6	11.9	16.7	16.7	16.7	11.9	337	10.7	121.7	122	121.7
LOS by Move:	C	C	B	C	C	C	B	F	B	F	F	F
ApproachDel:	14.2			16.7			287.1			121.7		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	14.2			16.7			287.1			121.7		
LOS by Appr:	B			C			F			F		
AllWayAvgQ:	0.5	0.5	0.2	0.6	0.6	0.6	0.2	44.0	0.2	14.7	14.7	14.7

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #5 Roth Road / Harlan Road Cumulative + MPB AM

Base Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

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-----|-----|-----|-----|-----|
Control:      Stop Sign      Stop Sign      Stop Sign      Stop Sign
Lanes:        0  1  0  0  1    0  0  1! 0  0    1  0  1  0  1    0  0  1! 0  0
Initial Vol:   80   40   70    50  30   70    60  777   80    30  461   30
-----|-----|-----|-----|-----|
Major Street Volume:      1438
Minor Approach Volume:    190
Minor Approach Volume Threshold: 218
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SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Signalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	1.00	1.00	0.95	1.00	0.96	
Satd. Flow (prot)	1520	824	1043	1557	922	
Flt Permitted	1.00	1.00	0.95	1.00	0.96	
Satd. Flow (perm)	1520	824	1043	1557	922	
Volume (vph)	377	140	46	401	124	28
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.90	0.90
Adj. Flow (vph)	401	149	49	427	138	31
RTOR Reduction (vph)	0	94	0	0	15	0
Lane Group Flow (vph)	401	55	49	427	154	0
Heavy Vehicles (%)	25%	96%	73%	22%	98%	71%
Turn Type	Perm		Prot			
Protected Phases	4		3	8	2	
Permitted Phases		4				
Actuated Green, G (s)	15.2	15.2	1.6	20.8	12.1	
Effective Green, g (s)	15.2	15.2	1.6	20.8	12.1	
Actuated g/C Ratio	0.37	0.37	0.04	0.51	0.30	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	565	306	41	792	273	
v/s Ratio Prot	c0.26		c0.05	0.27	c0.17	
v/s Ratio Perm		0.07				
v/c Ratio	0.71	0.18	1.20	0.54	0.56	
Uniform Delay, d1	11.0	8.7	19.6	6.8	12.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	0.3	203.7	0.7	2.7	
Delay (s)	15.0	8.9	223.4	7.5	14.8	
Level of Service	B	A	F	A	B	
Approach Delay (s)	13.4			29.7	14.8	
Approach LOS	B			C	B	
Intersection Summary						
HCM Average Control Delay			20.1		HCM Level of Service	C
HCM Volume to Capacity ratio			0.68			
Actuated Cycle Length (s)			40.9		Sum of lost time (s)	12.0
Intersection Capacity Utilization			41.8%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

7/14/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
						
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1308	1380	1480	1776	1624	1196
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1308	1380	1480	1776	1624	1196
Volume (vph)	218	110	149	596	231	275
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.93	0.93
Adj. Flow (vph)	237	120	157	627	248	296
RTOR Reduction (vph)	0	93	0	0	0	181
Lane Group Flow (vph)	237	27	157	627	248	115
Heavy Vehicles (%)	38%	17%	22%	7%	17%	35%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	11.8	11.8	8.4	33.0	20.6	20.6
Effective Green, g (s)	11.8	11.8	8.4	33.0	20.6	20.6
Actuated g/C Ratio	0.22	0.22	0.16	0.63	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	292	308	235	1110	634	467
v/s Ratio Prot	c0.18		c0.11	c0.35	0.15	
v/s Ratio Perm		0.02				0.10
v/c Ratio	0.81	0.09	0.67	0.56	0.39	0.25
Uniform Delay, d1	19.4	16.2	20.9	5.7	11.6	10.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.6	0.1	7.0	0.7	0.4	0.3
Delay (s)	35.1	16.4	27.9	6.4	12.0	11.1
Level of Service	D	B	C	A	B	B
Approach Delay (s)	28.8			10.7	11.5	
Approach LOS	C			B	B	
Intersection Summary						
HCM Average Control Delay			14.8		HCM Level of Service	B
HCM Volume to Capacity ratio			0.63			
Actuated Cycle Length (s)			52.8		Sum of lost time (s)	8.0
Intersection Capacity Utilization			50.1%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	1.00	
Frt		0.92			0.95		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1413			1720		1480	3231		1770	1675	
Flt Permitted		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1413			1720		1480	3231		1770	1675	
Volume (vph)	31	5	46	260	10	150	82	888	90	60	593	57
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.97	0.97	0.97	0.95	0.95	0.95
Adj. Flow (vph)	34	6	51	289	11	167	85	915	93	63	624	60
RTOR Reduction (vph)	0	41	0	0	16	0	0	6	0	0	3	0
Lane Group Flow (vph)	0	50	0	0	451	0	85	1002	0	63	681	0
Heavy Vehicles (%)	22%	22%	22%	2%	2%	2%	22%	11%	2%	2%	11%	22%
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		8.9			30.1		8.0	50.7		5.5	48.2	
Effective Green, g (s)		8.9			30.1		8.0	50.7		5.5	48.2	
Actuated g/C Ratio		0.08			0.27		0.07	0.46		0.05	0.43	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		113			466		106	1473		88	726	
v/s Ratio Prot		c0.04			c0.26		0.06	c0.31		0.04	c0.41	
v/s Ratio Perm												
v/c Ratio		0.44			0.97		0.80	0.68		0.72	0.94	
Uniform Delay, d1		48.8			40.1		50.8	23.9		52.1	30.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.7			33.1		33.9	1.3		24.0	19.6	
Delay (s)		51.5			73.1		84.7	25.2		76.1	49.7	
Level of Service		D			E		F	C		E	D	
Approach Delay (s)		51.5			73.1			29.8			51.9	
Approach LOS		D			E			C			D	
Intersection Summary												
HCM Average Control Delay		46.0					HCM Level of Service			D		
HCM Volume to Capacity ratio		0.86										
Actuated Cycle Length (s)		111.2					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		80.0%					ICU Level of Service		D			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	965	440	458	1493	0	0	0	0	305	10	1020
Peak Hour Factor	0.95	0.95	0.95	0.98	0.98	0.98	0.25	0.25	0.25	0.95	0.95	0.95
Hourly flow rate (vph)	0	1016	463	467	1523	0	0	0	0	321	11	1074
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked	0.52						0.52	0.52		0.52	0.52	0.52
vC, conflicting volume	1523			1479			4784	3706	1247	3706	3937	1523
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2007			1479			8280	6204	1247	6204	6650	2007
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			0			0	0	100	0	0	0
cM capacity (veh/h)	147			452			0	0	211	0	0	38
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	1479	467	1523	1405								
Volume Left	0	467	0	321								
Volume Right	463	0	0	1074								
cSH	1700	452	1700	0								
Volume to Capacity	0.87	1.03	0.90	Err								
Queue Length 95th (ft)	0	355	0	Err								
Control Delay (s)	0.0	81.8	0.0	Err								
Lane LOS		F		F								
Approach Delay (s)	0.0	19.2		Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization		320.5%		ICU Level of Service		H						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free				Stop		Stop	
Grade	0%				0%				0%		0%	
Volume (veh/h)	550	720	0	0	1321	588	630	10	396	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.98	0.98	0.98	0.95	0.95	0.95	0.25	0.25	0.25
Hourly flow rate (vph)	579	758	0	0	1348	600	663	11	417	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.41							0.41	0.41			0.41
vC, conflicting volume	1948			758				3564	3864	758	3986	3564
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3318			758				7270	8004	758	8302	7270
tC, single (s)	4.1			4.1				7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0
p0 queue free %	0			100				0	0	0	0	0
cM capacity (veh/h)	35			849				0	0	405	0	0
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	579	758	1948	1091								
Volume Left	579	0	0	663								
Volume Right	0	0	600	417								
cSH	35	1700	1700	0								
Volume to Capacity	16.74	0.45	1.15	Err								
Queue Length 95th (ft)	Err	0	0	Err								
Control Delay (s)	7300.7	0.0	0.0	Err								
Lane LOS	F			F								
Approach Delay (s)	3161.7	0.0		Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization	320.5%		ICU Level of Service				H					
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.91		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3453		1752	1845	1568	1752	3188		1752	3129	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3453		1752	1845	1568	1752	3188		1752	3129	
Volume (vph)	110	906	100	65	1579	63	230	40	60	65	40	100
Peak-hour factor, PHF	0.95	0.95	0.95	0.98	0.98	0.98	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	116	954	105	66	1611	64	256	44	67	87	53	133
RTOR Reduction (vph)	0	6	0	0	0	8	0	59	0	0	104	0
Lane Group Flow (vph)	116	1053	0	66	1611	56	256	52	0	87	82	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	7.8	68.0		7.9	68.1	68.1	12.0	13.4		8.7	10.1	
Effective Green, g (s)	7.8	68.0		7.9	68.1	68.1	12.0	13.4		8.7	10.1	
Actuated g/C Ratio	0.07	0.60		0.07	0.60	0.60	0.11	0.12		0.08	0.09	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	120	2060		121	1102	937	184	375		134	277	
v/s Ratio Prot	c0.07	0.30		0.04	c0.87		c0.15	c0.02		0.05	c0.03	
v/s Ratio Perm						0.04						
v/c Ratio	0.97	0.51		0.55	1.46	0.06	1.39	0.14		0.65	0.30	
Uniform Delay, d1	53.0	13.4		51.3	23.0	9.6	51.0	45.1		51.2	48.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	71.0	0.9		4.9	212.9	0.1	205.8	0.2		10.4	0.6	
Delay (s)	124.0	14.3		56.3	235.8	9.7	256.8	45.3		61.5	49.2	
Level of Service	F	B		E	F	A	F	D		E	D	
Approach Delay (s)		25.1			220.7			192.9			53.1	
Approach LOS		C			F			F			D	
Intersection Summary												
HCM Average Control Delay		140.3				HCM Level of Service		F				
HCM Volume to Capacity ratio		1.32										
Actuated Cycle Length (s)		114.0				Sum of lost time (s)		20.0				
Intersection Capacity Utilization		118.5%				ICU Level of Service		H				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & Fifth Street

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.90		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3483		1752	1660		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3483		1752	1660		1752	1845	1568
Volume (vph)	20	831	20	20	1207	53	40	20	40	135	20	60
Peak-hour factor, PHF	0.94	0.94	0.94	0.96	0.96	0.96	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	21	884	21	21	1257	55	50	25	50	169	25	75
RTOR Reduction (vph)	0	0	13	0	3	0	0	34	0	0	0	47
Lane Group Flow (vph)	21	884	8	21	1309	0	50	41	0	169	25	28
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	2.2	33.1	33.1	2.2	33.1		3.5	27.8		9.0	33.3	33.3
Effective Green, g (s)	2.2	33.1	33.1	2.2	33.1		3.5	27.8		9.0	33.3	33.3
Actuated g/C Ratio	0.02	0.38	0.38	0.02	0.38		0.04	0.32		0.10	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	44	1317	589	44	1309		70	524		179	697	593
v/s Ratio Prot	c0.01	0.25		0.01	c0.38		c0.03	c0.02		c0.10	0.01	
v/s Ratio Perm			0.01									0.02
v/c Ratio	0.48	0.67	0.01	0.48	1.00		0.71	0.08		0.94	0.04	0.05
Uniform Delay, d1	42.4	23.0	17.3	42.4	27.5		41.8	21.2		39.3	17.3	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.9	1.4	0.0	7.9	24.7		29.1	0.3		50.8	0.1	0.2
Delay (s)	50.3	24.3	17.3	50.3	52.2		70.9	21.4		90.1	17.4	17.5
Level of Service	D	C	B	D	D		E	C		F	B	B
Approach Delay (s)		24.7			52.1			41.2			63.1	
Approach LOS		C			D			D			E	
Intersection Summary												
HCM Average Control Delay			43.2			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			88.1			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			55.9%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	↵
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3444		1752	3505	1752	1568
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3444		1752	3505	1752	1568
Volume (vph)	906	120	85	1159	110	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.80	0.80
Adj. Flow (vph)	954	126	89	1220	138	62
RTOR Reduction (vph)	11	0	0	0	0	51
Lane Group Flow (vph)	1069	0	89	1220	138	11
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Turn Type			Prot			Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	36.1		4.5	44.6	10.9	10.9
Effective Green, g (s)	36.1		4.5	44.6	10.9	10.9
Actuated g/C Ratio	0.57		0.07	0.70	0.17	0.17
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1958		124	2462	301	269
v/s Ratio Prot	c0.31		c0.05	0.35	c0.08	
v/s Ratio Perm						0.01
v/c Ratio	0.55		0.72	0.50	0.46	0.04
Uniform Delay, d1	8.6		28.9	4.3	23.6	21.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		17.9	0.2	1.1	0.1
Delay (s)	8.9		46.8	4.5	24.8	22.0
Level of Service	A		D	A	C	C
Approach Delay (s)	8.9			7.3	23.9	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			9.3		HCM Level of Service	A
HCM Volume to Capacity ratio			0.54			
Actuated Cycle Length (s)			63.5		Sum of lost time (s)	12.0
Intersection Capacity Utilization			49.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1703	1827	1524	1752	1697		1703	1746		1583	1810	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1703	1827	1524	1752	1697		1703	1746		1583	1810	1553
Volume (vph)	177	457	174	110	677	339	197	584	100	78	434	449
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	188	486	185	116	713	357	214	635	109	85	472	488
RTOR Reduction (vph)	0	0	113	0	15	0	0	5	0	0	0	187
Lane Group Flow (vph)	188	486	72	116	1055	0	214	739	0	85	472	301
Heavy Vehicles (%)	6%	4%	6%	3%	5%	9%	6%	7%	3%	14%	5%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	10.0	47.0	47.0	15.0	52.0		11.0	36.0		6.0	31.0	31.0
Effective Green, g (s)	10.0	47.0	47.0	15.0	52.0		11.0	36.0		6.0	31.0	31.0
Actuated g/C Ratio	0.08	0.39	0.39	0.12	0.43		0.09	0.30		0.05	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	142	716	597	219	735		156	524		79	468	401
v/s Ratio Prot	c0.11	0.27		0.07	c0.62		0.13	c0.42		0.05	c0.26	
v/s Ratio Perm			0.05									0.19
v/c Ratio	1.32	0.68	0.12	0.53	1.43		1.37	1.41		1.08	1.01	0.75
Uniform Delay, d1	55.0	30.2	23.3	49.2	34.0		54.5	42.0		57.0	44.5	40.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	186.3	5.1	0.4	2.3	203.5		202.5	195.9		123.5	43.7	12.2
Delay (s)	241.3	35.4	23.7	51.5	237.5		257.0	237.9		180.5	88.2	53.1
Level of Service	F	D	C	D	F		F	F		F	F	D
Approach Delay (s)		77.9			219.3			242.1			79.4	
Approach LOS		E			F			F			E	
Intersection Summary												
HCM Average Control Delay			158.6			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.36									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			120.6%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	1810	1568	1752	3271		1752	3386	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	1810	1568	1752	3271		1752	3386	
Volume (vph)	178	454	80	180	726	220	170	250	200	400	360	105
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	193	493	87	194	781	237	200	294	235	435	391	114
RTOR Reduction (vph)	0	0	57	0	0	98	0	125	0	0	23	0
Lane Group Flow (vph)	193	493	30	194	781	139	200	404	0	435	482	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	11.0	39.7	39.7	17.4	46.1	46.1	15.9	18.5		25.0	27.6	
Effective Green, g (s)	11.0	39.7	39.7	17.4	46.1	46.1	15.9	18.5		25.0	27.6	
Actuated g/C Ratio	0.09	0.34	0.34	0.15	0.40	0.40	0.14	0.16		0.21	0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	165	1171	534	261	716	620	239	519		376	801	
v/s Ratio Prot	c0.11	0.14		0.11	c0.43		0.11	c0.12		c0.25	0.14	
v/s Ratio Perm			0.02			0.09						
v/c Ratio	1.17	0.42	0.06	0.74	1.09	0.22	0.84	0.78		1.16	0.60	
Uniform Delay, d1	52.8	29.6	25.8	47.5	35.2	23.4	49.1	47.1		45.8	39.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	123.0	0.2	0.0	10.9	61.1	0.2	21.7	7.2		96.5	1.3	
Delay (s)	175.8	29.8	25.9	58.3	96.3	23.6	70.8	54.3		142.3	40.9	
Level of Service	F		C	E	F	C	E	D		F	D	
Approach Delay (s)		65.9			76.0			58.8			87.8	
Approach LOS		E			E			E			F	
Intersection Summary												
HCM Average Control Delay			73.5				HCM Level of Service			E		
HCM Volume to Capacity ratio			1.06									
Actuated Cycle Length (s)			116.6				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			96.9%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Lathrop Road & SR 99 SB Ramps

7/14/2010

												
Movement	EBT	EBR	EBR2	WBL	WBT	WBR	NBL	NBR	NBR2	SBL2	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑	↑↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.88		0.97	0.95	1.00	1.00	0.88	1.00	1.00	0.95	0.88
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Flt Permitted	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Volume (vph)	698	614	70	80	1021	80	100	620	130	20	300	280
Peak-hour factor, PHF	0.95	0.95	0.95	0.96	0.96	0.96	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	735	646	74	83	1064	83	109	674	141	22	333	311
RTOR Reduction (vph)	0	8	0	0	0	40	0	0	98	0	0	73
Lane Group Flow (vph)	735	712	0	83	1064	43	109	674	43	22	333	238
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Prot		Perm	Prot	custom	custom	Prot		Perm
Protected Phases	4			3	8		5			1	6	
Permitted Phases		4				8		2	2			6
Actuated Green, G (s)	32.5	32.5		4.8	41.3	41.3	6.0	24.3	24.3	2.4	20.7	20.7
Effective Green, g (s)	32.5	32.5		4.8	41.3	41.3	6.0	24.3	24.3	2.4	20.7	20.7
Actuated g/C Ratio	0.41	0.41		0.06	0.52	0.52	0.08	0.30	0.30	0.03	0.26	0.26
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1438	1132		206	1827	817	133	847	481	53	916	721
v/s Ratio Prot	0.21			0.02	c0.30		c0.06			0.01	0.09	
v/s Ratio Perm		c0.26				0.03		c0.24	0.03			0.09
v/c Ratio	0.51	0.63		0.40	0.58	0.05	0.82	0.80	0.09	0.42	0.36	0.33
Uniform Delay, d1	17.8	18.9		36.2	13.4	9.6	36.5	25.6	19.9	38.1	24.3	24.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	2.7		1.3	1.4	0.1	31.0	5.2	0.1	5.2	0.2	0.3
Delay (s)	19.1	21.6		37.5	14.7	9.7	67.4	30.8	20.0	43.3	24.5	24.3
Level of Service	B	C		D	B	A	E	C	C	D	C	C
Approach Delay (s)	20.3				15.9						25.0	
Approach LOS	C				B						C	
Intersection Summary												
HCM Average Control Delay			22.6									
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			80.0									
Intersection Capacity Utilization			54.3%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

17: Lathrop Road & SR 99 NB Ramps

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3433	1583
Volume (vph)	323	1015	180	295	886	70
Peak-hour factor, PHF	0.95	0.95	0.85	0.85	0.94	0.94
Adj. Flow (vph)	340	1068	212	347	943	74
RTOR Reduction (vph)	0	0	0	0	0	50
Lane Group Flow (vph)	340	1068	212	347	943	24
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Turn Type		Free	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	26.1	75.0	12.5	42.6	24.4	24.4
Effective Green, g (s)	26.1	75.0	12.5	42.6	24.4	24.4
Actuated g/C Ratio	0.35	1.00	0.17	0.57	0.33	0.33
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1232	1583	295	2010	1117	515
v/s Ratio Prot	0.10		0.12	0.10	c0.27	
v/s Ratio Perm		c0.67				0.02
v/c Ratio	0.28	0.67	0.72	0.17	0.84	0.05
Uniform Delay, d1	17.6	0.0	29.6	7.8	23.5	17.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.3	8.1	0.2	6.0	0.0
Delay (s)	18.2	2.3	37.7	7.9	29.5	17.4
Level of Service	B	A	D	A	C	B
Approach Delay (s)	6.2			19.2	28.6	
Approach LOS	A			B	C	
Intersection Summary						
HCM Average Control Delay			16.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			75.0		Sum of lost time (s)	4.0
Intersection Capacity Utilization			54.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

7/14/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	30	40	841	10	13	705
Peak Hour Factor	0.85	0.85	0.97	0.97	0.96	0.96
Hourly flow rate (vph)	35	47	867	10	14	734
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)					1308	
pX, platoon unblocked	0.76					
vC, conflicting volume	1628	867			877	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1827	867			877	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	44	87			98	
cM capacity (veh/h)	63	352			757	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	35	47	867	10	14	734
Volume Left	35	0	0	0	14	0
Volume Right	0	47	0	10	0	0
cSH	63	352	1700	1700	757	1700
Volume to Capacity	0.56	0.13	0.51	0.01	0.02	0.43
Queue Length 95th (ft)	57	11	0	0	1	0
Control Delay (s)	118.8	16.8	0.0	0.0	9.8	0.0
Lane LOS	F	C			A	
Approach Delay (s)	60.5		0.0		0.2	
Approach LOS	F					
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			54.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1752	1759		1752	1845	1568	1752	1845	1568	1752	1806	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1752	1759		1752	1845	1568	1752	1845	1568	1752	1806	
Volume (vph)	120	200	90	200	540	165	160	646	50	58	579	95
Peak-hour factor, PHF	0.87	0.87	0.87	0.92	0.92	0.92	0.94	0.94	0.94	0.93	0.93	0.93
Adj. Flow (vph)	138	230	103	217	587	179	170	687	53	62	623	102
RTOR Reduction (vph)	0	13	0	0	0	119	0	0	29	0	5	0
Lane Group Flow (vph)	138	320	0	217	587	60	170	687	24	62	720	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	9.0	27.4		17.6	36.0	36.0	11.0	55.0	55.0	4.8	48.8	
Effective Green, g (s)	9.0	27.4		17.6	36.0	36.0	11.0	55.0	55.0	4.8	48.8	
Actuated g/C Ratio	0.07	0.23		0.15	0.30	0.30	0.09	0.46	0.46	0.04	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	131	399		255	550	467	160	840	714	70	730	
v/s Ratio Prot	c0.08	0.18		0.12	c0.32		c0.10	0.37		0.04	c0.40	
v/s Ratio Perm						0.04			0.02			
v/c Ratio	1.05	0.80		0.85	1.07	0.13	1.06	0.82	0.03	0.89	0.99	
Uniform Delay, d1	55.9	44.1		50.3	42.4	30.9	54.9	28.6	18.2	57.7	35.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	93.6	11.0		22.8	57.6	0.1	88.7	6.2	0.0	68.8	29.7	
Delay (s)	149.5	55.2		73.2	100.0	31.1	143.6	34.8	18.2	126.6	65.4	
Level of Service	F	E		E	F	C	F	C	B	F	E	
Approach Delay (s)		82.8			81.5			54.1			70.2	
Approach LOS		F			F			D			E	
Intersection Summary												
HCM Average Control Delay			71.0			HCM Level of Service				E		
HCM Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			120.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			93.5%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: French Camp Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1570	1792	1538	1641	1792	1524	1703	3111		1703	1776	1468
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1570	1792	1538	1641	1792	1524	1703	3111		1703	1776	1468
Volume (vph)	60	350	107	187	390	120	79	411	109	160	590	70
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.94	0.94	0.94	0.93	0.93	0.93
Adj. Flow (vph)	67	389	119	203	424	130	84	437	116	172	634	75
RTOR Reduction (vph)	0	0	61	0	0	0	0	23	0	0	0	45
Lane Group Flow (vph)	67	389	58	203	424	130	84	530	0	172	634	30
Heavy Vehicles (%)	15%	6%	5%	10%	6%	6%	6%	13%	10%	6%	7%	10%
Turn Type	Prot		Perm	Prot		Free	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			Free						6
Actuated Green, G (s)	6.1	25.5	25.5	14.3	33.7	103.9	6.1	36.9		11.2	42.0	42.0
Effective Green, g (s)	6.1	25.5	25.5	14.3	33.7	103.9	6.1	36.9		11.2	42.0	42.0
Actuated g/C Ratio	0.06	0.25	0.25	0.14	0.32	1.00	0.06	0.36		0.11	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	92	440	377	226	581	1524	100	1105		184	718	593
v/s Ratio Prot	0.04	c0.22		c0.12	0.24		0.05	0.17		c0.10	c0.36	
v/s Ratio Perm			0.04			0.09						0.02
v/c Ratio	0.73	0.88	0.15	0.90	0.73	0.09	0.84	0.48		0.93	0.88	0.05
Uniform Delay, d1	48.1	37.8	30.7	44.1	31.1	0.0	48.4	26.0		46.0	28.7	18.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	24.8	18.6	0.2	33.5	4.6	0.1	43.1	0.3		47.5	12.4	0.0
Delay (s)	72.9	56.4	30.9	77.6	35.6	0.1	91.5	26.4		93.5	41.1	18.9
Level of Service	E	E	C	E	D	A	F	C		F	D	B
Approach Delay (s)		53.0			40.8			35.0			49.4	
Approach LOS		D			D			C			D	
Intersection Summary												
HCM Average Control Delay			44.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			103.9			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			77.5%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↵	↑↑					↵	↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	520	10	444	30	0	0	0	0	407	10	120
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.25	0.25	0.25	0.94	0.94	0.94
Hourly flow rate (vph)	0	565	11	472	32	0	0	0	0	433	11	128
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	32			576			1664	1547	288	1259	1553	16
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	32			576			1664	1547	288	1259	1553	16
tC, single (s)	4.2			4.8			7.5	6.5	6.9	8.2	6.6	7.0
tC, 2 stage (s)												
tF (s)	2.3			2.5			3.5	4.0	3.3	3.8	4.1	3.4
p0 queue free %	100			42			100	100	100	0	76	88
cM capacity (veh/h)	1550			808			25	47	709	53	45	1046
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2					
Volume Total	377	199	472	16	16	289	283					
Volume Left	0	0	472	0	0	289	144					
Volume Right	0	11	0	0	0	0	128					
cSH	1700	1700	808	1700	1700	53	91					
Volume to Capacity	0.22	0.12	0.58	0.01	0.01	5.49	3.10					
Queue Length 95th (ft)	0	0	97	0	0	Err	Err					
Control Delay (s)	0.0	0.0	15.5	0.0	0.0	Err	Err					
Lane LOS			C			F	F					
Approach Delay (s)	0.0		14.5			9999.0						
Approach LOS						F						
Intersection Summary												
Average Delay			3463.0									
Intersection Capacity Utilization			68.8%	ICU Level of Service				C				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

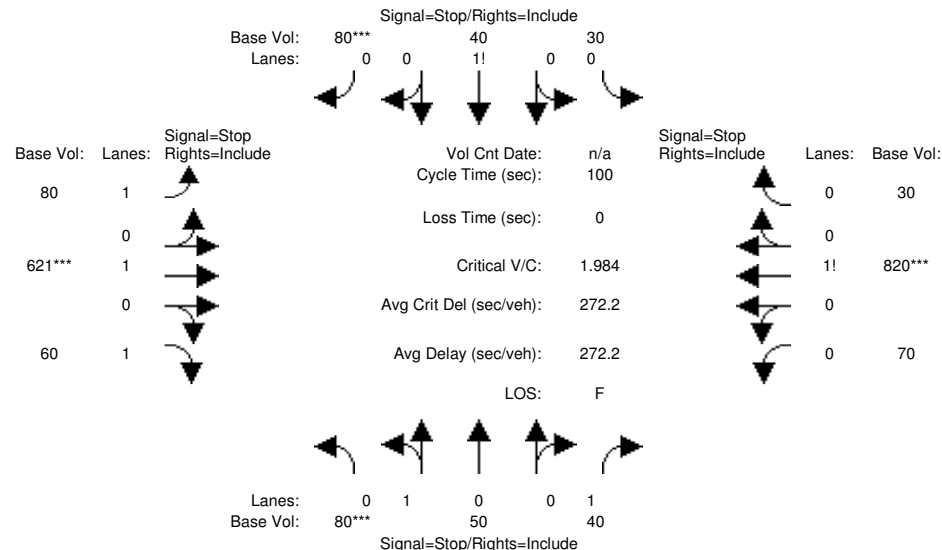
3: Roth Road & NB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	470	457	0	0	454	526	20	10	304	0	0	0
Peak Hour Factor	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92	0.25	0.25	0.25
Hourly flow rate (vph)	500	486	0	0	478	554	22	11	330	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									18			
Median type									None	None		
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1032			486			1725	2518	243	2003	2241	516
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1032			486			1725	2518	243	2003	2241	516
tC, single (s)	4.3			4.1			7.5	6.5	7.5	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.6	3.5	4.0	3.3
p0 queue free %	18			100			0	0	51	0	100	100
cM capacity (veh/h)	612			1073			18	5	679	0	8	504
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1						
Volume Total	500	243	243	319	713	363						
Volume Left	500	0	0	0	0	22						
Volume Right	0	0	0	0	554	330						
cSH	612	1700	1700	1700	1700	154						
Volume to Capacity	0.82	0.14	0.14	0.19	0.42	2.36						
Queue Length 95th (ft)	209	0	0	0	0	765						
Control Delay (s)	31.7	0.0	0.0	0.0	0.0	119.8						
Lane LOS	D					F						
Approach Delay (s)	16.1			0.0			119.8					
Approach LOS							F					
Intersection Summary												
Average Delay	24.9											
Intersection Capacity Utilization	68.8%			ICU Level of Service				C				
Analysis Period (min)	15											

Level Of Service Computation Report
2000 HCM 4-Way Stop (Base Volume Alternative)
Default Scenario

Intersection #6: Roth Road / Harlan Road Cumulative + MPB PM



Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0

Volume Module:

Base Vol:	80	50	40	30	40	80	80	621	60	70	820	30
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	80	50	40	30	40	80	80	621	60	70	820	30
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95	0.97	0.97	0.97
PHF Volume:	89	56	44	33	44	89	84	654	63	72	845	31
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	89	56	44	33	44	89	84	654	63	72	845	31
PCE 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
MLF 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
Final Volume:	89	56	44	33	44	89	84	654	63	72	845	31

Saturation Flow Module:

Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.62	0.38	1.00	0.20	0.27	0.53	1.00	1.00	1.00	0.08	0.89	0.03
Final Sat.:	251	157	460	86	114	228	457	489	539	36	426	16

Capacity Analysis Module:

Vol/Sat:	0.35	0.35	0.10	0.39	0.39	0.39	0.18	1.34	0.12	1.98	1.98	1.98
Crit Moves:	***					***		***			***	
Delay/Veh:	16.0	16.0	11.2	16.4	16.4	16.4	12.3	186	10.2	468.2	468	468.2
Delay 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
AdjDel/Veh:	16.0	16.0	11.2	16.4	16.4	16.4	12.3	186	10.2	468.2	468	468.2
LOS by Move:	C	C	B	C	C	C	B	F	B	F	F	F
ApproachDel:	14.9			16.4			154.2			468.2		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	14.9			16.4			154.2			468.2		
LOS by Appr:	B			C			F			F		
AllWayAvgQ:	0.5	0.5	0.1	0.6	0.6	0.6	0.2	24.0	0.1	60.8	60.8	60.8

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

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #6 Roth Road / Harlan Road Cumulative + MPB PM

Base Volume Alternative: Peak Hour Warrant Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R

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-----|-----|-----|-----|-----|
Control:      Stop Sign      Stop Sign      Stop Sign      Stop Sign
Lanes:        0 1 0 0 1      0 0 1! 0 0      1 0 1 0 1      0 0 1! 0 0
Initial Vol:   80  50   40   30  40   80   80 621   60   70 820   30
-----|-----|-----|-----|-----|
Major Street Volume:                1681
Minor Approach Volume:                170
Minor Approach Volume Threshold: 151
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SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

HCM Signalized Intersection Capacity Analysis

5: Roth Road & UPRR Intermodal Dwy

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (prot)	1667	820	955	1570	927	
Flt Permitted	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (perm)	1667	820	955	1570	927	
Volume (vph)	571	190	28	520	167	76
Peak-hour factor, PHF	0.95	0.95	0.97	0.97	0.90	0.90
Adj. Flow (vph)	601	200	29	536	186	84
RTOR Reduction (vph)	0	118	0	0	30	0
Lane Group Flow (vph)	601	82	29	536	240	0
Heavy Vehicles (%)	14%	97%	89%	21%	93%	83%
Turn Type	Perm		Prot			
Protected Phases	4		3	8	2	
Permitted Phases	4					
Actuated Green, G (s)	20.9	20.9	1.9	26.8	15.9	
Effective Green, g (s)	20.9	20.9	1.9	26.8	15.9	
Actuated g/C Ratio	0.41	0.41	0.04	0.53	0.31	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	687	338	36	830	291	
v/s Ratio Prot	c0.36		0.03	c0.34	c0.26	
v/s Ratio Perm		0.10				
v/c Ratio	0.87	0.24	0.81	0.65	0.83	
Uniform Delay, d1	13.7	9.7	24.2	8.6	16.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	12.0	0.4	75.6	1.7	17.2	
Delay (s)	25.7	10.1	99.8	10.3	33.3	
Level of Service	C	B	F	B	C	
Approach Delay (s)	21.8			14.9	33.3	
Approach LOS	C			B	C	
Intersection Summary						
HCM Average Control Delay	21.3		HCM Level of Service		C	
HCM Volume to Capacity ratio	0.87					
Actuated Cycle Length (s)	50.7		Sum of lost time (s)		12.0	
Intersection Capacity Utilization	50.6%		ICU Level of Service		A	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Roth Road & Airport Way

7/14/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
						
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1357	1442	1597	1776	1810	1223
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1357	1442	1597	1776	1810	1223
Volume (vph)	245	320	186	441	580	240
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.94	0.94
Adj. Flow (vph)	258	337	196	464	617	255
RTOR Reduction (vph)	0	151	0	0	0	158
Lane Group Flow (vph)	258	186	196	464	617	97
Heavy Vehicles (%)	33%	12%	13%	7%	5%	32%
Turn Type	Perm		Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	13.8	13.8	8.8	34.2	21.4	21.4
Effective Green, g (s)	13.8	13.8	8.8	34.2	21.4	21.4
Actuated g/C Ratio	0.25	0.25	0.16	0.61	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	334	355	251	1085	692	467
v/s Ratio Prot	c0.19		c0.12	0.26	c0.34	
v/s Ratio Perm		0.13				0.08
v/c Ratio	0.77	0.52	0.78	0.43	0.89	0.21
Uniform Delay, d1	19.6	18.3	22.7	5.7	16.2	11.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.6	1.4	14.5	0.3	13.8	0.2
Delay (s)	30.2	19.7	37.2	6.0	30.0	11.8
Level of Service	C	B	D	A	C	B
Approach Delay (s)	24.2			15.3	24.7	
Approach LOS	C			B	C	
Intersection Summary						
HCM Average Control Delay			21.6		HCM Level of Service	C
HCM Volume to Capacity ratio			0.83			
Actuated Cycle Length (s)			56.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			64.4%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	1.00	
Frt		0.93			0.97		1.00	0.97		1.00	0.99	
Flt Protected		0.98			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1555			1748		1626	3299		1770	1749	
Flt Permitted		0.98			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1555			1748		1626	3299		1770	1749	
Volume (vph)	120	17	163	150	13	40	135	853	230	160	1085	95
Peak-hour factor, PHF	0.94	0.94	0.94	0.85	0.85	0.85	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	128	18	173	176	15	47	139	879	237	165	1119	98
RTOR Reduction (vph)	0	35	0	0	8	0	0	20	0	0	3	0
Lane Group Flow (vph)	0	284	0	0	230	0	139	1096	0	165	1214	0
Heavy Vehicles (%)	11%	11%	11%	2%	2%	2%	11%	7%	2%	2%	7%	11%
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		19.0			18.1		8.0	52.0		14.0	58.0	
Effective Green, g (s)		19.0			18.1		8.0	52.0		14.0	58.0	
Actuated g/C Ratio		0.16			0.15		0.07	0.44		0.12	0.49	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		248			266		109	1440		208	852	
v/s Ratio Prot		c0.18			c0.13		c0.09	0.33		0.09	c0.69	
v/s Ratio Perm												
v/c Ratio		1.14			0.87		1.28	0.76		0.79	1.43	
Uniform Delay, d1		50.0			49.3		55.5	28.3		51.1	30.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		101.6			24.2		177.3	2.4		18.5	198.3	
Delay (s)		151.6			73.5		232.9	30.7		69.6	228.8	
Level of Service		F			E		F	C		E	F	
Approach Delay (s)		151.6			73.5			53.1			209.8	
Approach LOS		F			E			D			F	
Intersection Summary												
HCM Average Control Delay		132.3					HCM Level of Service			F		
HCM Volume to Capacity ratio		1.26										
Actuated Cycle Length (s)		119.1					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		100.4%					ICU Level of Service		G			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

8: Lathrop Road & I-5 SB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	1617	990	380	1169	0	0	0	0	530	10	750
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.25	0.25	0.25	0.98	0.98	0.98
Hourly flow rate (vph)	0	1650	1010	388	1193	0	0	0	0	541	10	765
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)					1175							
pX, platoon unblocked												
vC, conflicting volume	1193			2660			4894	4123	2155	4123	4629	1193
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1193			2660			4894	4123	2155	4123	4629	1193
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			0			0	0	100	0	0	0
cM capacity (veh/h)	582			156			0	0	60	0	0	227
Direction, Lane #	EB 1	WB 1	WB 2	SB 1								
Volume Total	2660	388	1193	1316								
Volume Left	0	388	0	541								
Volume Right	1010	0	0	765								
cSH	1700	156	1700	0								
Volume to Capacity	1.56	2.49	0.70	Err								
Queue Length 95th (ft)	0	834	0	Err								
Control Delay (s)	0.0	734.6	0.0	Err								
Lane LOS		F		F								
Approach Delay (s)	0.0	180.2		Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization		370.2%		ICU Level of Service						H		
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis

9: Lathrop Road & I-5 NB Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free			Stop			Stop	
Grade	0%				0%			0%			0%	
Volume (veh/h)	850	1297	0	0	1009	386	540	10	717	0	0	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.25	0.25	0.25
Hourly flow rate (vph)	859	1310	0	0	1019	390	551	10	732	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)	624											
pX, platoon unblocked	0.47						0.47	0.47		0.47	0.47	0.47
vC, conflicting volume	1409			1310			4241	4436	1310	4978	4241	1214
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1864			1310			7845	8257	1310	9401	7845	1452
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	0			100			0	0	0	0	0	100
cM capacity (veh/h)	152			525			0	0	193	0	0	75
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	859	1310	1409	1293								
Volume Left	859	0	0	551								
Volume Right	0	0	390	732								
cSH	152	1700	1700	0								
Volume to Capacity	5.65	0.77	0.83	Err								
Queue Length 95th (ft)	Err	0	0	Err								
Control Delay (s)	2148.9	0.0	0.0	Err								
Lane LOS	F			F								
Approach Delay (s)	850.7		0.0	Err								
Approach LOS				F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			370.2%		ICU Level of Service				H			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Lathrop Road & Harlan Rd.

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.90		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3458		1752	1845	1568	1752	3172		1752	3216	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3458		1752	1845	1568	1752	3172		1752	3216	
Volume (vph)	230	1624	160	117	1095	69	190	100	173	127	90	110
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.82	0.82	0.82	0.85	0.85	0.85
Adj. Flow (vph)	232	1640	162	118	1106	70	232	122	211	149	106	129
RTOR Reduction (vph)	0	6	0	0	0	13	0	142	0	0	116	0
Lane Group Flow (vph)	232	1796	0	118	1106	57	232	191	0	149	119	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	13.0	65.1		9.0	61.1	61.1	13.0	12.2		12.4	11.6	
Effective Green, g (s)	13.0	65.1		9.0	61.1	61.1	13.0	12.2		12.4	11.6	
Actuated g/C Ratio	0.11	0.57		0.08	0.53	0.53	0.11	0.11		0.11	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	199	1963		137	983	835	199	337		189	325	
v/s Ratio Prot	c0.13	c0.52		0.07	c0.60		c0.13	c0.06		0.09	0.04	
v/s Ratio Perm						0.04						
v/c Ratio	1.17	0.92		0.86	1.13	0.07	1.17	0.57		0.79	0.37	
Uniform Delay, d1	50.9	22.3		52.2	26.8	13.0	50.9	48.7		49.9	48.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	115.7	8.1		39.0	69.6	0.2	115.7	2.2		19.2	0.7	
Delay (s)	166.5	30.5		91.2	96.4	13.2	166.5	50.9		69.1	48.8	
Level of Service	F	C		F	F	B	F	D		E	D	
Approach Delay (s)		46.0			91.4			98.4			56.7	
Approach LOS		D			F			F			E	
Intersection Summary												
HCM Average Control Delay			67.6			HCM Level of Service				E		
HCM Volume to Capacity ratio			1.06									
Actuated Cycle Length (s)			114.7			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			100.3%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Lathrop Road & 5th Street

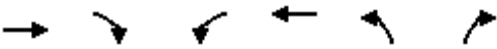
7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3438		1752	1706		1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3438		1752	1706		1752	1845	1568
Volume (vph)	60	1444	70	40	959	139	40	30	30	107	40	40
Peak-hour factor, PHF	0.99	0.99	0.99	0.95	0.95	0.95	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	61	1459	71	42	1009	146	50	38	38	134	50	50
RTOR Reduction (vph)	0	0	32	0	13	0	0	27	0	0	0	33
Lane Group Flow (vph)	61	1459	39	42	1142	0	50	49	0	134	50	17
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	4.7	36.6	36.6	3.5	35.4		3.5	26.1		8.6	31.2	31.2
Effective Green, g (s)	4.7	36.6	36.6	3.5	35.4		3.5	26.1		8.6	31.2	31.2
Actuated g/C Ratio	0.05	0.40	0.40	0.04	0.39		0.04	0.29		0.09	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	91	1413	632	68	1340		68	490		166	634	539
v/s Ratio Prot	c0.03	c0.42		0.02	0.33		c0.03	c0.03		c0.08	0.03	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.67	1.03	0.06	0.62	0.85		0.74	0.10		0.81	0.08	0.03
Uniform Delay, d1	42.3	27.1	16.6	43.0	25.3		43.2	23.7		40.3	20.1	19.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	17.7	32.7	0.0	15.5	5.4		33.4	0.4		24.2	0.2	0.1
Delay (s)	60.0	59.8	16.6	58.5	30.8		76.6	24.1		64.4	20.3	19.9
Level of Service	E	E	B	E	C		E	C		E	C	B
Approach Delay (s)		57.9			31.7			45.0			45.5	
Approach LOS		E			C			D			D	
Intersection Summary												
HCM Average Control Delay			46.5			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			90.8			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			65.8%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: Lathrop Road & McKinley Avenue

7/14/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	↵
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3470		1752	3505	1752	1568
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3470		1752	3505	1752	1568
Volume (vph)	1390	100	37	1078	90	43
Peak-hour factor, PHF	0.99	0.99	0.97	0.97	0.85	0.85
Adj. Flow (vph)	1404	101	38	1111	106	51
RTOR Reduction (vph)	5	0	0	0	0	43
Lane Group Flow (vph)	1500	0	38	1111	106	8
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Turn Type			Prot			Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	48.2		2.7	54.9	11.2	11.2
Effective Green, g (s)	48.2		2.7	54.9	11.2	11.2
Actuated g/C Ratio	0.65		0.04	0.74	0.15	0.15
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2257		64	2597	265	237
v/s Ratio Prot	c0.43		0.02	c0.32	c0.06	
v/s Ratio Perm						0.00
v/c Ratio	0.66		0.59	0.43	0.40	0.03
Uniform Delay, d1	8.0		35.2	3.6	28.4	26.8
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7		13.9	0.1	1.0	0.1
Delay (s)	8.7		49.1	3.8	29.4	26.9
Level of Service	A		D	A	C	C
Approach Delay (s)	8.7			5.3	28.6	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			8.4		HCM Level of Service	A
HCM Volume to Capacity ratio			0.62			
Actuated Cycle Length (s)			74.1		Sum of lost time (s)	12.0
Intersection Capacity Utilization			53.3%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1538	1752	1756		1703	1775		1687	1810	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1827	1538	1752	1756		1703	1775		1687	1810	1553
Volume (vph)	493	867	196	120	559	131	116	635	160	342	688	309
Peak-hour factor, PHF	0.96	0.96	0.96	0.94	0.94	0.94	0.95	0.95	0.95	0.97	0.97	0.97
Adj. Flow (vph)	514	903	204	128	595	139	122	668	168	353	709	319
RTOR Reduction (vph)	0	0	75	0	7	0	0	8	0	0	0	205
Lane Group Flow (vph)	514	903	129	128	727	0	122	828	0	353	709	114
Heavy Vehicles (%)	4%	4%	5%	3%	4%	10%	6%	4%	3%	7%	5%	4%
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	20.0	47.0	47.0	7.0	34.0		7.0	35.0		15.0	43.0	43.0
Effective Green, g (s)	20.0	47.0	47.0	7.0	34.0		7.0	35.0		15.0	43.0	43.0
Actuated g/C Ratio	0.17	0.39	0.39	0.06	0.28		0.06	0.29		0.12	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	289	716	602	102	498		99	518		211	649	556
v/s Ratio Prot	c0.30	0.49		0.07	c0.41		0.07	c0.47		c0.21	0.39	
v/s Ratio Perm			0.08									0.07
v/c Ratio	1.78	1.26	0.21	1.25	1.46		1.23	1.60		1.67	1.09	0.21
Uniform Delay, d1	50.0	36.5	24.2	56.5	43.0		56.5	42.5		52.5	38.5	26.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	364.0	128.6	0.8	172.5	217.7		165.5	278.5		322.7	63.2	0.8
Delay (s)	414.0	165.1	25.1	229.0	260.7		222.0	321.0		375.2	101.7	27.5
Level of Service	F	F	C	F	F		F	F		F	F	C
Approach Delay (s)		226.4			256.0			308.4			154.5	
Approach LOS		F			F			F			F	
Intersection Summary												
HCM Average Control Delay			227.4			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.60									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			140.1%			ICU Level of Service				H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	1810	1568	1752	3405		1752	3349	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	1810	1568	1752	3405		1752	3349	
Volume (vph)	136	951	184	160	567	360	157	550	130	240	380	160
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	140	980	190	167	591	375	171	598	141	267	422	178
RTOR Reduction (vph)	0	0	79	0	0	216	0	17	0	0	38	0
Lane Group Flow (vph)	140	980	111	167	591	159	171	722	0	267	562	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	10.7	36.5	36.5	13.5	39.3	39.3	13.7	25.6		19.4	31.3	
Effective Green, g (s)	10.7	36.5	36.5	13.5	39.3	39.3	13.7	25.6		19.4	31.3	
Actuated g/C Ratio	0.10	0.33	0.33	0.12	0.35	0.35	0.12	0.23		0.17	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	169	1131	516	213	641	555	216	785		306	944	
v/s Ratio Prot	0.08	0.29		c0.10	c0.33		0.10	c0.21		c0.15	0.17	
v/s Ratio Perm			0.07			0.10						
v/c Ratio	0.83	0.87	0.22	0.78	0.92	0.29	0.79	0.92		0.87	0.60	
Uniform Delay, d1	49.2	35.0	26.9	47.3	34.4	25.8	47.3	41.7		44.6	34.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	27.1	7.2	0.2	17.0	18.8	0.3	17.7	15.7		22.8	1.0	
Delay (s)	76.3	42.1	27.1	64.4	53.2	26.0	65.0	57.4		67.4	35.4	
Level of Service	E	D	C	E	D	C	E	E		E	D	
Approach Delay (s)		43.6			45.9			58.8			45.3	
Approach LOS		D			D			E			D	
Intersection Summary												
HCM Average Control Delay			47.8				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			111.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			83.4%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

15: Lathrop Road & SR 99 SB Ramps

7/14/2010

												
Movement	EBT	EBR	EBR2	WBL	WBT	WBR	NBL	NBR	NBR2	SBL2	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑	↑↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.88		0.97	0.95	1.00	1.00	0.88	1.00	1.00	0.95	0.88
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Flt Permitted	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3539	2787		3433	3539	1583	1770	2787	1583	1770	3539	2787
Volume (vph)	606	797	90	120	1007	30	80	450	110	10	660	453
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.92	0.92	0.92	0.92	0.95	0.95
Adj. Flow (vph)	631	830	94	125	1049	31	87	489	120	11	695	477
RTOR Reduction (vph)	0	9	0	0	0	16	0	0	77	0	0	86
Lane Group Flow (vph)	631	915	0	125	1049	15	87	489	43	11	695	391
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Prot		Perm	Prot	custom	custom	Prot		Perm
Protected Phases	4			3	8		5			1	6	
Permitted Phases		4				8		2	2			6
Actuated Green, G (s)	29.6	29.6		4.8	38.4	38.4	4.8	28.4	28.4	1.2	24.8	24.8
Effective Green, g (s)	29.6	29.6		4.8	38.4	38.4	4.8	28.4	28.4	1.2	24.8	24.8
Actuated g/C Ratio	0.37	0.37		0.06	0.48	0.48	0.06	0.35	0.35	0.01	0.31	0.31
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1309	1031		206	1699	760	106	989	562	27	1097	864
v/s Ratio Prot	0.18			0.04	c0.30		c0.05			0.01	c0.20	
v/s Ratio Perm		c0.33				0.01		c0.18	0.03			0.14
v/c Ratio	0.48	0.89		0.61	0.62	0.02	0.82	0.49	0.08	0.41	0.63	0.45
Uniform Delay, d1	19.3	23.6		36.7	15.4	10.9	37.2	20.2	17.1	39.0	23.7	22.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	11.3		5.0	1.7	0.0	37.7	0.4	0.1	9.7	1.2	0.4
Delay (s)	20.6	34.9		41.7	17.1	11.0	74.9	20.6	17.2	48.8	24.9	22.5
Level of Service	C	C		D	B	B	E	C	B	D	C	C
Approach Delay (s)	29.1				19.5						24.2	
Approach LOS	C				B						C	
Intersection Summary												
HCM Average Control Delay			25.0				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)		20.0			
Intersection Capacity Utilization			62.7%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

17: Lathrop Road & SR 99 NB Ramps

7/14/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3433	1583
Volume (vph)	329	737	70	377	780	240
Peak-hour factor, PHF	0.92	0.92	0.90	0.90	0.94	0.94
Adj. Flow (vph)	358	801	78	419	830	255
RTOR Reduction (vph)	0	0	0	0	0	177
Lane Group Flow (vph)	358	801	78	419	830	78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Turn Type		Free	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		Free				2
Actuated Green, G (s)	31.6	75.0	8.5	44.1	22.9	22.9
Effective Green, g (s)	31.6	75.0	8.5	44.1	22.9	22.9
Actuated g/C Ratio	0.42	1.00	0.11	0.59	0.31	0.31
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1491	1583	201	2081	1048	483
v/s Ratio Prot	0.10		0.04	0.12	c0.24	
v/s Ratio Perm		c0.51				0.05
v/c Ratio	0.24	0.51	0.39	0.20	0.79	0.16
Uniform Delay, d1	14.0	0.0	30.8	7.2	23.9	19.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	1.2	1.2	0.2	4.2	0.2
Delay (s)	14.4	1.2	32.1	7.4	28.0	19.2
Level of Service	B	A	C	A	C	B
Approach Delay (s)	5.2			11.3	26.0	
Approach LOS	A			B	C	
Intersection Summary						
HCM Average Control Delay			14.5		HCM Level of Service	B
HCM Volume to Capacity ratio			0.60			
Actuated Cycle Length (s)			75.0		Sum of lost time (s)	4.0
Intersection Capacity Utilization			45.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

19: Hastings Drive & Airport Way

7/14/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	30	27	884	70	39	965
Peak Hour Factor	0.75	0.75	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	40	36	911	72	40	995
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1987	911			984	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1987	911			984	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	37	89			94	
cM capacity (veh/h)	63	332			694	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	40	36	911	72	40	995
Volume Left	40	0	0	0	40	0
Volume Right	0	36	0	72	0	0
cSH	63	332	1700	1700	694	1700
Volume to Capacity	0.63	0.11	0.54	0.04	0.06	0.59
Queue Length 95th (ft)	67	9	0	0	5	0
Control Delay (s)	131.1	17.2	0.0	0.0	10.5	0.0
Lane LOS	F	C			B	
Approach Delay (s)	77.1		0.0		0.4	
Approach LOS	F					
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			60.8%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1752	1777		1752	1845	1568	1752	1845	1568	1752	1794	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1752	1777		1752	1845	1568	1752	1845	1568	1752	1794	
Volume (vph)	143	740	240	120	450	140	180	654	280	236	694	157
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.94	0.94	0.94	0.96	0.96	0.96
Adj. Flow (vph)	151	779	253	130	489	152	191	696	298	246	723	164
RTOR Reduction (vph)	0	10	0	0	0	102	0	0	41	0	7	0
Lane Group Flow (vph)	151	1022	0	130	489	50	191	696	258	246	881	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	13.2	46.0		7.0	39.8	39.8	9.0	39.0	39.0	12.0	42.0	
Effective Green, g (s)	13.2	46.0		7.0	39.8	39.8	9.0	39.0	39.0	12.0	42.0	
Actuated g/C Ratio	0.11	0.38		0.06	0.33	0.33	0.08	0.32	0.32	0.10	0.35	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	193	681		102	612	520	131	600	510	175	628	
v/s Ratio Prot	0.09	c0.58		c0.07	0.27		0.11	0.38		c0.14	c0.49	
v/s Ratio Perm						0.03			0.16			
v/c Ratio	0.78	1.50		1.27	0.80	0.10	1.46	1.16	0.50	1.41	1.40	
Uniform Delay, d1	52.0	37.0		56.5	36.5	27.7	55.5	40.5	32.7	54.0	39.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	18.4	233.1		179.8	7.2	0.1	243.2	89.5	0.8	213.1	190.4	
Delay (s)	70.4	270.1		236.3	43.7	27.8	298.7	130.0	33.5	267.1	229.4	
Level of Service	E	F		F	D	C	F	F	C	F	F	
Approach Delay (s)		244.6			73.0			132.9			237.6	
Approach LOS		F			E			F			F	
Intersection Summary												
HCM Average Control Delay			180.8				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.46									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			129.6%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

Peak Hour Signal Warrants

Cumulative Plus CIC Project Conditions

Major Street **Roth Road**
Minor Street **I-5 SB Ramps**

Sheet No **1** of **6**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Plus CIC Conditions**
Peak Hour **AM**

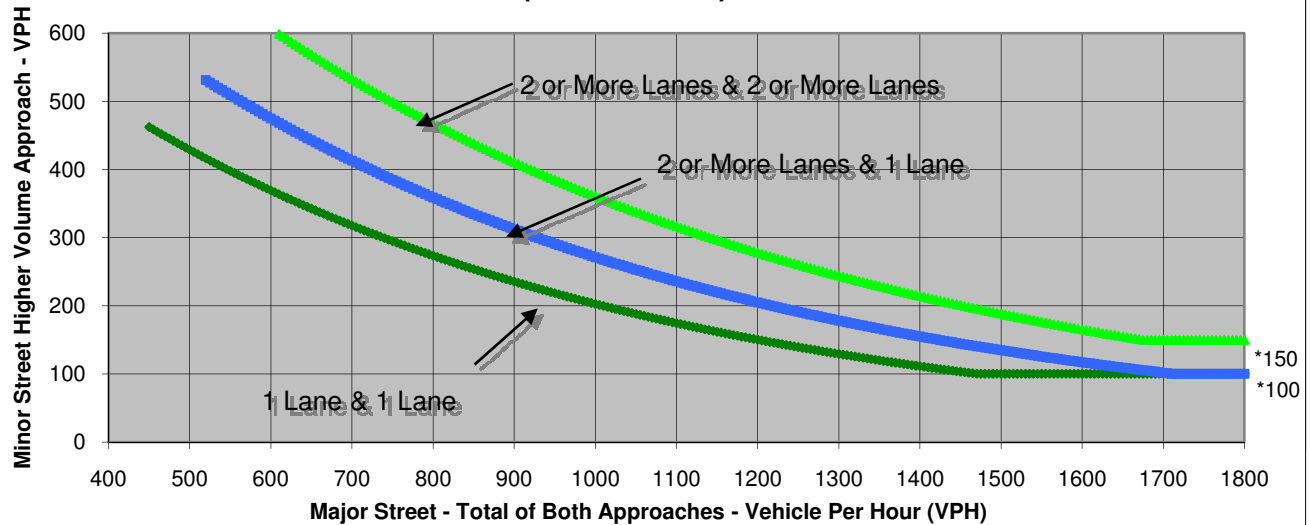
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	422	0	233
Through	0	10	110	40
Right	0	340	10	0
Total	0	772	120	273

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	393	772	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
Minor Street I-5 NB Ramps

Project Centerpoint Intermodal Center
Scenario Cumulative Plus CIC Conditions
Peak Hour AM

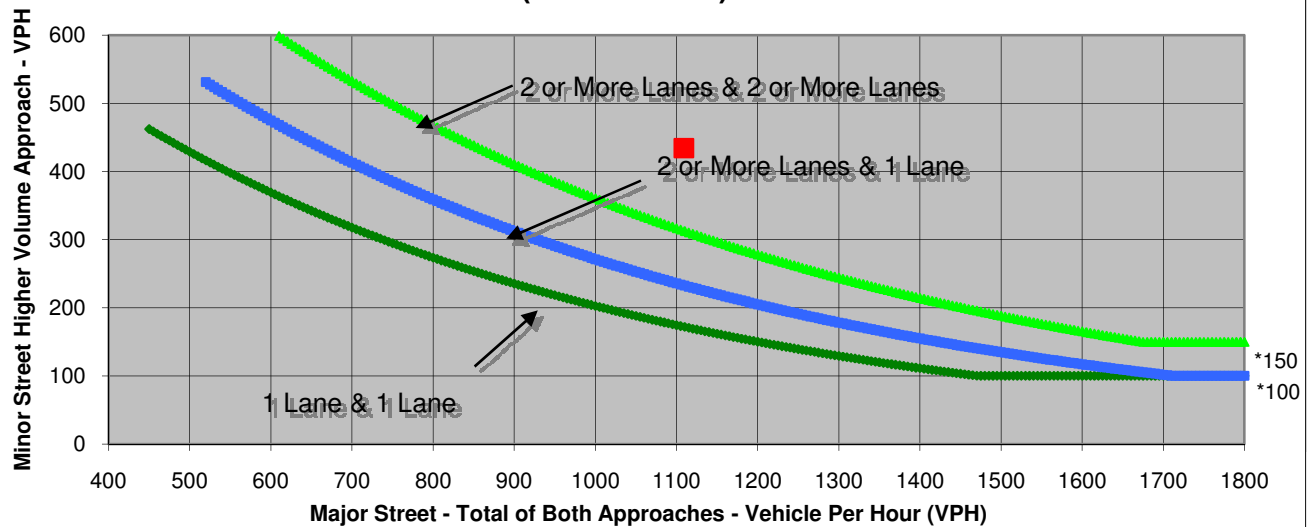
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	0	90	0
Through	10	0	442	253
Right	404	0	0	324
Total	434	0	532	577

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,109	434	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street Harlan Road

Sheet No 3 of 6

Project Centerpoint Intermodal Center
 Scenario Cumulative Plus CIC Conditions
 Peak Hour AM

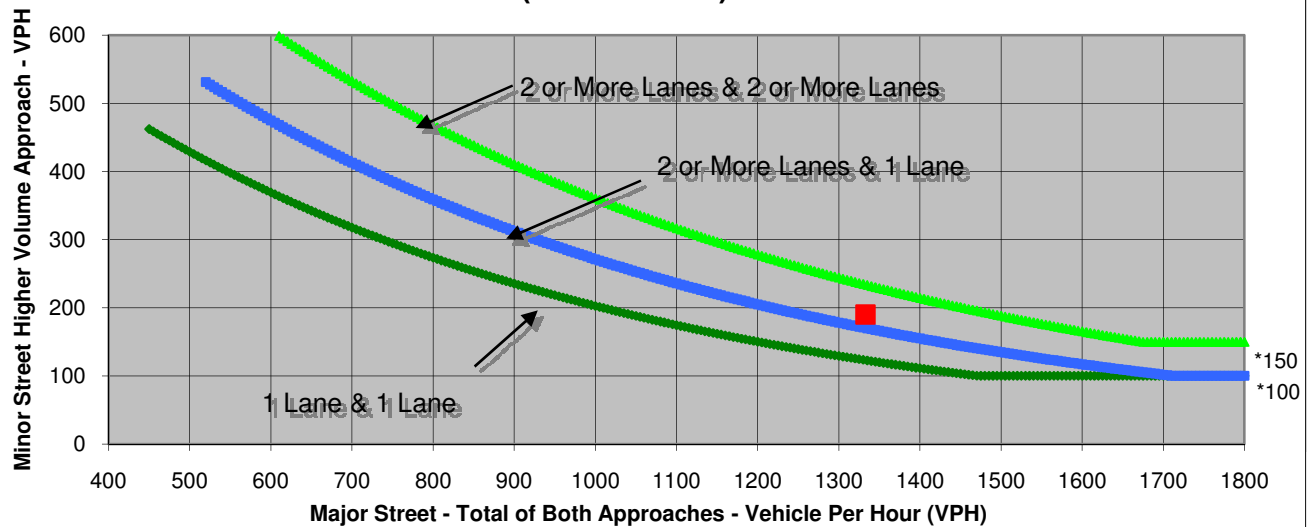
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	50	60	30
Through	40	30	706	427
Right	70	70	80	30
Total	190	150	846	487

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,333	190	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
Minor Street I-5 SB Ramps

Sheet No 4 of 6

Project Centerpoint Intermodal Center
Scenario Cumulative Plus CIC Conditions
Peak Hour AM

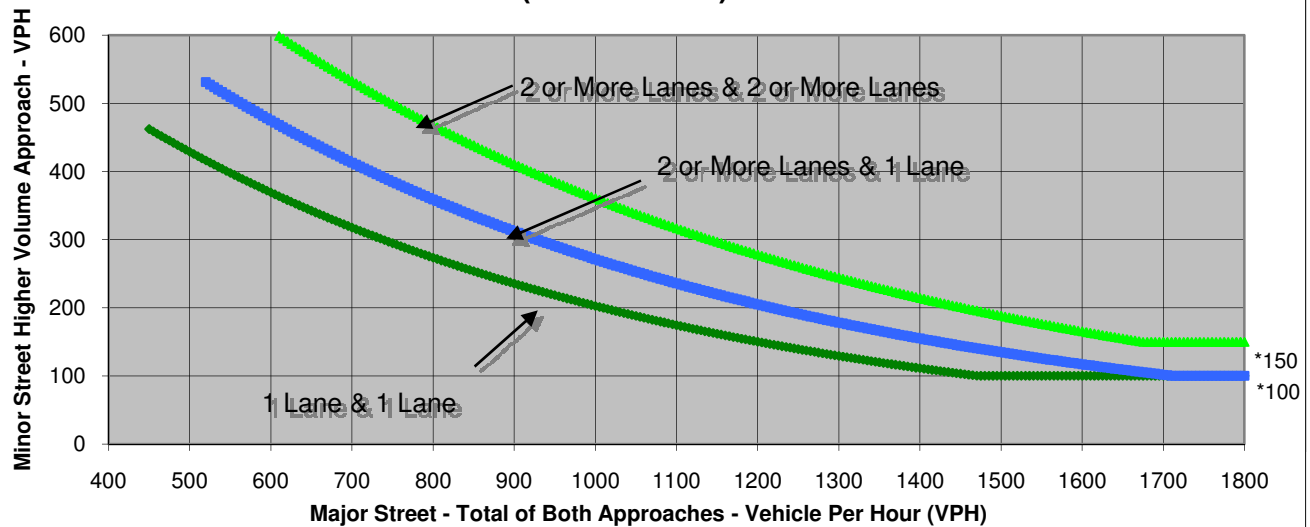
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	292	0	449
Through	0	10	962	1,491
Right	0	1,020	440	0
Total	0	1,322	1,402	1,940

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,342	1,322	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Plus CIC Conditions**
Peak Hour **AM**

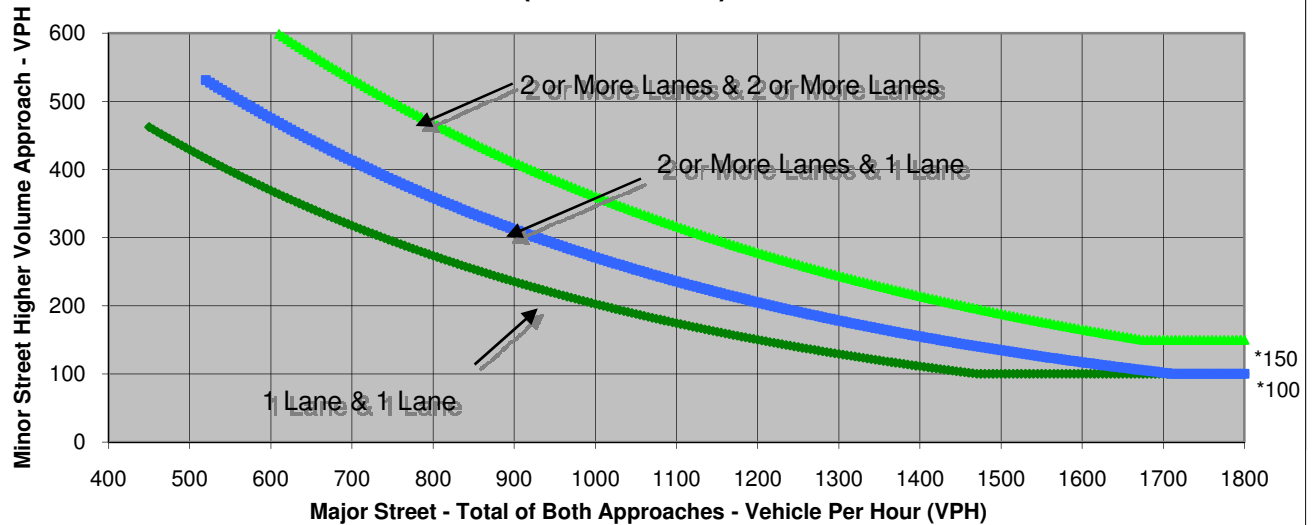
Turn Movement Volumes

	NB	SB	EB	WB
Left	630	0	550	0
Through	10	0	704	1,310
Right	376	0	0	581
Total	1,016	0	1,254	1,891

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,145	1,016	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Airport Way
Minor Street Hastings Drive

Sheet No 7 of 6

Project Centerpoint Intermodal Center
Scenario Cumulative Plus CIC Conditions
Peak Hour AM

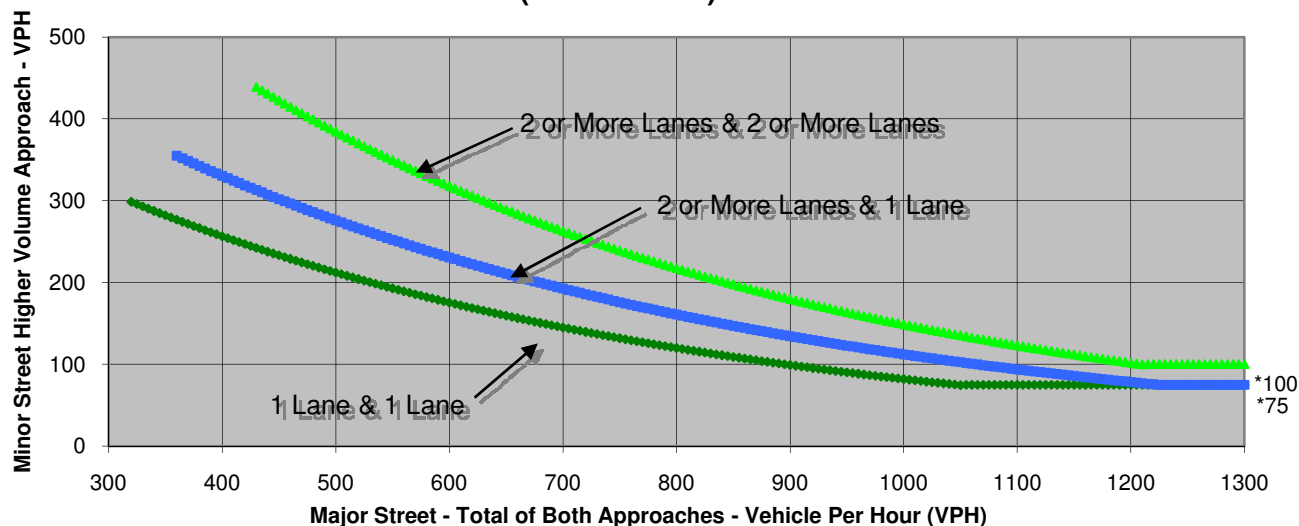
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	12	0	30
Through	780	674	0	0
Right	10	0	0	37
Total	790	686	0	67

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Airport Way	Hastings Drive	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,476	67	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street Roth Road
 Minor Street I-5 SB Ramps

Sheet No 1 of 6

Project Centerpoint Intermodal Center
 Scenario Cumulative Plus CIC Conditions
 Peak Hour PM

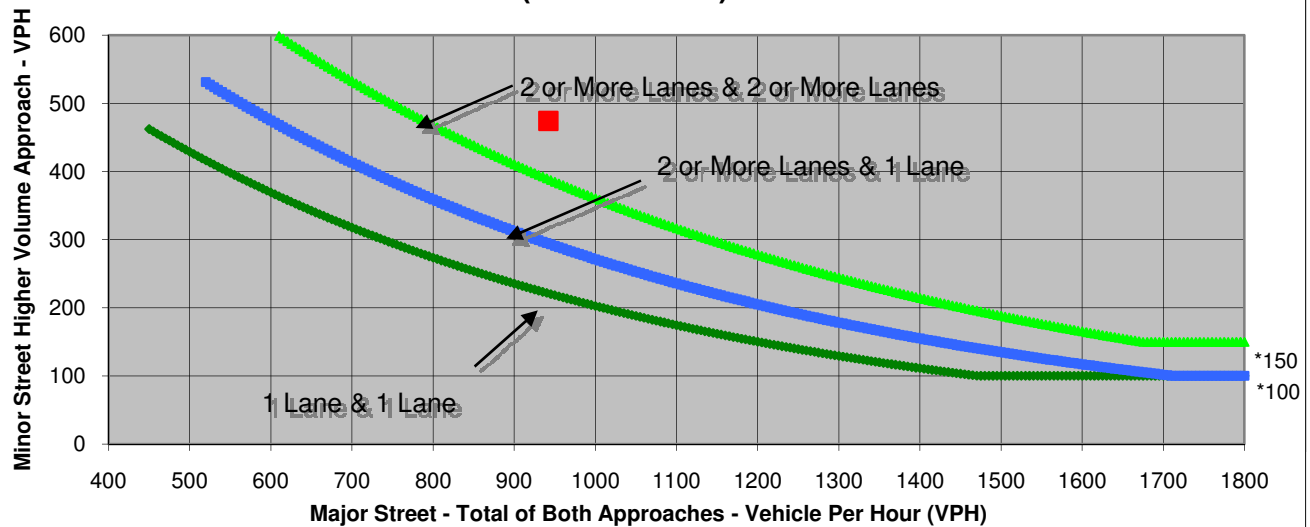
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	344	0	382
Through	0	10	520	30
Right	0	120	10	0
Total	0	474	530	412

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	942	474	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
Minor Street I-5 NB Ramps

Project Centerpoint Intermodal Center
Scenario Cumulative Plus CIC Conditions
Peak Hour PM

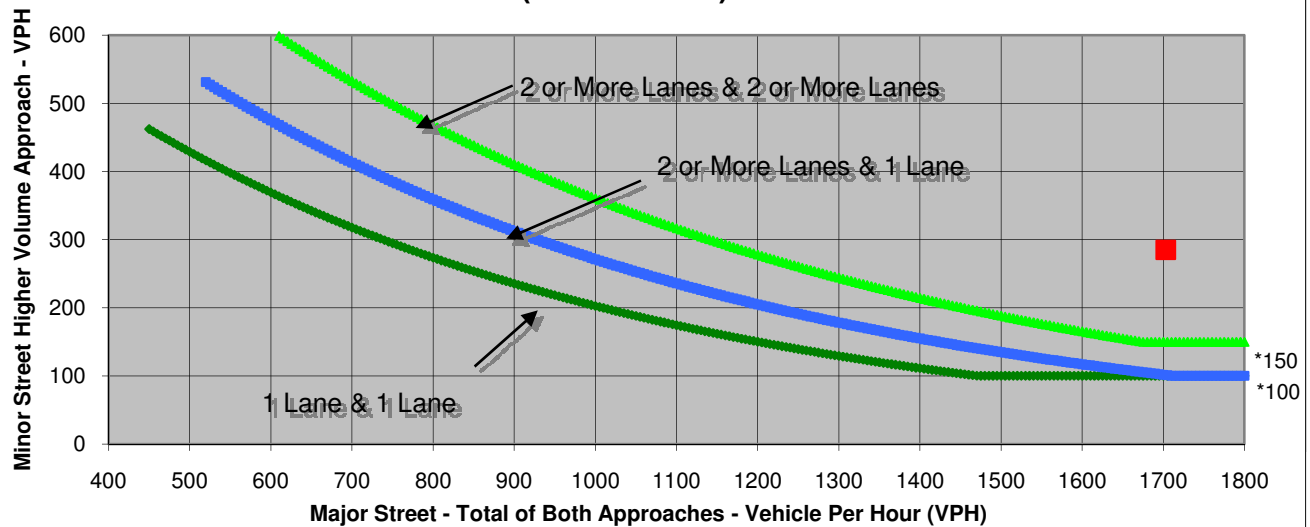
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	0	470	0
Through	10	0	394	392
Right	255	0	0	447
Total	285	0	864	839

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,703	285	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**

 Minor Street **Harlan Road**

 Project **Centerpoint Intermodal Center**

 Scenario **Cumulative Plus CIC Conditions**

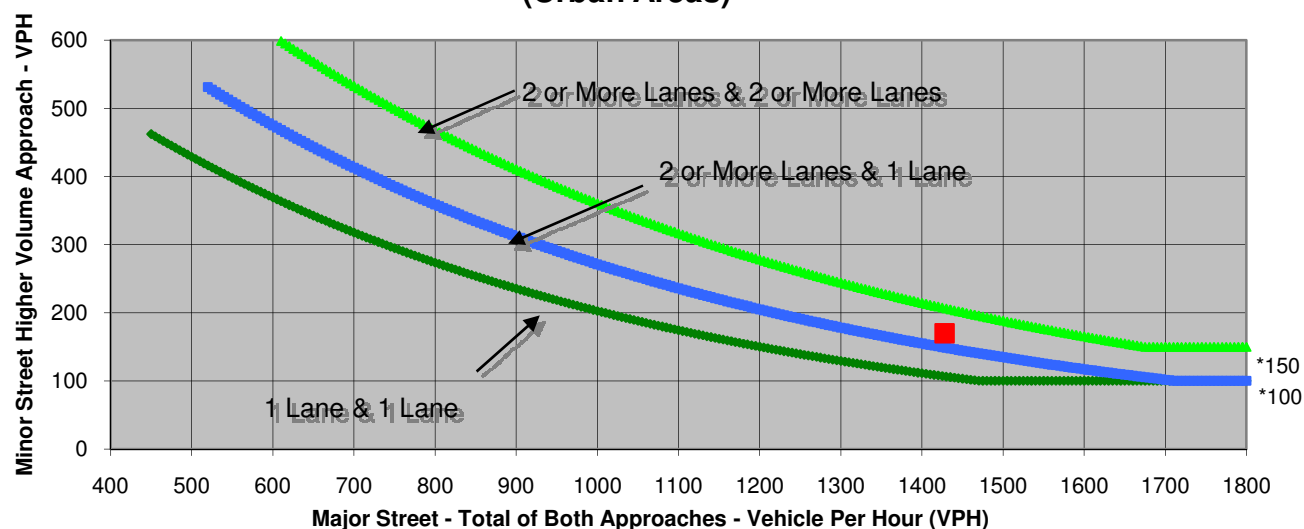
 Peak Hour **PM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	30	80	70
Through	50	40	509	679
Right	40	80	60	30
Total	170	150	649	779

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,428	170	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
Minor Street I-5 SB Ramps

Sheet No 4 of 6

Project Centerpoint Intermodal Center
Scenario Cumulative Plus CIC Conditions
Peak Hour PM

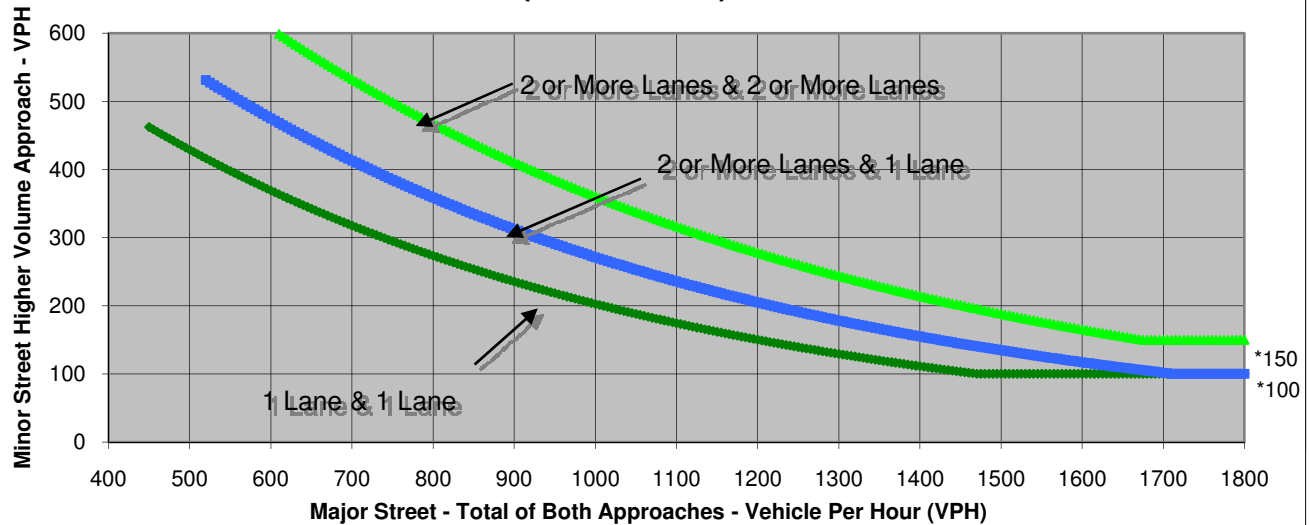
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	512	0	342
Through	0	10	1,612	1,163
Right	0	750	990	0
Total	0	1,272	2,602	1,505

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	4,107	1,272	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Plus CIC Conditions**
Peak Hour **PM**

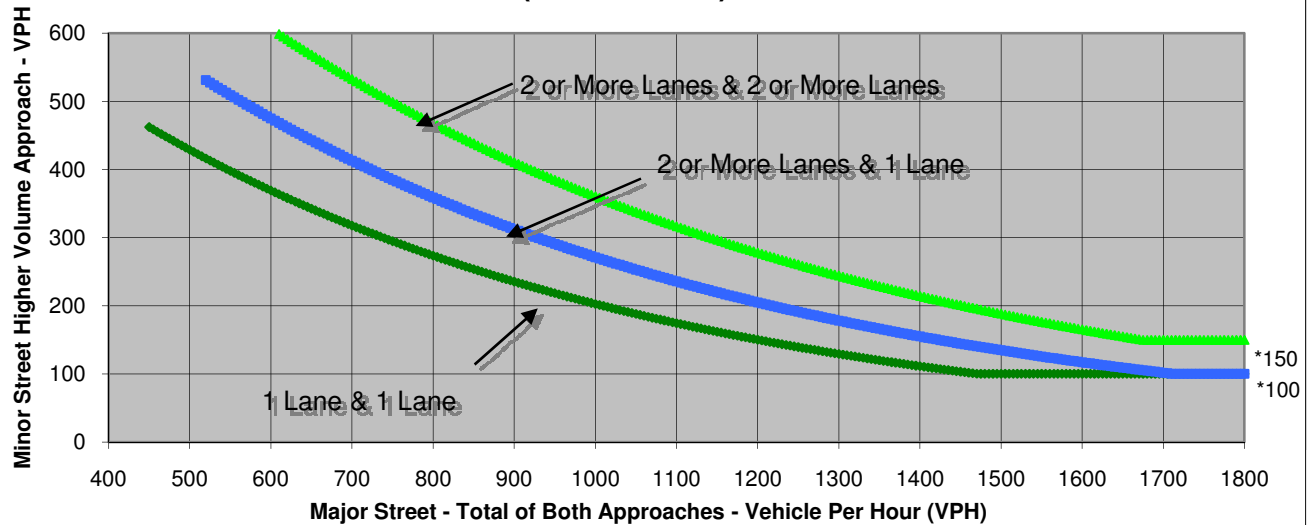
Turn Movement Volumes

	NB	SB	EB	WB
Left	540	0	850	0
Through	10	0	1,274	965
Right	687	0	0	362
Total	1,237	0	2,124	1,327

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,451	1,237	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Airport Way
Minor Street Hastings Drive

Sheet No 6 of 6

Project Centerpoint Intermodal Center
Scenario Cumulative Plus CIC Conditions
Peak Hour PM

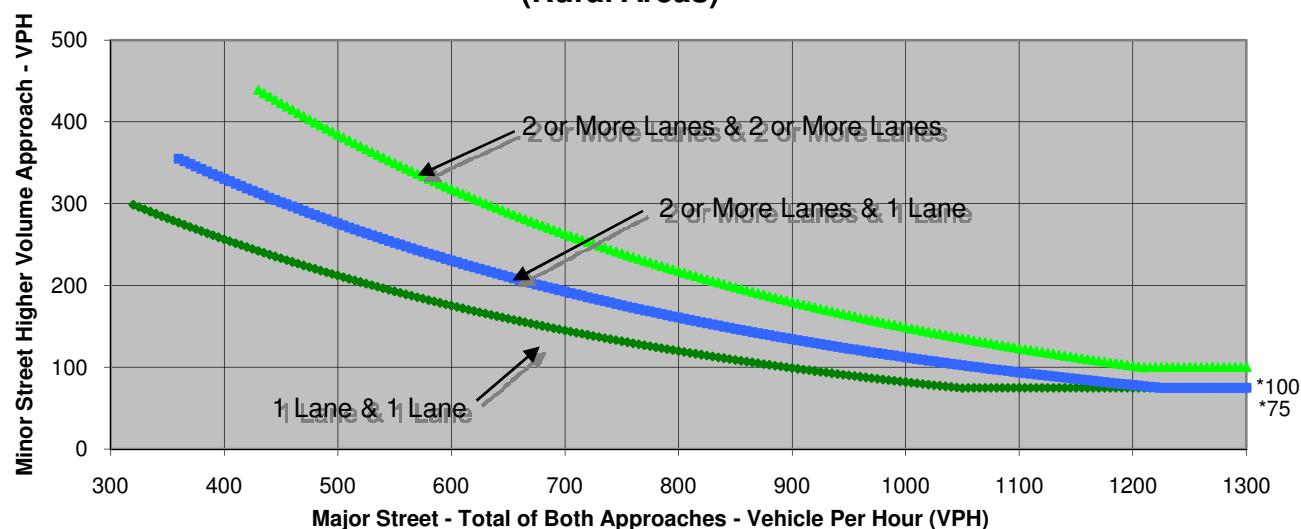
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	32	0	30
Through	797	855	0	0
Right	70	0	0	22
Total	867	887	0	52

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Airport Way	Hastings Drive	
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,754	52	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Peak Hour Signal Warrants

Cumulative Plus Master Plan Buildout Conditions

Major Street Roth Road
Minor Street I-5 SB Ramps

Project Centerpoint Intermodal Center
Scenario Cumulative Plus MPB
Peak Hour AM

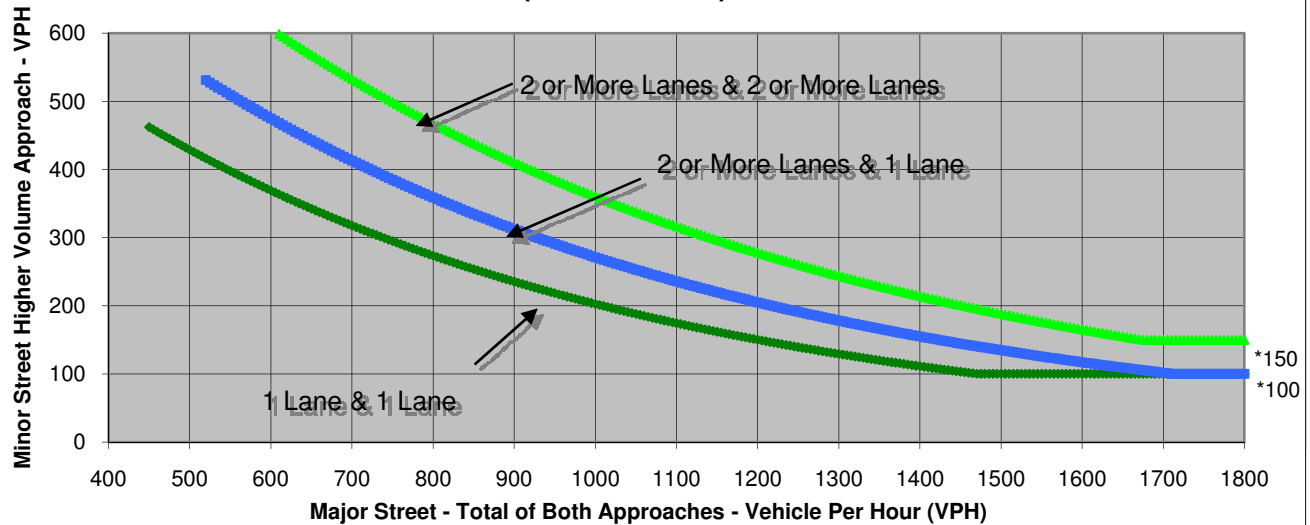
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	461	0	249
Through	0	10	110	40
Right	0	340	10	0
Total	0	811	120	289

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	409	811	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street I-5 NB Ramps

Sheet No 2 of 6

Project Centerpoint Intermodal Center
 Scenario Cumulative Plus MPB
 Peak Hour AM

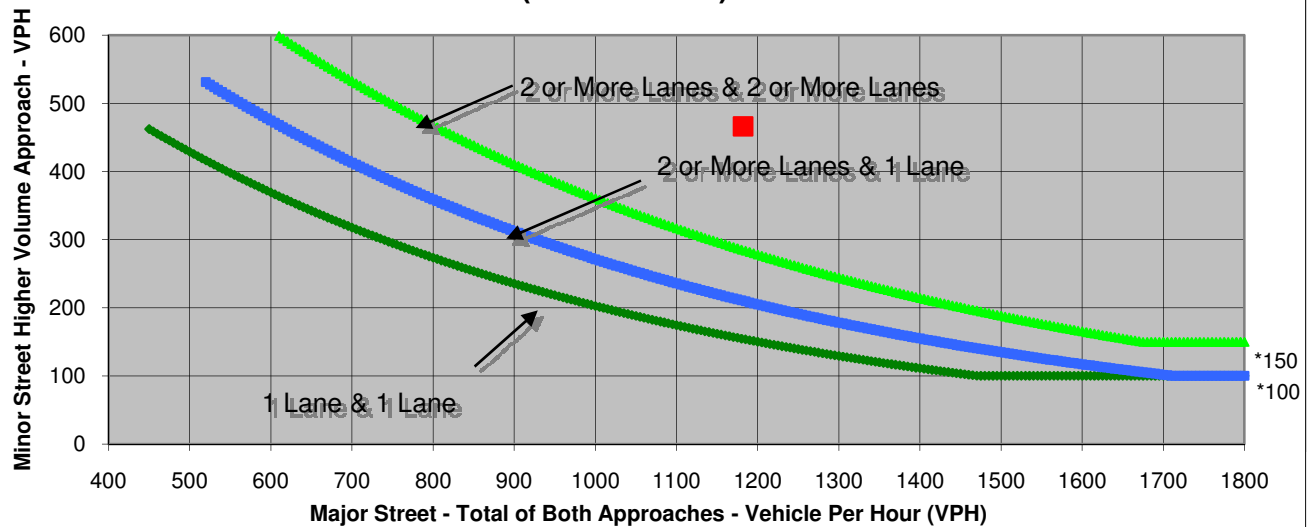
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	0	90	0
Through	10	0	481	269
Right	436	0	0	342
Total	466	0	571	611

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,182	466	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Roth Road
 Minor Street Harlan Road

Sheet No 3 of 6

Project Centerpoint Intermodal Center
 Scenario Cumulative Plus MPB
 Peak Hour AM

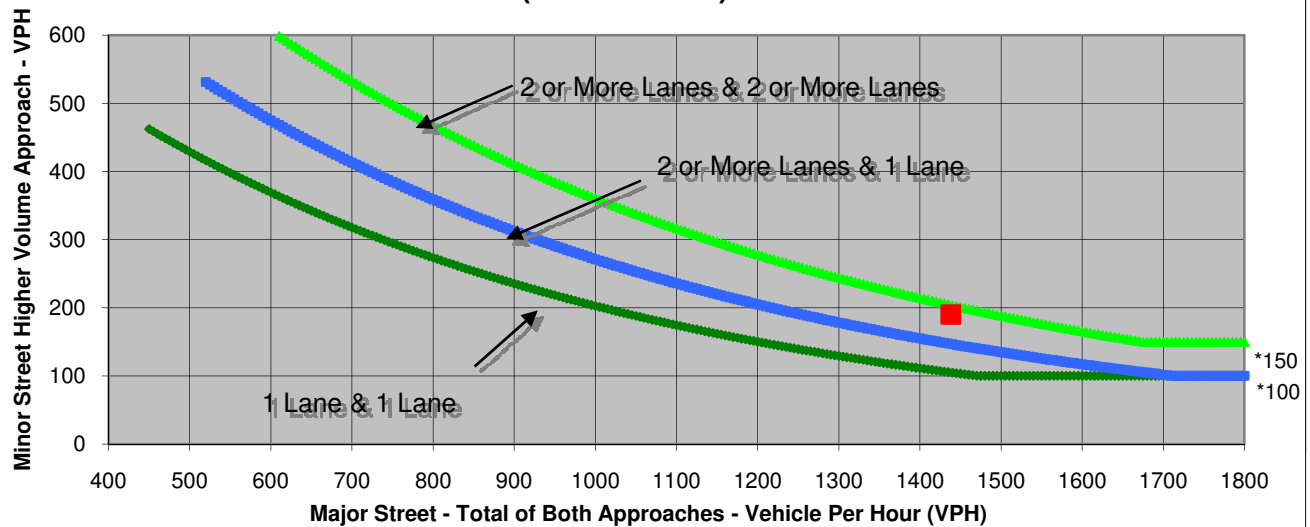
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	50	60	30
Through	40	30	777	461
Right	70	70	80	30
Total	190	150	917	521

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,438	190	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
Minor Street I-5 SB Ramps

Sheet No 4 of 6

Project Centerpoint Intermodal Center
Scenario Cumulative Plus MPB
Peak Hour AM

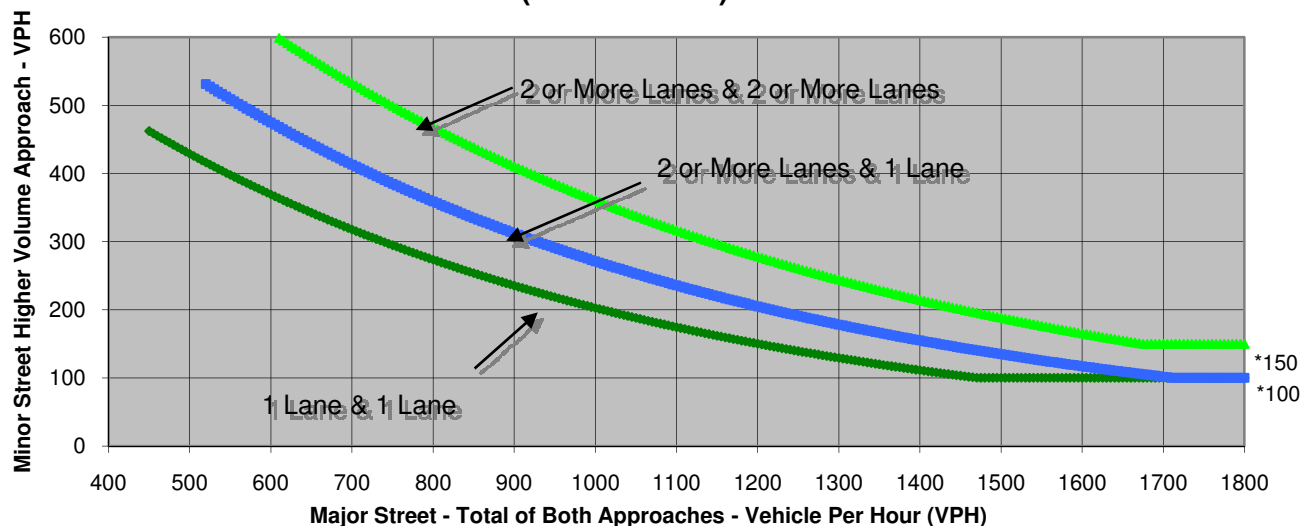
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	305	0	458
Through	0	10	965	1,493
Right	0	1,020	440	0
Total	0	1,335	1,405	1,951

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street	Minor Street	<u>Warrant Met</u>
	Lathrop Road	I-5 SB Ramps	
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,356	1,335	
* Note: Traffic Volume for Major Street is Total Volume of Both Approaches. Traffic Volume for Minor Street is the Volume of High Volume Approach.			

Major Street **Lathrop Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Plus MPB**
Peak Hour **AM**

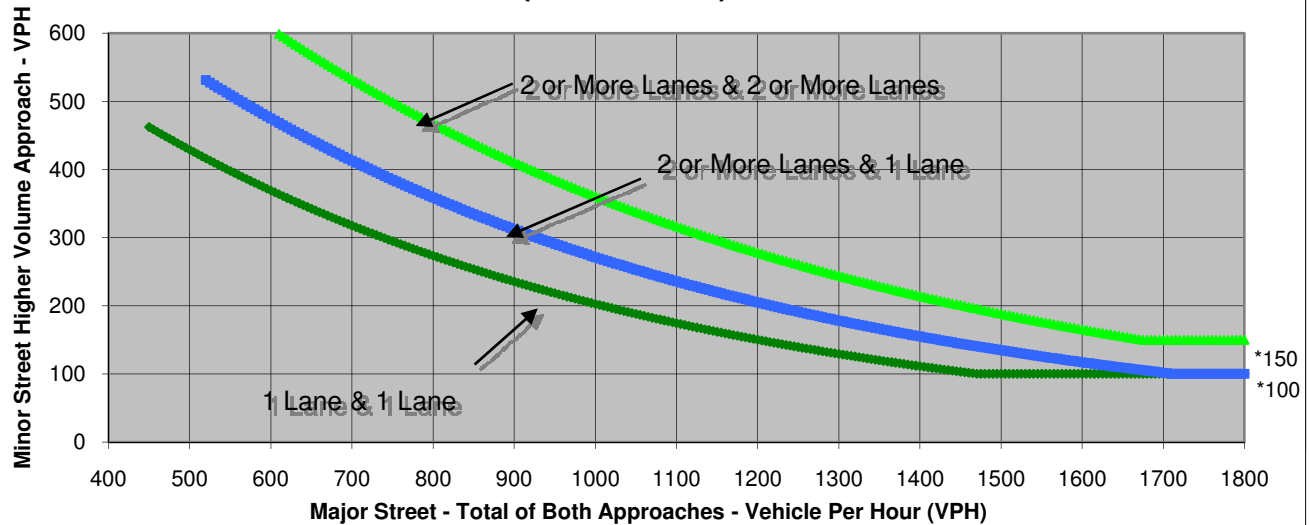
Turn Movement Volumes

	NB	SB	EB	WB
Left	630	0	550	0
Through	10	0	720	1,321
Right	396	0	0	588
Total	1,036	0	1,270	1,909

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,179	1,036	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Airport Way
Minor Street Hastings Drive

Sheet No 6 of 6

Project Centerpoint Intermodal Center
Scenario Cumulative Plus MPB
Peak Hour AM

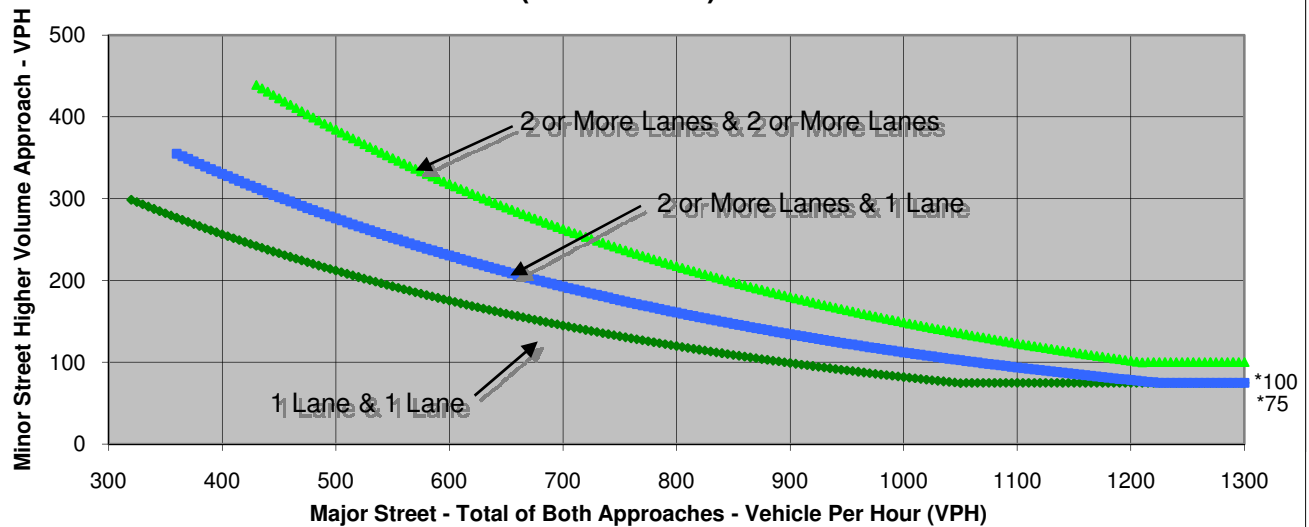
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	13	0	30
Through	841	705	0	0
Right	10	0	0	40
Total	851	718	0	70

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Hastings Drive	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,569	70	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**
Minor Street **I-5 SB Ramps**

Sheet No **1** of **6**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Plus MPB**
Peak Hour **PM**

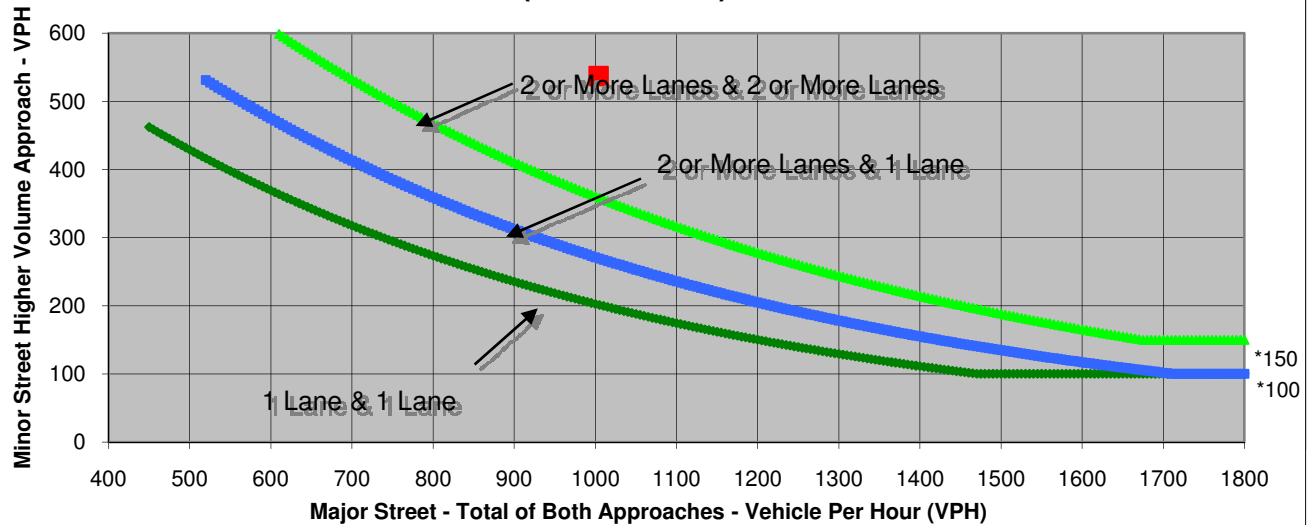
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	407	0	444
Through	0	10	520	30
Right	0	120	10	0
Total	0	537	530	474

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,004	537	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Plus MPB**
Peak Hour **PM**

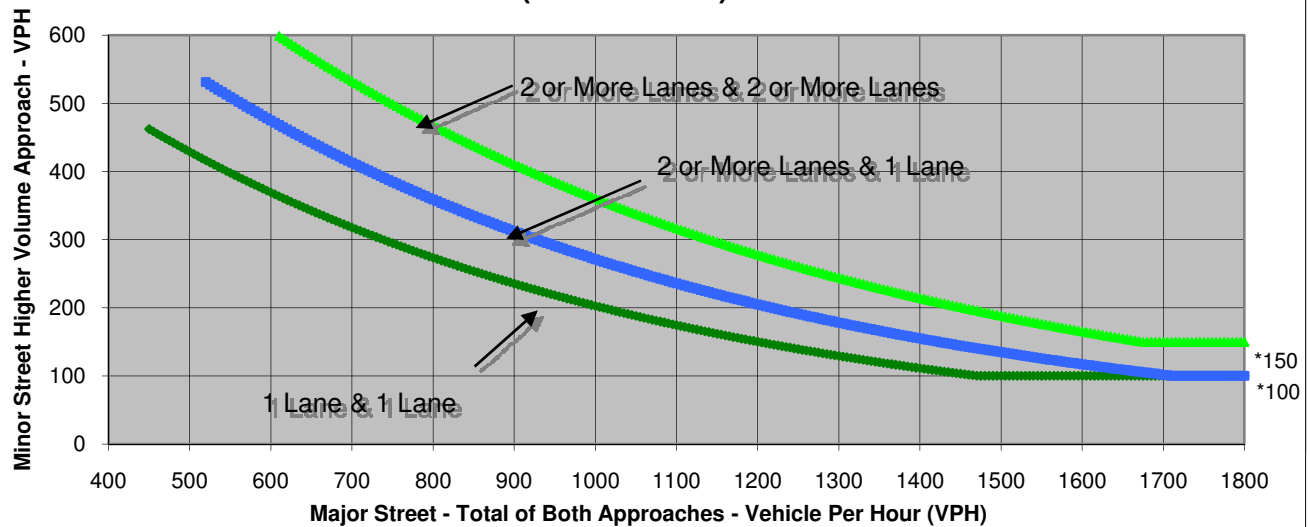
Turn Movement Volumes

	NB	SB	EB	WB
Left	20	0	470	0
Through	10	0	457	454
Right	304	0	0	526
Total	334	0	927	980

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,907	334	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Roth Road**

 Minor Street **Harlan Road**

 Project **Centerpoint Intermodal Center**

 Scenario **Cumulative Plus MPB**

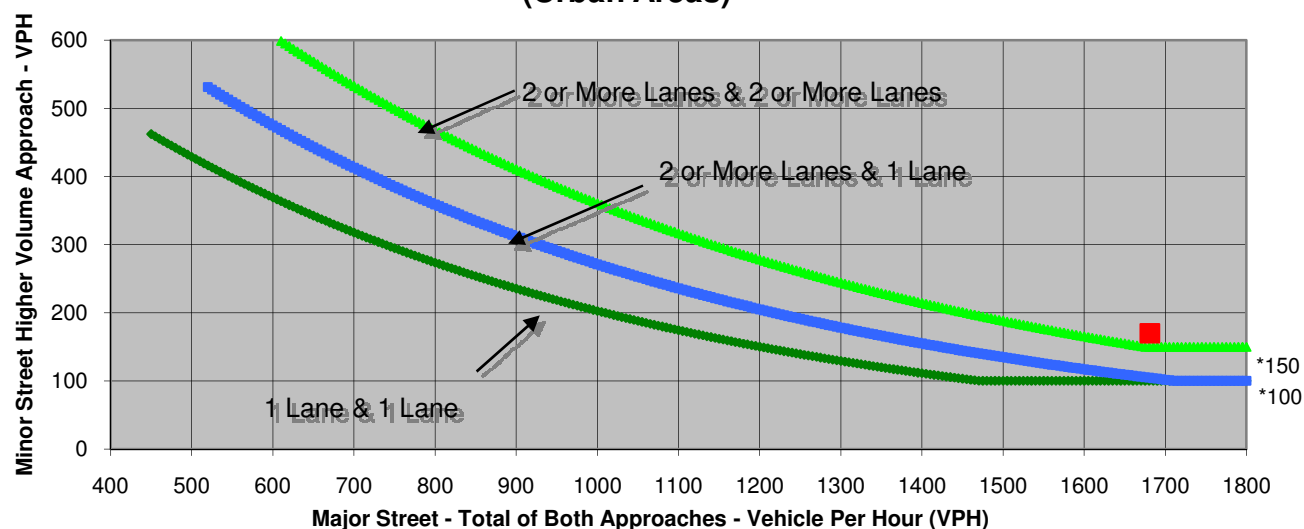
 Peak Hour **PM**
Turn Movement Volumes

	NB	SB	EB	WB
Left	80	30	80	30
Through	50	40	621	820
Right	40	80	60	70
Total	170	150	761	920

Major Street Direction

	North/South
x	East/West

Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Roth Road	Minor Street Harlan Road	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	1,681	170	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Lathrop Road
 Minor Street I-5 SB Ramps

Sheet No 4 of 6

Project Centerpoint Intermodal Center
 Scenario Cumulative Plus MPB
 Peak Hour PM

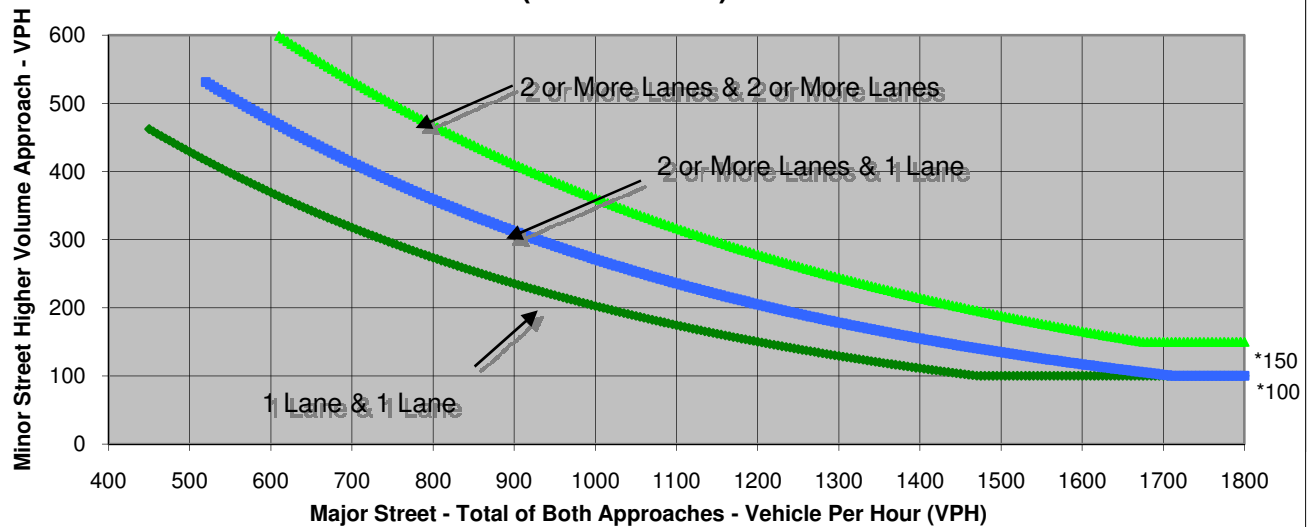
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	530	0	380
Through	0	10	1,617	1,169
Right	0	750	990	0
Total	0	1,290	2,607	1,549

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
 Warrant 3, Peak Hour
 (Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 SB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	4,156	1,290	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street **Lathrop Road**
Minor Street **I-5 NB Ramps**

Project **Centerpoint Intermodal Center**
Scenario **Cumulative Plus MPB**
Peak Hour **PM**

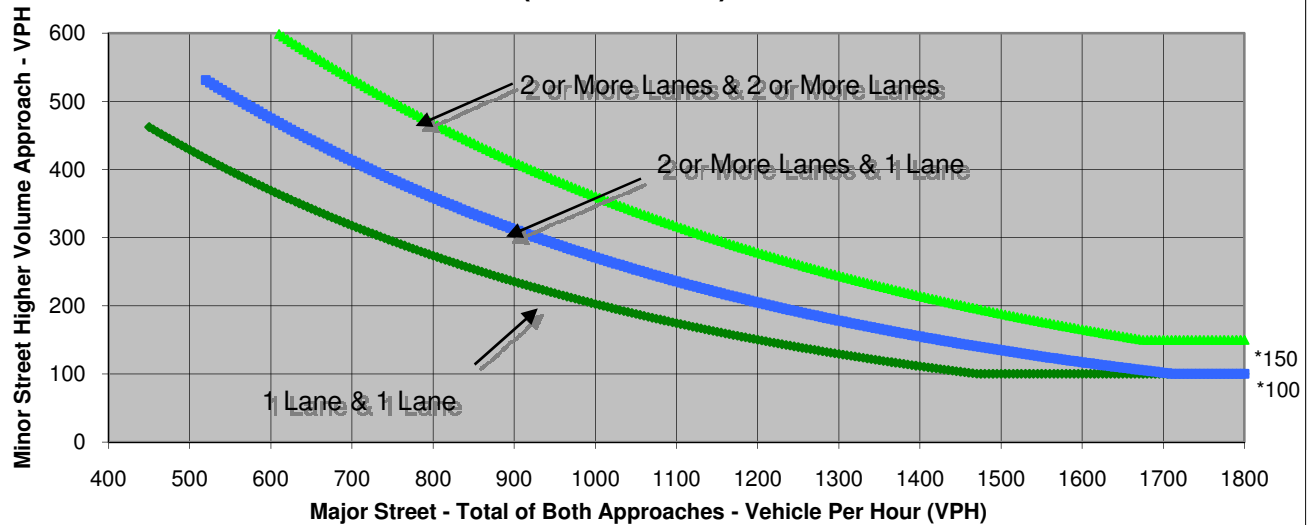
Turn Movement Volumes

	NB	SB	EB	WB
Left	540	0	850	0
Through	10	0	1,297	1,009
Right	717	0	0	386
Total	1,267	0	2,147	1,395

Major Street Direction

	North/South
x	East/West

**Figure 4C-3
Warrant 3, Peak Hour
(Urban Areas)**



* Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Lathrop Road	Minor Street I-5 NB Ramps	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>YES</u>
Traffic Volume (VPH) *	3,542	1,267	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Major Street Airport Way
 Minor Street Hastings Drive

Sheet No 6 of 6

Project Centerpoint Intermodal Center
 Scenario Cumulative Plus MPB
 Peak Hour PM

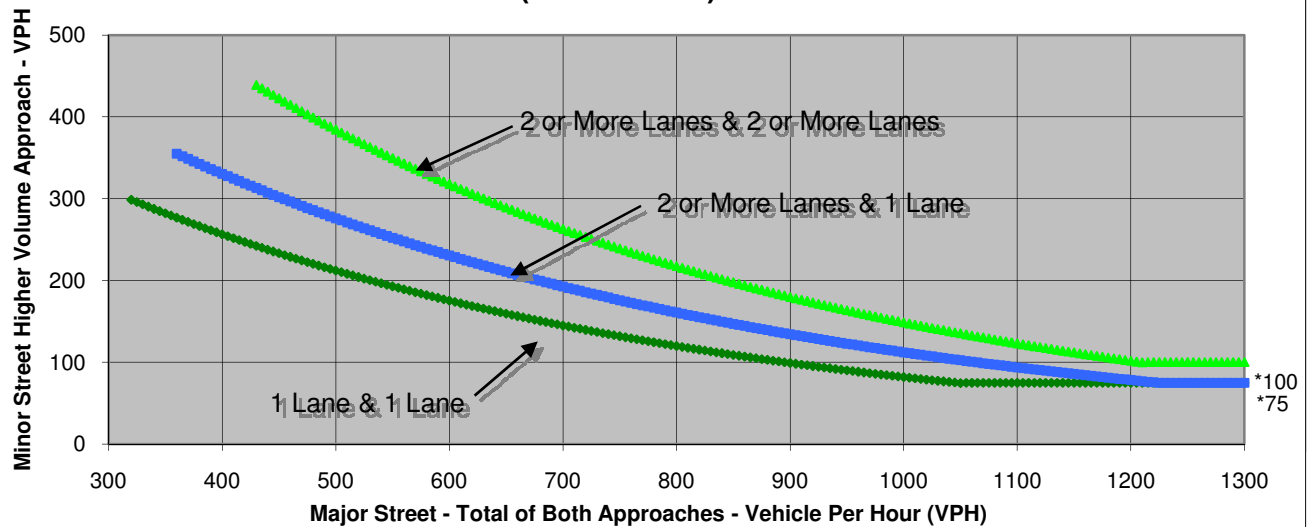
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	39	0	30
Through	884	965	0	0
Right	70	0	0	27
Total	954	1,004	0	57

Major Street Direction

x	North/South
	East/West

Figure 4C-4
Warrant 3, Peak Hour (70% Factor)
(Rural Areas)



* Note: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2006

	Major Street Airport Way	Minor Street Hastings Drive	<u>Warrant Met</u>
Number of Approach Lanes	1	1	<u>NO</u>
Traffic Volume (VPH) *	1,958	57	

* Note: Traffic Volume for Major Street is Total Volume of Both Approaches.
 Traffic Volume for Minor Street is the Volume of High Volume Approach.

Peak Hour Ramp Junction Analysis
Cumulative Plus CIC Project Conditions

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative Plus CIC
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information				Freeway Data					Freeway Volume Adjustment										On-Ramp	
Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane		PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Type	
1	I-5 NB	Roth Road	AM	4	65.0	4,171	Yes	330	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	4,384	Right	
2	I-5 SB	Roth Road	AM	4	65.0	5,362	Yes	1070	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	4,898	Right	
3	I-5 NB	Roth Road	PM	4	65.0	5,872	Yes	1170	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	5,366	Right	
4	I-5 SB	Roth Road	PM	4	65.0	4,592	Yes	370	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	4,819	Right	

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			np Data			On-Ramp Volume Adjustment													
Freeway/ Direction	On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	
1 I-5 NB	Roth Road	1	45.0	424	450	0	450	0.92	Level			32.0%	0.0%	1.5	1.2	0.86	1.00	535	
2 I-5 SB	Roth Road	1	45.0	253	550	0	550	0.95	Level			32.0%	0.0%	1.5	1.2	0.86	1.00	309	
3 I-5 NB	Roth Road	1	45.0	927	450	0	450	0.94	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	1,149	
4 I-5 SB	Roth Road	1	45.0	402	550	0	550	0.91	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	515	

**HCM 2000
Merge Ramp Junctions
Capacity Analysis**

General Information

	Freeway/ Direction	On-ramp
1	I-5 NB	Roth Road
2	I-5 SB	Roth Road
3	I-5 NB	Roth Road
4	I-5 SB	Roth Road

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation						
	Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			P_{FM}	V_{12} (pcph)
			25-2	25-3	1	2	3		
1	I-5 NB	Roth Road			0.590			0.590	2,587
2	I-5 SB	Roth Road			0.593			0.593	2,904
3	I-5 NB	Roth Road			0.590			0.590	3,167
4	I-5 SB	Roth Road			0.593			0.593	2,857

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
Freeway/ Direction	On-ramp		V_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	V_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $v_{12}/2$?	V_{12a} (pcph)	V_{R12a} (pcph)	Max V_{R12a} (pcph)	LOS F?	V_R (pcph)	Max v_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,384	7,200	No	4,918	7,200	No	1,797	No	No	2,587	3,121	4,600	No	535	2,100	No
2	I-5 SB	Roth Road	4,898	7,200	No	5,207	7,200	No	1,994	No	No	2,904	3,213	4,600	No	309	2,100	No
3	I-5 NB	Roth Road	5,366	7,200	No	6,515	7,200	No	2,200	No	No	3,167	4,316	4,600	No	1,149	2,100	No
4	I-5 SB	Roth Road	4,819	7,200	No	5,333	7,200	No	1,962	No	No	2,857	3,372	4,600	No	515	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	26.8	C	0.369	56.5	60.3	57.9
2	I-5 SB	Roth Road	26.9	C	0.368	56.5	59.6	57.7
3	I-5 NB	Roth Road	35.8	E	0.572	51.8	58.9	54.0
4	I-5 SB	Roth Road	28.1	D	0.385	56.1	59.7	57.4

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative Plus CIC
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information

Freeway Data

Freeway Volume Adjustment

Freeway/ Direction			Analysis Time Period	S _{FF} (mph)	V (vph)	HOV Lane		Grade			Length (mi)	Truck/ Bus %		RV %		E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)
	Off-ramp		Lanes			HOV Lane?	Volume	PHF	Terrain											
1	I-5 NB	Roth Road	AM	4	65.0	4,605	Yes	370	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00			4,833
2	I-5 SB	Roth Road	AM	4	65.0	6,134	Yes	1230	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00			5,597
3	I-5 NB	Roth Road	PM	4	65.0	6,157	Yes	1230	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00			5,623
4	I-5 SB	Roth Road	PM	4	65.0	5,066	Yes	410	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00			5,314

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Effective	Off-Ramp Data						Off-Ramp Volume Adjustment											Flow Rate
Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)		Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_p	Flow Rate v_p (pcph)
1	I-5 NB	Roth Road	4,833	Right	1	45.0	434	150		150	0.93	Level			32.0%		1.5	1.2	0.86	1.00	541
2	I-5 SB	Roth Road	5,597	Right	1	45.0	772	150		150	0.94	Level			32.0%		1.5	1.2	0.86	1.00	953
3	I-5 NB	Roth Road	5,623	Right	1	45.0	285	150		150	0.91	Level			33.0%		1.5	1.2	0.86	1.00	365
4	I-5 SB	Roth Road	5,314	Right	1	45.0	474	150		150	0.92	Level			33.0%		1.5	1.2	0.86	1.00	600

**HCM 2000
Diverge Ramp Junctions
Capacity Analysis**

General Information

	Freeway/ Direction	Off-ramp
1	I-5 NB	Roth Road
2	I-5 SB	Roth Road
3	I-5 NB	Roth Road
4	I-5 SB	Roth Road

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation			
	Freeway/ Direction	Off-ramp	L_{EQ}		P_{FD}	v_{12} (pcph)
			25-13	25-14		
1	I-5 NB	Roth Road			0.614	3,178
2	I-5 SB	Roth Road			0.576	3,629
3	I-5 NB	Roth Road			0.603	3,534
4	I-5 SB	Roth Road			0.600	3,426

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks														
Freeway/ Direction	Off-ramp		V_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $v_{12}/2$?	V_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	V_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,833	7,200	No	1,656	No	No	3,178	4,400	No	4,292	7,200	No	541	2,100	No
2	I-5 SB	Roth Road	5,597	7,200	No	1,968	No	No	3,629	4,400	No	4,644	7,200	No	953	2,100	No
3	I-5 NB	Roth Road	5,623	7,200	No	2,089	No	No	3,534	4,400	No	5,258	7,200	No	365	2,100	No
4	I-5 SB	Roth Road	5,314	7,200	No	1,888	No	No	3,426	4,400	No	4,714	7,200	No	600	2,100	No

**HCM 2000
Diverge Ramp Junctions
Capacity Analysis**

General Information			Results		Speed Estimation			
	Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	30.2	D	0.347	57.0	68.7	60.6
2	I-5 SB	Roth Road	34.1	D	0.384	56.2	67.5	59.7
3	I-5 NB	Roth Road	33.3	D	0.331	57.4	67.1	60.6
4	I-5 SB	Roth Road	32.4	D	0.352	56.9	67.8	60.4

Peak Hour Ramp Junction Analysis

Cumulative Plus Master Plan Buildout Conditions

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative Plus MPB
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information				Freeway Data				Freeway Volume Adjustment										On-Ramp	
Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Type
1 I-5 NB	Roth Road	AM	4	65.0	4,178	Yes	330	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,392	Right
2 I-5 SB	Roth Road	AM	4	65.0	5,375	Yes	1080	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,902	Right
3 I-5 NB	Roth Road	PM	4	65.0	5,896	Yes	1180	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	5,382	Right
4 I-5 SB	Roth Road	PM	4	65.0	4,610	Yes	370	0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,839	Right

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			np Data			On-Ramp Volume Adjustment													
Freeway/ Direction	On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	
1 I-5 NB	Roth Road	1	45.0	442	450	0	450	0.94	Level			32.0%	0.0%	1.5	1.2	0.86	1.00	545	
2 I-5 SB	Roth Road	1	45.0	269	550	0	550	0.95	Level			32.0%	0.0%	1.5	1.2	0.86	1.00	328	
3 I-5 NB	Roth Road	1	45.0	1,006	450	0	450	0.92	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	1,274	
4 I-5 SB	Roth Road	1	45.0	464	550	0	550	0.95	Level			33.0%	0.0%	1.5	1.2	0.86	1.00	569	

**HCM 2000
Merge Ramp Junctions
Capacity Analysis**

General Information

	Freeway/ Direction	On-ramp
1	I-5 NB	Roth Road
2	I-5 SB	Roth Road
3	I-5 NB	Roth Road
4	I-5 SB	Roth Road

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation						
	Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			P_{FM}	V_{12} (pcph)
			25-2	25-3	1	2	3		
1	I-5 NB	Roth Road			0.590			0.590	2,592
2	I-5 SB	Roth Road			0.593			0.593	2,906
3	I-5 NB	Roth Road			0.590			0.590	3,176
4	I-5 SB	Roth Road			0.593			0.593	2,869

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
Freeway/ Direction	On-ramp		V_{FI} (pcph)	Max V_{FI} (pcph)	LOS F?	V_{FO} (pcph)	Max V_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $V_{12}/2$?	V_{12a} (pcph)	V_{R12a} (pcph)	Max V_{R12a} (pcph)	LOS F?	V_R (pcph)	Max V_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,392	7,200	No	4,937	7,200	No	1,800	No	No	2,592	3,137	4,600	No	545	2,100	No
2	I-5 SB	Roth Road	4,902	7,200	No	5,230	7,200	No	1,996	No	No	2,906	3,235	4,600	No	328	2,100	No
3	I-5 NB	Roth Road	5,382	7,200	No	6,656	7,200	No	2,206	No	No	3,176	4,450	4,600	No	1,274	2,100	No
4	I-5 SB	Roth Road	4,839	7,200	No	5,408	7,200	No	1,970	No	No	2,869	3,438	4,600	No	569	2,100	No

**HCM 2000
Merge Ramp Junctions
Capacity Analysis**

General Information			Results		Speed Estimation			
Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)	
1 I-5 NB	Roth Road	26.9	C	0.370	56.5	60.3	57.8	
2 I-5 SB	Roth Road	27.1	C	0.371	56.5	59.6	57.6	
3 I-5 NB	Roth Road	36.8	E	0.614	50.9	58.9	53.3	
4 I-5 SB	Roth Road	28.6	D	0.393	56.0	59.7	57.3	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative Plus MPB
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Centerpoint EIR

General Information

Freeway Data

Freeway Volume Adjustment

Freeway/ Direction			Analysis Time Period	S _{FF} (mph)	V (vph)	HOV Lane		Grade		Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	
	Off-ramp		Lanes			HOV Lane?	Volume	PHF	Terrain									
1	I-5 NB	Roth Road	AM	4	65.0	4,644	Yes	370	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	4,878
2	I-5 SB	Roth Road	AM	4	65.0	6,186	Yes	1240	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	5,645
3	I-5 NB	Roth Road	PM	4	65.0	6,230	Yes	1250	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	5,684
4	I-5 SB	Roth Road	PM	4	65.0	5,147	Yes	410	0.92	Level		10.0%	0.0%	1.5	1.2	0.95	1.00	5,406

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Effective	Off-Ramp Data						Off-Ramp Volume Adjustment											Flow Rate
Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)		Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_p	Flow Rate v_p (pcph)
1	I-5 NB	Roth Road	4,878	Right	1	45.0	466	150		150	0.94	Level			32.0%		1.5	1.2	0.86	1.00	575
2	I-5 SB	Roth Road	5,645	Right	1	45.0	811	150		150	0.94	Level			32.0%		1.5	1.2	0.86	1.00	1,001
3	I-5 NB	Roth Road	5,684	Right	1	45.0	334	150		150	0.92	Level			33.0%		1.5	1.2	0.86	1.00	423
4	I-5 SB	Roth Road	5,406	Right	1	45.0	537	150		150	0.94	Level			33.0%		1.5	1.2	0.86	1.00	666

**HCM 2000
Diverge Ramp Junctions
Capacity Analysis**

General Information

	Freeway/ Direction	Off-ramp
1	I-5 NB	Roth Road
2	I-5 SB	Roth Road
3	I-5 NB	Roth Road
4	I-5 SB	Roth Road

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation		
	Freeway/ Direction	Off-ramp	L_{EQ}		v_{12} (pcph)
			25-13	25-14	
1	I-5 NB	Roth Road			0.612 3,207
2	I-5 SB	Roth Road			0.573 3,661
3	I-5 NB	Roth Road			0.598 3,571
4	I-5 SB	Roth Road			0.594 3,483

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks														
Freeway/ Direction	Off-ramp		V_{FI} (pcph)	Max V_{FI} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $V_{12}/2$?	V_{12a} (pcph)	Max V_{12} (pcph)	LOS F?	V_{FO} (pcph)	Max V_{FO} (pcph)	LOS F?	V_R (pcph)	Max V_R (pcph)	LOS F?
1	I-5 NB	Roth Road	4,878	7,200	No	1,671	No	No	3,207	4,400	No	4,303	7,200	No	575	2,100	No
2	I-5 SB	Roth Road	5,645	7,200	No	1,984	No	No	3,661	4,400	No	4,644	7,200	No	1,001	2,100	No
3	I-5 NB	Roth Road	5,684	7,200	No	2,112	No	No	3,571	4,400	No	5,261	7,200	No	423	2,100	No
4	I-5 SB	Roth Road	5,406	7,200	No	1,924	No	No	3,483	4,400	No	4,741	7,200	No	666	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	I-5 NB	Roth Road	30.5	D	0.350	57.0	68.7	60.5
2	I-5 SB	Roth Road	34.4	D	0.388	56.1	67.5	59.6
3	I-5 NB	Roth Road	33.6	D	0.336	57.3	67.0	60.5
4	I-5 SB	Roth Road	32.9	D	0.358	56.8	67.7	60.2

Technical Appendix E

Cumulative Plus CIC Project Conditions with Mitigation and Cumulative Plus Master Plan Buildout Conditions with Mitigation

HCM Signalized Intersection Capacity Analysis

2: Roth Road & I-5 SB Ramps

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95		1.00	0.95					0.95	0.95	
Frt		0.99		1.00	1.00					1.00	0.88	
Flt Protected		1.00		0.95	1.00					0.95	0.99	
Satd. Flow (prot)		3365		1367	3406					1299	1419	
Flt Permitted		1.00		0.95	1.00					0.95	0.99	
Satd. Flow (perm)		3365		1367	3406					1299	1419	
Volume (vph)	0	110	10	233	40	0	0	0	0	422	10	340
Peak-hour factor, PHF	0.80	0.80	0.80	0.95	0.95	0.95	0.25	0.25	0.25	0.94	0.94	0.94
Adj. Flow (vph)	0	138	12	245	42	0	0	0	0	449	11	362
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	149	0
Lane Group Flow (vph)	0	144	0	245	42	0	0	0	0	353	320	0
Heavy Vehicles (%)	6%	6%	6%	32%	6%	2%	2%	2%	2%	32%	6%	6%
Turn Type				Prot						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases												
Actuated Green, G (s)		28.5		28.0	60.5					31.5	31.5	
Effective Green, g (s)		28.5		28.0	60.5					31.5	31.5	
Actuated g/C Ratio		0.28		0.28	0.60					0.32	0.32	
Clearance Time (s)		4.0		4.0	4.0					4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		959		383	2061					409	447	
v/s Ratio Prot		c0.04		c0.18	0.01					c0.27	0.23	
v/s Ratio Perm												
v/c Ratio		0.15		0.64	0.02					0.86	0.72	
Uniform Delay, d1		26.7		31.6	7.9					32.2	30.3	
Progression Factor		1.00		1.30	1.19					1.00	1.00	
Incremental Delay, d2		0.3		3.3	0.0					16.9	5.4	
Delay (s)		27.0		44.5	9.4					49.1	35.7	
Level of Service		C		D	A					D	D	
Approach Delay (s)		27.0			39.4			0.0			41.5	
Approach LOS		C			D			A			D	
Intersection Summary												
HCM Average Control Delay			39.3			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			48.6%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Roth Road & I-5 NB Ramps

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0			
Lane Util. Factor	1.00	0.95			0.95			1.00	1.00			
Frt	1.00	1.00			0.92			1.00	0.85			
Flt Protected	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (prot)	1703	2714			2505			1735	1223			
Flt Permitted	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (perm)	1703	2714			2505			1735	1223			
Volume (vph)	90	442	0	0	253	324	20	10	404	0	0	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.25	0.25	0.25
Adj. Flow (vph)	98	480	0	0	272	348	22	11	434	0	0	0
RTOR Reduction (vph)	0	0	0	0	134	0	0	0	240	0	0	0
Lane Group Flow (vph)	98	480	0	0	486	0	0	33	194	0	0	0
Heavy Vehicles (%)	6%	33%	2%	2%	32%	32%	6%	6%	32%	2%	2%	2%
Turn Type	Prot						Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases									2			
Actuated Green, G (s)	9.2	72.7			59.5			19.3	19.3			
Effective Green, g (s)	9.2	72.7			59.5			19.3	19.3			
Actuated g/C Ratio	0.09	0.73			0.60			0.19	0.19			
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0			
Lane Grp Cap (vph)	157	1973			1490			335	236			
v/s Ratio Prot	c0.06	0.18			c0.19			0.02				
v/s Ratio Perm									c0.16			
v/c Ratio	0.62	0.24			0.33			0.10	0.82			
Uniform Delay, d1	43.7	4.5			10.2			33.2	38.7			
Progression Factor	0.44	1.32			0.44			1.00	1.00			
Incremental Delay, d2	7.5	0.2			0.4			0.1	19.5			
Delay (s)	26.6	6.2			4.9			33.3	58.2			
Level of Service	C	A			A			C	E			
Approach Delay (s)		9.6			4.9			56.4			0.0	
Approach LOS		A			A			E			A	
Intersection Summary												
HCM Average Control Delay		21.0			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.47										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		48.6%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: Roth Road & Harlan Road

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99			1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.98	
Satd. Flow (prot)	1612	1462	1442	1612	1460			1642	1442		1563	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.98	
Satd. Flow (perm)	1612	1462	1442	1612	1460			1642	1442		1563	
Volume (vph)	60	706	80	30	427	30	80	40	70	50	30	70
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	63	743	84	32	454	32	89	44	78	56	33	78
RTOR Reduction (vph)	0	0	37	0	2	0	0	0	68	0	33	0
Lane Group Flow (vph)	63	743	47	32	484	0	0	133	10	0	134	0
Heavy Vehicles (%)	12%	30%	12%	12%	30%	12%	12%	12%	12%	12%	12%	12%
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	7.9	54.4	54.4	4.2	50.7			12.7	12.7		12.7	
Effective Green, g (s)	7.9	54.4	54.4	4.2	50.7			12.7	12.7		12.7	
Actuated g/C Ratio	0.08	0.54	0.54	0.04	0.51			0.13	0.13		0.13	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	127	795	784	68	740			209	183		199	
v/s Ratio Prot	0.04	c0.51		0.02	c0.33			c0.08			c0.09	
v/s Ratio Perm			0.03						0.01			
v/c Ratio	0.50	0.93	0.06	0.47	0.65			0.64	0.05		0.67	
Uniform Delay, d1	44.1	21.1	10.7	46.8	18.2			41.5	38.4		41.7	
Progression Factor	0.90	1.42	2.09	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	2.5	17.1	0.1	5.1	2.1			6.2	0.1		8.6	
Delay (s)	42.3	47.2	22.6	51.9	20.3			47.7	38.5		50.3	
Level of Service	D	D	C	D	C			D	D		D	
Approach Delay (s)		44.5			22.2			44.3			50.3	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			38.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			65.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3303	3471	1524	3400	3438	1482	3303	3374	1568	3072	3438	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3303	3471	1524	3400	3438	1482	3303	3374	1568	3072	3438	1553
Volume (vph)	191	440	160	110	640	306	170	547	100	61	415	458
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	203	468	170	116	674	322	185	595	109	66	451	498
RTOR Reduction (vph)	0	0	112	0	0	165	0	0	67	0	0	202
Lane Group Flow (vph)	203	468	58	116	674	157	185	595	42	66	451	296
Heavy Vehicles (%)	6%	4%	6%	3%	5%	9%	6%	7%	3%	14%	5%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	10.2	34.0	34.0	6.9	30.7	30.7	9.5	38.6	38.6	4.8	33.9	33.9
Effective Green, g (s)	10.2	34.0	34.0	6.9	30.7	30.7	9.5	38.6	38.6	4.8	33.9	33.9
Actuated g/C Ratio	0.10	0.34	0.34	0.07	0.31	0.31	0.09	0.38	0.38	0.05	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	336	1177	517	234	1052	454	313	1298	603	147	1162	525
v/s Ratio Prot	c0.06	0.13		0.03	c0.20		c0.06	0.18		0.02	0.13	
v/s Ratio Perm			0.04			0.11			0.03			c0.19
v/c Ratio	0.60	0.40	0.11	0.50	0.64	0.35	0.59	0.46	0.07	0.45	0.39	0.56
Uniform Delay, d1	43.1	25.3	22.8	45.0	30.0	27.0	43.5	23.0	19.5	46.5	25.3	27.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.1	1.0	0.4	1.7	3.0	2.1	3.0	1.2	0.2	2.2	1.0	4.3
Delay (s)	46.2	26.3	23.2	46.7	33.0	29.1	46.5	24.2	19.7	48.6	26.3	31.5
Level of Service	D	C	C	D	C	C	D	C	B	D	C	C
Approach Delay (s)		30.5			33.3			28.3			30.3	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			30.7				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			100.3				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			60.9%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	3438	1568	1752	3271		1752	3398	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	3438	1568	1752	3271		1752	3398	
Volume (vph)	171	435	73	180	687	220	155	250	200	400	360	92
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	186	473	79	194	739	237	182	294	235	435	391	100
RTOR Reduction (vph)	0	0	59	0	0	178	0	163	0	0	24	0
Lane Group Flow (vph)	186	473	20	194	739	59	182	366	0	435	467	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	11.1	22.1	22.1	11.1	22.1	22.1	13.7	15.4		24.2	25.9	
Effective Green, g (s)	11.1	22.1	22.1	11.1	22.1	22.1	13.7	15.4		24.2	25.9	
Actuated g/C Ratio	0.12	0.25	0.25	0.12	0.25	0.25	0.15	0.17		0.27	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	219	856	390	219	856	390	270	567		477	991	
v/s Ratio Prot	0.11	0.14		c0.11	c0.21		0.10	c0.11		c0.25	0.14	
v/s Ratio Perm			0.01			0.04						
v/c Ratio	0.85	0.55	0.05	0.89	0.86	0.15	0.67	0.65		0.91	0.47	
Uniform Delay, d1	38.0	29.0	25.4	38.2	31.9	26.0	35.4	34.2		31.3	25.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	25.1	0.8	0.1	31.8	9.0	0.2	6.5	2.5		21.6	0.4	
Delay (s)	63.2	29.8	25.4	70.0	40.9	26.2	41.9	36.7		52.9	26.2	
Level of Service	E	C	C	E	D	C	D	D		D	C	
Approach Delay (s)		37.8			42.8			38.0			38.7	
Approach LOS		D			D			D			D	
Intersection Summary												
HCM Average Control Delay			39.7				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			88.8				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			77.3%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Volume (vph)	114	200	90	200	540	154	160	608	50	52	560	92
Peak-hour factor, PHF	0.87	0.87	0.87	0.92	0.92	0.92	0.94	0.94	0.94	0.93	0.93	0.93
Adj. Flow (vph)	131	230	103	217	587	167	170	647	53	56	602	99
RTOR Reduction (vph)	0	0	81	0	0	120	0	0	35	0	0	72
Lane Group Flow (vph)	131	230	22	217	587	47	170	647	18	56	602	27
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.9	15.5	15.5	11.9	20.5	20.5	9.3	24.9	24.9	3.8	19.4	19.4
Effective Green, g (s)	6.9	15.5	15.5	11.9	20.5	20.5	9.3	24.9	24.9	3.8	19.4	19.4
Actuated g/C Ratio	0.10	0.21	0.21	0.17	0.28	0.28	0.13	0.35	0.35	0.05	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	168	754	337	289	997	446	226	1210	542	92	943	422
v/s Ratio Prot	0.07	0.07		c0.12	c0.17		c0.10	0.18		0.03	c0.17	
v/s Ratio Perm			0.01			0.03			0.01			0.02
v/c Ratio	0.78	0.31	0.07	0.75	0.59	0.11	0.75	0.53	0.03	0.61	0.64	0.06
Uniform Delay, d1	31.9	23.8	22.5	28.7	22.2	19.0	30.3	18.9	15.6	33.4	23.3	19.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.1	0.2	0.1	10.5	0.9	0.1	13.2	0.5	0.0	10.9	1.4	0.1
Delay (s)	52.0	24.0	22.6	39.2	23.1	19.1	43.5	19.4	15.7	44.3	24.7	19.7
Level of Service	D	C	C	D	C	B	D	B	B	D	C	B
Approach Delay (s)		31.6			26.0			23.9			25.5	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			26.1				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			72.1				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			58.9%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95		1.00	0.95					0.95	0.95	
Frt		1.00		1.00	1.00					1.00	0.93	
Flt Protected		1.00		0.95	1.00					0.95	0.98	
Satd. Flow (prot)		3398		1357	3406					1289	1370	
Flt Permitted		1.00		0.95	1.00					0.95	0.98	
Satd. Flow (perm)		3398		1357	3406					1289	1370	
Volume (vph)	0	520	10	382	30	0	0	0	0	344	10	120
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.25	0.25	0.25	0.92	0.92	0.92
Adj. Flow (vph)	0	565	11	420	33	0	0	0	0	374	11	130
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	0	0	39	0
Lane Group Flow (vph)	0	575	0	420	33	0	0	0	0	228	248	0
Heavy Vehicles (%)	2%	6%	2%	33%	6%	2%	2%	2%	2%	33%	6%	6%
Turn Type				Prot						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases												
Actuated Green, G (s)		23.4		27.1	54.5					17.5	17.5	
Effective Green, g (s)		23.4		27.1	54.5					17.5	17.5	
Actuated g/C Ratio		0.29		0.34	0.68					0.22	0.22	
Clearance Time (s)		4.0		4.0	4.0					4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		994		460	2320					282	300	
v/s Ratio Prot		c0.17		c0.31	0.01					0.18	c0.18	
v/s Ratio Perm												
v/c Ratio		0.58		0.91	0.01					0.81	0.83	
Uniform Delay, d1		24.1		25.3	4.1					29.7	29.8	
Progression Factor		1.00		0.57	0.43					1.00	1.00	
Incremental Delay, d2		2.4		18.4	0.0					15.5	16.8	
Delay (s)		26.5		32.8	1.8					45.2	46.6	
Level of Service		C		C	A					D	D	
Approach Delay (s)		26.5			30.5			0.0			45.9	
Approach LOS		C			C			A			D	
Intersection Summary												
HCM Average Control Delay			34.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			64.6%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Roth Road & NB I-5 Ramps

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0			
Lane Util. Factor	1.00	0.95			0.95			1.00	1.00			
Frt	1.00	1.00			0.92			1.00	0.85			
Flt Protected	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (prot)	1612	2777			2700			1803	1242			
Flt Permitted	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (perm)	1612	2777			2700			1803	1242			
Volume (vph)	470	394	0	0	392	447	20	10	255	0	0	0
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.91	0.91	0.91	0.25	0.25	0.25
Adj. Flow (vph)	500	419	0	0	417	476	22	11	280	0	0	0
RTOR Reduction (vph)	0	0	0	0	220	0	0	0	249	0	0	0
Lane Group Flow (vph)	500	419	0	0	673	0	0	33	31	0	0	0
Heavy Vehicles (%)	12%	30%	2%	2%	15%	30%	2%	2%	30%	2%	2%	2%
Turn Type	Prot						Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases									2			
Actuated Green, G (s)	26.8	63.1			32.3			8.9	8.9			
Effective Green, g (s)	26.8	63.1			32.3			8.9	8.9			
Actuated g/C Ratio	0.34	0.79			0.40			0.11	0.11			
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0			
Lane Grp Cap (vph)	540	2190			1090			201	138			
v/s Ratio Prot	c0.31	0.15			c0.25			0.02				
v/s Ratio Perm									c0.03			
v/c Ratio	0.93	0.19			0.62			0.16	0.23			
Uniform Delay, d1	25.6	2.1			18.9			32.2	32.4			
Progression Factor	0.81	0.13			0.27			1.00	1.00			
Incremental Delay, d2	17.4	0.1			1.5			0.4	0.8			
Delay (s)	38.0	0.4			6.5			32.6	33.2			
Level of Service	D	A			A			C	C			
Approach Delay (s)		20.9			6.5			33.2			0.0	
Approach LOS		C			A			C			A	
Intersection Summary												
HCM Average Control Delay		16.7			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.69										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		64.6%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: Roth Road & Harlan Road

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.99	
Satd. Flow (prot)	1703	1792	1524	1703	1781			1739	1524		1646	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.99	
Satd. Flow (perm)	1703	1792	1524	1703	1781			1739	1524		1646	
Volume (vph)	80	509	60	70	679	30	80	50	40	30	40	80
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	86	547	65	73	707	31	89	56	44	33	44	89
RTOR Reduction (vph)	0	0	35	0	2	0	0	0	38	0	57	0
Lane Group Flow (vph)	86	547	30	73	736	0	0	145	6	0	109	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	4.8	37.2	37.2	4.8	37.2			11.6	11.6		10.4	
Effective Green, g (s)	4.8	37.2	37.2	4.8	37.2			11.6	11.6		10.4	
Actuated g/C Ratio	0.06	0.47	0.47	0.06	0.47			0.14	0.14		0.13	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	102	833	709	102	828			252	221		214	
v/s Ratio Prot	c0.05	0.31		0.04	c0.41			c0.08			c0.07	
v/s Ratio Perm			0.02						0.00			
v/c Ratio	0.84	0.66	0.04	0.72	0.89			0.58	0.03		0.51	
Uniform Delay, d1	37.2	16.5	11.7	36.9	19.5			31.9	29.4		32.4	
Progression Factor	0.92	0.87	0.90	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	41.4	3.8	0.1	21.1	13.7			3.2	0.1		2.1	
Delay (s)	75.7	18.0	10.6	58.1	33.2			35.1	29.4		34.5	
Level of Service	E	B	B	E	C			D	C		C	
Approach Delay (s)		24.4			35.5			33.7			34.5	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM Average Control Delay			31.1			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			67.3%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3367	3471	1538	3400	3471	1468	3303	3471	1568	3273	3438	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3367	3471	1538	3400	3471	1468	3303	3471	1568	3273	3438	1553
Volume (vph)	502	810	150	120	510	78	80	579	160	270	617	322
Peak-hour factor, PHF	0.96	0.96	0.96	0.94	0.94	0.94	0.95	0.95	0.95	0.97	0.97	0.97
Adj. Flow (vph)	523	844	156	128	543	83	84	609	168	278	636	332
RTOR Reduction (vph)	0	0	97	0	0	58	0	0	120	0	0	220
Lane Group Flow (vph)	523	844	59	128	543	25	84	609	48	278	636	112
Heavy Vehicles (%)	4%	4%	5%	3%	4%	10%	6%	4%	3%	7%	5%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	16.0	38.3	38.3	7.7	30.0	30.0	4.8	29.0	29.0	9.8	34.0	34.0
Effective Green, g (s)	16.0	38.3	38.3	7.7	30.0	30.0	4.8	29.0	29.0	9.8	34.0	34.0
Actuated g/C Ratio	0.16	0.38	0.38	0.08	0.30	0.30	0.05	0.29	0.29	0.10	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	534	1319	584	260	1033	437	157	999	451	318	1160	524
v/s Ratio Prot	c0.16	c0.24		0.04	0.16		0.03	c0.18		c0.08	0.18	
v/s Ratio Perm			0.04			0.02			0.03			0.07
v/c Ratio	0.98	0.64	0.10	0.49	0.53	0.06	0.54	0.61	0.11	0.87	0.55	0.21
Uniform Delay, d1	42.2	25.6	20.2	44.7	29.5	25.3	46.9	31.0	26.4	44.9	27.2	23.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	33.3	2.4	0.3	1.5	1.9	0.2	3.5	2.8	0.5	22.3	1.9	0.9
Delay (s)	75.5	28.0	20.5	46.1	31.4	25.5	50.4	33.8	26.9	67.2	29.0	24.8
Level of Service	E	C	C	D	C	C	D	C	C	E	C	C
Approach Delay (s)		43.5			33.2			34.1			36.4	
Approach LOS		D			C			C			D	
Intersection Summary												
HCM Average Control Delay			37.9				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			100.8				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			65.5%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	3438	1568	1752	3405		1752	3362	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	3438	1568	1752	3405		1752	3362	
Volume (vph)	112	877	157	160	509	360	136	550	130	240	380	142
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	115	904	162	167	530	375	148	598	141	267	422	158
RTOR Reduction (vph)	0	0	86	0	0	254	0	21	0	0	38	0
Lane Group Flow (vph)	115	904	76	167	530	121	148	718	0	267	542	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	9.0	29.0	29.0	10.7	30.7	30.7	12.5	23.4		16.2	27.1	
Effective Green, g (s)	9.0	29.0	29.0	10.7	30.7	30.7	12.5	23.4		16.2	27.1	
Actuated g/C Ratio	0.09	0.30	0.30	0.11	0.32	0.32	0.13	0.25		0.17	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	165	1046	477	197	1108	505	230	836		298	956	
v/s Ratio Prot	0.07	c0.26		c0.10	0.15		0.08	c0.21		c0.15	c0.16	
v/s Ratio Perm			0.05			0.08						
v/c Ratio	0.70	0.86	0.16	0.85	0.48	0.24	0.64	0.86		0.90	0.57	
Uniform Delay, d1	41.8	31.3	24.2	41.5	25.9	23.7	39.3	34.4		38.7	29.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.1	7.6	0.2	27.1	0.3	0.2	6.0	8.7		27.1	0.8	
Delay (s)	53.9	38.9	24.4	68.6	26.2	24.0	45.3	43.1		65.9	29.9	
Level of Service	D	D	C	E	C	C	D	D		E	C	
Approach Delay (s)		38.3			32.0			43.5			41.2	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			38.4				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			95.3				Sum of lost time (s)			20.0		
Intersection Capacity Utilization			79.1%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/20/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Volume (vph)	134	740	240	120	450	124	180	599	280	215	625	145
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.94	0.94	0.94	0.96	0.96	0.96
Adj. Flow (vph)	141	779	253	130	489	135	191	637	298	224	651	151
RTOR Reduction (vph)	0	0	181	0	0	99	0	0	44	0	0	110
Lane Group Flow (vph)	141	779	72	130	489	36	191	637	254	224	651	41
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.2	22.0	22.0	7.2	21.0	21.0	11.6	20.1	20.1	12.5	21.0	21.0
Effective Green, g (s)	8.2	22.0	22.0	7.2	21.0	21.0	11.6	20.1	20.1	12.5	21.0	21.0
Actuated g/C Ratio	0.11	0.28	0.28	0.09	0.27	0.27	0.15	0.26	0.26	0.16	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	185	991	443	162	946	423	261	906	405	281	946	423
v/s Ratio Prot	c0.08	c0.22		0.07	0.14		0.11	0.18		c0.13	c0.19	
v/s Ratio Perm			0.05			0.02			0.16			0.03
v/c Ratio	0.76	0.79	0.16	0.80	0.52	0.09	0.73	0.70	0.63	0.80	0.69	0.10
Uniform Delay, d1	33.9	25.7	21.0	34.6	24.1	21.2	31.6	26.1	25.5	31.4	25.5	21.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.8	4.2	0.2	24.1	0.5	0.1	10.1	2.5	3.0	14.5	2.1	0.1
Delay (s)	50.7	29.9	21.1	58.7	24.6	21.3	41.7	28.6	28.5	45.9	27.6	21.4
Level of Service	D	C	C	E	C	C	D	C	C	D	C	C
Approach Delay (s)		30.5			29.9			30.8			30.7	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			30.5				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			77.8				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			68.9%				ICU Level of Service			C		
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95		1.00	0.95					0.95	0.95	
Frt		0.99		1.00	1.00					1.00	0.89	
Flt Protected		1.00		0.95	1.00					0.95	0.99	
Satd. Flow (prot)		3365		1367	3406					1299	1415	
Flt Permitted		1.00		0.95	1.00					0.95	0.99	
Satd. Flow (perm)		3365		1367	3406					1299	1415	
Volume (vph)	0	110	10	249	40	0	0	0	0	461	10	340
Peak-hour factor, PHF	0.80	0.80	0.80	0.95	0.95	0.95	0.25	0.25	0.25	0.94	0.94	0.94
Adj. Flow (vph)	0	138	12	262	42	0	0	0	0	490	11	362
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	107	0
Lane Group Flow (vph)	0	146	0	262	42	0	0	0	0	379	377	0
Heavy Vehicles (%)	6%	6%	6%	32%	6%	2%	2%	2%	2%	32%	6%	6%
Turn Type				Prot						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases												
Actuated Green, G (s)		31.9		37.0	72.9					39.1	39.1	
Effective Green, g (s)		31.9		37.0	72.9					39.1	39.1	
Actuated g/C Ratio		0.27		0.31	0.61					0.33	0.33	
Clearance Time (s)		4.0		4.0	4.0					4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		895		421	2069					423	461	
v/s Ratio Prot		c0.04		c0.19	0.01					c0.29	0.27	
v/s Ratio Perm												
v/c Ratio		0.16		0.62	0.02					0.90	0.82	
Uniform Delay, d1		33.8		35.5	9.4					38.5	37.2	
Progression Factor		1.00		0.73	0.82					1.00	1.00	
Incremental Delay, d2		0.4		2.7	0.0					20.9	10.8	
Delay (s)		34.2		28.5	7.7					59.4	47.9	
Level of Service		C		C	A					E	D	
Approach Delay (s)		34.2			25.6			0.0			53.0	
Approach LOS		C			C			A			D	
Intersection Summary												
HCM Average Control Delay			44.5			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			50.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Roth Road & NB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0			
Lane Util. Factor	1.00	0.95			0.95			1.00	1.00			
Frt	1.00	1.00			0.92			1.00	0.85			
Flt Protected	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (prot)	1703	2735			2505			1736	1223			
Flt Permitted	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (perm)	1703	2735			2505			1736	1223			
Volume (vph)	90	481	0	0	269	342	20	10	436	0	0	0
Peak-hour factor, PHF	0.93	0.93	0.93	0.94	0.94	0.94	0.94	0.94	0.94	0.25	0.25	0.25
Adj. Flow (vph)	97	517	0	0	286	364	21	11	464	0	0	0
RTOR Reduction (vph)	0	0	0	0	120	0	0	0	196	0	0	0
Lane Group Flow (vph)	97	517	0	0	530	0	0	32	268	0	0	0
Heavy Vehicles (%)	6%	32%	32%	2%	32%	32%	6%	6%	32%	2%	2%	2%
Turn Type	Prot						Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases									2			
Actuated Green, G (s)	11.5	83.3			67.8			28.7	28.7			
Effective Green, g (s)	11.5	83.3			67.8			28.7	28.7			
Actuated g/C Ratio	0.10	0.69			0.56			0.24	0.24			
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0			
Lane Grp Cap (vph)	163	1899			1415			415	293			
v/s Ratio Prot	c0.06	0.19			c0.21			0.02				
v/s Ratio Perm									c0.22			
v/c Ratio	0.60	0.27			0.37			0.08	0.91			
Uniform Delay, d1	52.0	6.9			14.4			35.4	44.4			
Progression Factor	0.56	2.60			0.65			1.00	1.00			
Incremental Delay, d2	3.9	0.2			0.7			0.1	31.0			
Delay (s)	33.2	18.2			10.1			35.5	75.4			
Level of Service	C	B			B			D	E			
Approach Delay (s)		20.6			10.1			72.8			0.0	
Approach LOS		C			B			E			A	
Intersection Summary												
HCM Average Control Delay		31.4			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.54										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		50.6%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: Roth Road & Harlan Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99			1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.98	
Satd. Flow (prot)	1612	1462	1442	1612	2775			1642	1442		1563	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.98	
Satd. Flow (perm)	1612	1462	1442	1612	2775			1642	1442		1563	
Volume (vph)	60	777	80	30	461	30	80	40	70	50	30	70
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	65	845	87	33	501	33	89	44	78	56	33	78
RTOR Reduction (vph)	0	0	30	0	3	0	0	0	69	0	26	0
Lane Group Flow (vph)	65	845	57	33	531	0	0	133	9	0	141	0
Heavy Vehicles (%)	12%	30%	12%	12%	30%	12%	12%	12%	12%	12%	12%	12%
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	7.6	72.6	72.6	3.6	68.6			13.7	13.7		14.1	
Effective Green, g (s)	7.6	72.6	72.6	3.6	68.6			13.7	13.7		14.1	
Actuated g/C Ratio	0.06	0.60	0.60	0.03	0.57			0.11	0.11		0.12	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	102	885	872	48	1586			187	165		184	
v/s Ratio Prot	c0.04	c0.58		0.02	0.19			c0.08			c0.09	
v/s Ratio Perm			0.04						0.01			
v/c Ratio	0.64	0.95	0.07	0.69	0.33			0.71	0.05		0.76	
Uniform Delay, d1	54.9	22.2	9.7	57.6	13.6			51.2	47.4		51.3	
Progression Factor	0.99	1.48	0.94	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	10.2	18.4	0.1	33.8	0.6			12.0	0.1		17.0	
Delay (s)	64.7	51.3	9.2	91.4	14.2			63.3	47.5		68.3	
Level of Service	E	D	A	F	B			E	D		E	
Approach Delay (s)		48.5			18.7			57.4			68.3	
Approach LOS		D			B			E			E	
Intersection Summary												
HCM Average Control Delay			42.5			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			69.5%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		0.95		1.00	0.99		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1470	1302		1720		1456	3231		1770	3252	1302
Flt Permitted		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1470	1302		1720		1456	3231		1770	3252	1302
Volume (vph)	31	5	46	260	10	150	82	888	90	60	593	57
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.97	0.97	0.97	0.95	0.95	0.95
Adj. Flow (vph)	34	6	51	289	11	167	85	915	93	63	624	60
RTOR Reduction (vph)	0	0	46	0	17	0	0	6	0	0	0	43
Lane Group Flow (vph)	0	40	5	0	450	0	85	1002	0	63	624	17
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	24%	11%	2%	2%	11%	24%
Turn Type	Split		Perm	Split			Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		7.9	7.9		27.6		11.3	32.7		4.3	25.7	25.7
Effective Green, g (s)		7.9	7.9		27.6		11.3	32.7		4.3	25.7	25.7
Actuated g/C Ratio		0.09	0.09		0.31		0.13	0.37		0.05	0.29	0.29
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		131	116		536		186	1194		86	944	378
v/s Ratio Prot		c0.03			c0.26		0.06	c0.31		0.04	c0.19	
v/s Ratio Perm			0.00									0.01
v/c Ratio		0.31	0.04		0.84		0.46	0.84		0.73	0.66	0.05
Uniform Delay, d1		37.7	36.8		28.4		35.8	25.5		41.5	27.6	22.6
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		1.3	0.1		11.1		1.8	5.3		27.2	1.7	0.1
Delay (s)		39.1	37.0		39.4		37.5	30.8		68.7	29.3	22.6
Level of Service		D	D		D		D	C		E	C	C
Approach Delay (s)		37.9			39.4			31.3			32.1	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay		33.4					HCM Level of Service			C		
HCM Volume to Capacity ratio		0.78										
Actuated Cycle Length (s)		88.5					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		71.5%					ICU Level of Service		C			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3303	3471	1524	3400	3438	1482	3303	3374	1568	3072	3438	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3303	3471	1524	3400	3438	1482	3303	3374	1568	3072	3438	1553
Volume (vph)	177	457	174	110	677	339	197	584	100	78	434	449
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	188	486	185	116	713	357	214	635	109	85	472	488
RTOR Reduction (vph)	0	0	126	0	0	165	0	0	65	0	0	181
Lane Group Flow (vph)	188	486	59	116	713	192	214	635	44	85	472	307
Heavy Vehicles (%)	6%	4%	6%	3%	5%	9%	6%	7%	3%	14%	5%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	9.5	32.0	32.0	6.9	29.4	29.4	10.3	40.5	40.5	4.8	35.0	35.0
Effective Green, g (s)	9.5	32.0	32.0	6.9	29.4	29.4	10.3	40.5	40.5	4.8	35.0	35.0
Actuated g/C Ratio	0.09	0.32	0.32	0.07	0.29	0.29	0.10	0.40	0.40	0.05	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	313	1109	487	234	1009	435	340	1364	634	147	1201	542
v/s Ratio Prot	c0.06	0.14		0.03	c0.21		c0.06	0.19		0.03	0.14	
v/s Ratio Perm			0.04			0.13			0.03			c0.20
v/c Ratio	0.60	0.44	0.12	0.50	0.71	0.44	0.63	0.47	0.07	0.58	0.39	0.57
Uniform Delay, d1	43.5	27.0	24.1	45.0	31.6	28.7	43.1	21.9	18.3	46.7	24.6	26.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.2	1.3	0.5	1.7	4.2	3.2	3.6	1.1	0.2	5.4	1.0	4.2
Delay (s)	46.8	28.2	24.7	46.6	35.7	32.0	46.7	23.1	18.5	52.1	25.6	30.7
Level of Service	D	C	C	D	D	C	D	C	B	D	C	C
Approach Delay (s)		31.5			35.7			27.8			30.1	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM Average Control Delay		31.5					HCM Level of Service		C			
HCM Volume to Capacity ratio		0.63										
Actuated Cycle Length (s)		100.2					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		62.1%					ICU Level of Service		B			
Analysis Period (min)		15										
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	3438	1568	1752	3271		1752	3386	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	3438	1568	1752	3271		1752	3386	
Volume (vph)	178	454	80	180	726	220	170	250	200	400	360	105
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	193	493	87	194	781	237	200	294	235	435	391	114
RTOR Reduction (vph)	0	0	65	0	0	176	0	163	0	0	28	0
Lane Group Flow (vph)	193	493	22	194	781	61	200	366	0	435	477	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	11.0	23.1	23.1	11.0	23.1	23.1	14.7	15.5		24.1	24.9	
Effective Green, g (s)	11.0	23.1	23.1	11.0	23.1	23.1	14.7	15.5		24.1	24.9	
Actuated g/C Ratio	0.12	0.26	0.26	0.12	0.26	0.26	0.16	0.17		0.27	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	215	885	404	215	885	404	287	565		471	940	
v/s Ratio Prot	0.11	0.14		c0.11	c0.23		0.11	c0.11		c0.25	0.14	
v/s Ratio Perm			0.01			0.04						
v/c Ratio	0.90	0.56	0.06	0.90	0.88	0.15	0.70	0.65		0.92	0.51	
Uniform Delay, d1	38.8	28.9	25.1	38.8	32.0	25.7	35.4	34.6		31.9	27.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	34.6	0.8	0.1	35.8	10.3	0.2	7.2	2.6		23.8	0.4	
Delay (s)	73.4	29.6	25.1	74.6	42.3	25.9	42.6	37.1		55.7	27.7	
Level of Service	E	C	C	E	D	C	D	D		E	C	
Approach Delay (s)		40.0			44.3			38.6			40.6	
Approach LOS		D			D			D			D	
Intersection Summary												
HCM Average Control Delay			41.3				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			89.7				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			78.8%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Volume (vph)	120	200	90	200	540	165	160	646	50	58	579	95
Peak-hour factor, PHF	0.87	0.87	0.87	0.92	0.92	0.92	0.94	0.94	0.94	0.93	0.93	0.93
Adj. Flow (vph)	138	230	103	217	587	179	170	687	53	62	623	102
RTOR Reduction (vph)	0	0	80	0	0	129	0	0	35	0	0	74
Lane Group Flow (vph)	138	230	23	217	587	50	170	687	18	62	623	28
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.4	16.1	16.1	11.9	20.6	20.6	9.3	25.2	25.2	4.3	20.2	20.2
Effective Green, g (s)	7.4	16.1	16.1	11.9	20.6	20.6	9.3	25.2	25.2	4.3	20.2	20.2
Actuated g/C Ratio	0.10	0.22	0.22	0.16	0.28	0.28	0.13	0.34	0.34	0.06	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	176	768	343	284	982	439	222	1202	538	102	963	431
v/s Ratio Prot	0.08	0.07		c0.12	c0.17		c0.10	0.20		0.04	c0.18	
v/s Ratio Perm			0.01			0.03			0.01			0.02
v/c Ratio	0.78	0.30	0.07	0.76	0.60	0.11	0.77	0.57	0.03	0.61	0.65	0.07
Uniform Delay, d1	32.3	24.0	22.7	29.5	22.9	19.7	31.0	19.7	16.1	33.8	23.5	19.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.1	0.2	0.1	11.6	1.0	0.1	14.5	0.7	0.0	9.8	1.5	0.1
Delay (s)	52.3	24.2	22.8	41.0	23.9	19.8	45.6	20.4	16.1	43.6	25.0	19.7
Level of Service	D	C	C	D	C	B	D	C	B	D	C	B
Approach Delay (s)		32.1			26.9			24.9			25.8	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			26.8				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			73.5				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			59.8%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Roth Road & SB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95		1.00	0.95					0.95	0.95	
Frt		1.00		1.00	1.00					1.00	0.94	
Flt Protected		1.00		0.95	1.00					0.95	0.97	
Satd. Flow (prot)		3396		1357	3406					1289	1362	
Flt Permitted		1.00		0.95	1.00					0.95	0.97	
Satd. Flow (perm)		3396		1357	3406					1289	1362	
Volume (vph)	0	520	10	444	30	0	0	0	0	407	10	120
Peak-hour factor, PHF	0.92	0.92	0.92	0.94	0.94	0.94	0.25	0.25	0.25	0.94	0.94	0.94
Adj. Flow (vph)	0	565	11	472	32	0	0	0	0	433	11	128
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	0	0	28	0
Lane Group Flow (vph)	0	575	0	472	32	0	0	0	0	257	287	0
Heavy Vehicles (%)	6%	6%	6%	33%	6%	2%	2%	2%	2%	33%	6%	6%
Turn Type				Prot						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases												
Actuated Green, G (s)		23.6		33.2	60.8					21.2	21.2	
Effective Green, g (s)		23.6		33.2	60.8					21.2	21.2	
Actuated g/C Ratio		0.26		0.37	0.68					0.24	0.24	
Clearance Time (s)		4.0		4.0	4.0					4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		891		501	2301					304	321	
v/s Ratio Prot		c0.17		c0.35	0.01					0.20	c0.21	
v/s Ratio Perm												
v/c Ratio		0.64		0.94	0.01					0.85	0.89	
Uniform Delay, d1		29.5		27.5	4.8					32.8	33.3	
Progression Factor		1.00		0.59	0.40					1.00	1.00	
Incremental Delay, d2		3.6		20.2	0.0					18.9	25.3	
Delay (s)		33.1		36.3	1.9					51.8	58.6	
Level of Service		C		D	A					D	E	
Approach Delay (s)		33.1			34.1			0.0			55.5	
Approach LOS		C			C			A			E	
Intersection Summary												
HCM Average Control Delay			41.2			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			68.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Roth Road & NB I-5 Ramps

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0			
Lane Util. Factor	1.00	0.95			0.95			1.00	1.00			
Frt	1.00	1.00			0.92			1.00	0.85			
Flt Protected	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (prot)	1612	2777			2697			1803	1242			
Flt Permitted	0.95	1.00			1.00			0.97	1.00			
Satd. Flow (perm)	1612	2777			2697			1803	1242			
Volume (vph)	470	457	0	0	454	526	20	10	304	0	0	0
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92	0.25	0.25	0.25
Adj. Flow (vph)	500	486	0	0	478	554	22	11	330	0	0	0
RTOR Reduction (vph)	0	0	0	0	201	0	0	0	297	0	0	0
Lane Group Flow (vph)	500	486	0	0	831	0	0	33	33	0	0	0
Heavy Vehicles (%)	12%	30%	2%	2%	15%	30%	2%	2%	30%	2%	2%	2%
Turn Type	Prot						Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases									2			
Actuated Green, G (s)	29.8	72.9			39.1			9.1	9.1			
Effective Green, g (s)	29.8	72.9			39.1			9.1	9.1			
Actuated g/C Ratio	0.33	0.81			0.43			0.10	0.10			
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0			
Lane Grp Cap (vph)	534	2249			1172			182	126			
v/s Ratio Prot	c0.31	0.18			c0.31			0.02				
v/s Ratio Perm									c0.03			
v/c Ratio	0.94	0.22			0.71			0.18	0.26			
Uniform Delay, d1	29.2	2.0			20.8			37.0	37.4			
Progression Factor	0.86	0.10			0.24			1.00	1.00			
Incremental Delay, d2	17.7	0.1			2.8			0.5	1.1			
Delay (s)	42.8	0.3			7.8			37.5	38.5			
Level of Service	D	A			A			D	D			
Approach Delay (s)		21.9			7.8			38.4			0.0	
Approach LOS		C			A			D			A	
Intersection Summary												
HCM Average Control Delay		18.3			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.74										
Actuated Cycle Length (s)		90.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		68.8%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: Roth Road & Harlan Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.99	
Satd. Flow (prot)	1612	1462	1442	1612	2776			1646	1442		1558	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.97	1.00		0.99	
Satd. Flow (perm)	1612	1462	1442	1612	2776			1646	1442		1558	
Volume (vph)	80	621	60	70	820	30	80	50	40	30	40	80
Peak-hour factor, PHF	0.94	0.94	0.94	0.96	0.96	0.96	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	85	661	64	73	854	31	89	56	44	33	44	89
RTOR Reduction (vph)	0	0	32	0	3	0	0	0	38	0	49	0
Lane Group Flow (vph)	85	661	32	73	882	0	0	145	6	0	117	0
Heavy Vehicles (%)	12%	30%	12%	12%	30%	12%	12%	12%	12%	12%	12%	12%
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	5.6	45.3	45.3	4.8	44.5			12.5	12.5		11.4	
Effective Green, g (s)	5.6	45.3	45.3	4.8	44.5			12.5	12.5		11.4	
Actuated g/C Ratio	0.06	0.50	0.50	0.05	0.49			0.14	0.14		0.13	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	100	736	726	86	1373			229	200		197	
v/s Ratio Prot	c0.05	c0.45		0.05	0.32			c0.09			c0.08	
v/s Ratio Perm			0.02						0.00			
v/c Ratio	0.85	0.90	0.04	0.85	0.64			0.63	0.03		0.59	
Uniform Delay, d1	41.8	20.3	11.4	42.2	16.9			36.6	33.5		37.1	
Progression Factor	0.90	0.92	0.93	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	42.5	14.8	0.1	50.3	2.3			5.6	0.1		4.8	
Delay (s)	80.1	33.5	10.6	92.5	19.2			42.2	33.6		41.9	
Level of Service	F	C	B	F	B			D	C		D	
Approach Delay (s)		36.6			24.8			40.2			41.9	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			32.0			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			61.9%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Daisywood Drive & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖↗		↖	↖↗		↖	↖↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		0.97		1.00	0.97		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.96		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1611	1429		1748		1597	3299		1770	3374	1429
Flt Permitted		0.96	1.00		0.96		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1611	1429		1748		1597	3299		1770	3374	1429
Volume (vph)	120	17	163	150	13	40	135	853	230	160	1085	95
Peak-hour factor, PHF	0.94	0.94	0.94	0.85	0.85	0.85	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	128	18	173	176	15	47	139	879	237	165	1119	98
RTOR Reduction (vph)	0	0	148	0	9	0	0	20	0	0	0	54
Lane Group Flow (vph)	0	146	25	0	229	0	139	1096	0	165	1119	44
Heavy Vehicles (%)	13%	13%	13%	2%	2%	2%	13%	7%	2%	2%	7%	13%
Turn Type	Split		Perm	Split			Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		13.6	13.6		17.0		10.1	36.1		10.2	36.2	36.2
Effective Green, g (s)		13.6	13.6		17.0		10.1	36.1		10.2	36.2	36.2
Actuated g/C Ratio		0.15	0.15		0.18		0.11	0.39		0.11	0.39	0.39
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		236	209		320		174	1282		194	1315	557
v/s Ratio Prot		c0.09			c0.13		0.09	c0.33		0.09	c0.33	
v/s Ratio Perm			0.02									0.03
v/c Ratio		0.62	0.12		0.72		0.80	0.85		0.85	0.85	0.08
Uniform Delay, d1		37.2	34.5		35.7		40.4	26.0		40.6	25.9	17.8
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		4.8	0.3		7.4		22.0	5.8		28.3	5.5	0.1
Delay (s)		42.0	34.7		43.1		62.4	31.8		68.9	31.4	17.9
Level of Service		D	C		D		E	C		E	C	B
Approach Delay (s)		38.0			43.1			35.2			34.9	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM Average Control Delay			35.9			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			92.9			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			67.9%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: Lathrop Road & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3367	3471	1538	3400	3471	1468	3303	3471	1568	3273	3438	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3367	3471	1538	3400	3471	1468	3303	3471	1568	3273	3438	1553
Volume (vph)	493	867	196	120	559	131	116	635	160	342	688	309
Peak-hour factor, PHF	0.96	0.96	0.96	0.94	0.94	0.94	0.95	0.95	0.95	0.97	0.97	0.97
Adj. Flow (vph)	514	903	204	128	595	139	122	668	168	353	709	319
RTOR Reduction (vph)	0	0	130	0	0	99	0	0	119	0	0	211
Lane Group Flow (vph)	514	903	74	128	595	40	122	668	49	353	709	108
Heavy Vehicles (%)	4%	4%	5%	3%	4%	10%	6%	4%	3%	7%	5%	4%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	15.0	36.3	36.3	7.7	29.0	29.0	6.9	29.0	29.0	11.0	33.1	33.1
Effective Green, g (s)	15.0	36.3	36.3	7.7	29.0	29.0	6.9	29.0	29.0	11.0	33.1	33.1
Actuated g/C Ratio	0.15	0.36	0.36	0.08	0.29	0.29	0.07	0.29	0.29	0.11	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	505	1260	558	262	1007	426	228	1007	455	360	1138	514
v/s Ratio Prot	c0.15	c0.26		0.04	0.17		0.04	c0.19		c0.11	0.21	
v/s Ratio Perm			0.05			0.03			0.03			0.07
v/c Ratio	1.02	0.72	0.13	0.49	0.59	0.09	0.54	0.66	0.11	0.98	0.62	0.21
Uniform Delay, d1	42.5	27.4	21.3	44.3	30.4	25.9	45.0	31.2	26.0	44.4	28.2	24.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	44.6	3.5	0.5	1.4	2.5	0.4	2.4	3.4	0.5	42.0	2.6	0.9
Delay (s)	87.1	30.9	21.8	45.7	33.0	26.4	47.4	34.7	26.5	86.4	30.8	25.0
Level of Service	F	C	C	D	C	C	D	C	C	F	C	C
Approach Delay (s)		47.6			33.8			34.8			43.7	
Approach LOS		D			C			C			D	
Intersection Summary												
HCM Average Control Delay			41.5				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			70.2%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Lathrop Road & Union Road

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3438	1568	1752	3438	1568	1752	3405		1752	3349	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1752	3438	1568	1752	3438	1568	1752	3405		1752	3349	
Volume (vph)	136	951	184	160	567	360	157	550	130	240	380	160
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	140	980	190	167	591	375	171	598	141	267	422	178
RTOR Reduction (vph)	0	0	93	0	0	266	0	21	0	0	45	0
Lane Group Flow (vph)	140	980	97	167	591	109	171	718	0	267	555	0
Heavy Vehicles (%)	3%	5%	3%	3%	5%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	12.1	29.1	29.1	10.8	27.8	27.8	13.9	23.8		16.3	26.2	
Effective Green, g (s)	12.1	29.1	29.1	10.8	27.8	27.8	13.9	23.8		16.3	26.2	
Actuated g/C Ratio	0.13	0.30	0.30	0.11	0.29	0.29	0.14	0.25		0.17	0.27	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	221	1042	475	197	996	454	254	844		297	914	
v/s Ratio Prot	0.08	c0.29		c0.10	0.17		0.10	c0.21		c0.15	0.17	
v/s Ratio Perm			0.06			0.07						
v/c Ratio	0.63	0.94	0.20	0.85	0.59	0.24	0.67	0.85		0.90	0.61	
Uniform Delay, d1	39.8	32.6	24.9	41.8	29.3	26.0	38.9	34.4		39.0	30.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.8	15.6	0.2	27.1	1.0	0.3	6.9	8.2		27.6	1.1	
Delay (s)	45.7	48.2	25.1	68.9	30.2	26.3	45.8	42.6		66.7	31.6	
Level of Service	D	D	C	E	C	C	D	D		E	C	
Approach Delay (s)		44.6			34.6			43.2			42.4	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			41.2				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			96.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			81.1%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

20: Louise Avenue & Airport Way

7/14/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3505	1568	1752	3505	1568	1752	3505	1568
Volume (vph)	143	740	240	120	450	140	180	654	280	236	694	157
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.94	0.94	0.94	0.96	0.96	0.96
Adj. Flow (vph)	151	779	253	130	489	152	191	696	298	246	723	164
RTOR Reduction (vph)	0	0	182	0	0	111	0	0	44	0	0	117
Lane Group Flow (vph)	151	779	71	130	489	41	191	696	254	246	723	47
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.1	22.5	22.5	7.1	21.5	21.5	11.8	21.7	21.7	13.2	23.1	23.1
Effective Green, g (s)	8.1	22.5	22.5	7.1	21.5	21.5	11.8	21.7	21.7	13.2	23.1	23.1
Actuated g/C Ratio	0.10	0.28	0.28	0.09	0.27	0.27	0.15	0.27	0.27	0.16	0.29	0.29
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	176	980	438	155	936	419	257	945	423	287	1006	450
v/s Ratio Prot	c0.09	c0.22		0.07	0.14		0.11	0.20		c0.14	c0.21	
v/s Ratio Perm			0.05			0.03			0.16			0.03
v/c Ratio	0.86	0.79	0.16	0.84	0.52	0.10	0.74	0.74	0.60	0.86	0.72	0.10
Uniform Delay, d1	35.6	26.9	21.9	36.1	25.1	22.2	32.9	26.8	25.6	32.7	25.8	21.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	31.5	4.5	0.2	30.8	0.5	0.1	11.0	3.0	2.4	21.4	2.5	0.1
Delay (s)	67.1	31.4	22.1	67.0	25.7	22.3	43.9	29.8	28.0	54.2	28.3	21.2
Level of Service	E	C	C	E	C	C	D	C	C	D	C	C
Approach Delay (s)		33.9			32.0			31.6			32.9	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay			32.7				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			80.5				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			71.6%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												