APPENDIX C

TRAFFIC IMPACTS ANALYSIS

Traffic Impact Analysis

LIVINGSTON CONCRETE BATCH PLANT
PLACER COUNTY, CA

REVISED
October 6, 2006

Prepared for:

Placer County, CA

Prepared by:

Kimley-Horn and Associates, Inc.

Kimley-Horn
and Associates, Inc.

EXECUTIVE SUMMARY

This report documents the results of a traffic impact analysis completed for the proposed Livingston Concrete Batch Plant on Ophir Road in Placer County (the "proposed project," or PP). The site is located just east of Geraldson Road and is approximately 4.9 acres in size. The purpose of this analysis is to identify potential environmental impacts as required by the California Environmental Quality Act (CEQA).

Significant findings of this analysis include:

- The majority of project traffic occurs during off-peak times. The project is expected to generate 26 trips occurring during the AM peak hour (7-9 am) and 12 trips during the PM peak hour (4-6 pm).
- This study considers the 70th percentile trip generation expected for the site.
- Two existing and one new intersection were considered for this study. They are:
    - Taylor Road/Ophir Road/I-80 Off-Ramp
    - Ophir Road/Geraldson Road
    - Ophir Road/Proposed Site Access
- The addition of project traffic does not cause any of the study intersections to fall below the minimum acceptable Level of Service of C as required by the Placer County General Plan. Furthermore, the addition of project traffic does not cause any intersection in the State right-of-way to fall below the minimum acceptable Level of Service of D. Therefore, no significant impacts are expected.
- The proposed project's fair share for the Taylor Road/Ophir Road/I-80 Off-Ramp intersection is estimated to be 1.6%.
- The intersection of Ophir Road/Taylor Road/I-80 Westbound Ramps is anticipated to warrant signalization by the year 2025 based on peak hour warrants.
- A roundabout could be considered for the Ophir Road/Taylor Road/I-80 Westbound Ramps intersection in the future.
- The proposed project is not expected to noticeably affect I-80 ramp operations at the Ophir Road interchange.

TABLE OF CONTENTS

INTRODUCTION **1**

PROJECT DESCRIPTION **1**

PROJECT AREA ROADWAYS **1**

Study Area Roadway Descriptions *1*

ANALYSIS METHODOLOGY **4**

EXISTING (2005) CONDITIONS **5**

FUTURE (2025) WITHOUT PROJECT CONDITIONS **7**

Peak Hour Intersection Analysis *7*

ANALYSIS OF PROPOSED PROJECT **9**

Project Trip Generation *9*
Project Trip Distribution *10*

EXISTING (2005) PLUS PROPOSED PROJECT CONDITIONS **13**

FUTURE (2025) PLUS PROPOSED PROJECT CONDITIONS **15**

IMPACTS AND MITIGATION **17**

Standards of Significance *17*
Impacts *17*
Mitigation *17*

ANALYSIS OF PROJECT ALTERNATIVES **17**

NON-CEQA ISSUES **19**

CONCLUSIONS **22**

APPENDICES

Traffic Count Data Sheets ..... *Appendix A*
Worksheet for Existing (2005) without Proposed Project Conditions ..... *Appendix B*
Worksheet for Future (2025) without Proposed Project Conditions ..... *Appendix C*
Worksheet for Existing (2005) plus Proposed Project Conditions ..... *Appendix D*
Worksheet for Future (2025) plus Proposed Project Conditions ..... *Appendix E*
Worksheets for Traffic Signal Warrant Analysis ..... *Appendix F*
Worksheets for I-80 Ramp Merge/Diverge Operations ..... *Appendix G*

LIST OF TABLES

TABLE 1 - UNSIGNALIZED INTERSECTION LEVEL OF SERVICE 4
TABLE 2 - EXISTING (2005) LEVEL OF SERVICE....5
TABLE 3 - FUTURE (2025) WITHOUT PROPOSED PROJECT LEVEL OF SERVICE....7
TABLE 4 - SAMPLE SITE TRIP GENERATION 9
TABLE 5 - PROJECT TRIP GENERATION 9
TABLE 6 - EXISTING (2005) AND EXISTING (2005) PLUS PROPOSED PROJECT LEVEL OF SERVICE 13
TABLE 7 - FUTURE (2025) AND FUTURE (2025) PLUS PROPOSED PROJECT LEVEL OF SERVICE....15
TABLE 8 - TRIP GENERATION COMPARISON (OTHER DEVELOPMENT SCENARIO) 18
TABLE 9 – TRAFFIC SIGNAL WARRANT ANALYSIS
(TAYLOR ROAD/OPHIR ROAD/I-80 WESTBOUND RAMPS INTERSECTION)....20
TABLE 10 – EXISTING (2005) I-80 RAMP MERGE/DIVERGE EVALUATION 21

LIST OF FIGURES

FIGURE 1 – PROJECT STUDY AREA 2
FIGURE 2 – PROJECT SITE PLAN....3
FIGURE 3 – EXISTING (2005) PEAK HOUR TRAFFIC VOLUMES....6
FIGURE 4 – FUTURE (2025) PEAK HOUR TRAFFIC VOLUMES 8
FIGURE 5 – PROJECT TRIP DISTRIBUTION 11
FIGURE 6 – PROJECT PEAK HOUR TRAFFIC VOLUMES 12
FIGURE 7 – EXISTING PLUS PROPOSED PROJECT PEAK HOUR TRAFFIC VOLUMES 14
FIGURE 8 – FUTURE PLUS PROPOSED PROJECT PEAK HOUR TRAFFIC VOLUMES 16

INTRODUCTION

This report documents the results of a traffic impact analysis completed for the proposed concrete batch plant on Ophir Road in Placer County (the "proposed project," or PP). The site is located east of Geraldson Road and lies on a 4.9 acre undeveloped parcel. The purpose of this analysis is to identify potential environmental impacts as required by the California Environmental Quality Act (CEQA).

Sections included in this report describe the analysis methodology, existing conditions, existing plus project conditions, future (2025) conditions and future (2025) plus project conditions. Potential impacts and recommended mitigation measures, if needed, are also included in this report.

PROJECT DESCRIPTION

The proposed project is a concrete batch plant and is to be located on Ophir Road, east of Geraldson Road in Placer County, CA. Figure 1 illustrates the proposed project location and study intersections, and Figure 2 illustrates the proposed project site plan.

PROJECT AREA ROADWAYS

Study Area Roadway Descriptions

Below are descriptions of roadways in the vicinity of the project.

Interstate 80 (I-80) Freeway is a freeway located just south of the project site. Generally, the I-80 Freeway provides regional access to Sacramento to the west and Auburn to the east. It runs east-west through Placer County and provides 3 lanes in each direction. Access to the project site from the freeway is provided by ramps at the Taylor Road/Ophir Road intersection and the Ophir Road interchange east of the project site. In the project area, I-80 serves approximately 85,000 vehicles per day.

Taylor Road is a two lane rural roadway that runs east-west. Taylor Road parallels Interstate 80 and connects the towns of Loomis and Newcastle to the west of the project site. Taylor Road terminates at the Ophir Road intersection. There are no signalized intersections on Taylor Road within the study area.

Ophir Road is a two lane rural roadway that runs parallel with Interstate 80. The posted speed limit on Ophir Road is 45 mph from Taylor Road to Wise Road. It is a continuous roadway that terminates at the Interstate 80 interchange in the City of Auburn and provides access to adjacent light industrial uses. At the project site, Ophir Road serves approximately 2,800 vehicles per day.

Geraldson Road is a two lane rural roadway that runs north-south. Geraldson Road is approximately one mile in length and extends from Sunset Lane to Ophir Road. There are no signalized intersections on Geraldson Road and it serves rural, residential land uses.

The study area includes two unsignalized intersections and the project site access. These intersections are listed below and are shown in Figure 1:

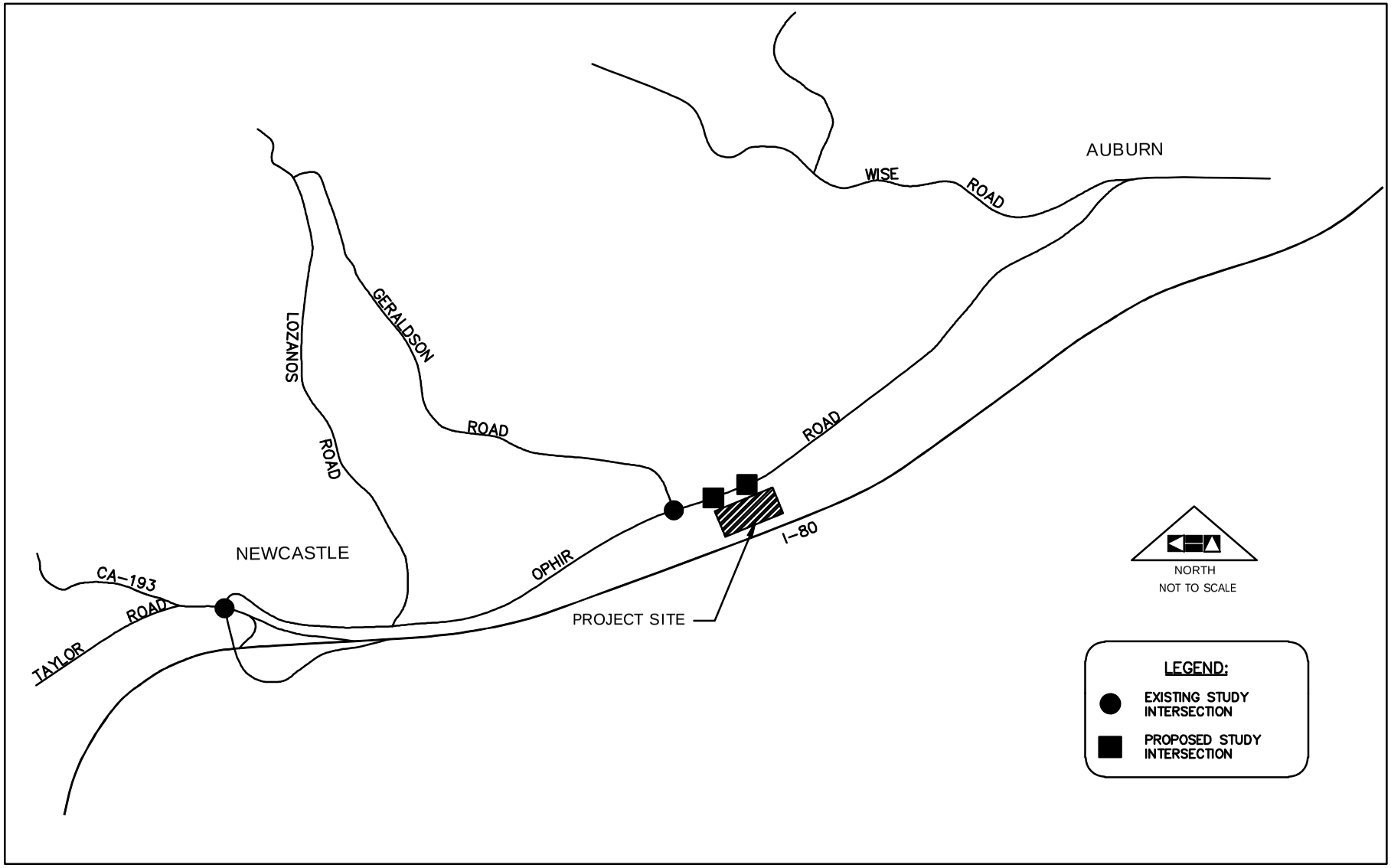

FIGURE 1

PROJECT LOCATION AND STUDY INTERSECTIONS

Kimley-Horn and Associates, Inc.

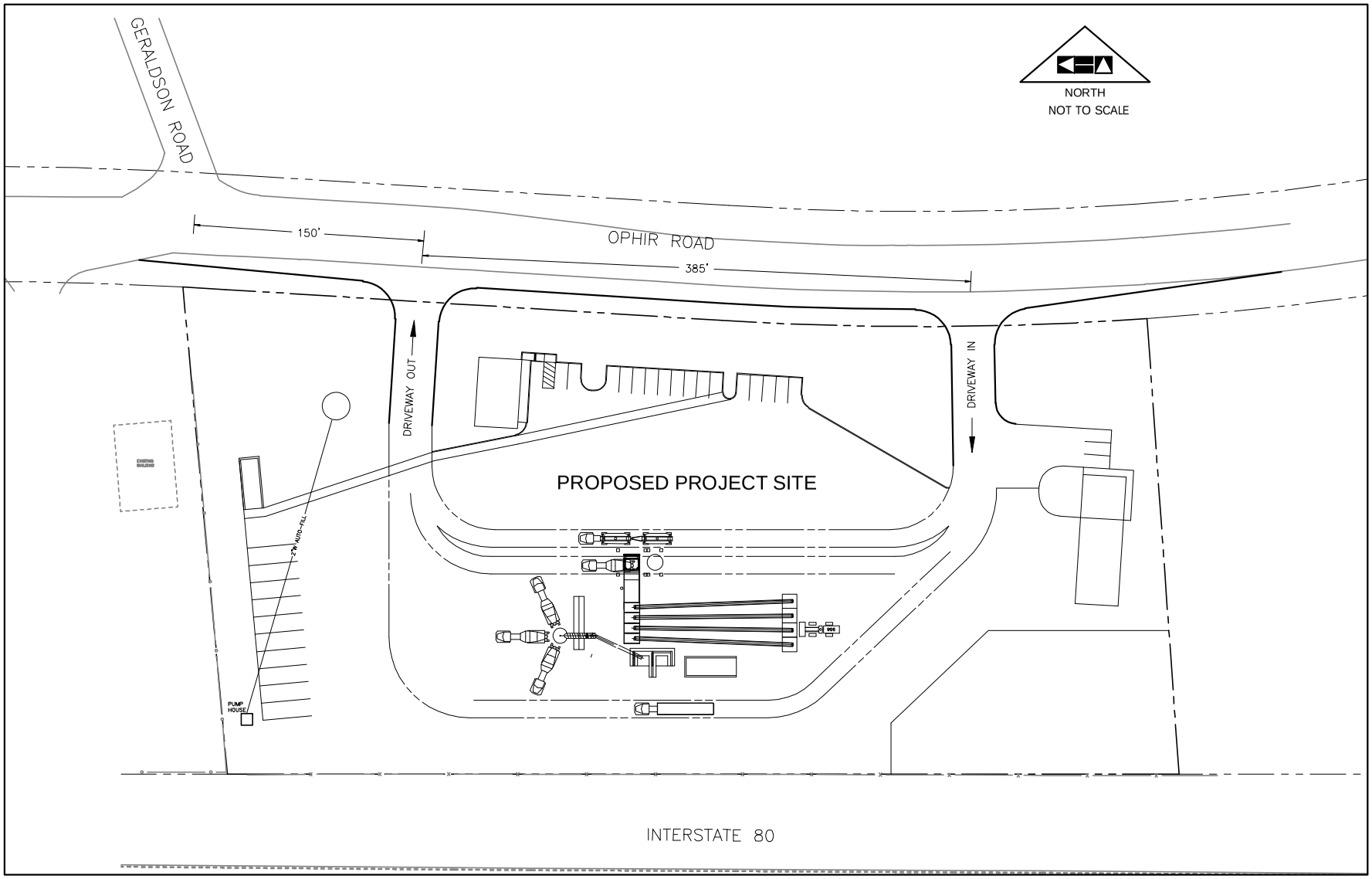

FIGURE 2

LIVINGSTON CONCRETE - SITE PLAN

Courtesy of: Ourada Engineering

Kimley-Horn and Associates, Inc.

- Taylor Road/Ophir Road/I-80 Off-Ramp
- Ophir Road/Geraldson Road
- Ophir Road/Project Site Access

Each of these locations was analyzed for potential weekday AM and PM peak-hour traffic impacts.

The site access is split into two driveways. The easterly driveway serves inbound trips and the westerly driveway serves outbound trips.

ANALYSIS METHODOLOGY

Analysis of impacts at the study intersections is based on the concept of Level of Service. The Level of Service (LOS) of an intersection is a qualitative measure used to describe the operational conditions. LOS ranges from A (best), which represents minimal delay, to F (worst), which represents heavy delay and a facility that is operating at or near its functional capacity. Intersection Level of Service (LOS) is determined using methods defined in the *Highway Capacity Manual, 2000 (HCM),* and appropriate traffic analysis software. Table 1 presents intersection level of service (LOS) definitions utilizing control delay per vehicle, as defined in the HCM.

The HCM includes procedures for analyzing all-way- and two-way stop controlled intersections. The two-way stop-controlled (TWSC) procedure defines LOS as a function of average control delay on the minor street approaches. Furthermore, the all-way stop-controlled (AWSC) procedure defines LOS as a function of average control delay with each intersection approach analyzed independently. The Taylor Road/Ophir Road/I-80 Off-Ramp intersection is all-way stop-controlled and the Ophir Road/Geraldson Road intersection and the site driveways are two-way stop-controlled.

Table 1 - Unsignalized Intersection Level of Service

HCM Value (seconds of control delay)	Level of Service (LOS)
≤ 10	A
>10 and ≤ 15	B
>15 and ≤ 25	C
>25 and ≤ 35	D
>55 and ≤ 50	E
> 50	F
HCM Data Source: Highway Capacity Manual, 2000.	

Impact analyses were conducted for the study intersections for both AM and PM peak hours for the following time periods:

A. Existing
B. Existing plus Proposed Projects
C. Future (2025) conditions without project
D. Future (2025) with the proposed project.

These are described below.

EXISTING (2005) CONDITIONS

Analysis of Existing (2005) traffic conditions is based upon new peak-hour traffic counts conducted in August, 2005. A 24-hour traffic volume count was conducted on Ophir Road to determine the current Average Daily Traffic (ADT) for the roadway. This count was also used to determine that the AM peak hour occurs generally between 7:15 a.m. and 8:15 a.m. and the PM peak hour occurs between 4:30 p.m. and 5:30 p.m. The weekday AM and PM peak-hour intersection traffic counts were conducted between the hours of 7 a.m. and 9 a.m. and 4 p.m. and 6 p.m., respectively. Average Daily Traffic (ADT) and peak hour turn movement volumes, along with the corresponding lane configurations, are summarized in Figure 3 and the traffic count data sheets are provided in Appendix A.

The study intersections were analyzed using the methods described above, using current traffic volumes. Table 2 presents the Existing (2005) peak-hour intersection operating conditions. Table 2 indicates that all of the study area intersections currently operate at LOS A. Analysis worksheets from Synchro for the existing conditions scenario are provided in Appendix B.

Table 2 - Existing (2005) Level of Service

Intersection		LOS			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
1	Taylor Road/Ophir Road/I-80 Off-Ramp	8.5	A	9.9	A
2	Ophir Road/Geraldson Road	9.2	A	9.4	A

Source: Kimley-Horn & Associates, Inc.

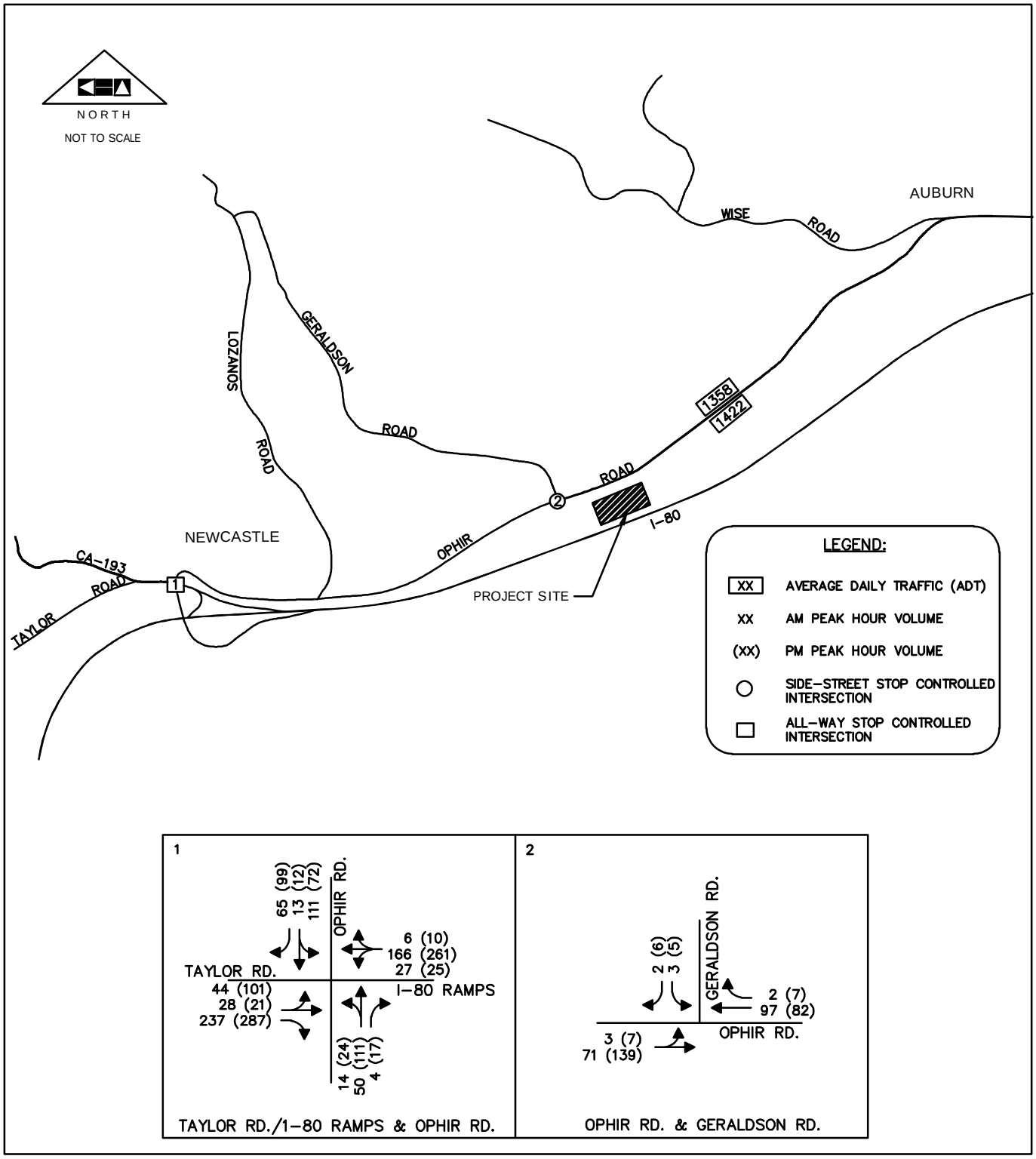

FIGURE 3

PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING CONDITIONS

Kimley-Horn and Associates, Inc.

FUTURE (2025) WITHOUT PROJECT CONDITIONS

Peak Hour Intersection Analysis

The future Average Daily Traffic (ADT) volumes for the project area roadways were provided by Placer County. These volumes reflect future development and expected traffic growth throughout the county. The turn movement percentages from the existing traffic counts were utilized along with the future ADT to generate the future turn movement volumes at each of the intersection approaches The future volumes were then adjusted to reflect no development at the project site to derive 2025, no project conditions. The peak-hour intersection traffic volumes for the Future (2025) without-project scenario for AM and PM peaks are illustrated in Figure 4.

The study intersections were analyzed with the 2025, no project volumes. Table 3 presents a summary of the future operating conditions without the proposed project. Analysis worksheets for this scenario are provided in Appendix C. Table 3 indicates that all of the study area intersections would operate at LOS C or better under the future, no project scenario during both peak hours, except for the Taylor Road/Ophir Road/I-80 Off-Ramp intersection. That intersection is expected to operate at LOS F in the PM Peak Hour.

Table 3 - Future (2025) Without Proposed Project Level of Service

Intersection		LOS			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
1	Taylor Road/Ophir Road/I-80 Off-Ramp	16.5	C	76.9	F
2	Ophir Road/Geraldson Road	10.3	B	10.7	B

Source: Kimley-Horn & Associates, Inc.

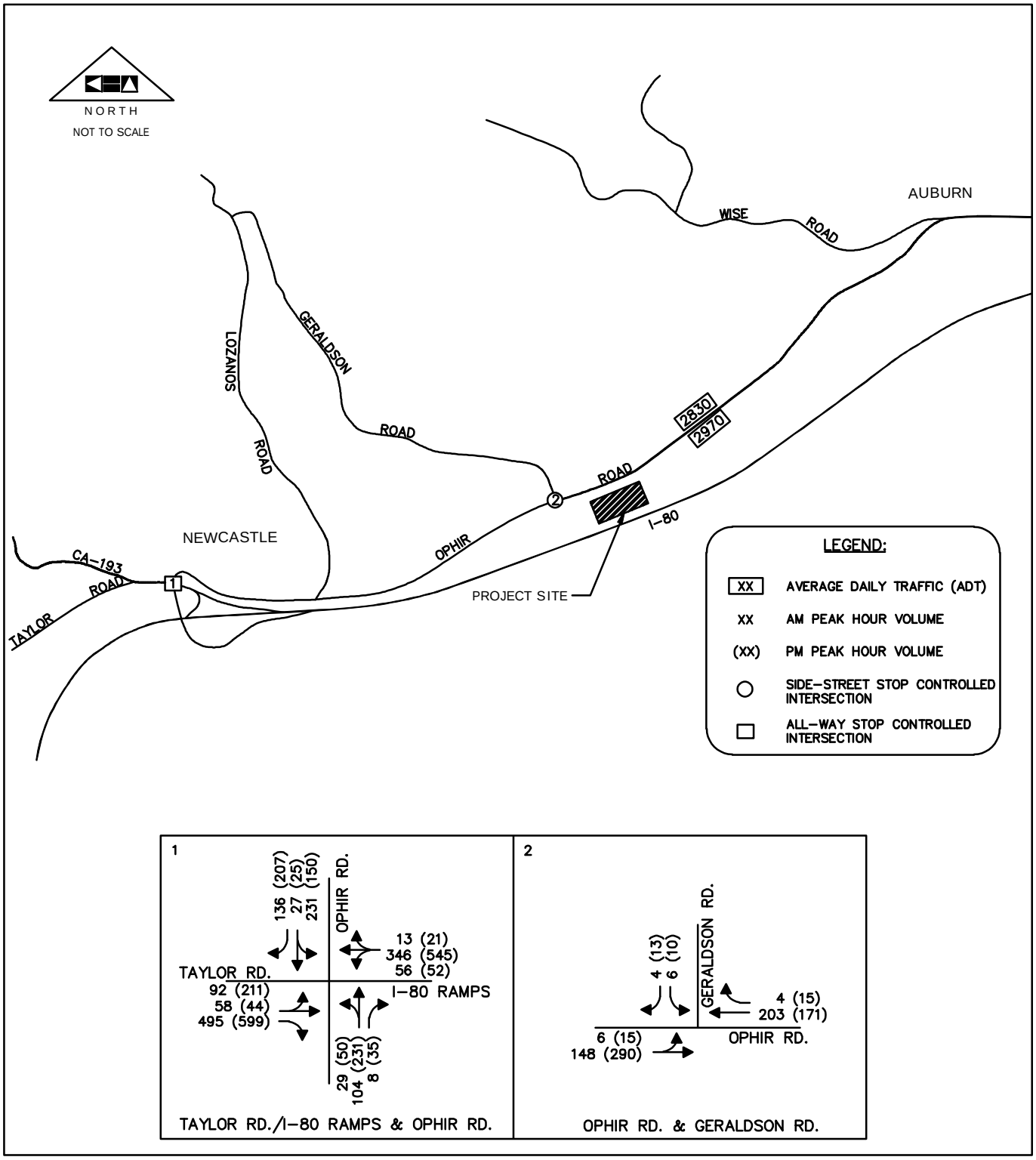

FIGURE 4

PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - FUTURE (2025) NO PROJECT CONDITIONS

Kimley-Horn and Associates, Inc.

ANALYSIS OF PROPOSED PROJECT

Project Trip Generation

Trip generation for a proposed project is typically derived using data included in *Trip Generation*, published by the Institute of Transportation Engineers (ITE). However, *Trip Generation* does not currently contain an appropriate comparable land use for the proposed project. As such, trip generation rates for the proposed project were derived from data collected at sites similar to the proposed batch plant.

Both AM and PM peak hour traffic counts were conducted at Livingston Concrete Service, Inc. concrete batch plants in the greater Sacramento area. This data included the number of vehicular trips (including trucks) in and out of the site, as well as the size and capacity of each facility. Counts included trips for employees, vehicles delivering raw materials, and concrete delivery trucks. The data obtained in the driveway counts were used to derive the 70th percentile trips for both AM and PM peak hours. For this analysis, it was assumed the sample site data is normally distributed.

The 70th percentile trip generation for the three sites results in 26 AM peak hour trips and 12 PM peak hour trips, as indicated in Table 5. Table 5 also indicates the assumed percentage of vehicles entering and leaving the project site. These percentages are weighted averages (weighted by plant capacity) derived from the sample site data shown in Table 4.

Table 4 - Sample Site Trip Generation

		AM Peak Hour					PM Peak Hour				
Sample Site	Output Capacity (yd^3)[1]	Total Trips	IN		OUT		Total Trips	IN		OUT	
			%	Trips	%	Trips		%	Trips	%	Trips
North Highlands	343	25	60	15	40	10	9	22	2	78	7
Rancho Cordova	445	17	65	11	35	6	9	33	3	67	6
Lincoln	600	26	50	13	50	13	13	38	5	62	8

Table 5 - Project Trip Generation

AM Peak Hour					PM Peak Hour				
Total Trips	IN		OUT		Total Trips	IN		OUT	
	%	Trips	%	Trips		%	Trips	%	Trips
26	57	15	43	11	12	32	4	68	8

It should be noted that using the 70th percentile *trip generation* from the sample sites results in a conservative analysis when compared to determining the 70th percentile *trip rate* of the sample sites. This difference is the result of all of the sample sites having a larger plant capacity than that of the proposed project, which is 300

[1] Per Livingston Concrete Service, Inc.

cubic yards per day. Using the trip data shown in Table 5, the trip rate (project trips divided by plant capacity) for the site is 0.087 trips/yd^3 in the AM peak hour and 0.040 trips/yd^3 in the PM peak hour. However the 70th percentile trip rates based on the sample data is 0.061 trips/yd^3 in the AM peak hour and 0.035 trips/yd^3 in the PM peak hour. As a result, using the 70th percentile trip generation results in analyzing more trips than using the 70th percentile trip rate, and is, therefore, more conservative.

Project Trip Distribution

The distribution of project traffic was developed based upon existing traffic patterns in the study area and characteristics of the proposed project. The project trip distribution percentages are illustrated in Figure 5. The resulting project AM and PM peak-hour traffic volumes at the study area intersections are illustrated in Figure 6.

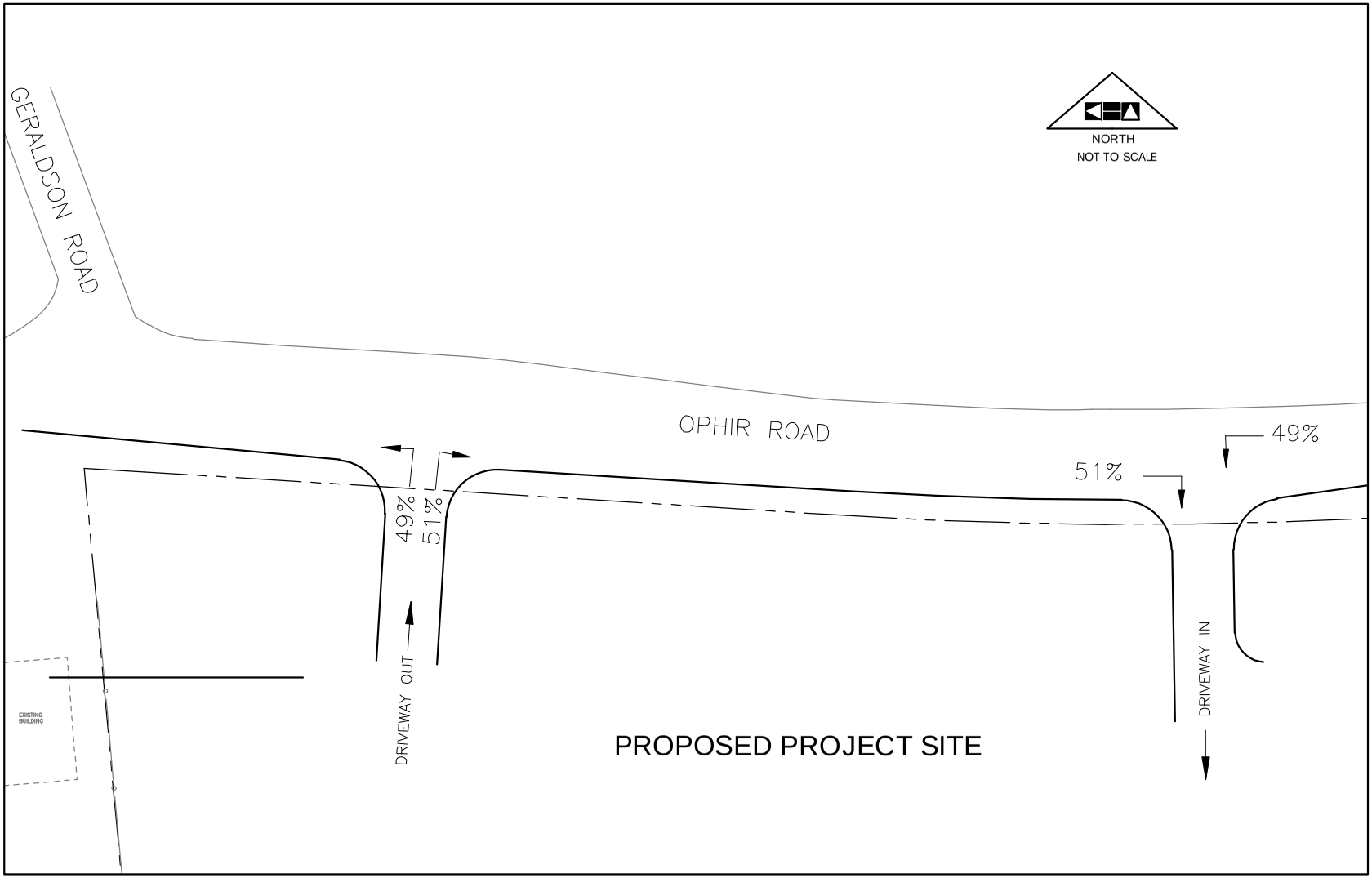

FIGURE 5

PROJECT TRIP DISTRIBUTION

Kimley-Horn and Associates, Inc.

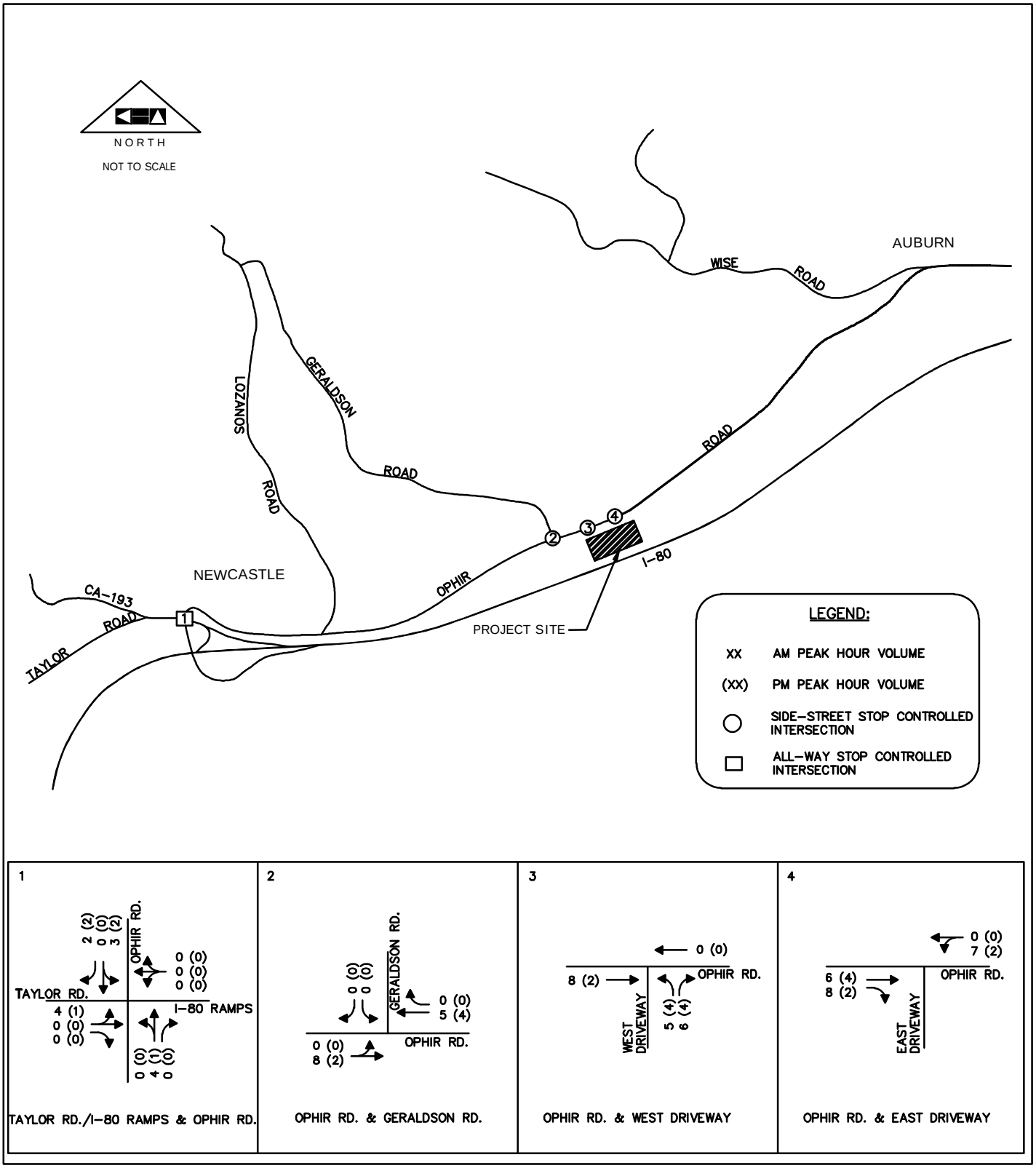

FIGURE 6

PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - PROPOSED PROJECT ONLY

Kimley-Horn and Associates, Inc.

EXISTING (2005) PLUS PROPOSED PROJECT CONDITIONS

Peak-hour project traffic was added to the Existing (2005) traffic volumes and the level of service was determined at the two existing intersections and site driveways. Table 6 provides a summary of the existing plus the proposed project intersection analysis, and Figure 7 provides the AM and PM existing plus proposed project traffic volumes at the study area intersections. Analysis worksheets for this scenario are provided in Appendix D.

Table 6 indicates that all of the study area intersections would operate at LOS B or above under the Existing (2005) plus the proposed project scenario.

Table 6 - Existing (2005) and Existing (2005) Plus Proposed Project Level of Service

Intersection	Existing (2005) Without Proposed Project				Existing (2005) Plus Proposed Project			
	AM		PM		AM		PM	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Taylor Road/Ophir Road/I-80 Off-Ramp80 Off-Ramp	8.5	A	9.9	A	8.5	A	9.9	A
Ophir Road/Geraldson Road	9.2	A	9.4	A	9.3	A	9.4	A
Ophir Road/West Driveway	N/A	N/A	N/A	N/A	10.1	B	10.2	B
Ophir Road/East Driveway	N/A	N/A	N/A	N/A	0.5	A	0.2	A

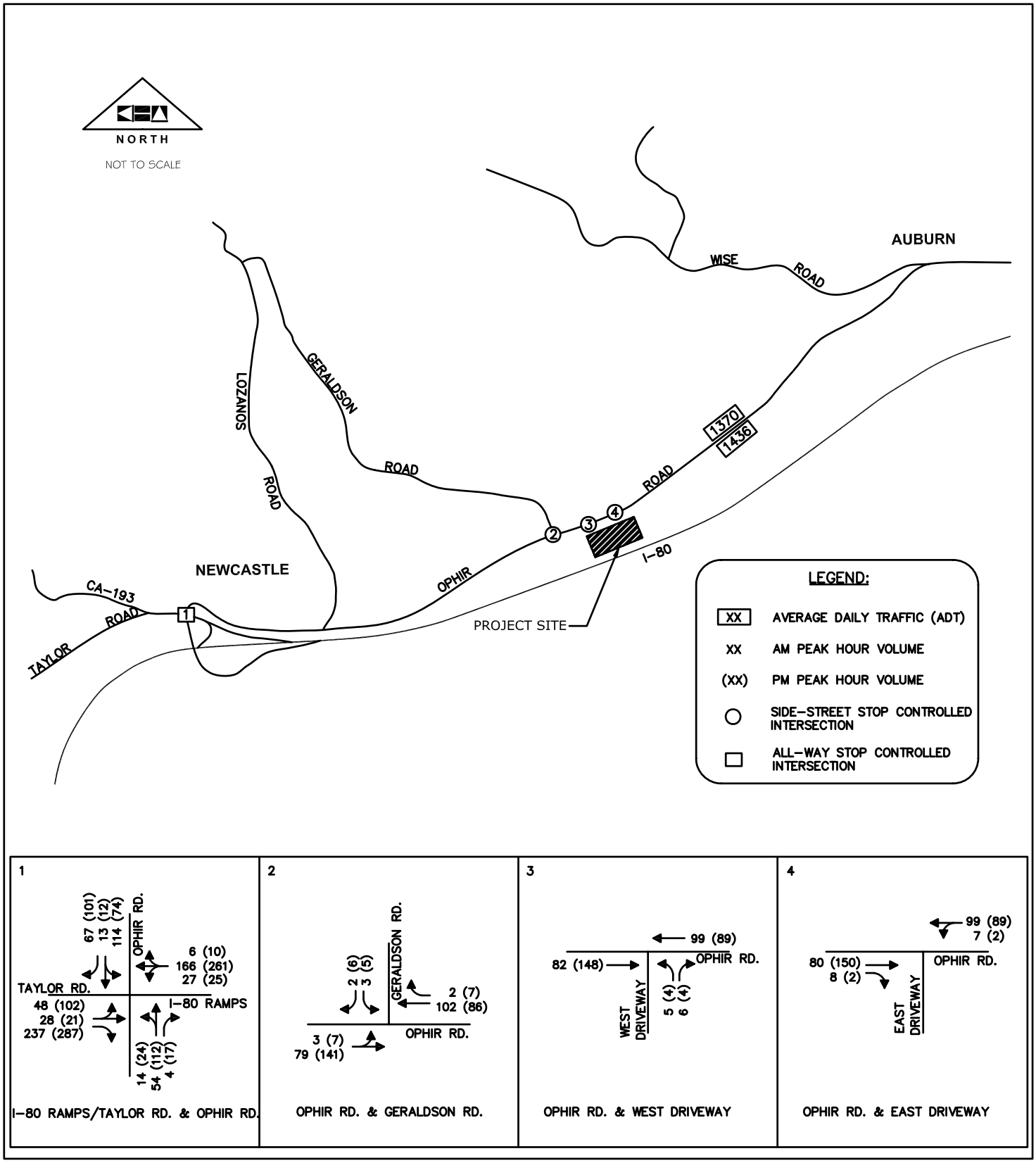

FIGURE 7

PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING PLUS PROPOSED PROJECT CONDITIONS

Kimley-Horn and Associates, Inc.

FUTURE (2025) PLUS PROPOSED PROJECT CONDITIONS

Peak-hour project traffic was added to the Future (2025) volumes to determine the future operating conditions with the project. Table 7 provides a summary of the Future (2025) Plus Proposed Project intersection analysis, and Figure 8 provides the AM and PM Future (2025) Plus Proposed Project traffic volumes at the study area intersections. Analysis worksheets for this scenario are provided in Appendix E.

Table 7 presents the projected LOS for the Future (2025) with and without the proposed project.

Table 7 - Future (2025) and Future (2025) Plus Proposed Project Level of Service

Intersection	Future (2025) Without Proposed Project				Future (2025) Plus Proposed Project			
	AM		PM		AM		PM	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Taylor Road/Ophir Road/I-80 Off-Ramp80 Off-Ramp	16.5	C	76.9	F	16.8	C	77.6	F
Ophir Road/Geraldson Road	10.3	B	10.7	B	10.4	B	10.8	B
Ophir Road/West Driveway	N/A	N/A	N/A	N/A	11.3	B	12.1	B
Ophir Road/East Driveway	N/A	N/A	N/A	N/A	0.3	A	0.1	A

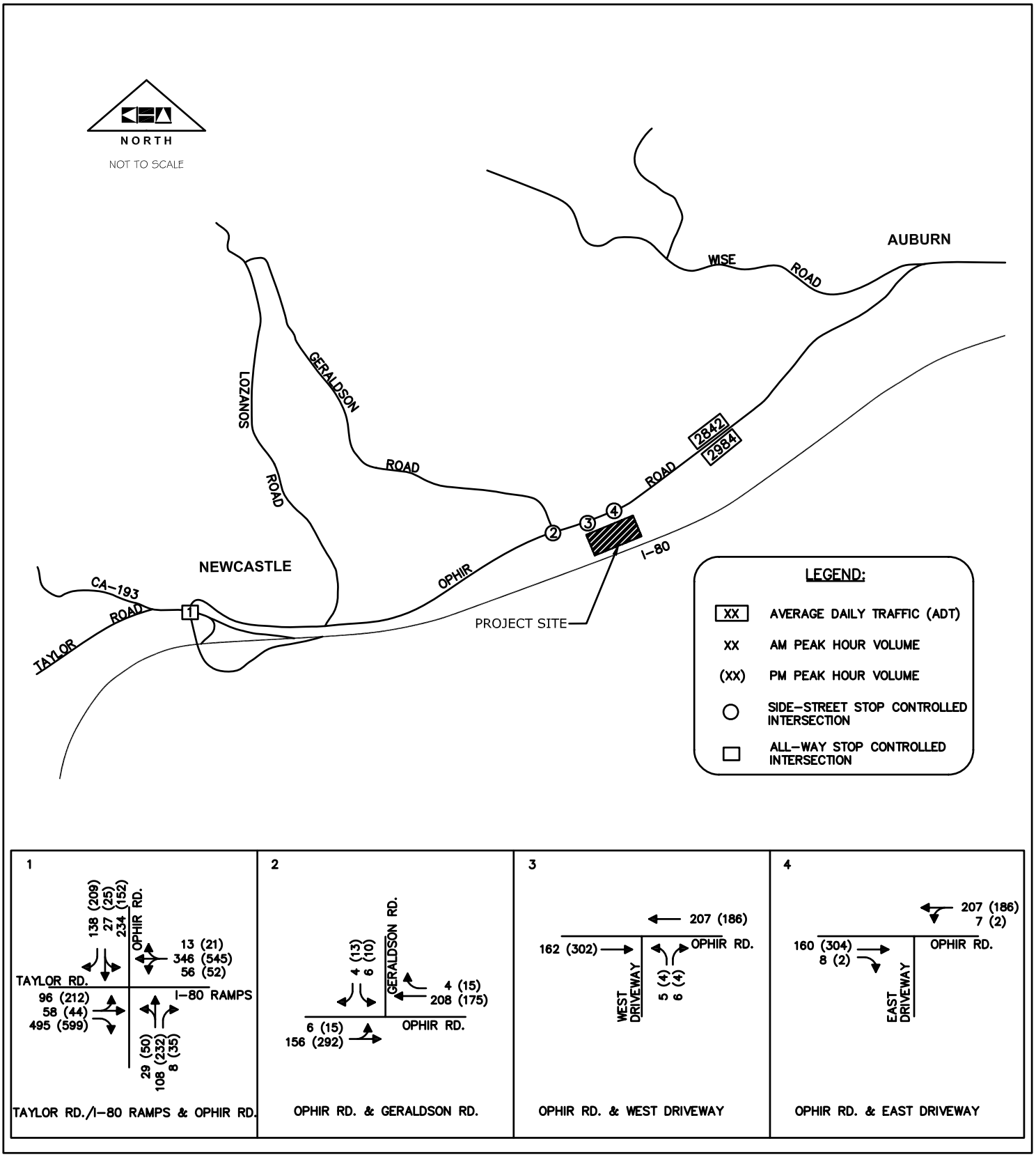

FIGURE 8

PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - FUTURE (2025) PLUS PROPOSED PROJECT CONDITIONS

Kimley-Horn and Associates, Inc.

IMPACTS AND MITIGATION

Standards of Significance

Impacts for existing and future conditions were determined by comparing conditions with the proposed project to those without the project. Impacts for intersections are created when traffic from the proposed project forces the LOS to fall below a specific threshold. County standards allow LOS C conditions for the AM and PM peak hours. The County requires that "Land development requirements shall be set to sustain LOS C at all county intersection locations"[2]. This county LOS requirement applies to intersections outside of Caltrans' right-of-way. For intersections in the state right-of-way, the State of California has established a threshold which allows a LOS D for intersections at interchanges.

Impacts

The proposed project does not cause any county intersection to change from LOS A, B, or C to LOS D, E, or F. Similarly, the project does not cause any intersection in the state right-of-way to change from LOS A, B, C, or D to LOS E or F. Because the Taylor Road/Ophir Road/I-80 Off-Ramp intersection is projected to operate at a LOS F in 2025 without the proposed project, the proposed project does not cause the intersection to fall below LOS D. As shown in Table 6, the proposed project is anticipated to result in an increase of 0.10 and 0.30 seconds of delay at this intersection during the AM and PM peak-hours respectively. As a result, **no impacts are created by the proposed project**.

Mitigation

None Required.

ANALYSIS OF PROJECT ALTERNATIVES

The following four (4) alternatives were evaluated as part of this project:

No Project (No Build) Alternative

This alternative assumes that the project is not constructed and the project site is built-out according to the General Plan. The resulting traffic conditions associated with this alternative were previously documented in Table 2 (Existing) and Table 3 (Future without Proposed Project).

As such, this alternative is not anticipated to result in any traffic conditions and/or impacts that have not already been accounted for in the evaluation of the proposed project. Depending on the location of the alternative, the project could result in potential impacts near that site. Any alternative locations should be evaluated for potential impacts.

[2] Placer County Planning Department website, http://www.placer.ca.gov/planning.

No Project (Other Development Scenario) Alternative

This alternative assumes that the project site is developed with a project consistent with the General Plan, a project that doesn't require the same volume of water or require a height variance. For the purposes of this evaluation, "mini-storage" was identified by others as the site development. Table 8 presents the comparison of anticipated trip generation for the proposed project and the "mini-storage" development alternative.

Table 8 - Trip Generation Comparison (Other Development Scenario)

Development Scenario (ITE Land Use Code)	AM Peak Hour					PM Peak Hour				
	Total Trips	IN		OUT		Total Trips	IN		OUT	
		%	Trips	%	Trips		%	Trips	%	Trips
Proposed Project	26	57	15	43	11	12	32	4	68	8
Mini-Storage* (151)	17	59	10	41	7	28	51	15	49	13
Difference:	*-9*		*-5*		*-4*	*+16*		*+11*		*+5*

* Gross floor area estimated to be 50% of project site.

As shown in Table 8, the "mini-storage" land use is anticipated to generate 9 fewer trips during the AM peak hour and 16 additional trips during the PM peak hour when compared to the proposed project.

As indicated, because the "mini-storage" land use would generate fewer AM peak hour trips when compared to the proposed project, traffic operations/impacts with this development scenario are not anticipated to be worse than the proposed project during the AM peak hour. Further, according to Table 6 and Table 7, the proposed project results in only a minimal increase in delay at the study intersections. As such, the 16 additional "mini-storage" trips during the PM peak hour are not anticipated to noticeably affect intersection operating conditions.

Public Services Location Alternative

This alternative involves the selection of different project site. More specifically, the alternate project site would include public services (i.e., water and sewer).

Given the nature of the proposed project, the proposed project site should ideally be located along a corridor with primarily industrial land uses and be located adjacent to freeway interchange(s). These features are consistent with currently proposed project site.

Reduced Scale Alternative

This alternative assumes that the project site is developed with a "reduced capacity" version of the proposed project. For the purposes of this evaluation, the capacity of the proposed project is reduced from the proposed 300 yd^3/day to 240 yd^3/day, a 20 percent reduction is daily plant capacity.

Because this alternative has a reduced capacity (240 yd^3/day), it can be concluded that fewer daily trips will be generated when compared to the proposed project (300 yd^3/day). For this reason, this alternative is not anticipated to result in any traffic conditions and/or impacts that have not already been accounted for in the evaluation of the proposed project.

NON-CEQA ISSUES

The proposed project will have two driveways on Ophir Road. In addition, there is a commercial facility, Barnum Mechanical, proposed on the north side of the Ophir Road, directly across for the proposed Livingston concrete facility.

The Barnum Mechanical site[3] is proposed to have two driveways on Ophir Road. The easterly Barnum driveway would be located approximately 325 feet east of the easterly Livingston driveway. The westerly Barnum driveway would be located approximately 30 feet west of the easterly Livingston driveway. It should be noted that the county will be requiring a two-way left-turn lane for Ophir Road. The first project to be constructed along this section of the roadway will be required to install the left turn lane[4]. The site plan for the Barnum Property indicates the left turn lane can be provided within the existing right-of-way.

Below is a summary of potential driveway turn conflicts associated with the proposed project.

Easterly Livingston Driveway
The easterly Livingston driveway is proposed to be an entrance only; therefore no left turn out conflicts would be created with the driveway at the Barnum site. However, it is recommended that the centerlines of the two driveways be aligned to simplify traffic movements at that location. It appears that this can be accomplished by revising the site plan for either project.

Westerly Livingston Driveway
The westerly site driveway, which is proposed to allow vehicles to exit only onto Ophir Road, would be approximately 150 feet east of the centerline of Geraldson Road. Concrete trucks turning left out of the site may occasionally conflict with left turns from Geraldson Road. However, the current left turn volume for Geraldson is extremely low and such conflicts would be very infrequent. To assist left turns out of the Livingston site, it is recommended that the two-way left turn lane be extended to Geraldson Road.

Fair-Share Improvement Calculation
According to the county[5], their "fair-share" calculation for future improvements is as follows:

$$P = T / (Tb-Te)$$

P = The equitable share for the project's traffic impact
T = The vehicle trips generated by the project during the peak hour of adjacent highway facility, vph
Tb = The forecasted traffic volume on an impacted State highway facility at the time of general plan build-out (2025), vph
Te = The traffic volume existing on the impacted highway facility plus other approved projects that will generate traffic that has yet to be constructed/opened, vph

As requested by the county, the following is the worst case (AM peak hour) "fair-share" calculation for future improvements at the Taylor Road/Ophir Road/I-80 Off-Ramp intersection:

$$P = 13 / (1{,}595 – 765)$$

As such, the proposed project's fair share is estimated to be 1.6%.

[3] Site plan dated March 2005 and received from Placer County Dept. of Public Works, August 18, 2005.
[4] Per email from Andrew Zmyslowski, Placer County Dept. of Public Works, August 24, 2005.
[5] Per email from Stephanie Holloway, Placer County Dept. of Public Works, October 31, 2005 and phone conversation with Ms. Holloway on January 10, 2006.

Traffic Signal Warrant Analysis
A planning level assessment of the need for traffic signalization for the intersection of Taylor Road/Ophir Road/I-80 Westbound Ramps was performed based on the peak hour warrant methodologies noted in Section 4.C of the *Manual on Uniform Traffic Control Devices (MUTCD)*, 2003 Edition, and the California Supplement, as applicable. This assessment was performed for the four analysis scenarios.

For the peak hour traffic signal warrant, the combination of major street volume and the highest side street volume must satisfy specific volume criteria (MUTCD, 2003 edition). The major street volumes (Taylor Road/I-80 Westbound Ramps) during the AM and PM peak hours for all scenarios are shown in Table 9. Given the major street volumes (Taylor Road/I-80 Westbound Ramps) for each of the four aforementioned scenarios, specific minor street volume (Ophir Road) thresholds must be satisfied to warrant signalization at this study intersection. These volume thresholds, as well as the actual projected volumes, are shown in Table 9.

Table 9 – Traffic Signal Warrant Analysis
(Taylor Road/Ophir Road/I-80 Westbound Ramps Intersection)

Scenario	Major Street Volume (vph)*	Minor Street Approach Volume (vph)**	Minor Street Approach Volume Threshold (vph)	Warrant Satisfied?
2005 AM Peak	508	189	665	No
2005 PM Peak	705	183	524	No
2005 plus Project AM Peak	512	194	662	No
2005 plus Project PM Peak	706	187	524	No
2025 AM Peak	1060	394	349	**Yes**
2025 PM Peak	1472	382	208	**Yes**
2025 plus Project AM Peak	1064	399	347	**Yes**
2025 plus Project PM Peak	1473	386	208	**Yes**

* Total of both major street approaches
** Higher volume minor street approach

As shown, the peak hour signal warrant is satisfied for the future (2025) scenarios. The analysis worksheets for this evaluation are included in Appendix F.

Roundabout Evaluation
As presented in Table 9, the intersection of Taylor Road/Ophir Road/I-80 Westbound Ramps is anticipated to warrant signalization by the year 2025. The increase both major street (Taylor Road/I-80 Westbound Ramps) and minor street (Ophir Road) will contribute to potentially congested traffic conditions.

The installation of a roundabout was qualitatively evaluated at this intersection as a potential operational improvement strategy. General comments related to the potential future installation of a roundabout at this intersection include the following:

- A roundabout would potentially minimize vehicle platooning entering I-80, both eastbound and westbound.
- Preliminary analysis results (*Highway Capacity Manual, 2000*) indicate that the circulating roadway of a single-lane roundabout would have adequate capacity to accommodate the project traffic volumes.
- A roundabout would require design characteristics conducive to the vehicles projected for the area (i.e., trucks/heavy vehicles).
- A roundabout would require design characteristics (horizontal and vertical geometrics, signing, lighting, etc.) consistent with State, County and industry standards for the placement of these devices at similar intersection locations.

The installation of a roundabout at the intersection of Taylor Road/Ophir Road/I-80 Westbound Ramps could be considered a future potential operational improvement as traffic volumes increase. Traffic signalization is warranted (peak hours) at this intersection in the future year (2025) and, as such, it may be advantageous to consider roundabout traffic control due to the anticipated LOS F condition in 2025 (with or without the proposed project) at this location.

I-80 Ramp Merge/Diverge Evaluation
A planning level assessment of I-80 ramp merge and diverge conditions at the Ophir Road interchange was performed based on the methodologies presented in the *Highway Capacity Manual, 2000*. This evaluation was performed for the single daily peak hour (AM or PM) for existing (2005) and existing (2005) plus proposed project conditions. Results of this evaluation are presented in Table 10.

Table 10 – Existing (2005) I-80 Ramp Merge/Diverge Evaluation

Analysis Location and Facility Type	Peak Hour of Analysis	Density (pc/mi/ln)*	LOS*
I-80 EB **Diverge**	PM	29.3 / 29.3	D / D
I-80 EB **Merge**	PM	26.7 / 26.7	C / C
I-80 WB **Diverge**	PM	29.5 / 29.5	D / D
I-80 WB **Merge**	AM	25.1 / 25.1	C / C

* Results are presented in **Existing / Existing plus Project** format.

As shown in Table 10, due to the relatively minor number of project generated trips, the addition of the proposed project traffic does not noticeably affect the I-80 ramp operations at the Ophir Road interchange. The analysis worksheets for this evaluation are included in Appendix G.

CONCLUSIONS

Based upon the analysis documented in this report, the following conclusions and recommendations are made.

- The proposed project includes the development of 4.9 acres for the construction of a concrete batch plant to be owned and operated by Livingston Concrete Service, Inc. The plant will have a maximum capacity of 300 cubic yards per day.
- The 70th percentile trip generation for the proposed project site is 26 trips during the AM peak hour and 12 trips during the PM peak hour.
- The addition of proposed project traffic does not cause any county intersection operating at or above LOS C without the proposed project to operate below LOS C. Similarly, the proposed project does not cause any intersection at a freeway interchange to fall below Caltrans' standard of LOS D. Therefore, no significant impacts are created.
- The proposed project's fair share for the Taylor Road/Ophir Road/I-80 Off-Ramp intersection is estimated to be 1.6%.
- The intersection of Ophir Road/Taylor Road/I-80 Westbound Ramps is anticipated to warrant signalization by the year 2025 based on peak hour warrants.
- A roundabout could be considered for the Ophir Road/Taylor Road/I-80 Westbound Ramps intersection in the future.
- The proposed project is not expected to noticeably affect I-80 ramp operations at the Ophir Road interchange.

APPENDIX A:

TRAFFIC COUNT DATA SHEETS

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

CITY OF NEWCASTLE

Site Code : 00000000
Start Date: 08/05/05
File I.D. : OPHTAYAM
Page : 1

	OPHIR ROAD Southbound					SR 80 WB RAMPS Westbound					Northbound					Eastbound							
Start Time	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Total-	TRCK=	
7:00am	32	3	12	2	49	6	47	1	2	56	1	5	1	1	8	12	8	34	5	59	172	10	162
7:15	30	3	22	2	57	6	30	1	4	41	6	9	1	4	20	16	6	53	5	80	198	15	183
7:30	20	1	20	3	44	7	56	0	8	71	5	12	0	0	17	11	6	76	9	102	234	20	214
7:45	39	6	15	2	62	11	38	1	7	57	3	11	1	1	16	9	12	57	3	81	216	13	203
Hour Total	121	13	69	9	212	30	171	3	21	225	15	37	3	6	61	48	32	220	22	322	820	58	762
8:00am	22	3	8	1	34	3	42	4	3	52	0	18	2	3	23	8	4	51	6	69	178	13	165
8:15	25	0	18	2	45	4	26	5	4	39	2	14	2	2	20	13	4	69	7	93	197	15	182
8:30	30	5	22	2	59	10	41	4	6	61	2	9	3	4	18	15	11	48	9	83	221	21	200
8:45	26	2	20	6	54	7	44	6	8	65	1	14	2	2	19	16	9	50	8	83	221	24	197
Hour Total	103	10	68	11	192	24	153	19	21	217	5	55	9	11	80	52	28	218	30	328	817	73	744
Grand	224	23	137	20	404	54	324	22	42	442	20	92	12	17	141	100	60	438	52	650	1637	131	1506
% of Total	13.7	1.4	8.4	1.2%		3.3	19.8	1.3	2.6%		1.2	5.6	.7	1.0%		6.1	3.7	26.8	3.2%			8.0%	92.0%
Apprch %					24.7%					27.0%					8.6%					39.7%			
% of Apprc	55.4	5.7	33.9	5.0%		12.2	73.3	5.0	9.5%		14.2	65.2	8.5	12.1%		15.4	9.2	67.4	8.0%				

Peak Hour Analysis By Entire Intersection for the Period: 07:00am to 08:45am on 08/05/05

Direction	Street Name	Start Peak Hour	Peak Hr Factor	Volumes Left	Thru	Rght	TRCK	Total	Percentages Left	Thru	Rght	TRCK
Southbound	OPHIR ROAD	07:15am	.794	111	13	65	8	197	56.3	6.5	32.9	4.0
Westbound	SR 80 WB RAMPS		.778	27	166	6	22	221	12.2	75.1	2.7	9.9
Northbound			.826	14	50	4	8	76	18.4	65.7	5.2	10.5
Eastbound			.814	44	28	237	23	332	13.2	8.4	71.3	6.9

CITY OF NEWCASTLE

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

Site Code : 00000000
Start Date: 08/05/05
File I.D. : OPHTAYAM
Page : 2

OPHIR ROAD

8
65 13 111
44
50
6
=====
100

Inbound 197
Outbound 100
Total 297

22

6

14
245 166
65

44

166

Inbound 332
Outbound 245
Total 577

28

Inbound 221
Outbound 143
Total 364

27

111
28 143
4

237

SR 80 WB RAMPS

Inbound 76
Outbound 277
Total 353

23

27 14 50 4 8
13
237
=====
277

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

CITY OF NEWCASTLE

Site Code : 00000000
Start Date: 08/09/05
File I.D. : OPHTAYAM
Page : 1

	OPHIR ROAD Southbound					SR 80 WB RAMPS Westbound					Northbound					Eastbound							
Start Time	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Total-	TRCK=	
7:00am	32	3	12	2	49	6	47	1	2	56	1	5	1	1	8	12	8	34	5	59	172	10	162
7:15	30	3	22	2	57	6	30	1	4	41	6	9	1	4	20	16	6	53	5	80	198	15	183
7:30	20	1	20	3	44	7	56	0	8	71	5	12	0	0	17	11	6	76	9	102	234	20	214
7:45	39	6	15	2	62	11	38	1	7	57	3	11	1	1	16	9	12	57	3	81	216	13	203
Hour Total	121	13	69	9	212	30	171	3	21	225	15	37	3	6	61	48	32	220	22	322	820	58	762
8:00am	22	3	8	1	34	3	42	4	3	52	0	18	2	3	23	8	4	51	6	69	178	13	165
8:15	25	0	18	2	45	4	26	5	4	39	2	14	2	2	20	13	4	69	7	93	197	15	182
8:30	30	5	22	2	59	10	41	4	6	61	2	9	3	4	18	15	11	48	9	83	221	21	200
8:45	26	2	20	6	54	7	44	6	8	65	1	14	2	2	19	16	9	50	8	83	221	24	197
Hour Total	103	10	68	11	192	24	153	19	21	217	5	55	9	11	80	52	28	218	30	328	817	73	744
Grand	224	23	137	20	404	54	324	22	42	442	20	92	12	17	141	100	60	438	52	650	1637	131	1506
% of Total	13.7	1.4	8.4	1.2%		3.3	19.8	1.3	2.6%		1.2	5.6	.7	1.0%		6.1	3.7	26.8	3.2%			8.0%	92.0%
Apprch %					24.7%					27.0%					8.6%					39.7%			
% of Apprc	55.4	5.7	33.9	5.0%		12.2	73.3	5.0	9.5%		14.2	65.2	8.5	12.1%		15.4	9.2	67.4	8.0%				

Peak Hour Analysis By Entire Intersection for the Period: 07:00am to 08:45am on 08/09/05

Direction	Street Name	Start Peak Hour	Peak Hr Factor	Volumes Left	Thru	Rght	TRCK	Total	Percentages Left	Thru	Rght	TRCK
Southbound	OPHIR ROAD	07:15am	.794	111	13	65	8	197	56.3	6.5	32.9	4.0
Westbound	SR 80 WB RAMPS		.778	27	166	6	22	221	12.2	75.1	2.7	9.9
Northbound			.826	14	50	4	8	76	18.4	65.7	5.2	10.5
Eastbound			.814	44	28	237	23	332	13.2	8.4	71.3	6.9

CITY OF NEWCASTLE

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

Site Code : 00000000
Start Date: 08/09/05
File I.D. : OPHTAYAM
Page : 2

OPHIR ROAD

8 | 65 | 13 | 111 | 44
50
6
=====
100

Inbound 197
Outbound 100
Total 297

22

6

14
245 166
65

44

166

Inbound 332
Outbound 245
28 Total 577

Inbound 221
Outbound 143 27
Total 364

237

111
28 143
4
SR 80 WB RAMPS

Inbound 76
Outbound 277
Total 353

23

27 | 14 | 50 | 4 | 8
13
237
=====
277

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

CITY OF NEWCASTLE

Site Code : 00000000
Start Date: 08/03/05
File I.D. : OPHTAYPM
Page : 1

	OPHIR ROAD Southbound					SR 80 WB RAMPS Westbound					Northbound					Eastbound							
Start Time	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Total-	TRCK=	
4:00pm	15	3	21	3	42	4	59	2	2	67	5	31	2	1	39	36	4	59	5	104	252	11	241
4:15	14	4	22	4	44	0	55	3	2	60	7	38	0	2	47	48	6	63	7	124	275	15	260
4:30	19	6	22	1	48	8	64	2	7	81	3	29	4	1	37	24	4	56	7	91	257	16	241
4:45	21	4	27	0	52	5	68	3	5	81	5	33	4	0	42	33	3	78	8	122	297	13	284
Hour Total	69	17	92	8	186	17	246	10	16	289	20	131	10	4	165	141	17	256	27	441	1081	55	1026
5:00pm	14	1	23	0	38	5	66	1	1	73	8	26	6	1	41	26	7	69	5	107	259	7	252
5:15	18	1	27	1	47	7	63	4	5	79	8	23	3	3	37	18	7	84	5	114	277	14	263
5:30	12	1	15	1	29	2	60	3	0	65	9	25	4	1	39	29	7	53	3	92	225	5	220
5:45	15	0	19	1	35	1	33	2	0	36	4	20	0	0	24	17	3	48	4	72	167	5	162
Hour Total	59	3	84	3	149	15	222	10	6	253	29	94	13	5	141	90	24	254	17	385	928	31	897
Grand	128	20	176	11	335	32	468	20	22	542	49	225	23	9	306	231	41	510	44	826	2009	86	1923
% of Total	6.4	1.0	8.8	.5%		1.6	23.3	1.0	1.1%		2.4	11.2	1.1	.4%		11.5	2.0	25.4	2.2%			4.3%	95.7%
Apprch %					16.7%					27.0%					15.2%					41.1%			
% of Apprc	38.2	6.0	52.5	3.3%		5.9	86.3	3.7	4.1%		16.0	73.5	7.5	2.9%		28.0	5.0	61.7	5.3%				

Peak Hour Analysis By Entire Intersection for the Period: 04:00pm to 05:45pm on 08/03/05

Direction	Street Name	Start Peak Hour	Peak Hr Factor	Volumes Left	Thru	Rght	TRCK	Total	Percentages Left	Thru	Rght	TRCK
Southbound	OPHIR ROAD	04:30pm	.889	72	12	99	2	185	38.9	6.4	53.5	1.0
Westbound	SR 80 WB RAMPS		.969	25	261	10	18	314	7.9	83.1	3.1	5.7
Northbound			.935	24	111	17	5	157	15.2	70.7	10.8	3.1
Eastbound			.889	101	21	287	25	434	23.2	4.8	66.1	5.7

CITY OF NEWCASTLE

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

Site Code : 00000000
Start Date: 08/03/05
File I.D. : OPHTAYPM
Page : 2

OPHIR ROAD

2
99
12
72
101
111
10
=====
222
18
10
261

Inbound 185
Outbound 222
Total 407

24
384 261
99
101

Inbound 434
Outbound 384
Total 818
21
287

Inbound 314
Outbound 110
Total 424
25

72
21 110
17
SR 80 WB RAMPS

Inbound 157
Outbound 324
Total 481
25
25
12
287
=====
324
24
111
17
5

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville, CA. 95678
(916) 771-8700

CITY OF NEWCASTLE

Site Code : 00000000
Start Date: 08/03/05
File I.D. : OPHGER
Page : 1

	GERALDSON ROAD Southbound					OPHIR ROAD Westbound					Northbound					Eastbound							
Start Time	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Total-	TRCK-	
7:00am	1	0	1	0	2	0	18	1	1	20	0	0	0	0	0	0	9	0	1	10	32	2	30
7:15	1	0	2	0	3	0	16	0	0	16	0	0	0	0	0	0	18	0	4	22	41	4	37
7:30	2	0	2	0	4	0	30	1	0	31	0	0	0	0	0	0	15	0	1	16	51	1	50
7:45	1	0	0	0	1	0	29	1	2	32	0	0	0	0	0	1	11	0	2	14	47	4	43
Hour Total	5	0	5	0	10	0	93	3	3	99	0	0	0	0	0	1	53	0	8	62	171	11	160
8:00am	1	0	1	0	2	0	19	0	0	19	0	0	0	0	0	1	11	0	1	13	34	1	33
8:15	1	0	0	0	1	0	22	0	5	27	0	0	0	0	0	0	25	0	6	31	59	11	48
8:30	0	0	1	0	1	0	27	1	2	30	0	0	0	0	0	1	24	0	5	30	61	7	54
8:45	0	0	3	0	3	0	16	0	3	19	0	0	0	0	0	1	18	0	3	22	44	6	38
Hour Total	2	0	5	0	7	0	84	1	10	95	0	0	0	0	0	3	78	0	15	96	198	25	173
Grand	7	0	10	0	17	0	177	4	13	194	0	0	0	0	0	4	131	0	23	158	369	36	333
% of Total	1.9	0.0	2.7	0.0%		0.0	48.0	1.1	3.5%		0.0	0.0	0.0	0.0%		1.1	35.5	0.0	6.2%			9.8%	90.2%
Apprch %					4.6%					52.6%										42.8%			
% of Apprc	41.2	0.0	58.8	0.0%		0.0	91.2	2.1	6.7%		0.0	0.0	0.0	0.0%		2.5	82.9	0.0	14.6%				

Peak Hour Analysis By Entire Intersection for the Period: 07:00am to 08:45am on 08/03/05

Direction	Street Name	Start Peak Hour	Peak Hr Factor	Volumes Left	Thru	Rght	TRCK	Total	Percentages Left	Thru	Rght	TRCK
Southbound	GERALDSON ROAD	07:45am	.625	3	0	2	0	5	60.0	.0	40.0	.0
Westbound	OPHIR ROAD		.844	0	97	2	9	108	.0	89.8	1.8	8.3
Northbound			.0	0	0	0	0	0	0.0	0.0	0.0	0.0
Eastbound			.710	3	71	0	14	88	3.4	80.6	.0	15.9

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

CITY OF NEWCASTLE

Site Code : 00000000
Start Date: 08/03/05
File I.D. : OPHGER
Page : 2

GERALDSON ROAD

0 2 0 3

3
0
2
=====
5

9

Inbound 5
Outbound 5
Total 10

2

0
99 97
2

97

3

Inbound 88
Outbound 99
71 Total 187

Inbound 108
Outbound 74 0
Total 182

0

3
71 74
0
OPHIR ROAD

Inbound 0
Outbound 0
Total 0

14

0 0 0 0 0
0
0
=====
0

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

CITY OF NEWCASTLE

Site Code : 00000000
Start Date: 08/03/05
File I.D. : OPHGER
Page : 1

	GERALDSON ROAD Southbound					OPHIR ROAD Westbound					Northbound					Eastbound							
Start Time	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Left	Thru	Rght	TRCK	Totl	Total-	TRCK=	
4:00pm	3	0	2	0	5	0	24	2	0	26	0	0	0	0	0	1	36	0	3	40	71	3	68
4:15	0	0	1	0	1	0	26	2	3	31	0	0	0	0	0	2	33	0	3	38	70	6	64
4:30	2	0	3	1	6	0	14	2	1	17	0	0	0	0	0	1	43	0	2	46	69	4	65
4:45	0	0	0	0	0	0	18	1	0	19	0	0	0	0	0	3	27	0	2	32	51	2	49
Hour Total	5	0	6	1	12	0	82	7	4	93	0	0	0	0	0	7	139	0	10	156	261	15	246
5:00pm	0	0	0	0	0	0	18	3	0	21	0	0	0	0	0	1	32	0	2	35	56	2	54
5:15	0	0	4	0	4	0	24	2	2	28	0	0	0	0	0	0	26	0	3	29	61	5	56
5:30	0	0	1	0	1	0	25	2	1	28	0	0	0	0	0	1	25	0	1	27	56	2	54
5:45	0	0	1	0	1	0	16	0	0	16	0	0	0	0	0	1	31	0	3	35	52	3	49
Hour Total	0	0	6	0	6	0	83	7	3	93	0	0	0	0	0	3	114	0	9	126	225	12	213
Grand	5	0	12	1	18	0	165	14	7	186	0	0	0	0	0	10	253	0	19	282	486	27	459
% of Total	1.0	0.0	2.5	.2%		0.0	34.0	2.9	1.4%		0.0	0.0	0.0	0.0%		2.1	52.1	0.0	3.9%			5.6%	94.4%
Apprch %					3.7%					38.3%										58.0%			
% of Apprc	27.8	0.0	66.7	5.6%		0.0	88.7	7.5	3.8%		0.0	0.0	0.0	0.0%		3.5	89.7	0.0	6.7%				

Peak Hour Analysis By Entire Intersection for the Period: 04:00pm to 05:45pm on 08/03/05

Direction	Street Name	Start Peak Hour	Peak Hr Factor	Volumes Left	Thru	Rght	TRCK	Total	Percentages Left	Thru	Rght	TRCK
Southbound	GERALDSON ROAD	04:00pm	.500	5	0	6	1	12	41.6	.0	50.0	8.3
Westbound	OPHIR ROAD		.750	0	82	7	4	93	.0	88.1	7.5	4.3
Northbound			.0	0	0	0	0	0	0.0	0.0	0.0	0.0
Eastbound			.848	7	139	0	10	156	4.4	89.1	.0	6.4

CITY OF NEWCASTLE

All Traffic Data
5098 Foothills Blvd. 3-302
Roseville,CA. 95678
(916)771-8700

Site Code : 00000000
Start Date: 08/03/05
File I.D. : OPHGER
Page : 2

GERALDSON ROAD

1 6 0 5 7
0
7
=====
14

Inbound 12
Outbound 14
Total 26

4

7

0
88 82
6

7

82

Inbound 156
Outbound 88
139 Total 244

Inbound 93
Outbound 144 0
Total 237

0

5
139 144
0
OPHIR ROAD

10

Inbound 0
Outbound 0
Total 0

0 0 0 0 0
0
0
=====
0

CITY OF AUBURN

All Traffic Data
(916) 771-8700

Site Code : 000000000000
Start Date: 08/03/2005
File I.D. : OPHIR-V
Page : 1

OPHIR ROAD 300 FEET EAST OF GERALDSON ROAD

Direction 1

Begin Time	<------ WB A.M.		P.M.		------><------ EB A.M.		P.M.		------><------Combined A.M.		P.M.		------> Wednesday
12:00 08/03	4		20		1		21		5		41		
12:15	0		21		3		26		3		47		
12:30	0		22		0		28		0		50		
12:45	1	5	24	87	3	7	25	100	4	12	49	187	
01:00	0		23		3		18		3		41		
01:15	0		14		2		16		2		30		
01:30	0		24		0		22		0		46		
01:45	1	1	18	79	1	6	25	81	2	7	43	160	
02:00	0		26		1		16		1		42		
02:15	0		23		1		25		1		48		
02:30	0		16		0		21		0		37		
02:45	0	*	27	92	3	5	26	88	3	5	53	180	
03:00	1		20		0		33		1		53		
03:15	0		34		0		33		0		67		
03:30	0		24		1		34		1		58		
03:45	2	3	32	110	0	1	36	136	2	4	68	246	
04:00	1		26		1		50		2		76		
04:15	1		29		0		39		1		68		
04:30	3		26		2		38		5		64		
04:45	5	10	15	96	1	4	40	167	6	14	55	263	
05:00	6		18		0		31		6		49		
05:15	10		23		4		31		14		54		
05:30	10		27		2		29		12		56		
05:45	18	44	19	87	8	14	23	114	26	58	42	201	
06:00	13		19		4		31		17		50		
06:15	22		17		8		21		30		38		
06:30	21		10		13		18		34		28		
06:45	33	89	16	62	16	41	12	82	49	130	28	144	
07:00	26		11		12		13		38		24		
07:15	17		12		11		12		28		24		
07:30	21		5		16		8		37		13		
07:45	30	94	6	34	18	57	10	43	48	151	16	77	
08:00	27		8		14		16		41		24		
08:15	27		5		16		12		43		17		
08:30	23		7		26		11		49		18		
08:45	23	100	13	33	24	80	10	49	47	180	23	82	
09:00	19		3		22		15		41		18		
09:15	21		10		16		16		37		26		
09:30	20		6		16		5		36		11		
09:45	25	85	5	24	31	85	4	40	56	170	9	64	
10:00	26		2		19		12		45		14		
10:15	18		2		22		6		40		8		
10:30	25		4		21		4		46		8		
10:45	25	94	5	13	23	85	3	25	48	179	8	38	
11:00	30		8		15		5		45		13		
11:15	26		1		27		6		53		7		
11:30	20		1		28		4		48		5		
11:45	27	103	3	13	25	95	2	17	52	198	5	30	
Totals	628		730		480		942		1108		1672		
Day Totals		1358				1422				2780			
Split %	56.6%		43.6%		43.3%		56.3%						
Peak Hour	07:45		03:15		11:00		04:00		11:00		03:45		
Volume	107		116		95		167		198		276		
P.H.F.	.89		.85		.84		.83		.93		.90		

APPENDIX B:

WORKSHEETS FOR EXISTING (2005) WITHOUT PROPOSED PROJECT CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	44	28	237	27	166	6	14	50	4	111	13	65
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	48	30	258	29	180	7	15	54	4	121	14	71

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	78	258	216	70	4	135	71
Volume Left (vph)	48	0	29	15	0	121	0
Volume Right (vph)	0	258	7	0	4	0	71
Hadj (s)	0.24	-0.48	0.18	0.30	-0.51	0.52	-0.63
Departure Headway (s)	5.2	3.2	4.9	5.8	5.0	5.9	4.7
Degree Utilization, x	0.11	0.23	0.30	0.11	0.01	0.22	0.09
Capacity (veh/h)	648	1122	698	578	666	580	717
Control Delay (s)	8.8	7.1	10.0	8.4	6.8	9.4	7.0
Approach Delay (s)	7.5		10.0	8.3		8.5	
Approach LOS	A		A	A		A	

Intersection Summary			
Delay	8.5		
HCM Level of Service	A		
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	3	71	97	2	3	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	77	105	2	3	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	108				189	105
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	108				189	105
tC, single (s)	4.3				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1400				802	954

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	80	105	2	5
Volume Left	3	0	0	3
Volume Right	0	0	2	2
cSH	1400	1700	1700	1337
Volume to Capacity	0.00	0.06	0.00	0.00
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.3	0.0	0.0	9.2
Lane LOS	A			A
Approach Delay (s)	0.3	0.0		9.2
Approach LOS				A

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	16.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	101	21	287	25	261	10	24	111	17	72	12	99
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	110	23	312	27	284	11	26	121	18	78	13	108

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	133	312	322	147	18	91	108
Volume Left (vph)	110	0	27	26	0	78	0
Volume Right (vph)	0	312	11	0	18	0	108
Hadj (s)	0.27	-0.50	0.10	0.14	-0.65	0.45	-0.68
Departure Headway (s)	5.7	3.2	5.2	6.2	5.4	6.5	5.4
Degree Utilization, x	0.21	0.28	0.47	0.25	0.03	0.16	0.16
Capacity (veh/h)	580	1112	649	526	606	513	617
Control Delay (s)	10.2	7.4	12.7	10.1	7.4	9.6	8.2
Approach Delay (s)	8.3		12.7	9.8		8.8	
Approach LOS	A		B	A		A	

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	7	139	82	7	5	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	151	89	8	5	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	97				255	89
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	97				255	89
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				99	99
cM capacity (veh/h)	1472				716	952

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	159	89	8	12
Volume Left	8	0	0	5
Volume Right	0	0	8	7
cSH	1472	1700	1700	1576
Volume to Capacity	0.01	0.05	0.00	0.01
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.4	0.0	0.0	9.4
Lane LOS	A			A
Approach Delay (s)	0.4	0.0		9.4
Approach LOS				A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	23.0%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX C:

WORKSHEETS FOR FUTURE (2025) WITHOUT PROPOSED PROJECT CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	92	58	495	56	346	13	29	104	8	231	27	136
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	100	63	538	61	376	14	32	113	9	251	29	148

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	163	538	451	145	9	280	148
Volume Left (vph)	100	0	61	32	0	251	0
Volume Right (vph)	0	538	14	0	9	0	148
Hadj (s)	0.24	-0.48	0.18	0.30	-0.51	0.52	-0.63
Departure Headway (s)	7.0	3.2	6.3	7.8	7.0	7.5	6.3
Degree Utilization, x	0.32	0.48	0.78	0.31	0.02	0.58	0.26
Capacity (veh/h)	455	1116	560	412	458	461	543
Control Delay (s)	13.2	9.1	28.2	13.1	8.9	19.1	10.3
Approach Delay (s)	10.1		28.2	12.9		16.1	
Approach LOS	B		D	B		C	

Intersection Summary			
Delay	16.5		
HCM Level of Service	C		
Intersection Capacity Utilization	77.0%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	6	148	203	4	6	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	161	221	4	7	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	225				395	221
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	225				395	221
tC, single (s)	4.3				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1265				610	824

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	167	221	4	11
Volume Left	7	0	0	7
Volume Right	0	0	4	4
cSH	1265	1700	1700	1017
Volume to Capacity	0.01	0.13	0.00	0.01
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.3	0.0	0.0	10.3
Lane LOS	A			B
Approach Delay (s)	0.3	0.0		10.3
Approach LOS				B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	211	44	599	52	545	21	50	231	35	150	25	207
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	229	48	651	57	592	23	54	251	38	163	27	225

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	277	651	672	305	38	190	225
Volume Left (vph)	229	0	57	54	0	163	0
Volume Right (vph)	0	651	23	0	38	0	225
Hadj (s)	0.27	-0.50	0.10	0.14	-0.65	0.45	-0.68
Departure Headway (s)	8.3	3.2	7.6	8.5	7.8	8.9	7.8
Degree Utilization, x	0.64	0.58	1.42	0.72	0.08	0.47	0.48
Capacity (veh/h)	410	1118	473	410	449	394	441
Control Delay (s)	25.1	10.5	224.6	29.8	10.3	18.3	16.6
Approach Delay (s)	14.9		224.6	27.6		17.4	
Approach LOS	B		F	D		C	

Intersection Summary			
Delay	76.9		
HCM Level of Service	F		
Intersection Capacity Utilization	89.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	15	290	171	15	10	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	315	186	16	11	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	202				534	186
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	202				534	186
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				98	98
cM capacity (veh/h)	1346				490	841

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	332	186	16	25
Volume Left	16	0	0	11
Volume Right	0	0	16	14
cSH	1346	1700	1700	1127
Volume to Capacity	0.01	0.11	0.01	0.02
Queue Length 95th (ft)	1	0	0	2
Control Delay (s)	0.5	0.0	0.0	10.7
Lane LOS	A			B
Approach Delay (s)	0.5	0.0		10.7
Approach LOS				B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D:

WORKSHEETS FOR EXISTING (2005) PLUS PROPOSED PROJECT CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	48	28	237	27	166	6	14	54	4	114	13	67
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	30	258	29	180	7	15	59	4	124	14	73

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	83	258	216	74	4	138	73
Volume Left (vph)	52	0	29	15	0	124	0
Volume Right (vph)	0	258	7	0	4	0	73
Hadj (s)	0.25	-0.48	0.18	0.29	-0.51	0.52	-0.63
Departure Headway (s)	5.2	3.2	4.9	5.8	5.0	5.9	4.8
Degree Utilization, x	0.12	0.23	0.30	0.12	0.01	0.23	0.10
Capacity (veh/h)	643	1122	693	576	662	577	713
Control Delay (s)	8.9	7.1	10.0	8.4	6.9	9.4	7.1
Approach Delay (s)	7.6		10.0	8.4		8.6	
Approach LOS	A		B	A		A	

Intersection Summary			
Delay	8.5		
HCM Level of Service	A		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	3	79	102	2	3	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	86	111	2	3	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	113				203	111
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	113				203	111
tC, single (s)	4.3				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1394				788	948

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	89	111	2	5
Volume Left	3	0	0	3
Volume Right	0	0	2	2
cSH	1394	1700	1700	1313
Volume to Capacity	0.00	0.07	0.00	0.00
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.3	0.0	0.0	9.3
Lane LOS	A			A
Approach Delay (s)	0.3	0.0		9.3
Approach LOS				A

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	82	0	0	99	5	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	89	0	0	108	5	7
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			89		197	89
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			89		197	89
tC, single (s)			4.1		7.2	7.0
tC, 2 stage (s)						
tF (s)			2.2		4.2	4.0
p0 queue free %			100		99	99
cM capacity (veh/h)			1519		641	787

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	89	108	5	7
Volume Left	0	0	5	0
Volume Right	0	0	0	7
cSH	1700	1700	641	787
Volume to Capacity	0.05	0.06	0.01	0.01
Queue Length 95th (ft)	0	0	1	1
Control Delay (s)	0.0	0.0	10.7	9.6
Lane LOS			B	A
Approach Delay (s)	0.0	0.0	10.1	
Approach LOS			B	

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	80	8	7	99	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	9	8	108	0	0
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			96		210	87
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			96		210	87
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1461		779	977

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	87	9	115
Volume Left	0	0	8
Volume Right	0	9	0
cSH	1700	1700	1461
Volume to Capacity	0.05	0.01	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.5
Lane LOS			A
Approach Delay (s)	0.0		0.5
Approach LOS			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	15.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	102	21	287	25	261	10	24	112	17	74	12	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	111	23	312	27	284	11	26	122	18	80	13	110

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	134	312	322	148	18	93	110
Volume Left (vph)	111	0	27	26	0	80	0
Volume Right (vph)	0	312	11	0	18	0	110
Hadj (s)	0.27	-0.50	0.10	0.14	-0.65	0.45	-0.68
Departure Headway (s)	5.7	3.2	5.2	6.2	5.4	6.5	5.4
Degree Utilization, x	0.21	0.28	0.47	0.26	0.03	0.17	0.16
Capacity (veh/h)	578	1112	647	525	604	512	617
Control Delay (s)	10.2	7.4	12.8	10.2	7.4	9.6	8.2
Approach Delay (s)	8.3		12.8	9.9		8.9	
Approach LOS	A		B	A		A	

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	7	141	86	7	5	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	153	93	8	5	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	101				262	93
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	101				262	93
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				99	99
cM capacity (veh/h)	1467				710	947

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	161	93	8	12
Volume Left	8	0	0	5
Volume Right	0	0	8	7
cSH	1467	1700	1700	1562
Volume to Capacity	0.01	0.05	0.00	0.01
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.4	0.0	0.0	9.4
Lane LOS	A			A
Approach Delay (s)	0.4	0.0		9.4
Approach LOS				A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	148	0	0	89	4	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	161	0	0	97	4	4
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			161		258	161
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			161		258	161
tC, single (s)			4.1		6.9	6.7
tC, 2 stage (s)						
tF (s)			2.2		3.9	3.7
p0 queue free %			100		99	99
cM capacity (veh/h)			1430		642	777

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	161	97	4	4
Volume Left	0	0	4	0
Volume Right	0	0	0	4
cSH	1700	1700	642	777
Volume to Capacity	0.09	0.06	0.01	0.01
Queue Length 95th (ft)	0	0	1	0
Control Delay (s)	0.0	0.0	10.6	9.7
Lane LOS			B	A
Approach Delay (s)	0.0	0.0	10.2	
Approach LOS			B	

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	150	2	2	89	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	163	2	2	97	0	0
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			165		264	163
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			165		264	163
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1401		728	887

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	163	2	99
Volume Left	0	0	2
Volume Right	0	2	0
cSH	1700	1700	1401
Volume to Capacity	0.10	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.2
Lane LOS			A
Approach Delay (s)	0.0		0.2
Approach LOS			

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	14.8%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX E:

WORKSHEETS FOR FUTURE (2025) PLUS PROPOSED PROJECT CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	96	58	495	56	346	13	29	108	8	234	27	138
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	63	538	61	376	14	32	117	9	254	29	150

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	167	538	451	149	9	284	150
Volume Left (vph)	104	0	61	32	0	254	0
Volume Right (vph)	0	538	14	0	9	0	150
Hadj (s)	0.24	-0.48	0.18	0.29	-0.51	0.52	-0.63
Departure Headway (s)	7.1	3.2	6.3	7.8	7.0	7.5	6.3
Degree Utilization, x	0.33	0.48	0.79	0.32	0.02	0.59	0.26
Capacity (veh/h)	451	1116	556	409	453	459	539
Control Delay (s)	13.5	9.1	29.0	13.4	8.9	19.7	10.4
Approach Delay (s)	10.1		29.0	13.1		16.5	
Approach LOS	B		D	B		C	

Intersection Summary			
Delay	16.8		
HCM Level of Service	C		
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	6	156	208	4	6	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	170	226	4	7	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	230				409	226
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	230				409	226
tC, single (s)	4.3				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1259				599	818

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	176	226	4	11
Volume Left	7	0	0	7
Volume Right	0	0	4	4
cSH	1259	1700	1700	998
Volume to Capacity	0.01	0.13	0.00	0.01
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.3	0.0	0.0	10.4
Lane LOS	A			B
Approach Delay (s)	0.3	0.0		10.4
Approach LOS				B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	162	0	0	207	5	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	176	0	0	225	5	7
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			176		401	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			176		401	176
tC, single (s)			4.1		7.2	7.0
tC, 2 stage (s)						
tF (s)			2.2		4.2	4.0
p0 queue free %			100		99	99
cM capacity (veh/h)			1412		477	697

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	176	225	5	7
Volume Left	0	0	5	0
Volume Right	0	0	0	7
cSH	1700	1700	477	697
Volume to Capacity	0.10	0.13	0.01	0.01
Queue Length 95th (ft)	0	0	1	1
Control Delay (s)	0.0	0.0	12.6	10.2
Lane LOS			B	B
Approach Delay (s)	0.0	0.0	11.3	
Approach LOS			B	

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	20.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	160	8	7	207	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	174	9	8	225	0	0
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			183		414	174
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			183		414	174
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1357		595	875

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	174	9	233
Volume Left	0	0	8
Volume Right	0	9	0
cSH	1700	1700	1357
Volume to Capacity	0.10	0.01	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.3
Lane LOS			A
Approach Delay (s)	0.0		0.3
Approach LOS			

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	21.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	212	44	599	52	545	21	50	232	35	152	25	209
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	230	48	651	57	592	23	54	252	38	165	27	227

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	278	651	672	307	38	192	227
Volume Left (vph)	230	0	57	54	0	165	0
Volume Right (vph)	0	651	23	0	38	0	227
Hadj (s)	0.27	-0.50	0.10	0.14	-0.65	0.45	-0.68
Departure Headway (s)	8.4	3.2	7.7	8.6	7.8	8.9	7.8
Degree Utilization, x	0.65	0.58	1.43	0.73	0.08	0.47	0.49
Capacity (veh/h)	409	1118	471	409	448	393	441
Control Delay (s)	25.4	10.5	227.1	30.2	10.3	18.5	16.8
Approach Delay (s)	15.0		227.1	28.0		17.6	
Approach LOS	B		F	D		C	

Intersection Summary			
Delay	77.6		
HCM Level of Service	F		
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		4%	
Volume (veh/h)	15	292	175	15	10	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	317	190	16	11	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	207				540	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	207				540	190
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				98	98
cM capacity (veh/h)	1341				486	836

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	334	190	16	25
Volume Left	16	0	0	11
Volume Right	0	0	16	14
cSH	1341	1700	1700	1117
Volume to Capacity	0.01	0.11	0.01	0.02
Queue Length 95th (ft)	1	0	0	2
Control Delay (s)	0.5	0.0	0.0	10.8
Lane LOS	A			B
Approach Delay (s)	0.5	0.0		10.8
Approach LOS				B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	302	0	0	186	4	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	328	0	0	202	4	4
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			328		530	328
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			328		530	328
tC, single (s)			4.1		6.9	6.7
tC, 2 stage (s)						
tF (s)			2.2		3.9	3.7
p0 queue free %			100		99	99
cM capacity (veh/h)			1243		438	619

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	328	202	4	4
Volume Left	0	0	4	0
Volume Right	0	0	0	4
cSH	1700	1700	438	619
Volume to Capacity	0.19	0.12	0.01	0.01
Queue Length 95th (ft)	0	0	1	1
Control Delay (s)	0.0	0.0	13.3	10.9
Lane LOS			B	B
Approach Delay (s)	0.0	0.0	12.1	
Approach LOS			B	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	304	2	2	186	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	330	2	2	202	0	0
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			333		537	330
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			333		537	330
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1216		507	716

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	330	2	204
Volume Left	0	0	2
Volume Right	0	2	0
cSH	1700	1700	1216
Volume to Capacity	0.19	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.1
Lane LOS			A
Approach Delay (s)	0.0		0.1
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX F:

WORKSHEETS FOR TRAFFIC SIGNAL WARRANT ANALYSIS

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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				Uncontrolled				Uncontrolled			
Lanes:	0	1	0	0 1	0	1	0	0 1	0	1	0	0 1	0	0	1!	0 0
Final Vol.:	14		50	4	111		13	65	44		28	237	27		166	6

Major Street Volume: 508
Minor Approach Volume: 189
Minor Approach Volume Threshold: 665

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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				Uncontrolled				Uncontrolled			
Lanes:	0	1	0	0 1	0	1	0	0 1	0	1	0	0 1	0	0	1!	0 0
Final Vol.:	24	111		17	72	12		99	101	21		287	25	261		10

Major Street Volume: 705
Minor Approach Volume: 183
Minor Approach Volume Threshold: 524

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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				Uncontrolled				Uncontrolled			
Lanes:	0	1	0	0 1	0	1	0	0 1	0	1	0	0 1	0	0	1!	0 0
Final Vol.:	14		54	4	114		13	67	48		28	237	27		166	6

Major Street Volume: 512
Minor Approach Volume: 194
Minor Approach Volume Threshold: 662

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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				Uncontrolled				Uncontrolled			
Lanes:	0	1	0	0 1	0	1	0	0 1	0	1	0	0 1	0	0	1!	0 0
Final Vol.:	25	112		17	74	12		101	102	21		287	25	261		10

Major Street Volume: 706
Minor Approach Volume: 187
Minor Approach Volume Threshold: 524

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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
Control:	Stop Sign				Stop Sign				Uncontrolled				Uncontrolled			
Lanes:	0	1	0	0 1	0	1	0	0 1	0	1	0	0 1	0	0	1!	0 0
Final Vol.:	29	104		8	231	27		136	92	58		495	56	346		13

Major Street Volume: 1060
Minor Approach Volume: 394
Minor Approach Volume Threshold: 349

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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
Control:	Stop Sign				Stop Sign				Uncontrolled				Uncontrolled			
Lanes:	0	1	0	0 1	0	1	0	0 1	0	1	0	0 1	0	0	1!	0 0
Final Vol.:	50	231		35	150		25	207	211		44	599	52	545		21

Major Street Volume: 1472
Minor Approach Volume: 382
Minor Approach Volume Threshold: 208

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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
Control:	Stop Sign				Stop Sign				Uncontrolled				Uncontrolled			
Lanes:	0	1	0	0 1	0	1	0	0 1	0	1	0	0 1	0	0	1!	0 0
Final Vol.:	29	108		8	234	27		138	96	58		495	56	346		13

Major Street Volume: 1064
Minor Approach Volume: 399
Minor Approach Volume Threshold: 347

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ophir Rd. & Taylor Rd.

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
Control:	Stop Sign					Stop Sign					Uncontrolled					Uncontrolled				
Lanes:	0	1	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	1!	0	0
Final Vol.:	50		232		35	152		25		209	212		44		599	52		545		21

Major Street Volume: 1473
Minor Approach Volume: 386
Minor Approach Volume Threshold: 208

APPENDIX G:

WORKSHEETS FOR I-80 RAMP MERGE/DIVERGE EVALUATION

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 EB Off-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 PM Peak (NP)	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	152	0.90	Level	7	2	0.962	1.00	175
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.641 using Equation (Exhibit 25-11)

V_{12} = 2911 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	4445	7050	No
V_{12}	2911	4400:All	No
$V_{FO} = V_F - V_R$	4270	7050	No
V_R	175	2100	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 29.3 (pc/ mi /ln)

LOS= D (Exhibit 25-4)

Speed Estimation

D_s = 0.379 (Exhibit 25-19)

S_R= 56.3 mph (Exhibit 25-19)

S_0= 69.2 mph (Exhibit 25-19)

S= mph (Exhibit 25-14)	S = 60.2 mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.1 Generated: 7/12/2006 9:16 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 EB Off-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 PM Peak	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	153	0.90	Level	7	2	0.962	1.00	177
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.641 using Equation (Exhibit 25-11)

V_{12} = 2912 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	4445	7050	No
V_{12}	2912	4400:All	No
$V_{FO} = V_F - V_R$	4268	7050	No
V_R	177	2100	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 29.3 (pc/ mi /ln)

LOS= D (Exhibit 25-4)

Speed Estimation

D_s = 0.379 (Exhibit 25-19)

S_R= 56.3 mph (Exhibit 25-19)

S_0= 69.2 mph (Exhibit 25-19)

S= mph (Exhibit 25-14)	S = 60.2 mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.1 Generated: 10/5/2006 1:18 PM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 EB On-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 PM Peak (NP)	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	324	0.90	Level	7	2	0.962	1.00	374
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 0.586 using Equation (Exhibit 25-5)

V_{12}= 2604 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4819	See Exhibit 25-7	No
V_{R12}	2978	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 26.7 (pc/ m/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.374 (Exibit 25-19)

S_R= 56.4 mph (Exhibit 25-19)

S_0= 60.2 mph(Exhibit 25-19)

S= 57.8 mph(Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph(Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved *HCS+*™ Version 5.1 Generated: 7/12/2006 9:18 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 EB On-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 PM Peak	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	324	0.90	Level	7	2	0.962	1.00	374
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 0.586 using Equation (Exhibit 25-5)

V_{12}= 2604 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4819	See Exhibit 25-7	No
V_{R12}	2978	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 26.7 (pc/ m/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.374 (Exibit 25-19)

S_R= 56.4 mph (Exhibit 25-19)

S_0= 60.2 mph(Exhibit 25-19)

S= 57.8 mph(Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph(Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved *HCS+*™ Version 5.1 Generated: 7/12/2006 9:18 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 WB Off-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 PM Peak (NP)	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	296	0.90	Level	7	2	0.962	1.00	342
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.633 using Equation (Exhibit 25-11)

V_{12} = 2940 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	4445	7050	No
V_{12}	2940	4400:All	No
$V_{FO} = V_F - V_R$	4103	7050	No
V_R	342	2100	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 29.5 (pc/ mi /ln)

LOS= D (Exhibit 25-4)

Speed Estimation

D_s = 0.394 (Exhibit 25-19)

S_R= 55.9 mph (Exhibit 25-19)

S_0= 69.3 mph (Exhibit 25-19)

S= mph (Exhibit 25-14)	S = 59.9 mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.1 Generated: 7/12/2006 9:19 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 WB Off-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 PM Peak	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

Vu = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	296	0.90	Level	7	2	0.962	1.00	342
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.633 using Equation (Exhibit 25-11)

V_{12} = 2940 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	4445	7050	No
V_{12}	2940	4400:All	No
$V_{FO} = V_F - V_R$	4103	7050	No
V_R	342	2100	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = 29.5 (pc/ mi /ln)

LOS= D (Exhibit 25-4)

Speed Estimation

D_s = 0.394 (Exhibit 25-19)

S_R= 55.9 mph (Exhibit 25-19)

S_0= 69.3 mph (Exhibit 25-19)

S= mph (Exhibit 25-14)	S = 59.9 mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.1 Generated: 7/12/2006 9:20 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 WB On-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 AM Peak (NP)	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	143	0.90	Level	7	2	0.962	1.00	165
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 0.586 using Equation (Exhibit 25-5)

V_{12}= 2604 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4610	See Exhibit 25-7	No
V_{R12}	2769	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 25.1 (pc/ m/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.359 (Exibit 25-19)

S_R= 56.7 mph (Exhibit 25-19)

S_0= 60.2 mph(Exhibit 25-19)

S= 58.1 mph(Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph(Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved *HCS+*™ Version 5.1 Generated: 7/12/2006 9:20 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-80 WB On-Ramp
Agency or Company	Kimley-Horn and Associates	Junction	Ophir Rd.
Date Performed	6/27/2006	Jurisdiction	City of Auburn
Analysis Time Period	2005 AM Peak	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 40.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3850	0.90	Level	7	2	0.962	1.00	4445
Ramp	146	0.90	Level	7	2	0.962	1.00	169
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 0.586 using Equation (Exhibit 25-5)

V_{12}= 2604 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4614	See Exhibit 25-7	No
V_{R12}	2773	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 25.1 (pc/ m/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.359 (Exibit 25-19)

S_R= 56.7 mph (Exhibit 25-19)

S_0= 60.2 mph(Exhibit 25-19)

S= 58.1 mph(Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph(Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

Copyright © 2005 University of Florida, All Rights Reserved *HCS+*™ Version 5.1 Generated: 7/12/2006 10:33 AM