Traffic Impact Analysis Report

Doobie Nights

Cannabis Dispensary Development

3011 Santa Rosa Avenue

Santa Rosa, California

March 6, 2019

TJKM

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EXECUTIVE SUMMARY

This report summarizes the results of the Traffic Impact Analysis (TIA) conducted for the proposed Cannabis Dispensary (Dispensary) located at 3011 Santa Rosa Avenue in the City of Santa Rosa, California. The project proposes to occupy an existing 5,820 sf of retail and office space in a small shopping center for Cannabis sales.

The project would be located in a two-story building that has 15,120 sf on the first floor, with 3 commercial units, and 7,560 sf on the second floor. The previous use was a Laser Tag recreational facility. The project proposes to utilize 3,072 sf of the previous use for retail and 2,748 sf on the second floor for office and storage.

The report also includes evaluations and recommendations concerning project site access and on-site circulation for vehicles, bicycles, and pedestrians; evaluation of on-site vehicle parking supply, passenger and commercial loading spaces, garbage/trash facilities.

To evaluate the impacts on the transportation infrastructure due to the addition of traffic from the proposed project, four study intersections were evaluated during the weekday morning (a.m.) peak hour, and evening (p.m.) peak hour under four study scenarios. The study intersections were evaluated under *No Project* and *plus Project* scenarios for Existing and Existing plus Approved and Pending Development. For the purposes of this analysis, potential traffic operational effects from the proposed project are identified based on established traffic operational thresholds for the City of Santa Rosa.

Project Trip Generation

The proposed project is expected to generate approximately 61 weekday a.m. peak hour trips (31 inbound trips, 30 outbound trips), and 106 weekday p.m. peak hour trips (53 inbound trips, 53 outbound trips).

Level of Service (LOS) Standards

The City standard is LOS D or better, except for facilities within downtown where attainment would result in significant environmental degradation, where significant geometric constraints make an improvement infeasible, or where attainment would ensure loss of an area's character.

Existing and Background Conditions

Under these scenarios, all of the study intersections operate within applicable jurisdictional standards of LOS D or better during the a.m., and p.m. peak hours except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which operates at LOS E in the a.m. peak hour.

Existing plus and Background plus Project Conditions

Under this scenarios, all of the study intersections operate within applicable jurisdictional standards of LOS D or better during the a.m. and p.m. peak hours except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which operates at LOS E in the a.m. peak hours.

Based on the City impact criteria the project is expected to have a **less-than-significant** impact at all of the study intersections.

Signal Warrant Analysis at Santa Rosa Avenue and Bellevue Avenue

Based on the 2014 California MUTCD warrant criteria and projected traffic conditions, Signal Warrant 3 is satisfied for the Existing, Background and plus Project Conditions for the intersection of Santa Rosa Avenue and Bellevue Avenue. Based on these findings, installation of a traffic signal at the intersection of Santa Rosa Avenue and Bellevue Avenue is warranted. It is recommended the City use the enclosed analysis to determine to install a signal, in order to improve pedestrian conditions.

Pedestrian Impacts

The proposed project provides adequate and appropriate facilities for safe non-motorized mobility. There is adequate pedestrian access to the project site from the surrounding area. The proposed project does not conflict with existing and planned pedestrian facilities; therefore, the impact to pedestrian facilities is ***less-than-significant***.

Bicycle Impacts

The project is not expected to generate additional bicycle trips on existing and planned bicycle facilities and does not conflict with existing and planned bicycle facilities; therefore, the impact to bicycle facilities is ***less than significant***.

Transit Impacts

The project site has Sonoma County Transit bus stops in front of the building in the southbound direction and across the street approximately 200 feet walking distance in the southbound direction. These bus routes operate near the project site with stops located within walking distance of the proposed development. The project site is adequately served by the VTA transit service. Therefore, impacts to transit service are expected to be ***less than significant***.

Site Access and On-Site Circulation

The existing project driveway on Santa Rosa Avenue is well spaced and properly aligned with opposing and adjacent driveways.

Emergency vehicle access would serve the site through public street frontages and within the parking lot. The line of sight for vehicles exiting the driveways and vehicles travelling on Santa Rosa Avenue is clear and visible.

Parking

The proposed project, per the City of Santa Rosa parking standards, requires 23 parking spaces. The current parking lot has 61 parking spaces and is shared amongst three tenants. Based on the current retail uses, there is enough space to accommodate all tenants with this project.

1.0 INTRODUCTION

This report summarizes the results of the Traffic Impact Analysis (TIA) for the proposed Cannabis Dispensary located at 3011 Santa Rosa Avenue in Santa Rosa, California.

1.1 Project Description

The purpose of this report is to identify potential impacts of the proposed Cannabis Dispensary, Doobie Nights, on the surrounding transportation system and to recommend mitigation measures improvements for significant impacts. For the purposes of this analysis, potential traffic impacts from the proposed project are identified based on established traffic operational thresholds of the City of Santa Rosa. The report also includes evaluations and recommendations concerning project site access and on-site circulation for vehicles, evaluation of on-site vehicle parking supply, queuing analysis at the driveways and at the study intersections. To evaluate the impacts on the transportation infrastructure due to the addition of traffic from the proposed project, the four intersections were evaluated during the weekday a.m. and p.m. peak hours under four study scenarios. The study intersections were evaluated under No Project and Plus Project scenarios for Existing and Existing plus Approved and Pending Projects.

The project site is located in the southern part of the City and zoned as Retail and Business Services shown in **Figure 1**. The general surroundings is commercial uses on the west side of Santa Rosa Avenue, residential east, and shopping centers north.

The proposed Dispensary will occupy the 3,072 tenant space for retail use including retail, intake lobby, security, office and inventory/storage. A site plan detailing the internal circulation and parking and floor plan are shown on **Figure 2** and **Figure 3** respectively.

1.2. Study Area

The study area is located on Santa Rosa Avenue in southeast Santa Rosa, also known as South Park. The project site is in close proximity to the Santa Rosa Town Center and other shopping centers and residential neighborhoods. Santa Rosa Avenue has continuous sidewalks, bicycle facilities and a transit stop in front of the proposed project. The roadway impacts of the proposed project were evaluated for the intersections and roadway segments disused below.

1.2.1 Study Intersections

TJKM evaluated traffic conditions at four study intersections during the a.m. and p.m. peak hours for a typical weekday. The study intersections were selected in consultation with the City of Santa Rosa staff. The peak periods observed were between 7:00-9:00 a.m. and 4:00-6:00 p.m. The study intersections and associated traffic controls are as follows:

1. Santa Rosa Avenue and Bellevue Avenue (unsignalized)
2. Santa Rosa Avenue and Burt Street (Signal)
3. Santa Rosa Avenue and Southside (Signal)
4. Santa Rosa Avenue and Yolanda Avenue(Signal)

1.2 Analysis Scenarios

This study addresses the following four traffic scenarios:

- **Existing Conditions** – This scenario evaluates the study intersections based on existing traffic volumes, lane geometry, and traffic controls.
- **Existing plus Project Conditions** – This scenario is identical to Existing Conditions, but with the addition of traffic from the proposed project.
- **Existing plus Approved/Pending (Background) Projects Conditions** – This scenario is similar to Existing Conditions, but with the addition of traffic from approved and pending developments within the vicinity of the proposed project.
- **Background plus Project Conditions** – This scenario is identical to Existing plus Approved/Pending Projects Conditions, but with the addition of traffic from the proposed project.

Vicinity Map

LEGEND

- X — Study Intersection
- Project Site
- Taylor Mountain Elementary School

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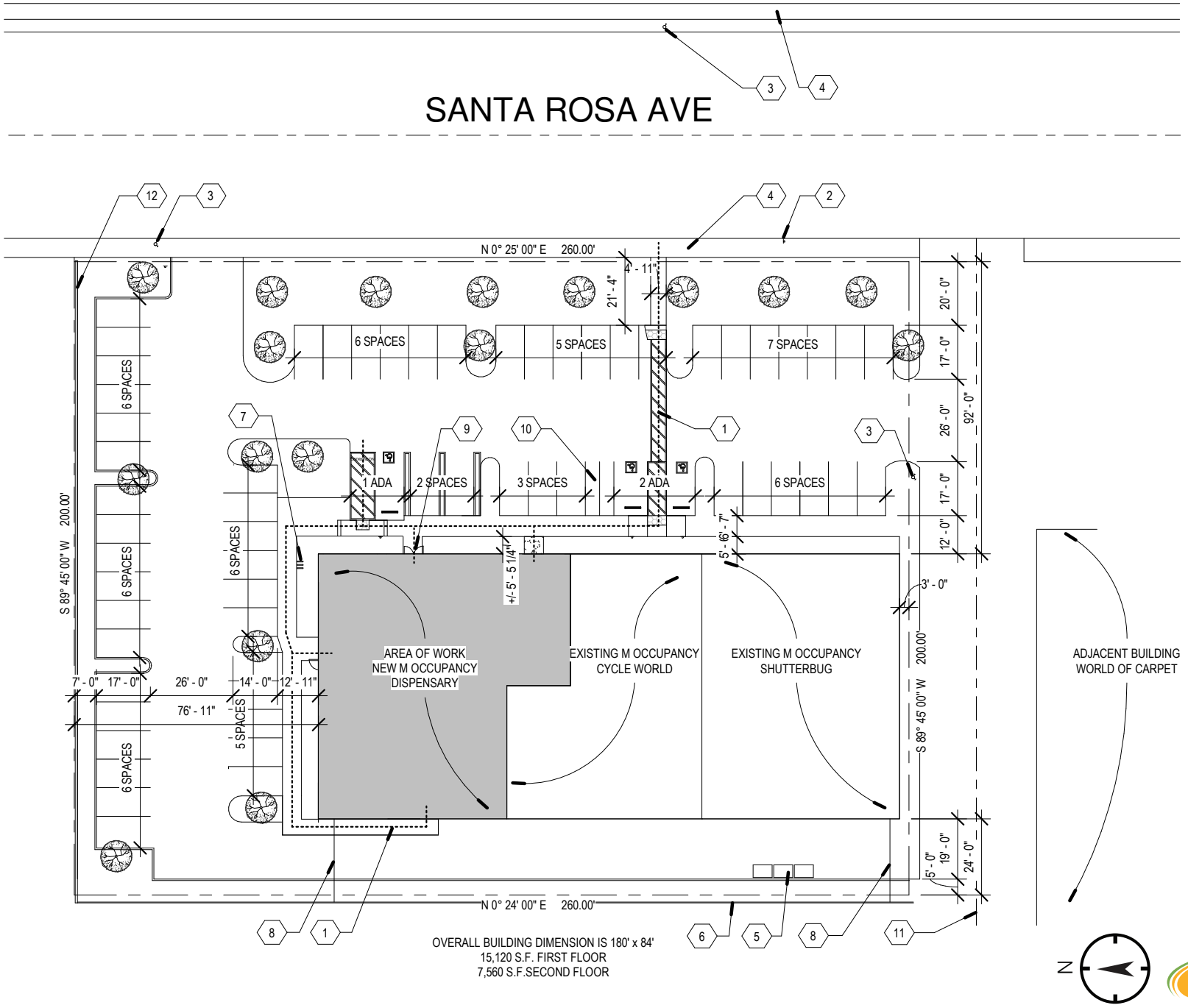
Site Plan


SANTA ROSA AVE
N 0° 25' 00" E 260.00'
N 0° 24' 00" E 260.00'
S 89° 45' 00" W 200.00'
S 89° 45' 00" W 200.00'
6 SPACES
5 SPACES
7 SPACES
1 ADA
2 SPACES
3 SPACES
2 ADA
6 SPACES
6 SPACES
6 SPACES
6 SPACES
6 SPACES
5 SPACES
AREA OF WORK
NEW M OCCUPANCY
DISPENSARY
EXISTING M OCCUPANCY
CYCLE WORLD
EXISTING M OCCUPANCY
SHUTTERBUG
ADJACENT BUILDING
WORLD OF CARPET
4' - 11"
21' - 4"
20' - 0"
17' - 0"
26' - 0"
92' - 0"
17' - 0"
12' - 0"
5' - 7"
+/- 5' - 5 1/4"
3' - 0"
7' - 0"
17' - 0"
26' - 0"
14' - 0"
12' - 11"
76' - 11"
5' - 0"
19' - 0"
24' - 0"
OVERALL BUILDING DIMENSION IS 180' x 84'
15,120 S.F. FIRST FLOOR
7,560 S.F.SECOND FLOOR
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2.0 STUDY METHODOLOGY

This chapter discusses the level of service analysis methodology for study intersections and roadway segments and criteria used to identify significant impacts.

2.1 Level of Service Analysis Methodology

LOS is a qualitative measure that describes operational conditions as they relate to the traffic stream and perceptions by motorists and passengers. The LOS generally describes these conditions in terms of such factors as speed and travel time, delays, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. The operational LOS are given letter designations from A to F, with A representing the best operating conditions (free-flow) and F the worst (severely-congested flow with high delays). Intersections generally are the capacity-controlling locations with respect to traffic operations on arterial and collector streets.

Signalized Intersections

The study intersections under traffic signal control were analyzed using the 2000 Highway Capacity Manual (HCM) Operations Methodology for signalized intersections described in Chapter 16 (HCM 2000). This methodology determines LOS based on average control delay per vehicle for the overall intersection during peak-hour intersection operating conditions. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections was calculated using Synchro analysis software and was correlated to a LOS designation as shown in **Appendix A**. The LOS methodology for signalized intersections is described in detail in **Appendix A**.

Unsignalized Intersections

The study intersections under stop control (Unsignalized) were analyzed using the 2000 HCM Operations Methodology for unsignalized intersections described in Chapter 17 (HCM 2000). LOS ratings for stop-sign controlled intersections are based on the average control delay expressed in seconds per vehicle. At the side street, controlled intersections or two-way stop sign intersections, the control delay is calculated for each movement, not for the intersection as a whole. For approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. The weighted average delay for the entire intersections is presented for all-way stop controlled intersections. The average control delay for unsignalized intersections was calculated using Synchro analysis software and was correlated to a LOS designation as shown in **Appendix A**. The LOS methodology for unsignalized intersections is described in detail in **Appendix A**.

2.2 Significant Impact Criteria/Level of Service Standards

Roadway Impact Criteria

In general, according to the City LOS standard (minimum acceptable operations) for signalized intersections is LOS D or better along all major corridors. Exceptions to meeting this standard are allowed for facilities within downtown, where attainment would result in significant environmental degradation,

where there are significant geometric constraints or where attainment would result in a loss of an area's character.

The City considers a significant impact to be satisfactorily mitigated when the measure implemented would restore LOS to Existing or Existing plus Approved Projects or better.

3.0 EXISTING CONDITIONS

This section describes existing conditions in the immediate project site vicinity, including roadway facilities, bicycle and pedestrian facilities, and available transit service. In addition, existing traffic volumes and operations are presented for the study intersection, including the results of LOS calculations.

3.1 Existing Setting and Roadway System

Descriptions of the existing roadways are provided as follows:

US 101 is a north-south, six-lane freeway with three mixed-flow lanes and one High Occupancy Vehicle (HOV) lane in each direction in the vicinity of the project. HOV Lanes, also known as diamond or carpool lanes, are restricted for use by vehicles occupied by two or more persons or motorcycles between 7 - 9 a.m. and between 3-6 p.m. HOV includes carpools, vanpools, and buses. US 101 is located parallel to the project site and provides regional freeway access north through the San Francisco Bay Area and between Northern and Southern California. The closest access from US 101 to the project site is provided Yolanda Avenue and Todd Road.

Santa Rosa Avenue is a north-south arterial roadway that parallels US 101 from downtown Santa Rosa to Rohnert Park. In the project vicinity, Santa Rosa Avenue is an undivided, four lane roadway and designated a Regional/Arterial Street per the City of Santa Rosa General Plan. The posted speed limit is 40 mph. A center two-way left turn lane provides access to and from the roadway from the project site.

Bellevue Avenue is an east-west roadway extending between Santa Rosa Avenue and terminates at Taylor Mountain Elementary School. Future plans for this roadway may include an extension to Petaluma Hill Road. This a two-lane roadway, one lane in each direction and predominantly serves the residential neighborhoods.

Burt Street is an east-west two-lane roadway that serves as an entrance point to the Santa Rosa Town Center at Santa Rosa Avenue and provides residential access to the east, extending to Madrus Rose Street where you can access Old Petaluma Hill Road.

Southside is a two-lane driveway that specifically fees into the shopping centers on the east and west of Santa Rosa Avenue.

Yolanda Avenue is a two-lane east-west roadway that extends between the on and off – ramp to US 101. The posted speed limit is 35 mph.

3.2 Existing Pedestrian Facilities

Walkability is defined as the ability to travel easily and safely between various origins and destinations without having to rely on automobiles or other motorized travel. The ideal "walkable" community includes wide sidewalks, a mix of land uses such as residential, employment, and shopping opportunities, a limited number of conflict points with vehicle traffic, and easy access to transit facilities and services.

Pedestrian facilities are comprised of crosswalks, sidewalks, pedestrian signals, and off-street paths, which provide safe and convenient routes for pedestrians to access the destinations such as institutions, businesses, public transportation, and recreation facilities.

In the project vicinity, there are sidewalks along Santa Rosa Avenue and adjacent cross streets. Streetlights are spaced to provide ample lighting during the evening hours. Santa Rosa Avenue has a ladder crosswalk with a flashing beacon at Bellevue Avenue and Court Road has a Rectangular Rapid Flashing Beacons (RRFB). In the 2018 Draft Bicycle and Pedestrian Master Plan Update (Update) there is a planned Class I Shared-Used Path located north of the project site near between Colgan Avenue and Petaluma Hill Road and also Kawana Springs Road

In the project vicinity, all signalized study intersections are equipped with countdown pedestrian signal heads. Most of the study intersections have crosswalks with curb ramps. At the unsignalized intersection of Santa Rosa Avenue and Bellevue Avenue there are crosswalks on three legs of the intersection with a pedestrian actuated flashing beacon and pedestrian refuge island on the north leg. The roadway segments surrounding project vicinity have sidewalk along the both sides.

There are two bus stops in the immediate vicinity of the project site. One bus stop is located directly in front of the project site. In the northbound direction, the other stop is located south of the Santa Rosa Avenue and El Portal Way intersection. All bus stops are accessible via existing sidewalks.

The existing pedestrian facilities in the study area are shown in **Figure 3**.

3.3 Existing Bicycle Facilities

The draft 2018 City of Santa Rosa Bicycle and Pedestrian Master Plan (Update) describes the four bikeways, which all meet the design guidelines of the Caltrans Highway Design Manual (HDM), Chapter 1000: Bikeway Planning and Design for multi-use trails. These bicycle facility types are described below.

- **Class I Bikeways/Multi-Use Paths**: Class I bikeways are also referred to as multi-use or shared-use paths. They provide completely separated and paved, exclusive right of way for people to walk and bike. There are 13 miles of Class I facilities, with a goal for 30.9 miles in the draft Update.
- **Class II Bikeways/On-Street Bike Lanes**: Class II bikeways are striped lanes on roadways for one-way bicycle travel. Currently there are 46 miles of Class II bikeways, with a goal to increase the mileage to 69.2.
- **Class III Bike Routes**: Class III bikeways signed bike routes where bicyclists share a travel lane with motorists. These are often marked on the roadway with a Sharrow and Shared Roadway sign. There are 18 miles of bicycle routes with a goal to convert the routes to Class II bicycle lanes. However, there is a focus to add 0.3 miles of bicycle boulevards within the City.
- **Class IV Separated Bikeways**: Class IV separated bikeways are on-street bicycle facilities that are physically separated from motor vehicle traffic by a vertical element or barrier, such as a curb, bollards, or vehicle parking. These can allow for one or two-way travel on one or both sides of the roadway. There are no current plans for a separated bikeway.

Within the project vicinity, there are Class II bike lanes along Santa Rosa Avenue. Class II bike lanes are proposed on Yolanda Avenue and Bellevue Avenue in the City's Update.

The existing bicycle facilities in the study area are shown in **Figure 4**.

3.4 Existing Transit Facilities

The existing public transit facilities in the study area are shown in **Figure 5**. The City is served by Sonoma County Transit (SC Transit) which has transit lines that run between Cloverdale and San Rafael. The closest transit stop is directly in front of the project site in the southbound direction. In the northbound direction, the closest stop is a walking distance of approximately 200 feet near the intersection of Santa Rosa Avenue and El Portal Way. The following bus routes are summarized in **Table 1.**

Table 1: Existing SC Transit Service

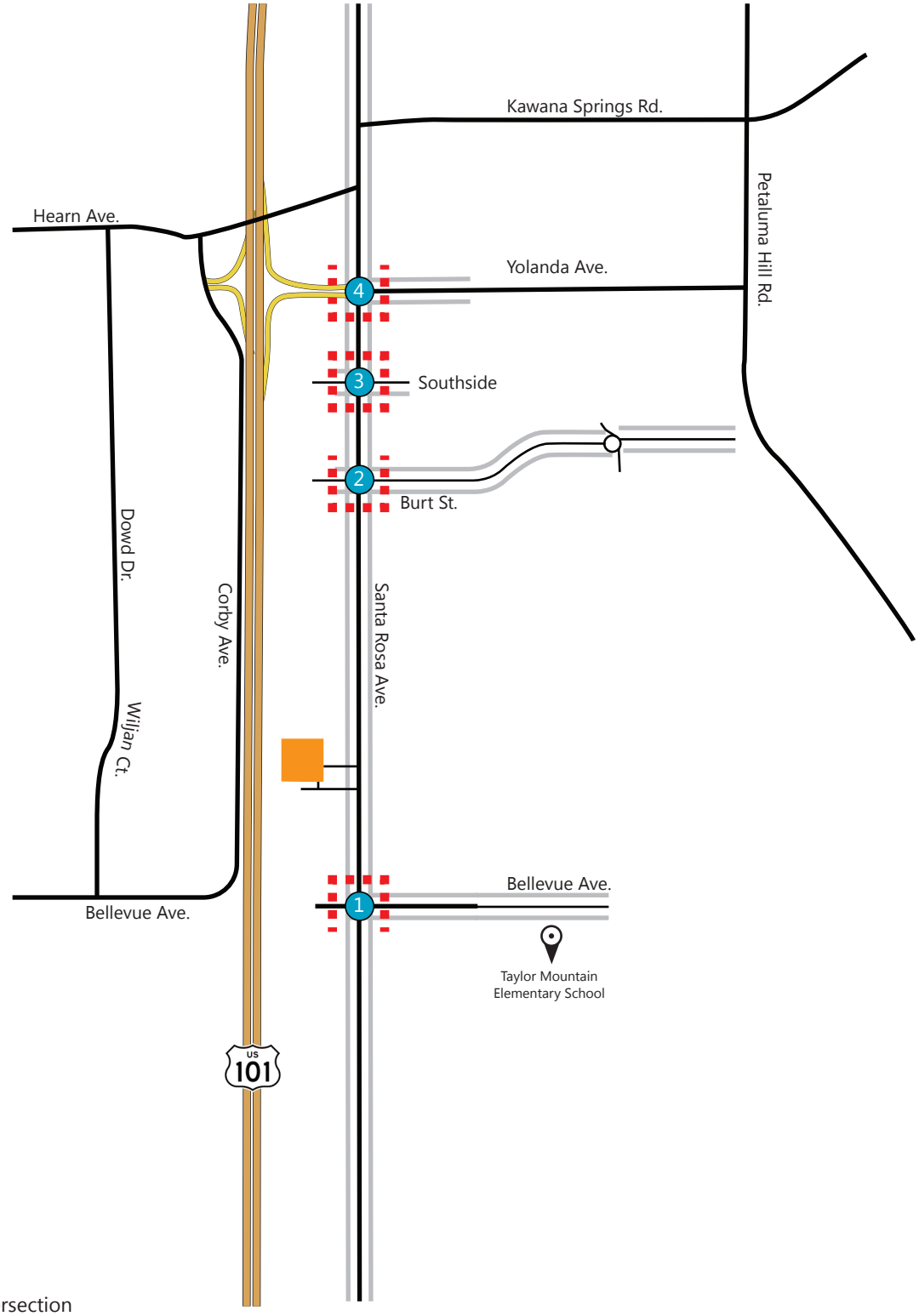
			Weekdays		*Weekends*	
Route	***From***	***To***	***Operating Hours***	***Headway (minutes)***	***Operating Hours***	***Headway (minutes)***
42	W. Robles Avenue/Standish Avenue	Santa Rosa Transit Mall	7:35 AM- 5:25 PM	30-120	No Service	N/A
44	Petaluma Transit Mall	Coddington Santa Rosa	5:20 AM – 10:29 PM	37-60	8:36 AM- 10:12 PM	3.5 hours
44x	Petaluma Transit Mall	Coddington Santa Rosa	9:22 AM–4:36 PM	60	No Service	N/A
48	Petaluma Fairgrounds Park & Ride	Coddington Santa Rosa	8:20 AM– 7:30 PM	50	7:00 AM– 9:51 PM	4 hours
54	Petaluma Downtown/Petaluma Transit Mall	Coddington, Santa Rosa	6:30 AM– 7:15 PM	60	No Service	N/A

Notes: Source SC Transit Website

These routes connect to Sonoma-Marin Area Rail Transit (SMART), which provide passenger rails service in Sonoma and Marin Counties at the Petaluma Transit Mall. Route 54 is the South County Connector to SMART.

The City of Santa Rosa also operates CityBus which provides a loop, fixed-route, local transit service from the Santa Rosa Transit Mall to various locations throughout the City. The closest route is on Elsa Drive, approximately 700 feet from the proposed project site. Route 3, Santa Rosa Avenue, has 30-minute headways between 6:00 a.m. and 8:00 p.m. during the weekdays, and 60-minute headways between 6:00 a.m. and 7:30 p.m. during the weekend.

Existing Pedestrian Facilities



LEGEND

- X — Study Intersection
- Project Site
- Taylor Mountain Elementary School
- Sidewalk
- Crosswalk

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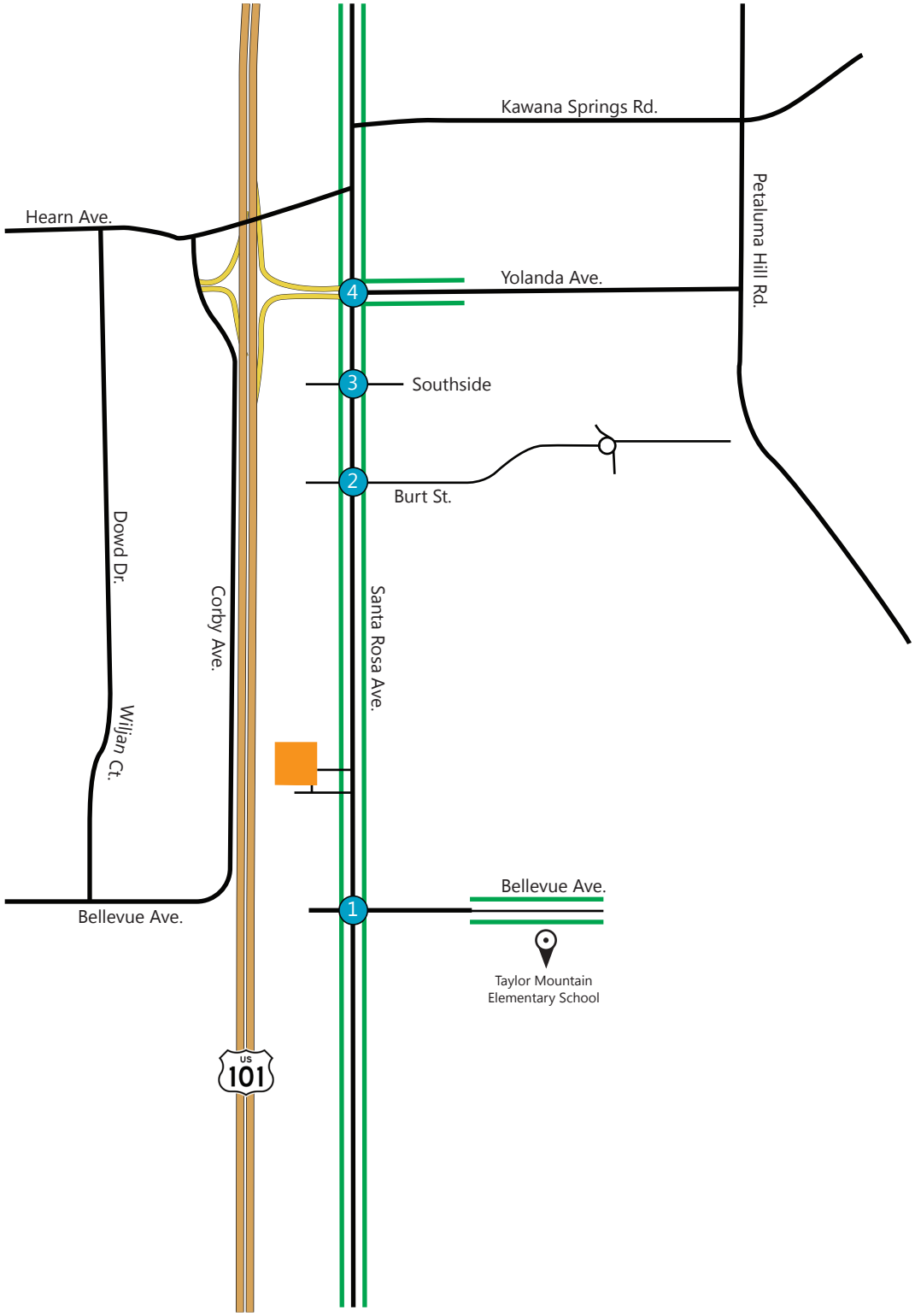
Existing Bicycle Facilities



LEGEND

- X — Study Intersection
- Project Site
- Taylor Mountain Elementary School
- Class II Bike Lane

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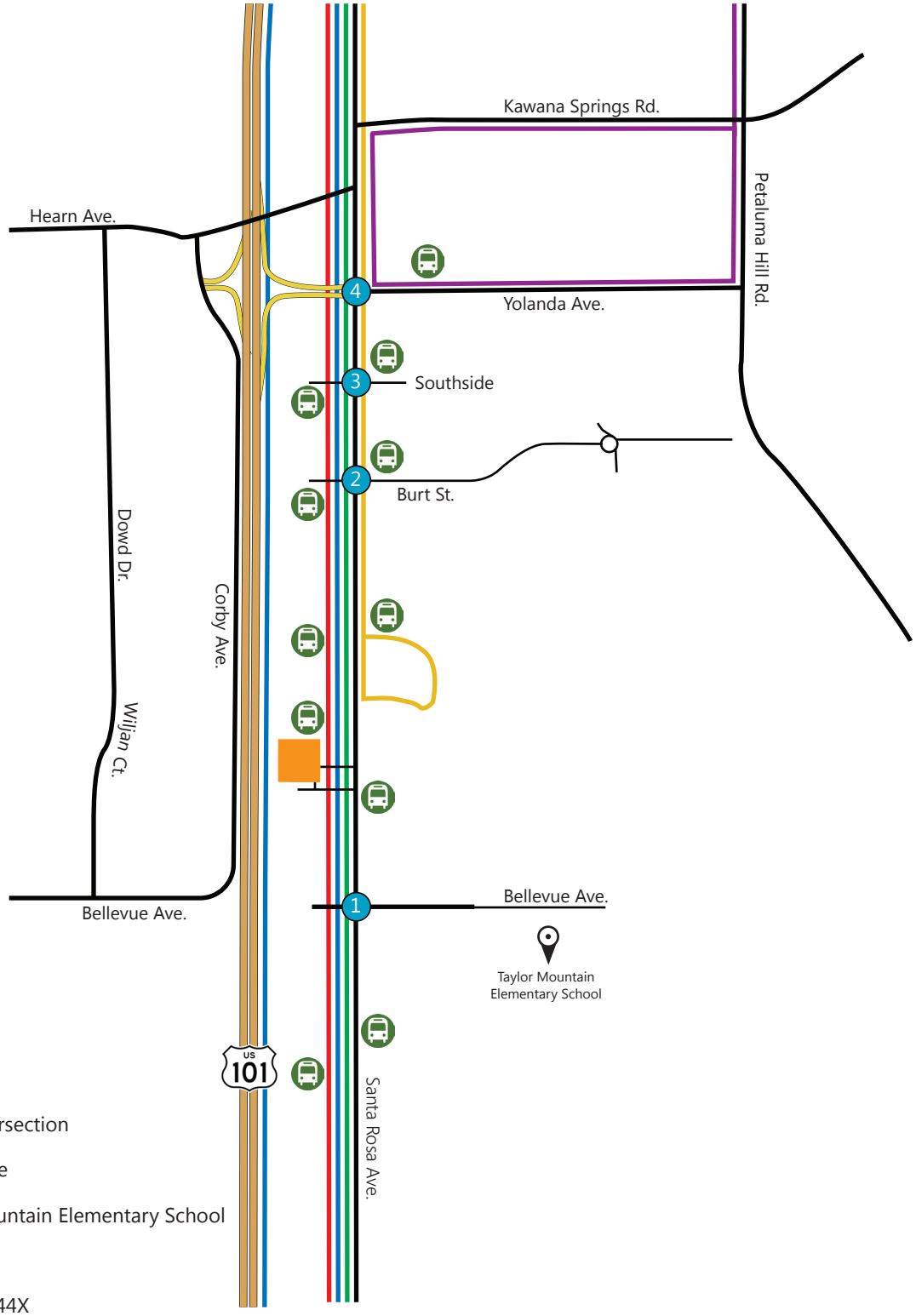
Existing Transit Facilities



LEGEND

- Study Intersection
- Project Site
- Taylor Mountain Elementary School
- Bus Stop
- Route 44/44X
- Route 48
- Route 54
- Route 5
- Route 3

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3.7 Existing Peak Hour Traffic Volumes And Lane Configurations

The existing operations of the study intersections were evaluated for the highest one-hour volumes during weekday morning, and evening peak periods. Recent turning movement counts for vehicles, bicycles, and pedestrians were conducted during the weekday a.m. peak period (7:00-9:00 a.m.) and p.m. peak period (4:00-6:00 p.m.) at the study intersections. These were provided by the City of Santa Rosa except for new counts taken at the intersection of Santa Rosa Avenue and Bellevue Avenue. Field verification of existing intersection lane configurations and traffic controls was also conducted and provided the basis for the level of service analysis for Existing Conditions. **Appendix B** includes all data sheets for the collected vehicle, bicycle, and pedestrian counts. **Figures 6** illustrate the existing lane geometry, and traffic controls at the study intersections. **Figure 7** illustrate the existing a.m. and p.m. peak hours vehicle turning movement volumes at the study intersections.

3.8 Intersection Level of Service Analysis – Existing Conditions

Existing intersection lane configurations, signal timings, and turning movement volumes are used to calculate the level of service for the study intersections during each peak hour. The peak hour factor based on counts was used to all study intersections for the existing analysis. The results of the LOS analysis using the SYNCHRO software program for Existing Conditions are summarized in **Table 2**.

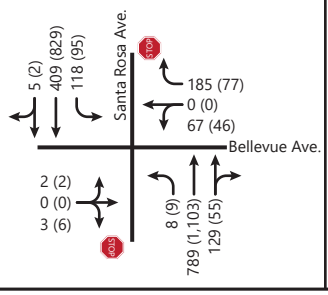
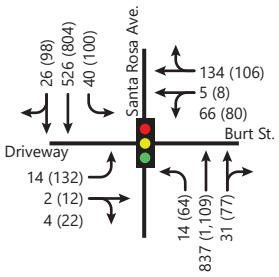
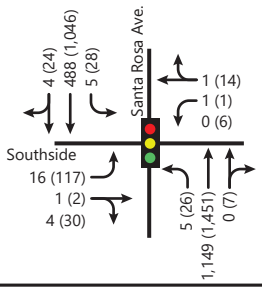
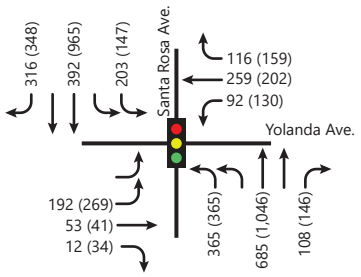
Table 2 below summarizes peak hour LOS at the study intersections under Existing Conditions. Under this scenario, all of the study intersections operate at acceptable service levels (LOS D or better) during a.m., and p.m. peak hours except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which operates at LOS E in the a.m. peak hour. LOS worksheets are provided in **Appendix C**.

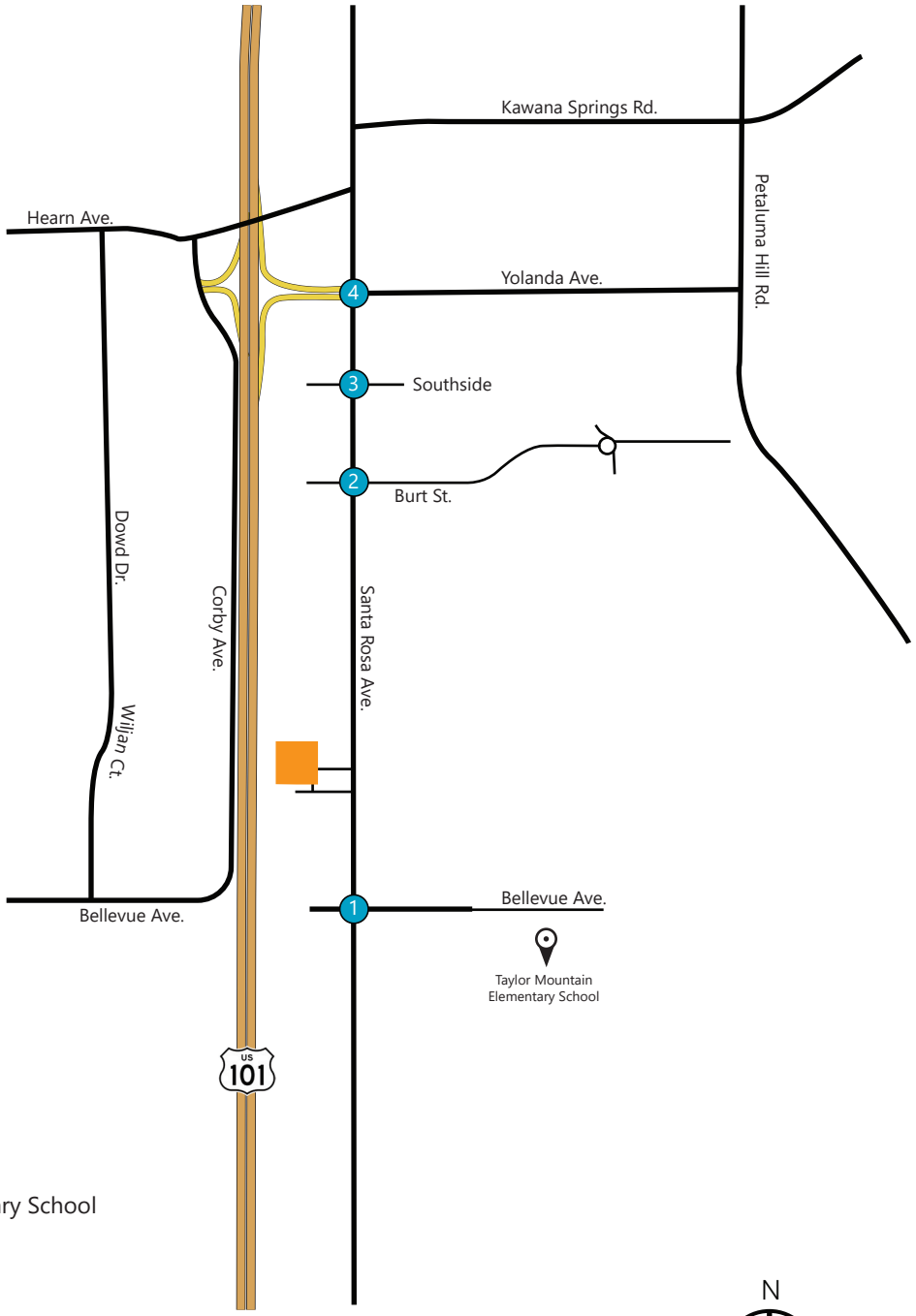
Table 2: Intersection Level of Service Analysis – Existing Conditions

#	Study Intersections	Control	Peak Hour[1]	Existing Conditions	
				Delay[2]	LOS[3]
1	Santa Rosa Avenue /Bellevue Avenue	Unsignalized	AM	**37.6**	**E**
			PM	24.2	C
2	Santa Rosa Avenue/Burt Street	Signalized	AM	11.7	B
			PM	20.1	C
3	Santa Rosa Avenue / Southside	Signalized	AM	2.8	A
			PM	9.9	A
4	Santa Rosa Avenue / Yolanda Avenue	Signalized	AM	38.4	D
			PM	40.9	D

Notes:
1. AM – morning peak hour, PM – evening peak hour
2. Delay – Whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop – controlled intersections.
3. LOS – Level of Service

Existing Lane Geometry and Volumes

Intersection #1 Bellevue Ave. / Santa Rosa Ave.	**Intersection #2** Burt St. / Santa Rosa Ave.	**Intersection #3** Southside / Santa Rosa Ave.	**Intersection #4** Yolanda Ave. / Santa Rosa Ave.
			



LEGEND

- X — Study Intersection
- Project Site
- Taylor Mountain Elementary School
- STOP — Stop Sign
- Traffic Signal
- XX — AM Peak Hour Volume
- (XX) — PM Peak Hour Volume

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4.0 EXISTING PLUS PROJECT CONDITIONS

Doobie Nights is a proposed Cannabis Dispensary consisting of 5,820 sf of retail and office space in an existing small shopping center. Operation Hours will be 9:30 am to 7:30 pm for staff and open between 10:00 am to 7:00 pm. Deliveries are expected to during open hours of operation, averaging once a day, but not expected to have daily deliveries.

The impacts of the proposed project on the transportation system are discussed in this chapter. First, the method used to estimate the amount of traffic generated by the project is described. Then, the results of the level of service calculations for Existing plus Project Conditions are presented. (Existing plus Project Conditions are defined as Existing Conditions plus traffic generated by the proposed project). A comparison of intersections under Existing plus Project Conditions and Existing Conditions is presented and the impacts of the project on the study intersections are discussed. Project impacts on roadway segments are also addressed.

The amount of traffic added to the roadway system by the proposed development is estimated using a three-step process.

- Trip Generation – Estimates the amount of traffic added to the roadway network,
- Trip Distribution – Estimates the direction of travel to and from the project site,
- Trip Assignment – The new trips are assigned to specific street segments and intersection turning movements.

4.1 Project Trip Generation

TJKM developed estimated project trip generation for the proposed project based on published trip generation rates from the *Institute of Transportation Engineers' (ITE) publication Trip Generation, 10th Edition*. The Land Use Code 882 for Marijuana Dispensary is new in this ITE edition, however, per the City of Santa Rosa, is close to the existing trips generated by approved facilities. TJKM applied trip discounts to the proposed project trip generation based on the previous use of the Laser Tag Facility (Multipurpose Recreational Facility, Code 435)

Table 3 shows the trip generation expected to be generated by the proposed project. The proposed project is expected to generate approximately 61 weekday a.m. peak hour trips (31 inbound trips, 30 outbound trips) and 106 weekday p.m. peak hour trips (53 inbound trips, 53 outbound trips).

Table 3: Project Trip Generation

Land Use (ITE code)	*Size*		*Daily*		*AM Peak*						*PM Peak*					
			Rate	*Trips*	*Rate*	*In %*	*Out %*	*In*	*Out*	*Total*	*Rate*	*In %*	*Out %*	*In*	*Out*	*Total*
Marijuana Dispensary (882) Weekday	5.82	ksf	252.70	**1,471**	10.44	50	50	31	30	**61**	21.83	50	50	63	64	**127**
Existing Use Multipurpose Recreational Facility-Lazer Tag (435)	5.82	ksf			No data available						3.58	48	52	10	11	**21**
Total				**1,471**				31	30	**61**				53	53	**106**

ksf- per thousand square feet

Note: Source-Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition,2017

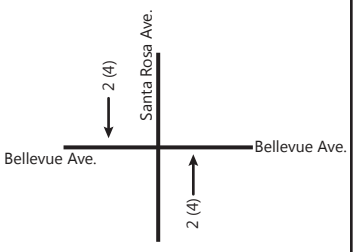
4.2 Project Trip Distribution and Assignment

Trip distribution is a process that determines in what proportion vehicles would be expected to travel between the project site and various destinations outside the project study area and determines the various routes that vehicles would take from the project site to each destination using the calculated trip distribution. Trip distribution assumptions for the proposed project were developed based on existing travel patterns and knowledge of the study area.

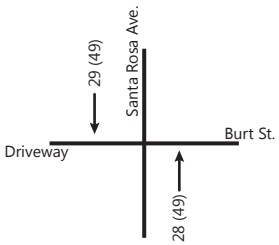
Figure 7 illustrates the trip distribution percentages and trip assignment developed for the proposed project. The assigned project trips were then added to traffic volumes under Existing Conditions to generate Existing plus Project Conditions traffic volumes.

Trip Distribution and Assignment

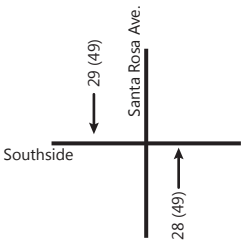
Intersection #1
Bellevue Ave. / Santa Rosa Ave.



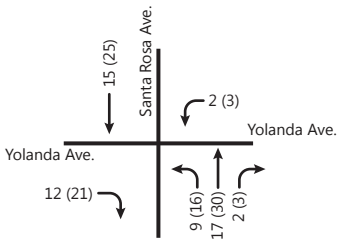
Intersection #2
Burt St. / Santa Rosa Ave.



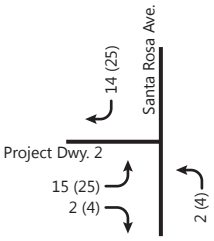
Intersection #3
Southside / Santa Rosa Ave.



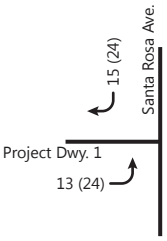
Intersection #4
Yolanda Ave. / Santa Rosa Ave.

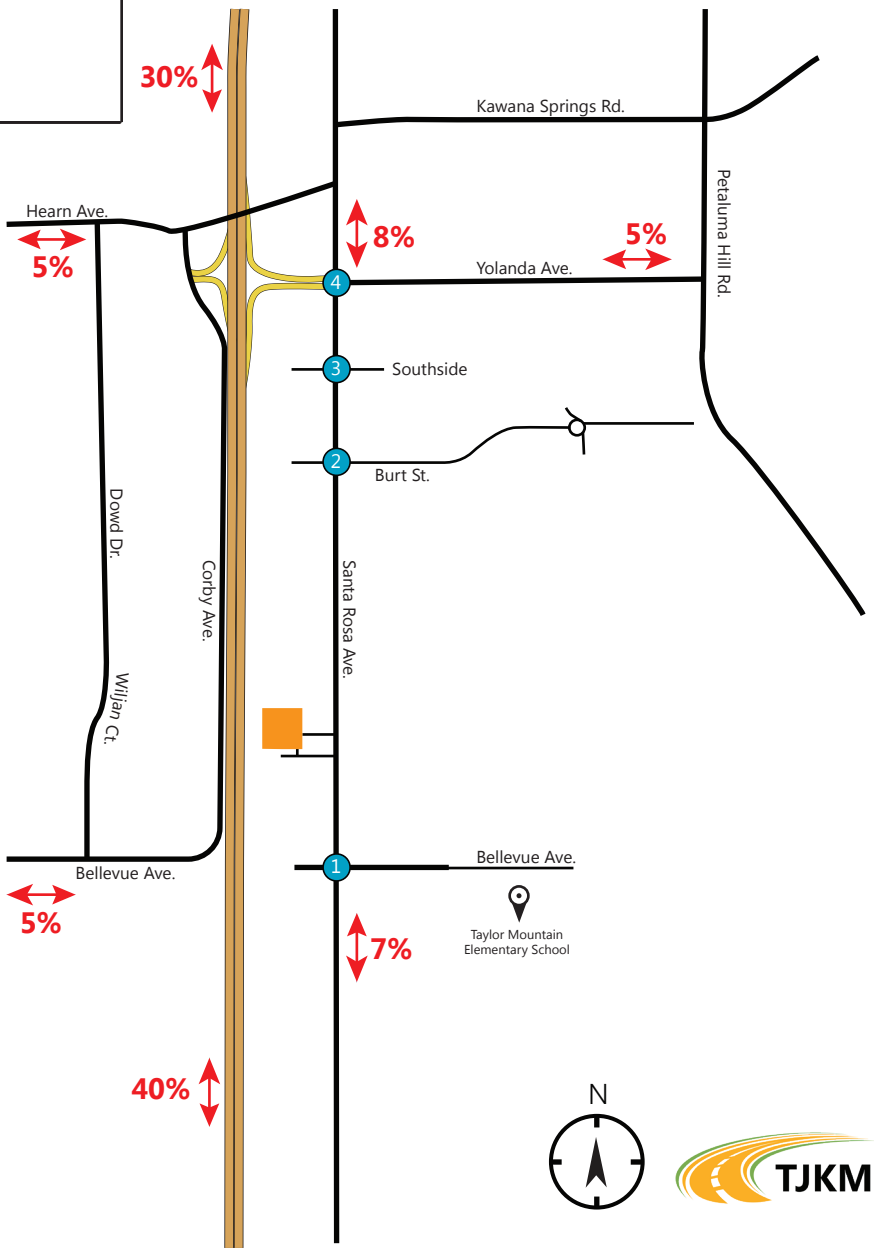


Intersection
Project Dwy. 2 / Santa Rosa Ave.



Intersection
Project Dwy. 1 / Santa Rosa Ave.





LEGEND

- X — Study Intersection
- Project Site
- Taylor Mountain Elementary School
- XX — AM Peak Hour Project Trips
- (XX) — PM Peak Hour Project Trips
- XX% — Trip Distribution

N

TJKM

4.3 Intersection Level of Service Analysis – Existing plus Project Conditions

The intersection LOS analysis results for Existing plus Project Conditions are summarized in **Table 4**. Detailed calculation sheets for Existing plus Project Conditions are contained in **Appendix D**. All intersections are expected to continue operating within applicable jurisdictional standards of LOS D except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which operates at LOS E in the a.m. and p.m. peak hours.

Based on the City of Santa Rosa's impact criteria the project is expected to have a **less-than-significant impact** at all the study intersections evaluated in this TIA. Though the LOS has degraded from C to E, due to the northbound and southbound traffic volumes in the p.m. peak hour, causing a 16 second delay on the side street, Bellevue Avenue. This is still considered less-than-significant because the project is only adding eight trips total to the network. A signal added to the intersection would alleviate the delay and improve the LOS. The signal warrant analysis is discussed in section 7.0 Additional Analysis.

Figure 8 shows projected peak hour turning movement volumes at all of the study intersections for Existing plus Project Conditions.

The results for Existing Conditions are included for comparison purposes, along with the projected increases in control delay. It should be noted that some of the study intersections are estimated to show a negative net increase in intersection delay due to the addition of project trips to non-critical turn movements.

Table 4: Intersection Level of Service Analysis – Existing plus Project Conditions

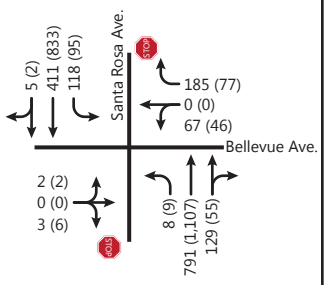
#	Study Intersections	Control	Peak Hour[1]	Existing Conditions		Existing plus Project Conditions		*Change in*
				Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delay[4]
1	Santa Rosa Avenue /Bellevue Avenue	Unsignalized	AM	**37.6**	**E**	**38.0**	**E**	0.4
			PM	24.2	C	23.2	C	-1.0
2	Santa Rosa Avenue/Burt Street	Signalized	AM	11.7	B	11.5	B	-0.2
			PM	20.1	C	19.6	B	-0.5
3	Santa Rosa Avenue / Southside	Signalized	AM	2.8	A	2.9	A	0.1
			PM	9.9	A	9.8	A	-0.1
4	Santa Rosa Avenue / Yolanda Avenue	Signalized	AM	38.4	D	38.8	D	0.4
			PM	40.9	D	40.5	D	-0.4

Notes:
1. AM – morning peak hour PM – evening peak hour
2. Delay – Whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop – controlled intersections.
3. LOS – Level of Service
4. Change in delay between Existing and Existing plus Project Conditions

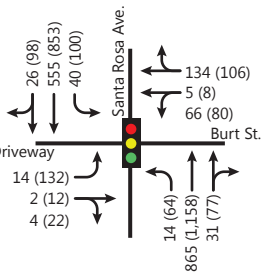
In the a.m. peak hour, the LOS remains at E with minimal delay added to the intersection. Based on operation hours, the a.m. peak should remain unaffected as employee and hours of operation are after the a.m. peak hour of 7:00 a.m. to 9:00 a.m.

Existing Plus Project Lane Geometry and Volumes

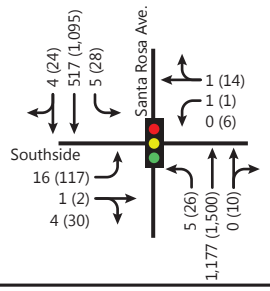
Intersection #1
Bellevue Ave. / Santa Rosa Ave.



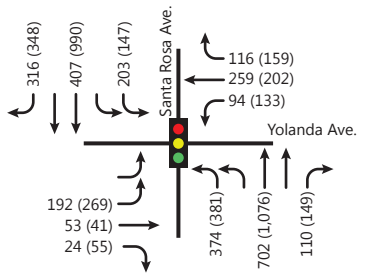
Intersection #2
Burt St. / Santa Rosa Ave.



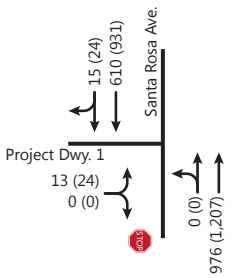
Intersection #3
Southside / Santa Rosa Ave.



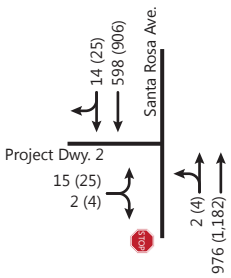
Intersection #4
Yolanda Ave. / Santa Rosa Ave.

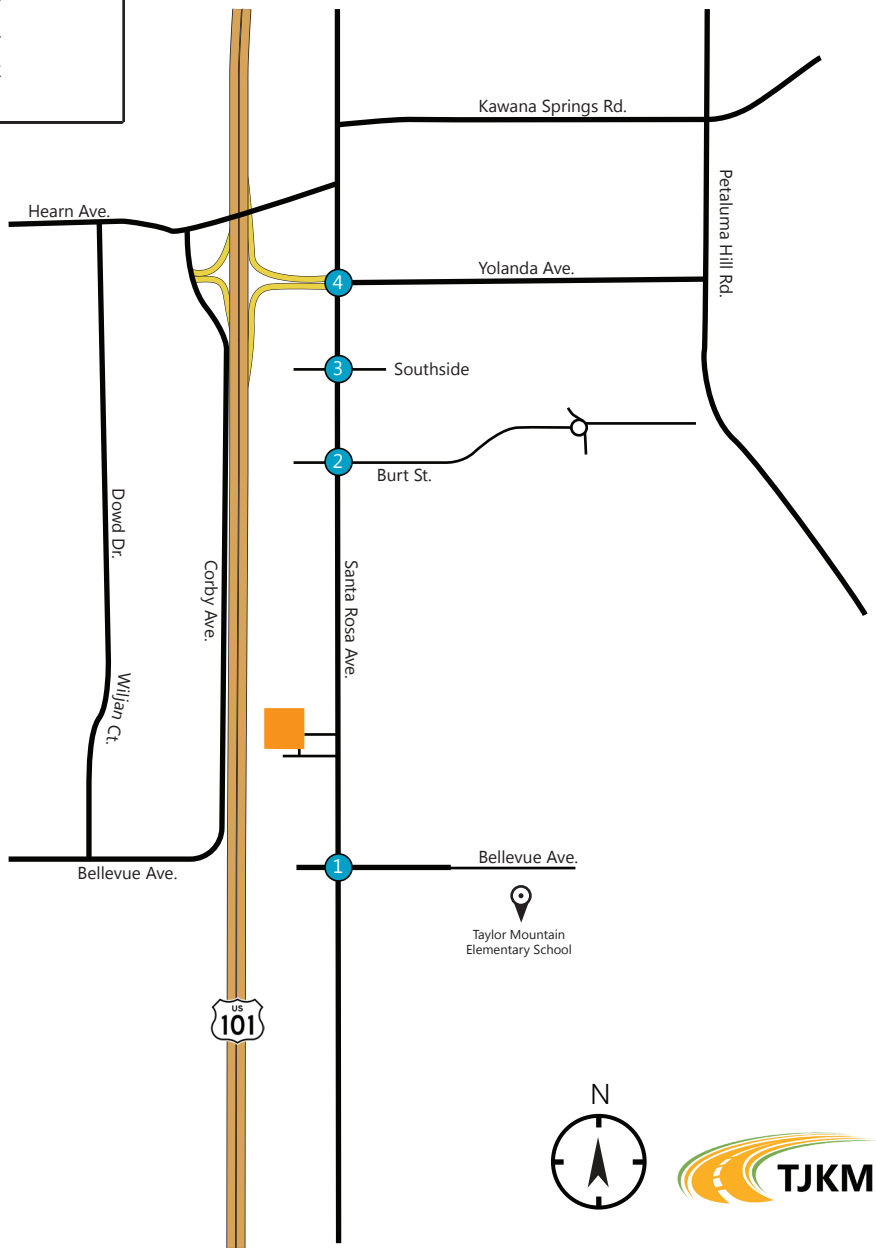


Intersection
Project Dwy. 1 / Santa Rosa Ave.



Intersection
Project Dwy. 2 / Santa Rosa Ave.





LEGEND

- X — Study Intersection
- Project Site
- Taylor Mountain Elementary School
- STOP — Stop Sign
- Traffic Signal
- XX — AM Peak Hour Volume
- (XX) — PM Peak Hour Volume

N

TJKM

5.0 EXISTING PLUS APPROVED (BACKGROUND) PROJECTS CONDITIONS

This scenario is similar to Existing Conditions, but with the addition of traffic from approved and pending developments located within the immediate vicinity of the project. The City staff provided the list of approved and pending projects that represents the traffic volumes generated by projects that are approved but not constructed. Trip volumes were determined and added to the Existing Conditions volumes to project the peak hour turning movements at the study intersections under Existing plus Approved and Pending (Background) Conditions. The volumes are included in **Appendix E**.

5.1 Approved Projects and Planned Developments

Approved and pending developments located within the immediate vicinity of the project are:

- 1650 Meda Avenue- 16 residential units
- 1846 Meda Avenue- 101 residential units
- 2604 Petaluma Hill Road- 120 residential units
- 2800 Petaluma Hill Road- 5 residential units
- 368 Yolanda Avenue- 24,000 sf light industrial
- 325 Yolanda Avenue- 252 residential units,
- 2532 Santa Rosa Avenue- Fast Food establishment

5.2 Intersections Level of Service Analysis – Background Conditions

The intersection LOS analysis results for Background Conditions are summarized in **Table 5**. Detailed calculation sheets for Background Conditions (Existing plus Approved Projects) are contained in **Appendix E**. All intersections are expected to continue operating within applicable jurisdictional standards of LOS D or better under this scenario except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which operates at LOS E in the a.m. peak hour.

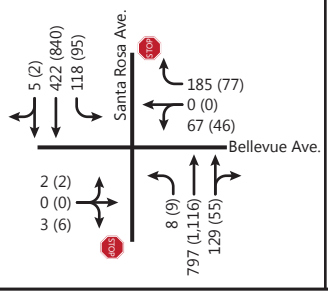
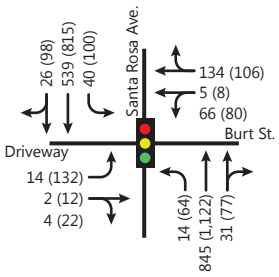
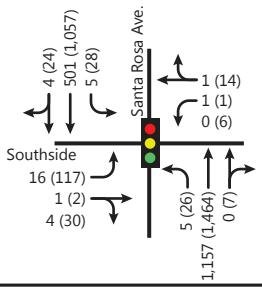
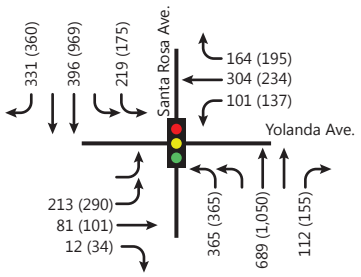
Table 5: Intersection Level of Service Analysis – Background Conditions

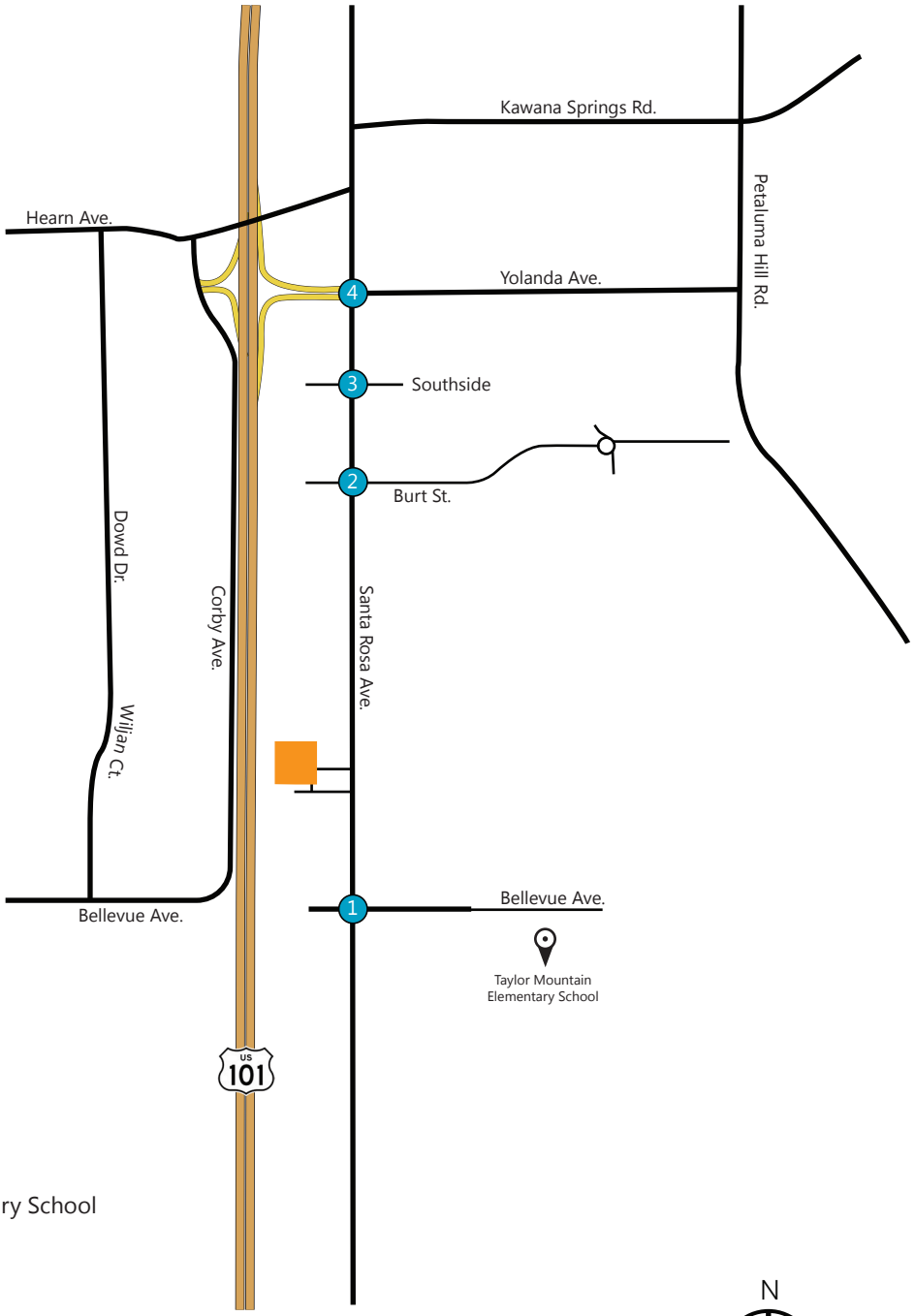
#	Study Intersections	Control	Peak Hour[1]	Background Conditions	
				Delay[2]	LOS[3]
1	Santa Rosa Avenue /Bellevue Avenue	Unsignalized	AM	**39.7**	**E**
			PM	24.6	C
2	Santa Rosa Avenue/Burt Street	Signalized	AM	11.6	B
			PM	20.0	C
3	Santa Rosa Avenue / Southside	Signalized	AM	2.8	A
			PM	9.8	A
4	Santa Rosa Avenue / Yolanda Avenue	Signalized	AM	44.6	D
			PM	42.9	D

Notes:
1. AM – morning peak hour, PM – evening peak hour
2. Delay – Whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop – controlled intersections.
3. LOS – Level of Service

Figure 9 shows projected peak hour turning movement volumes at all of the study intersections for Background Conditions

Background Lane Geometry and Volumes

Intersection #1 Bellevue Ave. / Santa Rosa Ave.	**Intersection #2** Burt St. / Santa Rosa Ave.	**Intersection #3** Southside / Santa Rosa Ave.	**Intersection #4** Yolanda Ave. / Santa Rosa Ave.
			



LEGEND

- Study Intersection
- Project Site
- Taylor Mountain Elementary School
- Stop Sign
- Traffic Signal
- XX — AM Peak Hour Volume
- (XX) — PM Peak Hour Volume

N

TJKM

6.0 BACKGROUND PLUS PROJECT CONDITIONS

This scenario is identical to Background Conditions, but with the addition of projected traffic from the proposed mixed-use development project. Trip generation and distribution for the proposed project are identical to that assumed under Existing plus Project Conditions.

6.1 Intersection Level of Service Analysis – Background plus Project Conditions

The intersection LOS analysis results for Background plus Project Conditions are summarized in **Table 6**. Detailed calculation sheets for Background plus Project Conditions are contained in **Appendix F** All intersections are expected to continue operating within applicable jurisdictional standards of LOS D except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which operates at LOS E in the a.m. and p.m. peak hours.

Based on the City of Santa Rosa's impact criteria, the project is expected to have a **less-than-significant impact** at all the study intersections evaluated in this TIA.

Similar to the Existing plus Project Conditions scenario, the LOS has degraded from C to E, due to the northbound and southbound traffic volumes in the p.m. peak hour, causing a 16 second delay on the side street, Bellevue Avenue. This is still considered less-than-significant because the project is only adding eight trips total to the network. A signal added to the intersection would alleviate the delay and improve the LOS. The signal warrant analysis is discussed in the next section, 7.0 Additional Analysis.

Figures 10 show projected peak hour turning movement volumes at all of the study intersections for Background plus Project Conditions.

The results for Background Conditions are included for comparison purposes, along with the projected increases in delay. It should be noted that some of the study intersections are estimated to show a negative net increase in intersection delay due to the addition of project trips to non-critical turn movements.

Table 6: Intersection Level of Service Analysis – Background plus Project Conditions

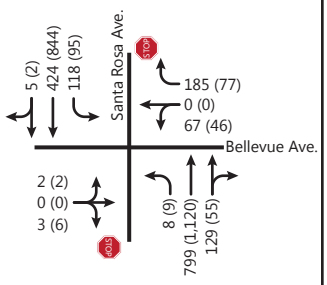
#	Study Intersections	Control	Peak Hour[1]	Background Conditions		Background plus Project Conditions		*Change in*
				Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delay[4]
1	Santa Rosa Avenue /Bellevue Avenue	Unsignalized	AM	**39.7**	**E**	**40.4**	**E**	0.7
			PM	24.6	C	23.7	C	-0.9
2	Santa Rosa Avenue/Burt Street	Signalized	AM	11.6	B	11.5	B	-0.1
			PM	20.0	C	19.7	B	-0.3
3	Santa Rosa Avenue / Southside	Signalized	AM	2.8	A	2.9	A	0.1
			PM	9.8	A	9.7	A	-0.1
4	Santa Rosa Avenue / Yolanda Avenue	Signalized	AM	44.6	D	44.9	D	0.3
			PM	42.9	D	44.4	D	1.5

Notes:
1. AM – morning peak hour, PM – evening peak hour
2. Delay – Whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop – controlled intersections.
3. LOS – Level of Service
4. Change in delay between Background and Background plus Project Conditions

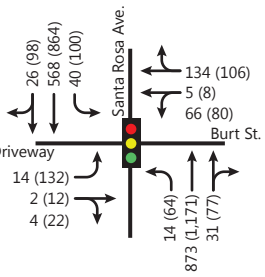
In the a.m. peak hour, the LOS remains at E with minimal delay added to the intersection. Based on operation hours, the a.m. peak should remain unaffected as employee and hours of operation are after the am peak hour of 7:00 am to 9:00 am.

Background Plus Project Lane Geometry and Volumes

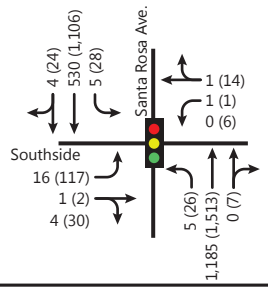
Intersection #1
Bellevue Ave. / Santa Rosa Ave.



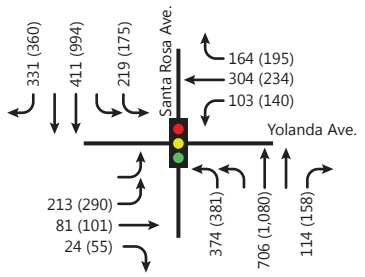
Intersection #2
Burt St. / Santa Rosa Ave.



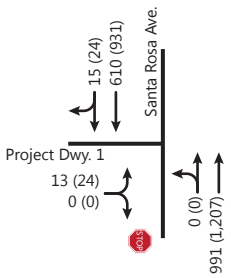
Intersection #3
Southside / Santa Rosa Ave.



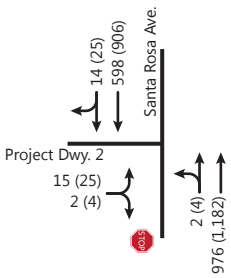
Intersection #4
Yolanda Ave. / Santa Rosa Ave.

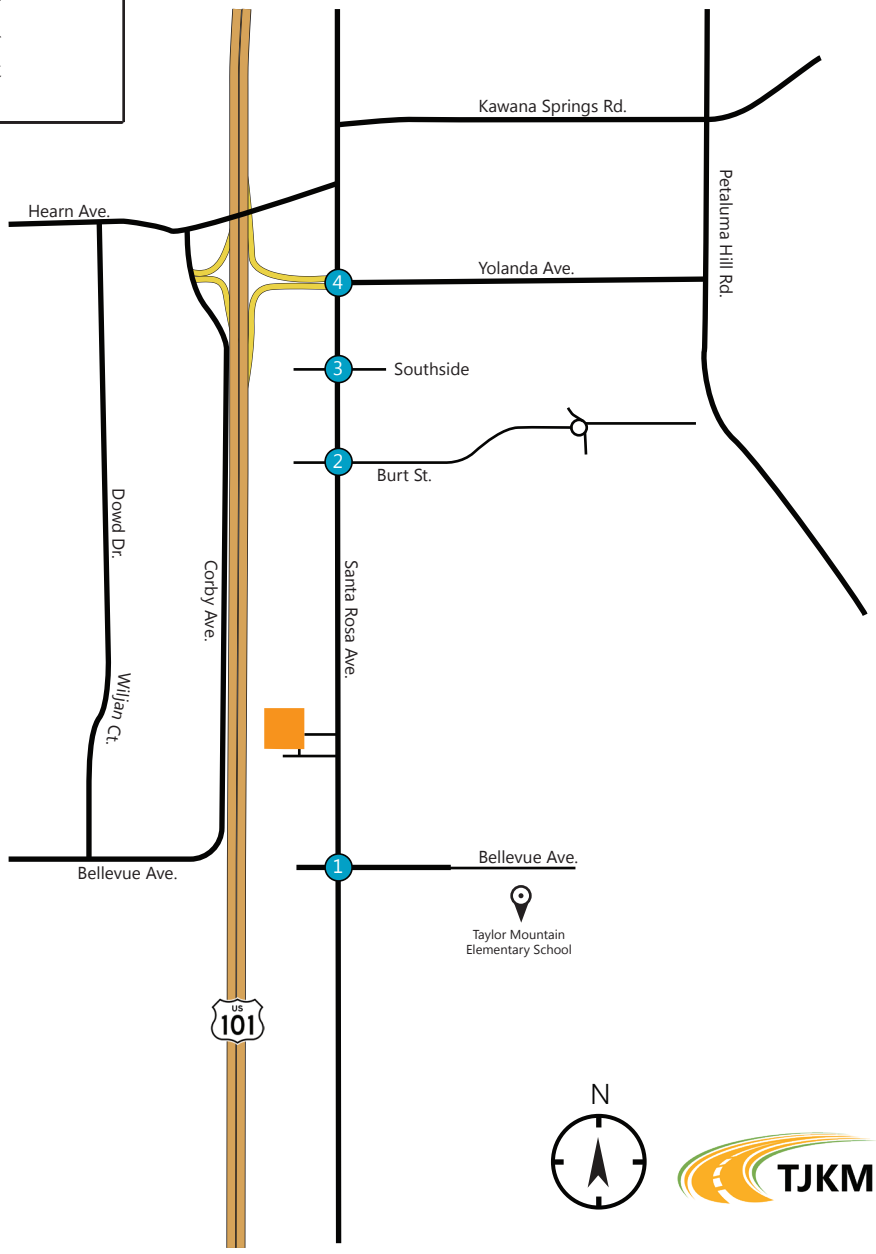


Intersection
Project Dwy. 1 / Santa Rosa Ave.



Intersection
Project Dwy. 2 / Santa Rosa Ave.





LEGEND

- X — Study Intersection
- Project Site
- Taylor Mountain Elementary School
- STOP — Stop Sign
- Traffic Signal
- XX — AM Peak Hour Volume
- (XX) — PM Peak Hour Volume

N

TJKM

7.0 ADDITIONAL ANALYSES

The following sections provide additional analyses of other transportation issues associated with the project site, including:

- Signal Warrant analysis at the intersection of Santa Rosa Avenue and Bellevue Avenue;
- Site access and onsite circulation;
- Pedestrian, bicycle and transit impacts;
- Parking analysis;
- Collision History

Unlike the LOS impact methodology, which is adopted by the City Council, the analyses in these sections is based on professional judgment in accordance with the standards and methods employed by traffic engineers. Although operational issues are not considered CEQA impacts, they do describe traffic conditions that are relevant to describing the project environment.

7.1 Signal Warrant Analysis At The Intersection Of Santa Rosa Avenue and Bellevue Avenue

TJKM conducted a signal warrant analysis at the intersection of Santa Rosa Avenue and Bellevue Avenue to assess the need for the signalization based on projected vehicle and pedestrian volumes resulting from the proposed development.

The intersection of Santa Rosa Avenue and Bellevue Avenue is currently two-way stop controlled. The west leg of the intersection is a private driveway. All approaches at Santa Rosa Avenue and Bellevue Avenue have one shared through/right/left lane and crosswalks on all sides of the intersection. The current surrounding land uses are mainly residential and commercial. There is no parking on Santa Rosa Avenue and some on street parking along Bellevue Avenue. The intersection has larger volumes on Santa Rosa Avenue and some, but relatively low bicycle and pedestrian volumes considering its proximity to a school.

TJKM conducted a signal warrant analysis for the intersection of Santa Rosa Avenue and Bellevue Avenue based on the 2014 California MUTCD standards and guidelines. The warrant analysis used existing traffic volumes and conditions.

Traffic signal warrants were developed by the Federal Highway Administration (FHWA) and are described in the CA MUTCD. Nine signal warrants correlate the need for a traffic signal at an intersection with pedestrian and vehicle volumes. Satisfying one or more of these warrants could justify the installation of a traffic signal at the intersection. The signal warrants are briefly summarized below:

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume

- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

Based on the data provided by the City of Santa Rosa, TJKM utilized Warrant 3, Peak Hour Vehicular Volume to determine if a signal would benefit this intersection.

WARRANT 3, PEAK HOUR VEHICULAR VOLUME

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street. **Table 7** details summarizes the findings.

Table 7: Traffic Signal Warrant Analysis Summary for Santa Rosa Avenue and Bellevue Avenue

Scenario	Traffic Signal Warrant Warrant 3 Peak Hour Volume
Existing Conditions	**Satisfied**
Existing plus Project Conditions	**Satisfied**
Background Conditions	**Satisfied**
Background plus Project Conditions	**Satisfied**

Based on these findings and provided data from the City of Santa Rosa, installation of a traffic signal at the intersection of Santa Rosa Avenue and Bellevue Avenue is warranted. However, other warrants can be performed with additional data to confirm a need for a signal. Additionally, the addition of project trips at this intersection, four in the a.m. peak and eight in the p.m. peak, are considered minimal and the signal warrants are already satisfied in the existing and background conditions.

7.2 Site Access and On-Site Circulation

Site Access

This section analyzes site access and internal circulation for vehicles, pedestrians and bicycles based on the site plan presented on **Figure 2**. TJKM reviewed internal and external access for the project site for vehicles, pedestrians, and bicycles.

On-Site Circulation

In terms of external access, the project conceptual plan (dated January 31, 2018) shows the driveway that the proposed project would use. The only driveway to this small shopping center is a full access 25-foot wide driveway providing. The internal circulation was reviewed for issues related to queuing, safety, dead-end aisles, and parking spaces with difficult maneuvers. All of the circulation aisles accommodate two-way travel and all of the proposed parking spaces are perpendicular. As an existing use, emergency and service vehicles are able to access the site as needed.

7.3 Pedestrian, Bicycle, and Transit Impacts

Pedestrian Access

An impact to pedestrians occurs if the proposed project disrupts existing pedestrian's facilities; or create inconsistencies with planned pedestrian facilities or adopted pedestrian system plans, guidelines, policies, or standards. The proposed project does not conflict with existing and planned pedestrian facilities; therefore, the impact to pedestrian facilities is ***less than significant***.

Bicycle Access

In terms of bicycle access to the project site, there are Class II bike lanes along Santa Rosa Avenue, Bellevue Avenue and proposed Class III bike routes on Yolanda Avenue and Bellevue Avenue in the City's Update. An impact to bicyclists occurs if the proposed project disrupts existing bicycle facilities; or conflicts or creates inconsistencies with adopted bicycle system plans, guidelines, policies or standards as per the City of Mountain View bicycle impact criteria. The project is expected to generate few additional bicycle trips on existing and planned bicycle facilities. The project does not conflict with existing and planned bicycle facilities; therefore, the impact to bicycle facilities is ***less than significant***.

Transit Access

A proposed project is considered to have a significant impact on transit if it conflicts with existing or planned transit facilities, or is expected to generate additional transit trips and does not provide adequate facilities for pedestrians and bicyclists to access transit routes and stops. The transit service within the immediate project site and additional trips generated by the proposed project could be accommodated by existing transit services. Therefore, impacts to transit service are expected to be ***less than significant***.

7.4 Collision History

Collision history was reviewed to determine any trends or patterns that may indicate a safety issues. Collision rates were calculated based on records available from the California Highway Patrol as published in the Statewide Integrated Traffic Records System Reports (SWITRS). The most current and available five-year period available is January 1, 2012 through December 31, 2017.

Table 8 shows the calculated collision rate compared to the statewide average collision rate. The accumulated collisions along Santa Rosa Avenue at the study intersections are above the statewide average. To reduce the collision rate, the City can consider modifying the signal timings and consider traffic calming measures along the corridor.

Table 8: Collision Rate Analysis

Study Intersections	Total # of Collisions (2012-17)	Intersection Collision Rate (ICR)	Statewide Average Collision Rate	Intersection Collision Rate > Statewide Average Collision Rate
Santa Rosa Avenue/Bellevue Avenue	8	0.56	0.19	Yes
Santa Rosa Avenue/Burt Street	9	0.57	0.24	Yes
Santa Rosa Avenue/Southside	6	0.37	0.24	Yes
Santa Rosa Avenue/Yolanda Avenue	20	0.82	0.24	Yes

Source: SWITRS

Notes: ICR = 1000000*A / (365*T*ADT)

ICR= Observed collision rate; Number of accidents/vehicles miles traveled

A = Number of collisions over study period

T = Total number of years over which intersection accidents were collected; 2012 to 2017 = 5 years

ADT = Average Daily Traffic

[1]Obtained from 2015 Collision Data on California State Highways, Basic Average Accident Rate Table for Intersections, Page 89 and 90

7.5 PARKING

Per the City of Santa Rosa Parking Zoning Code Section 20-3.6.040, the parking space facility for the retail use is one space per 250 sf and one bicycle parking space per 5,000 sf. The total amount of parking spaces in the shopping center is 61 spaces, including three ADA spaces. Based on the current leased space of the three-suite shopping center, the following parking requirements are detailed in **Table 9.**

Table 9: Parking Requirements at 3011 Santa Rosa Avenue

Suite	*Business Name/ Use*	*Leased SF*	*City Required Parking (Space/Square feet)*	*Required Parking Space*
A	Proposed Retail Cannabis Dispensary/ Retail	5,820	1/250	23
B	Cycle Gear/ Retail	4,180	1/250	17
C	Shutterbug Cameras/ Retail	5,000	1/250	20
			Total Required Parking	**60**
			Total Available Spaces on Site	**61**

Additionally, per the City's Zoning Code, the proposed project is required to provide one bicycle parking space.

Based on the current uses, the existing parking spaces can accommodate the proposed use on site.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Project Trip Generation

The proposed project is expected to generate approximately 61 weekday a.m. peak hour trips (31 inbound trips, 30 outbound trips) and 106 weekday p.m. peak hour trips (53 inbound trips, 53 outbound trips).

Existing and Background Conditions

Under these scenarios, all of the study intersections and roadway segments operate within applicable jurisdictional standards of LOS D or better during the a.m. and p.m. peak hours except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which operates at LOS E in the a.m. peak hour.

Existing, and Background plus Project Conditions

Under this scenario, all of the study intersections and roadway segments operate within applicable jurisdictional standards of LOS D or better during the a.m., and p.m. peak hours except for the intersection of Santa Rosa Avenue and Bellevue Avenue, which maintains LOS E in the a.m. peak hour.

Based on the City impact criteria the project is expected to have a **less-than-significant** impact at all of the study intersections.

Signal Warrant Analysis at Santa Rosa Avenue and Bellevue Avenue

Based on the 2014 California MUTCD warrant criteria, projected traffic conditions and data available, Signal Warrant 3 is satisfied for the Existing, Background and plus Project Conditions for the intersection of Santa Rosa Avenue and Bellevue Avenue. Based on these findings, installation of a traffic signal at the intersection of Santa Rosa Avenue and Bellevue Avenue is warranted. However, with additional data, other warrants can be analyzed to confirm if a signal is necessary. It is recommended the City use the enclosed analysis to determine, at their discretion, to install a signal or can consider other traffic calming methods to improve pedestrian access at this intersection. It should be noted the signal warrant was satisfied in the Existing and Background conditions, without the addition of the small number of estimated project trips, therefore it is not a mitigation of the project.

Pedestrian Impacts

The proposed project provides adequate and appropriate facilities for safe non-motorized mobility. There is adequate pedestrian access to the project site from the surrounding area.

The proposed project does not conflict with existing and planned pedestrian facilities; therefore, the impact to pedestrian facilities is ***less-than-significant***.

Bicycle Impacts

The project is not expected to generate additional bicycle trips on existing and planned bicycle facilities and does not conflict with existing and planned bicycle facilities; therefore, the impact to bicycle facilities is ***less than significant***.

Transit Impacts

The project site is in close proximity to transit which operate with 30 to 60 minute headways. The project site is adequately served by SC transit service. Therefore, impacts to transit service are expected to be ***less than significant***.

Site Access, On-Site Circulation and Parking

The proposed project is located in an existing shopping center and has adequate access and internal circulation. The project meets the City's parking requirements based on the existing retail uses of the neighboring tenants.

Appendix A – Level of Service Methodology

LEVEL OF SERVICE METHODOLOGY

LEVEL OF SERVICE

The description and procedures for calculating capacity and level of service are found in Transportation Research Board, *Highway Capacity Manual 2000*. *Highway Capacity Manual 2000* represents the latest research on capacity and quality of service for transportation facilities.

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six levels of service are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with level-of-service A representing the best operating conditions and level-of-service F the worst. Each level of service represents a range of operating conditions and the driver's perception of these conditions. Safety is not included in the measures that establish service levels.

A general description of service levels for various types of facilities is shown in Table A-I.

Table A-I

Level of Service Description

Facility Type	**Uninterrupted Flow**	**Interrupted Flow**
	Freeways Multi-lane Highways Two-lane Highways Urban Streets	Signalized Intersections Unsignalized Intersections Two-way Stop Control All-way Stop Control
LOS		
A	Free-flow	Very low delay.
B	Stable flow. Presence of other users noticeable.	Low delay.
C	Stable flow. Comfort and convenience starts to decline.	Acceptable delay.
D	High density stable flow.	Tolerable delay.
E	Unstable flow.	Limit of acceptable delay.
F	Forced or breakdown flow.	Unacceptable delay

Source: *Highway Capacity Manual 2000*

Urban Streets

The term "urban streets" refers to urban arterials and collectors, including those in downtown areas.

Arterial streets are roads that primarily serve longer through trips. However, providing access to abutting commercial and residential land uses is also an important function of arterials.

Collector streets provide both land access and traffic circulation within residential, commercial and industrial areas. Their access function is more important than that of arterials, and unlike arterials their operation is not always dominated by traffic signals.

Downtown streets are signalized facilities that often resemble arterials. They not only move through traffic but also provide access to local businesses for passenger cars, transit buses, and trucks. Pedestrian conflicts and lane obstructions created by stopping or standing buses, trucks and parking vehicles that cause turbulence in the traffic flow are typical of downtown streets.

The speed of vehicles on urban streets is influenced by three main factors, street environment, interaction among vehicles and traffic control. As a result, these factors also affect quality of service.

The street environment includes the geometric characteristics of the facility, the character of roadside activity and adjacent land uses. Thus, the environment reflects the number and width of lanes, type of median, driveway density, spacing between signalized intersections, existence of parking, level of pedestrian activity and speed limit.

The interaction among vehicles is determined by traffic density, the proportion of trucks and buses, and turning movements. This interaction affects the operation of vehicles at intersections and, to a lesser extent, between signals.

Traffic control (including signals and signs) forces a portion of all vehicles to slow or stop. The delays and speed changes caused by traffic control devices reduce vehicle speeds, however, such controls are needed to establish right-of-way.

The average travel speed for through vehicles along an urban street is the determinant of the operating level of service. The travel speed along a segment, section or entire length of an urban street is dependent on the running speed between signalized intersections and the amount of control delay incurred at signalized intersections.

Level-of-service A describes primarily free-flow operations. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal.

Level-of-service B describes reasonably unimpeded operations. The ability to maneuver within the traffic stream is only slightly restricted, and control delays at signalized intersections are not significant.

Level-of-service C describes stable operations, however, ability to maneuver and change lanes in midblock location may be more restricted than at level-of-service B. Longer queues, adverse signal coordination, or both may contribute to lower travel speeds.

Level-of-service D borders on a range in which in which small increases in flow may cause substantial increases in delay and decreases in travel speed. Level-of-service D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors.

Level-of-service E is characterized by significant delays and lower travel speeds. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.

Level-of-service F is characterized by urban street flow at extremely low speeds. Intersection congestion is likely at critical signalized locations, with high delays, high volumes, and extensive queuing.

The methodology to determine level of service stratifies urban streets into four classifications. The classifications are complex, and are related to functional and design categories. Table A-II describes the functional and design categories, while Table A-III relates these to the urban street classification.

Once classified, the urban street is divided into segments for analysis. An urban street segment is a one-way section of street encompassing a series of blocks or links terminating at a signalized intersection. Adjacent segments of urban streets may be combined to form larger street sections, provided that the segments have similar demand flows and characteristics.

Levels of service are related to the average travel speed of vehicles along the urban street segment or section.

Travel times for existing conditions are obtained by field measurements. The maximum-car technique is used. The vehicle is driven at the posted speed limit unless impeded by actual traffic conditions. In the maximum-car technique, a safe level of vehicular operation is maintained by observing proper following distances and by changing speeds at reasonable rates of acceleration and deceleration. The maximum-car technique provides the best base for measuring traffic performance.

An observer records the travel time and locations and duration of delay. The beginning and ending points are the centers of intersections. Delays include times waiting in queues at signalized intersections. The travel speed is determined by dividing the length of the segment by the travel time. Once the travel speed on the arterial is determined, the level of service is found by comparing the speed to the criteria in Table A-IV. Level-of-service criteria vary for the different classifications of urban street, reflecting differences in driver expectations.

Table A-II

Functional and Design Categories for Urban Streets

Criterion	Functional Category	
	Principal Arterial	**Minor Arterial**
Mobility function	Very important	Important
Access function	Very minor	Substantial
Points connected	Freeways, important activity centers, major traffic generators	Principal arterials
Predominant trips served	Relatively long trips between major points and through trips entering, leaving, and passing through city	Trips of moderate length within relatively small geographical areas

Criterion	Design Category			
	High-Speed	**Suburban**	**Intermediate**	**Urban**
Driveway access density	Very low density	Low density	Moderate density	High density
Arterial type	Multilane divided; undivided or two-lane with shoulders	Multilane divided: undivided or two-lane with shoulders	Multilane divided or undivided; one way, two lane	Undivided one way; two way, two or more lanes
Parking	No	No	Some	Usually
Separate left-turn lanes	Yes	Yes	Usually	Some
Signals per mile	0.5 to 2	1 to 5	4 to 10	6 to 12
Speed limits	45 to 55 mph	40 to 45 mph	30 to 40 mph	25 to 35 mph
Pedestrian activity	Very little	Little	Some	Usually
Roadside development	Low density	Low to medium density	Medium to moderate density	High density

Source: *Highway Capacity Manual 2000*

Table A-III

Urban Street Class based on Function and Design Categories

Design Category	Functional Category	
	Principal Arterial	**Minor Arterial**
High-Speed	I	Not applicable
Suburban	II	II
Intermediate	II	III or IV
Urban	III or IV	IV

Source: *Highway Capacity Manual 2000*

Table A-IV

Urban Street Levels of Service by Class

Urban Street Class	I	II	III	IV
Range of Free Flow Speeds (mph)	45 to 55	35 to 45	30 to 35	25 to 35
Typical Free Flow Speed (mph)	50	40	33	30
Level of Service	**Average Travel Speed (mph)**			
A	>42	>35	>30	>25
B	>34	>28	>24	>19
C	>27	>22	>18	>13
D	>21	>17	>14	>9
E	>16	>13	>10	>7
F	≤16	≤13	≤10	≤7

Source: *Highway Capacity Manual 2000*

Interrupted Flow

One of the more important elements limiting, and often interrupting the flow of traffic on a highway is the intersection. Flow on an interrupted facility is usually dominated by points of fixed operation such as traffic signals, stop and yield signs. These all operate quite differently and have differing impacts on overall flow.

Signalized Intersections

The capacity of a highway is related primarily to the geometric characteristics of the facility, as well as to the composition of the traffic stream on the facility. Geometrics are a fixed, or non-varying, characteristic of a facility.

At the signalized intersection, an additional element is introduced into the concept of capacity: time allocation. A traffic signal essentially allocates time among conflicting traffic movements seeking use of the same physical space. The way in which time is allocated has a significant impact on the operation of the intersection and on the capacity of the intersection and its approaches.

Level of service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, *i. e.,* in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Specifically, level of service criteria for traffic signals are stated in terms of average control delay per vehicle, typically for a 15-minute analysis period. Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the ratio of green time to cycle length and the volume to capacity ratio for the lane group.

For each intersection analyzed the average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection. A level of service designation is given to the control delay to better describe the level of operation. A

description of levels of service for signalized intersections can be found in Table A-V.

Table A-V

Description of Level of Service for Signalized Intersections

Level of Service	Description
A	Very low control delay, up to 10 seconds per vehicle. Progression is extremely favorable, and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.
B	Control delay greater than 10 and up to 20 seconds per vehicle. There is good progression or short cycle lengths or both. More vehicles stop causing higher levels of delay.
C	Control delay greater than 20 and up to 35 seconds per vehicle. Higher delays are caused by fair progression or longer cycle lengths or both. Individual cycle failures may begin to appear. Cycle failure occurs when a given green phase doe not serve queued vehicles, and overflow occurs. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.
D	Control delay greater than 35 and up to 55 seconds per vehicle. The influence of congestions becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volumes. Many vehicles stop, the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Control delay greater than 55 and up to 80 seconds per vehicle. The limit of acceptable delay. High delays usually indicate poor progression, long cycle lengths, and high volumes. Individual cycle failures are frequent.
F	Control delay in excess of 80 seconds per vehicle. Unacceptable to most drivers. Oversaturation, arrival flow rates exceed the capacity of the intersection. Many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to higher delay.

Source: *Highway Capacity Manual 2000*

The use of control delay, which may also be referred to as signal delay, was introduced in the 1997 update to the *Highway Capacity Manual*, and represents a departure from previous updates. In the third edition, published in 1985 and the 1994 update to the third edition, delay only included stopped delay. Thus, the level of service criteria listed in Table A-V differs from earlier criteria.

Unsignalized Intersections

The current procedures on unsignalized intersections were first introduced in the 1997 update to the *Highway Capacity Manual* and represent a revision of the methodology published in the 1994 update to the 1985 *Highway Capacity Manual*. The revised procedures use control delay as a measure of effectiveness to determine level of service. Delay is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, *i. e.,* in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Control delay is the increased time of travel for a vehicle approaching and passing through an unsignalized intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection.

Two-Way Stop Controlled Intersections

Two-way stop controlled intersections in which stop signs are used to assign the right-of-way, are the most prevalent type of intersection in the United States. At two-way stop-controlled intersections the stop-controlled approaches are referred as the minor street approaches and can be either public streets or private driveways. The approaches that are not controlled by stop signs are referred to as the major street approaches.

The capacity of movements subject to delay are determined using the "critical gap" method of capacity analysis. Expected average control delay based on movement volume and movement capacity is calculated. A level of service designation is given to the expected control delay for each minor movement. Level of service is not defined for the intersection as a whole. Control delay is the increased time of travel for a vehicle approaching and passing through a stop-controlled intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection. A description of levels of service for two-way stop-controlled intersections is found in Table A-VI.

Table A-VI

Description of Level of Service for Two-Way Stop Controlled Intersections

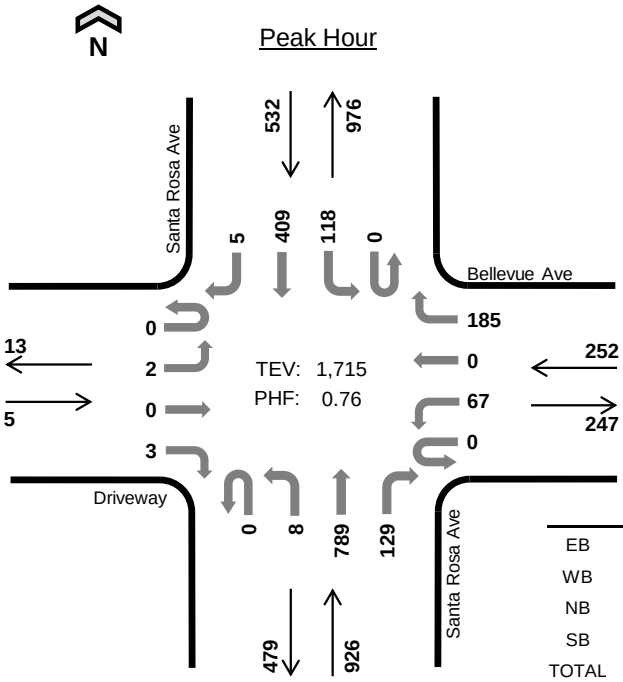
Level of Service	Description
A	Very low control delay less than 10 seconds per vehicle for each movement subject to delay.
B	Low control delay greater than 10 and up to 15 seconds per vehicle for each movement subject to delay.
C	Acceptable control delay greater than 15 and up to 25 seconds per vehicle for each movement subject to delay.
D	Tolerable control delay greater than 25 and up to 35 seconds per vehicle for each movement subject to delay.
E	Limit of tolerable control delay greater than 35 and up to 50 seconds per vehicle for each movement subject to delay.
F	Unacceptable control delay in excess of 50 seconds per vehicle for each movement subject to delay.

Source: *Highway Capacity Manual 2000*

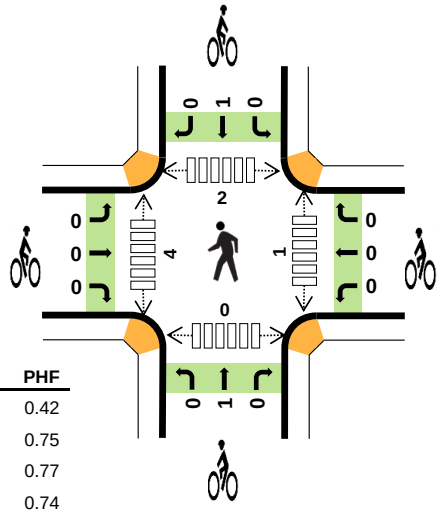
Appendix B – Existing Traffic Counts

Santa Rosa Ave
Bellevue Ave

Date: 12-18-2018
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:30 AM to 8:30 AM



	HV %:	PHF
EB	20.0%	0.42
WB	1.2%	0.75
NB	2.4%	0.77
SB	3.8%	0.74
TOTAL	2.7%	0.76



Two-Hour Count Summaries

Interval Start		Driveway Eastbound				Bellevue Ave Westbound				Santa Rosa Ave Northbound				Santa Rosa Ave Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	0	0	0	10	0	19	0	3	76	13	0	13	71	1	206	0
7:15 AM		0	0	0	0	0	9	0	38	0	0	125	10	0	22	68	1	273	0
7:30 AM		**0**	**0**	**0**	**1**	**0**	**19**	**0**	**50**	**0**	**4**	**217**	**28**	**0**	**30**	**71**	**2**	**422**	0
7:45 AM		**0**	**0**	**0**	**0**	**0**	**16**	**0**	**68**	**0**	**0**	**228**	**72**	**0**	**66**	**112**	**1**	**563**	1,464
8:00 AM		**0**	**1**	**0**	**2**	**0**	**29**	**0**	**48**	**0**	**3**	**180**	**19**	**0**	**6**	**102**	**1**	**391**	1,649
8:15 AM		**0**	**1**	**0**	**0**	**0**	**3**	**0**	**19**	**0**	**1**	**164**	**10**	**0**	**16**	**124**	**1**	**339**	**1,715**
8:30 AM		0	0	0	0	0	6	0	18	0	0	163	5	1	13	97	0	303	1,596
8:45 AM		0	1	0	1	0	4	0	10	0	0	137	6	0	12	99	1	271	1,304
Count Total		0	3	0	4	0	96	0	270	0	11	1,290	163	1	178	744	8	2,768	0
Peak Hour	**All**	**0**	**2**	**0**	**3**	**0**	**67**	**0**	**185**	**0**	**8**	**789**	**129**	**0**	**118**	**409**	**5**	**1,715**	**0**
	HV	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**1**	**0**	**1**	**20**	**1**	**0**	**0**	**20**	**0**	**46**	**0**
	HV%	**-**	**0%**	**-**	**33%**	**-**	**3%**	**-**	**1%**	**-**	**13%**	**3%**	**1%**	**-**	**0%**	**5%**	**0%**	**3%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals EB	WB	NB	SB	Total	Bicycles EB	WB	NB	SB	Total	Pedestrians (Crossing Leg) East	West	North	South	Total
7:00 AM	0	0	5	5	*10*	0	0	0	0	*0*	4	2	1	0	*7*
7:15 AM	0	2	8	5	*15*	0	0	1	0	*1*	0	0	0	0	*0*
7:30 AM	**0**	**3**	**5**	**3**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**0**	**0**	**8**	**4**	***12***	**0**	**0**	**0**	**1**	***1***	**1**	**0**	**0**	**0**	*1*
8:00 AM	**1**	**0**	**3**	**4**	***8***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**0**	**0**	**6**	**9**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**4**	**2**	**0**	***6***
8:30 AM	0	0	5	4	*9*	0	0	0	0	*0*	1	0	0	0	*1*
8:45 AM	1	1	1	2	*5*	0	0	0	1	*1*	3	1	1	0	*5*
Count Total	2	6	41	36	*85*	0	0	2	2	*4*	9	7	4	0	*20*
Peak Hour	**1**	**3**	**22**	**20**	***46***	**0**	**0**	**1**	**1**	***2***	**1**	**4**	**2**	**0**	***7***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	Driveway				Bellevue Ave				Santa Rosa Ave				Santa Rosa Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5	0	10	0
7:15 AM	0	0	0	0	0	0	0	2	0	0	6	2	0	1	4	0	15	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**4**	**1**	**0**	**0**	**3**	**0**	**11**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**4**	**0**	**12**	48
8:00 AM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**4**	**0**	**8**	46
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**0**	**0**	**0**	**9**	**0**	**15**	**46**
8:30 AM	0	0	0	0	0	0	0	0	0	0	4	1	0	0	4	0	9	44
8:45 AM	0	0	0	1	0	0	0	1	0	0	1	0	0	1	1	0	5	37
Count Total	0	0	0	2	0	2	0	4	0	1	35	5	0	2	34	0	85	0
Peak Hour	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**1**	**0**	**1**	**20**	**1**	**0**	**0**	**20**	**0**	**46**	**0**

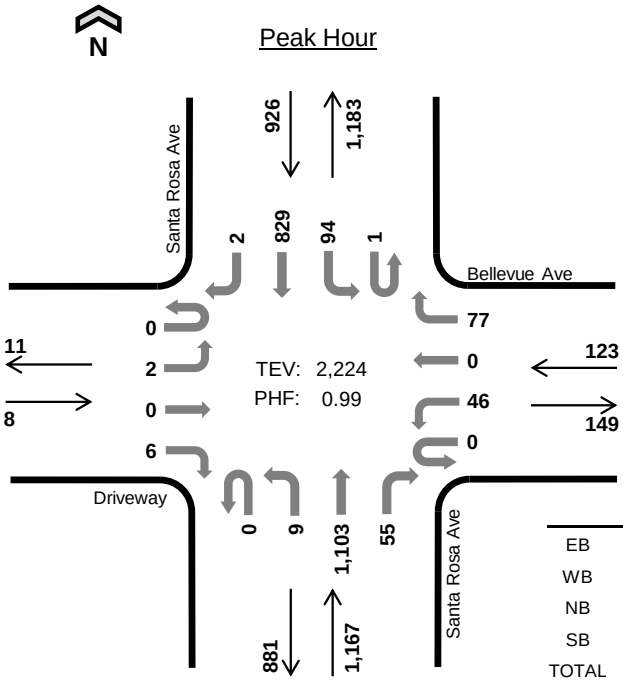
Two-Hour Count Summaries - Bikes

Interval Start	Driveway			Bellevue Ave			Santa Rosa Ave			Santa Rosa Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	2
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	3
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	2
Count Total	0	0	0	0	0	0	0	2	0	0	2	0	4	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**2**	**0**

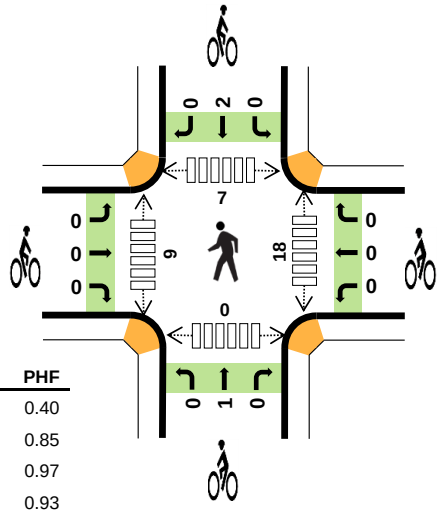
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Santa Rosa Ave
Bellevue Ave

Date: 12-18-2018
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	0.0%	0.40
WB	0.8%	0.85
NB	1.0%	0.97
SB	1.1%	0.93
TOTAL	1.0%	0.99



Two-Hour Count Summaries

Interval Start		Driveway Eastbound				Bellevue Ave Westbound				Santa Rosa Ave Northbound				Santa Rosa Ave Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	0	0	1	0	4	0	13	0	2	264	8	0	19	182	1	494	0
4:15 PM		**0**	**1**	**0**	**0**	**0**	**9**	**0**	**27**	**0**	**2**	**285**	**14**	**0**	**24**	**194**	**1**	**557**	0
4:30 PM		**0**	**0**	**0**	**1**	**0**	**14**	**0**	**22**	**0**	**2**	**269**	**10**	**1**	**16**	**224**	**0**	**559**	0
4:45 PM		**0**	**0**	**0**	**1**	**0**	**12**	**0**	**14**	**0**	**2**	**282**	**17**	**0**	**29**	**189**	**0**	**546**	2,156
5:00 PM		**0**	**1**	**0**	**4**	**0**	**11**	**0**	**14**	**0**	**3**	**267**	**14**	**0**	**25**	**222**	**1**	**562**	**2,224**
5:15 PM		0	1	0	5	0	10	0	23	0	1	260	21	0	22	197	1	541	2,208
5:30 PM		0	0	0	2	0	9	0	29	0	1	242	22	0	30	177	0	512	2,161
5:45 PM		0	0	0	2	0	12	0	17	0	0	242	12	0	21	189	1	496	2,111
Count Total		0	3	0	16	0	81	0	159	0	13	2,111	118	1	186	1,574	5	4,267	0
Peak Hour	**All**	**0**	**2**	**0**	**6**	**0**	**46**	**0**	**77**	**0**	**9**	**1,103**	**55**	**1**	**94**	**829**	**2**	**2,224**	**0**
	HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**9**	**0**	**0**	**0**	**9**	**1**	**23**	**0**
	HV%	**-**	**0%**	**-**	**0%**	**-**	**0%**	**-**	**1%**	**-**	**33%**	**1%**	**0%**	**0%**	**0%**	**1%**	**50%**	**1%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals EB	WB	NB	SB	Total	Bicycles EB	WB	NB	SB	Total	Pedestrians (Crossing Leg) East	West	North	South	Total
4:00 PM	0	0	2	2	*4*	0	0	1	0	*1*	1	0	0	0	*1*
4:15 PM	**0**	**1**	**6**	**4**	***11***	**0**	**0**	**0**	**1**	***1***	**4**	**1**	**0**	**0**	*5*
4:30 PM	**0**	**0**	**1**	**1**	***2***	**0**	**0**	**0**	**0**	***0***	**9**	**3**	**0**	**0**	*12*
4:45 PM	**0**	**0**	**2**	**2**	***4***	**0**	**0**	**1**	**1**	***2***	**2**	**3**	**3**	**0**	*8*
5:00 PM	**0**	**0**	**3**	**3**	***6***	**0**	**0**	**0**	**0**	***0***	**3**	**2**	**4**	**0**	***9***
5:15 PM	1	0	1	3	*5*	0	0	0	0	*0*	0	0	2	0	*2*
5:30 PM	0	0	3	1	*4*	0	0	0	0	*0*	3	1	0	0	*4*
5:45 PM	0	0	1	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	1	1	19	16	*37*	0	0	2	2	*4*	22	10	9	0	*41*
Peak Hour	**0**	**1**	**12**	**10**	***23***	**0**	**0**	**1**	**2**	***3***	**18**	**9**	**7**	**0**	***34***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	Driveway				Bellevue Ave				Santa Rosa Ave				Santa Rosa Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	4	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**5**	**0**	**0**	**0**	**4**	**0**	**11**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**0**	**4**	21
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**0**	**0**	**0**	**2**	**1**	**6**	**23**
5:15 PM	0	0	0	1	0	0	0	0	0	0	1	0	0	0	3	0	5	17
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	2	0	0	1	0	4	19
5:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	16
Count Total	0	0	0	1	0	0	0	1	0	4	12	3	0	0	15	1	37	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**9**	**0**	**0**	**0**	**9**	**1**	**23**	**0**

Two-Hour Count Summaries - Bikes

Interval Start	Driveway			Bellevue Ave			Santa Rosa Ave			Santa Rosa Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**2**	4
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	2	0	0	2	0	4	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	**0**	**3**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA SERVICES

DATE: 4/29/15 WEDNESDAY

LOCATION: SANTA ROSA
NORTH & SOUTH: SANTA ROSA
EAST & WEST: BURT

PROJECT #: 2015-0424-0210
LOCATION #: 12
CONTROL: SIGNAL

NOTES:

AM / PM / MD / OTHER / OTHER — ▲ N, ◄ W, E ►, S ▼

		NORTHBOUND SANTA ROSA			SOUTHBOUND SANTA ROSA			EASTBOUND BURT			WESTBOUND BURT			
	LANES:	NL 1	NT 2	NR 0	SL 1	ST 2	SR 0	EL 1	ET 1	ER 0	WL 1	WT 1	WR 0	TOTAL
AM	6:30 AM													0
	6:45 AM													0
	7:00 AM	3	109	9	8	75	3	2	0	1	14	0	27	251
	7:15 AM	5	106	11	7	73	3	5	2	3	16	1	33	265
	7:30 AM	0	243	8	15	92	3	2	0	0	21	3	41	428
	7:45 AM	4	227	9	3	121	7	1	2	2	19	1	35	431
	8:00 AM	6	190	9	13	190	6	4	0	1	16	0	32	467
	8:15 AM	4	177	5	9	123	10	7	0	1	10	1	26	373
	8:30 AM	3	219	8	4	133	6	6	1	2	18	0	24	424
	8:45 AM	7	131	10	11	134	13	8	1	0	13	2	23	353
	9:00 AM													0
	9:15 AM													0
	VOLUMES	32	1,402	69	70	941	51	35	6	10	127	8	241	2,992
	APPROACH %	2%	93%	5%	7%	89%	5%	69%	12%	20%	34%	2%	64%	
	APP/DEPART	1,503	/	1,678	1,062	/	1,078	51	/	145	376	/	91	0
	BEGIN PEAK HR		7:30 AM											
	VOLUMES	14	837	31	40	526	26	14	2	4	66	5	134	1,699
	APPROACH %	2%	95%	4%	7%	89%	4%	70%	10%	20%	32%	2%	65%	
	PEAK HR FACTOR		0.878			0.708			0.625			0.788		0.910
	APP/DEPART	882	/	985	592	/	596	20	/	73	205	/	45	0
MIDDAY	11:00 AM													0
	11:15 AM													0
	11:30 AM	12	141	12	22	153	24	48	1	9	11	1	22	456
	11:45 AM	6	165	14	19	154	37	34	3	11	14	1	21	479
	12:00 PM	11	183	15	18	169	30	29	1	7	15	1	24	503
	12:15 PM	17	184	11	20	187	46	37	2	5	20	2	19	550
	12:30 PM	20	190	9	22	190	34	35	1	7	13	4	24	549
	12:45 PM	12	177	7	26	164	37	42	4	4	10	2	18	503
	1:00 PM	14	185	13	25	200	39	38	0	4	10	1	40	569
	1:15 PM	19	188	11	23	160	46	43	2	3	10	2	23	530
	1:30 PM													0
	1:45 PM													0
	VOLUMES	111	1,413	92	175	1,377	293	306	14	50	103	14	191	4,139
	APPROACH %	7%	87%	6%	9%	75%	16%	83%	4%	14%	33%	5%	62%	
	APP/DEPART	1,616	/	1,910	1,845	/	1,530	370	/	281	308	/	418	0
	BEGIN PEAK HR		12:15 PM											
	VOLUMES	63	736	40	93	741	156	152	7	20	53	9	101	2,171
	APPROACH %	8%	88%	5%	9%	75%	16%	85%	4%	11%	33%	6%	62%	
	PEAK HR FACTOR		0.958			0.938			0.895			0.799		0.954
	APP/DEPART	839	/	989	990	/	814	179	/	140	163	/	228	0
PM	3:30 PM													0
	3:45 PM													0
	4:00 PM	18	249	10	26	134	17	18	1	3	16	4	12	508
	4:15 PM	15	220	12	24	155	35	44	1	4	20	4	23	557
	4:30 PM	12	258	14	30	211	32	38	2	3	15	3	27	645
	4:45 PM	23	257	11	20	182	29	37	2	3	21	2	25	612
	5:00 PM	15	264	16	35	191	23	31	3	3	12	1	25	619
	5:15 PM	16	301	21	15	198	22	32	2	3	24	4	27	665
	5:30 PM	18	299	23	21	235	28	29	2	10	21	1	24	711
	5:45 PM	15	245	17	29	180	25	40	5	6	23	2	30	617
	6:00 PM													0
	6:15 PM													0
	VOLUMES	132	2,093	124	200	1,486	211	269	18	35	152	21	193	4,934
	APPROACH %	6%	89%	5%	11%	78%	11%	84%	6%	11%	42%	6%	53%	
	APP/DEPART	2,349	/	2,555	1,897	/	1,673	322	/	342	366	/	364	0
	BEGIN PEAK HR		5:00 PM											
	VOLUMES	64	1,109	77	100	804	98	132	12	22	80	8	106	2,612
	APPROACH %	5%	89%	6%	10%	80%	10%	80%	7%	13%	41%	4%	55%	
	PEAK HR FACTOR		0.919			0.882			0.814			0.882		0.918
	APP/DEPART	1,250	/	1,347	1,002	/	906	166	/	189	194	/	170	0

U-TURNS

NB	SB	EB	WB	TTL
X	X	X	X	
				0
				0
0	1	0	0	1
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	1	0	0	1
0	1	0	0	1
0	1	0	0	1
				0
				0
0	4	0	0	4
				0
				0
				0
0	7	0	0	7
1	2	0	0	3
0	0	0	0	0
0	2	0	0	2
0	0	0	0	0
0	2	0	0	2
0	2	0	0	2
0	0	0	0	0
1	3	0	0	4
				0
				0
2	18	0	0	20
				0
				0
				0
0	3	0	0	3
0	0	0	0	0
0	0	0	0	0
0	1	0	0	1
0	1	0	0	1
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
				0
				0
0	5	0	0	5

PED + BIKE CROSS

LEG OF INTER N	S	E	W	TTL
0	0	0	0	0
0	0	0	0	0
0	0	1	1	2
0	0	3	1	4
1	2	7	3	13
0	3	2	1	6
0	0	3	0	3
0	0	2	0	2
0	0	2	0	2
0	0	3	4	7
0	0	0	0	0
0	0	0	0	0
1	5	23	10	39
0	0	2	0	2
0	0	2	1	3
0	2	4	1	7
0	4	1	1	6
0	1	3	1	5
0	4	4	4	12
0	0	2	1	3
0	4	0	7	11
0	0	0	0	0
0	0	0	0	0
0	15	17	19	51
0	0	2	1	3
0	0	4	1	5
0	0	4	1	5
0	0	2	1	3
0	0	1	0	1
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	23	18	5	46

PED CROSSING

LEG OF INTER N	S	E	W	TTL
				0
				0
0	0	0	1	1
0	0	1	0	1
0	2	3	2	7
0	3	2	0	5
0	0	1	0	1
0	0	1	0	1
0	0	2	4	6
				0
				0
0	5	10	7	22
0	0	2	1	3
0	0	1	1	2
0	2	0	2	4
0	0	0	0	0
0	1	2	1	4
0	0	1	1	2
0	0	0	3	7
0	0	0	0	0
0	0	0	5	9
0	0	0	0	0
0	0	0	0	0
0	15	3	11	29
0	0	2	1	3
0	0	1	0	1
0	0	1	0	1
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	22	2	3	27

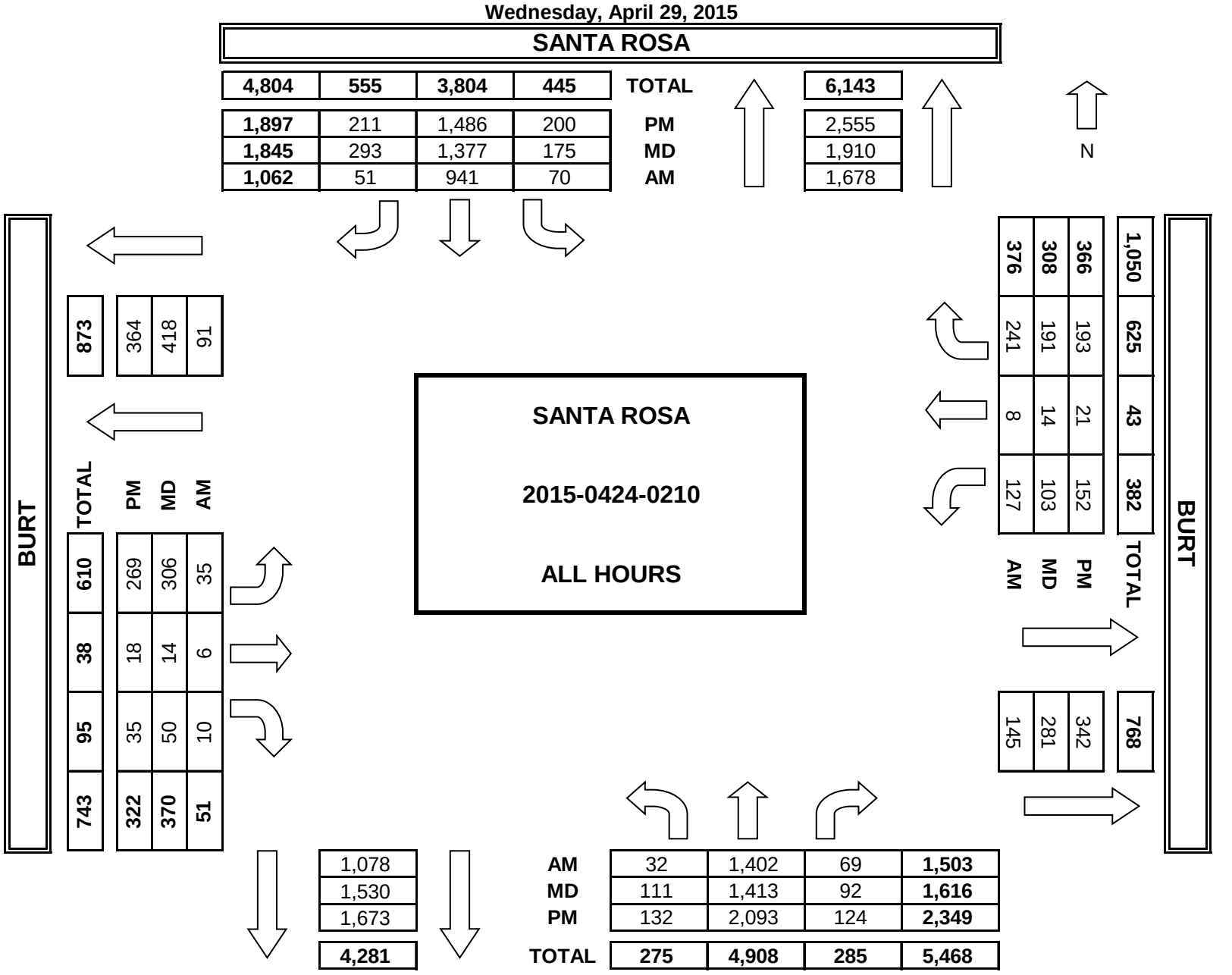
BIKE CROSSING

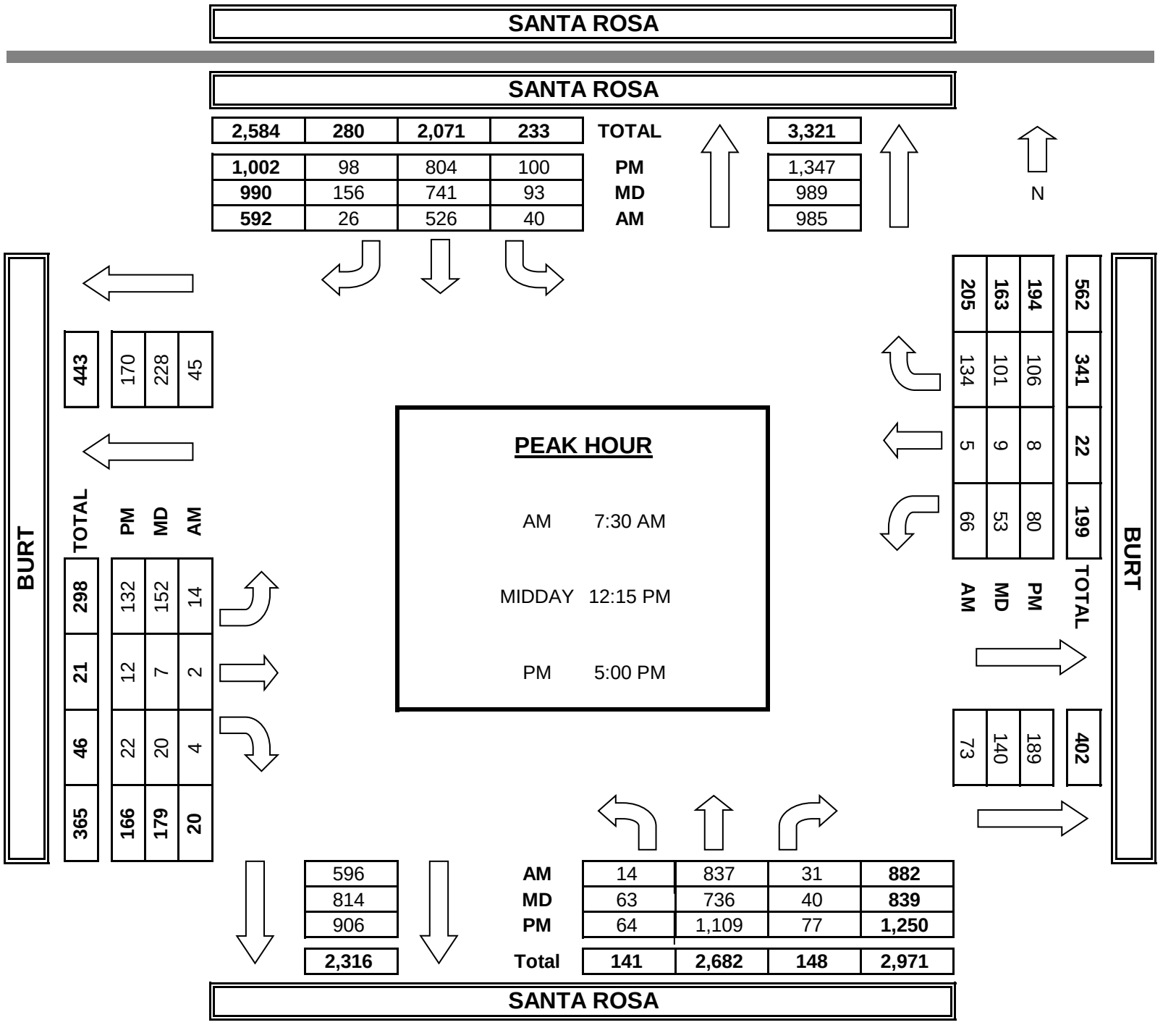
LEG OF INTER N	S	E	W	TTL
				0
				0
0	0	1	0	1
0	0	2	1	3
1	0	4	1	6
0	0	0	1	1
0	0	2	0	2
0	0	1	0	1
0	0	2	0	2
0	0	1	0	1
0	0	0	0	0
0	0	0	0	0
1	0	13	3	17
0	0	2	1	3
0	0	0	1	1
0	0	4	1	5
0	0	1	1	2
0	0	1	0	1
0	0	4	1	5
0	0	2	1	3
0	0	1	0	1
0	0	2	0	2
0	0	2	1	3
0	0	0	0	0
0	0	0	0	0
0	0	14	8	22
0	0	2	0	2
0	0	4	0	4
0	0	2	0	2
0	0	2	1	3
0	0	1	0	1
0	0	2	0	2
0	0	2	0	2
0	0	0	0	0
0	0	0	0	0
0	1	16	2	19

PACIFIC TRAFFIC DATA SERVICES

TURNING MOVEMENT COUNTS

Wednesday, April 29, 2015





INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA SERVICES

DATE: 3/16/16 WEDNESDAY

LOCATION: SANTA ROSA
NORTH & SOUTH: SANTA ROSA
EAST & WEST: SOUTHSIDE

PROJECT #: 0328-02-AP16
LOCATION #: 66
CONTROL: SIGNAL

NOTES:

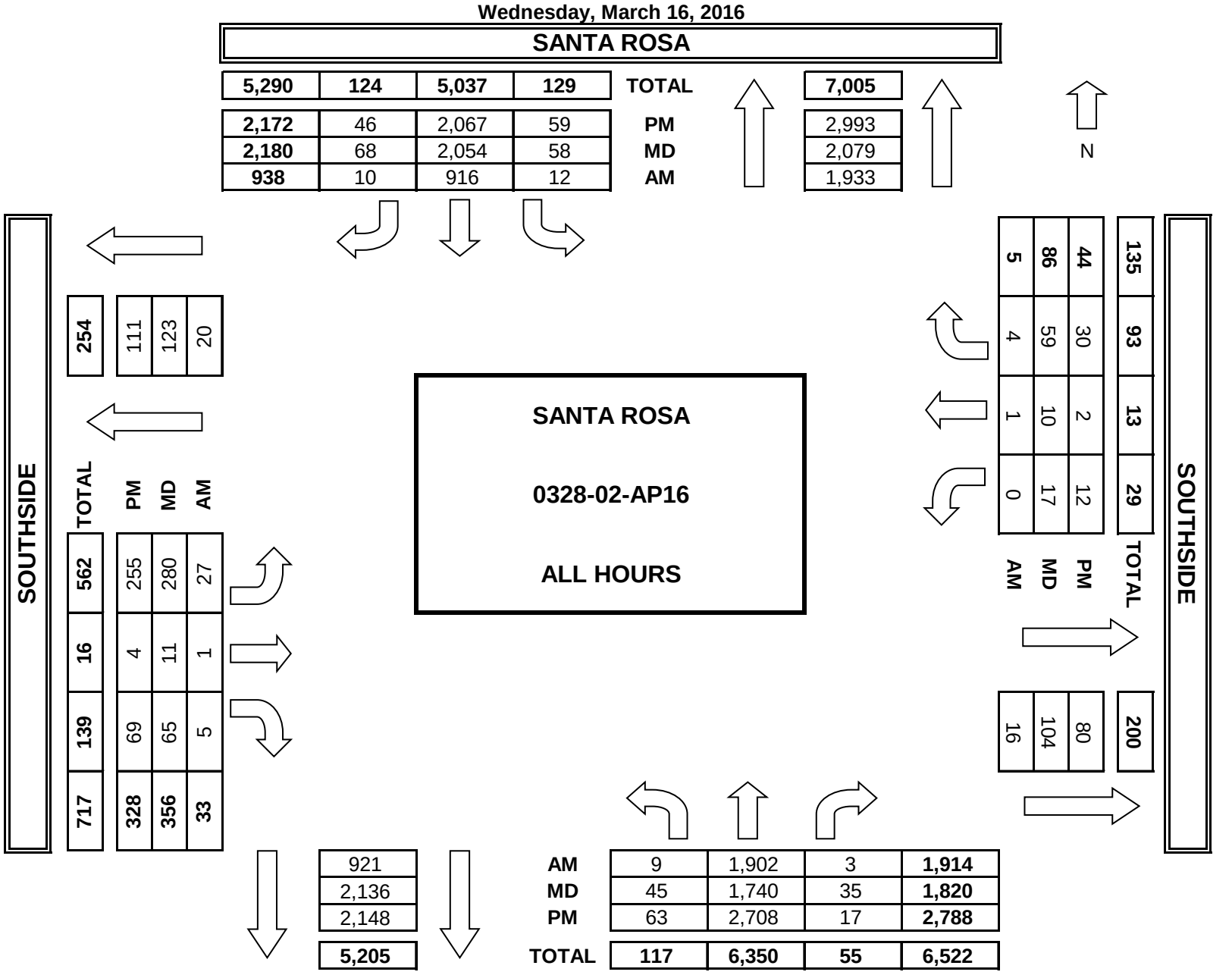
AM / PM / MD / OTHER / OTHER — ▲ N, ◄ W, E ►, S ▼

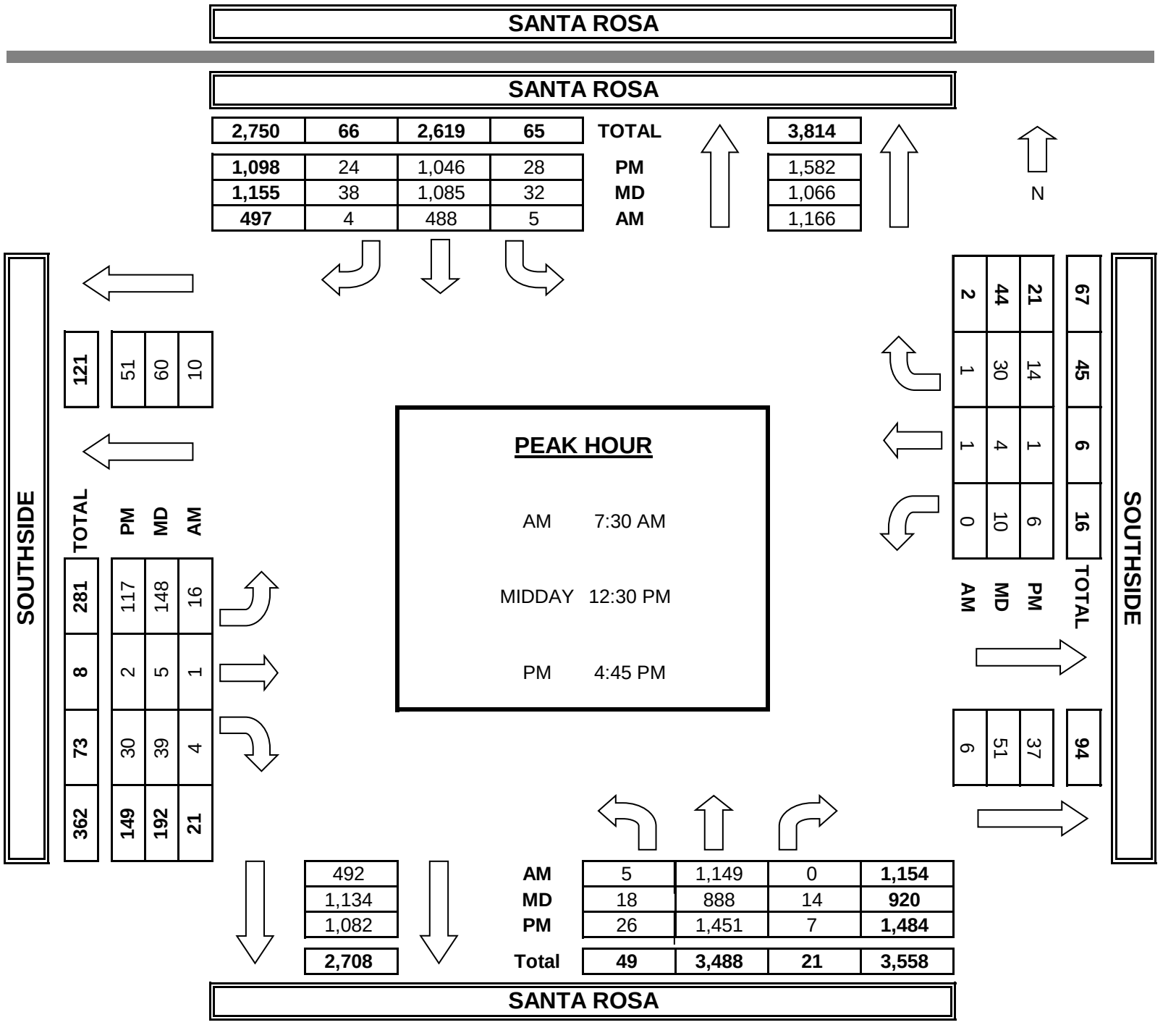
		NORTHBOUND SANTA ROSA			SOUTHBOUND SANTA ROSA			EASTBOUND SOUTHSIDE			WESTBOUND SOUTHSIDE				U-TURNS					PED + BIKE CROSS					PED CROSSING					BIKE CROSSING				
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL	LEG OF INTER N	S	E	W	TTL	LEG OF INTER N	S	E	W	TTL	LEG OF INTER N	S	E	W	TTL
	LANES:	1	2	0	1	2	0	1	0.5	0.5	1	0.5	0.5		X	X	X	X																
AM	6:30 AM													0					0	0	0	0	0	0					0					0
	6:45 AM													0					0	0	0	0	0	0					0					0
	7:00 AM	3	135	1	2	63	1	2	0	0	0	0	1	208	0	2	0	0	2	0	0	0	2	2	0	0	0	1	1	0	0	0	1	1
	7:15 AM	0	152	0	2	90	2	2	0	0	0	0	1	249	0	1	0	0	1	0	0	0	3	3	0	0	0	2	2	0	0	0	1	1
	7:30 AM	2	306	0	1	121	2	3	0	0	0	0	0	435	0	1	0	0	1	0	0	2	3	5	0	0	1	0	1	0	0	1	3	4
	7:45 AM	1	322	0	2	141	0	5	1	1	0	0	1	474	0	0	0	0	0	2	1	1	2	6	2	1	1	0	4	0	0	0	2	2
	8:00 AM	0	293	0	1	106	2	4	0	1	0	0	0	407	0	1	0	0	1	2	0	0	4	6	2	0	0	4	6	0	0	0	0	0
	8:15 AM	2	228	0	1	120	0	4	0	2	0	1	0	358	0	1	0	0	1	0	0	4	1	5	0	0	2	0	2	0	0	2	1	3
	8:30 AM	1	264	0	3	138	0	3	0	1	0	0	1	411	0	1	0	0	1	1	0	1	1	3	1	0	1	1	3	0	0	0	0	0
	8:45 AM	0	202	2	0	137	3	4	0	0	0	0	0	348	0	0	0	0	0	0	2	2	0	4	0	2	2	0	4	0	0	0	0	0
	9:00 AM													0					0	0	0	0	0	0					0					0
	9:15 AM													0					0	0	0	0	0	0					0					0
	VOLUMES	9	1,902	3	12	916	10	27	1	5	0	1	4	2,890	0	7	0	0	7	5	3	10	16	34	5	3	7	8	23	0	0	3	8	11
	APPROACH %	0%	99%	0%	1%	98%	1%	82%	3%	15%	0%	20%	80%																					
	APP/DEPART	1,914	/	1,933	938	/	921	33	/	16	5	/	20	0																				
	BEGIN PEAK HR		7:30 AM																															
	VOLUMES	5	1,149	0	5	488	4	16	1	4	0	1	1	1,674																				
	APPROACH %	0%	100%	0%	1%	98%	1%	76%	5%	19%	0%	50%	50%																					
	PEAK HR FACTOR		0.893			0.869			0.750			0.500		0.883																				
	APP/DEPART	1,154	/	1,166	497	/	492	21	/	6	2	/	10	0																				
MIDDAY	11:00 AM													0					0	0	0	0	0	0					0					0
	11:15 AM													0					0	0	0	0	0	0					0					0
	11:30 AM	1	177	11	9	237	8	37	0	7	2	4	11	504	0	3	0	0	3	0	0	4	1	5	0	0	4	0	4	0	0	0	1	1
	11:45 AM	3	236	3	8	225	4	32	3	6	2	1	5	528	0	7	0	0	7	0	2	2	0	4	0	2	1	0	3	0	0	1	0	1
	12:00 PM	8	223	7	2	267	8	30	0	5	2	0	4	556	0	0	0	0	0	0	1	4	1	6	0	1	3	0	4	0	0	1	1	2
	12:15 PM	15	216	0	7	240	10	33	3	8	1	1	9	543	0	1	0	0	1	2	1	4	2	9	2	1	4	2	9	0	0	0	0	0
	12:30 PM	1	203	4	2	289	11	34	1	7	1	0	5	558	0	0	0	0	0	1	0	4	1	6	0	0	3	1	4	1	0	1	0	2
	12:45 PM	4	246	6	7	267	3	43	2	10	5	0	7	600	0	3	0	0	3	1	2	4	3	10	1	2	2	2	7	0	0	2	1	3
	1:00 PM	6	211	0	12	258	11	36	2	10	3	2	11	562	0	1	0	0	1	0	0	3	0	3	0	0	1	0	1	0	0	2	0	2
	1:15 PM	7	228	4	11	271	13	35	0	12	1	2	7	591	0	5	0	0	5	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0
	1:30 PM													0					0	0	0	0	0	0					0					0
	1:45 PM													0					0	0	0	0	0	0					0					0
	VOLUMES	45	1,740	35	58	2,054	68	280	11	65	17	10	59	4,442	0	20	0	0	20	4	6	26	8	44	3	6	19	5	33	1	0	7	3	11
	APPROACH %	2%	96%	2%	3%	94%	3%	79%	3%	18%	20%	12%	69%																					
	APP/DEPART	1,820	/	2,079	2,180	/	2,136	356	/	104	86	/	123	0																				
	BEGIN PEAK HR		12:30 PM																															
	VOLUMES	18	888	14	32	1,085	38	148	5	39	10	4	30	2,311																				
	APPROACH %	2%	97%	2%	3%	94%	3%	77%	3%	20%	23%	9%	68%																					
	PEAK HR FACTOR		0.898			0.956			0.873			0.688		0.963																				
	APP/DEPART	920	/	1,066	1,155	/	1,134	192	/	51	44	/	60	0																				
PM	3:30 PM													0					0	0	0	0	0	0					0					0
	3:45 PM													0					0	0	0	0	0	0					0					0
	4:00 PM	8	273	4	11	256	7	37	0	11	2	1	3	613	0	4	0	0	4	0	0	2	2	4	0	0	2	1	3	0	0	0	1	1
	4:15 PM	11	329	2	12	248	9	29	0	7	3	0	5	655	0	7	0	0	7	1	6	24	1	32	0	5	19	0	24	1	1	5	1	8
	4:30 PM	12	311	2	5	267	3	37	0	10	1	0	6	654	0	1	0	0	1	0	1	6	3	10	0	0	1	0	1	0	1	5	3	9
	4:45 PM	7	366	0	6	255	7	39	1	7	1	0	4	693	0	1	0	0	1	0	0	1	1	2	0	0	1	1	2	0	0	0	0	0
	5:00 PM	8	358	4	5	256	6	22	1	8	0	1	4	673	0	5	0	0	5	4	0	16	0	20	2	0	11	0	13	2	0	5	0	7
	5:15 PM	6	371	1	9	281	7	32	0	9	5	0	5	726	0	5	0	0	5	3	0	4	2	9	3	0	0	2	5	0	0	4	0	4
	5:30 PM	5	356	2	8	254	4	24	0	6	0	0	1	660	0	6	0	0	6	0	1	1	3	5	0	0	0	0	0	0	1	1	3	5
	5:45 PM	6	344	2	3	250	3	35	2	11	0	0	2	658	0	2	0	0	2	0	0	4	2	6	0	0	2	1	3	0	0	2	1	3
	6:00 PM													0					0	0	0	0	0	0					0					0
	6:15 PM													0					0	0	0	0	0	0					0					0
	VOLUMES	63	2,708	17	59	2,067	46	255	4	69	12	2	30	5,332	0	31	0	0	31	8	8	58	14	88	5	5	36	5	51	3	3	22	9	37
	APPROACH %	2%	97%	1%	3%	95%	2%	78%	1%	21%	27%	5%	68%																					
	APP/DEPART	2,788	/	2,993	2,172	/	2,148	328	/	80	44	/	111	0																				
	BEGIN PEAK HR		4:45 PM																															
	VOLUMES	26	1,451	7	28	1,046	24	117	2	30	6	1	14	2,752																				
	APPROACH %	2%	98%	0%	3%	95%	2%	79%	1%	20%	29%	5%	67%																					
	PEAK HR FACTOR		0.981			0.924			0.793			0.525		0.948																				
	APP/DEPART	1,484	/	1,582	1,098	/	1,082	149	/	37	21	/	51	0																				

PACIFIC TRAFFIC DATA SERVICES

TURNING MOVEMENT COUNTS

Wednesday, March 16, 2016





INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA SERVICES

DATE: 3/16/16 WEDNESDAY

LOCATION: SANTA ROSA
NORTH & SOUTH: SANTA ROSA
EAST & WEST: YOLANDA

PROJECT #: 0328-02-AP16
LOCATION #: 68
CONTROL: SIGNAL

NOTES:

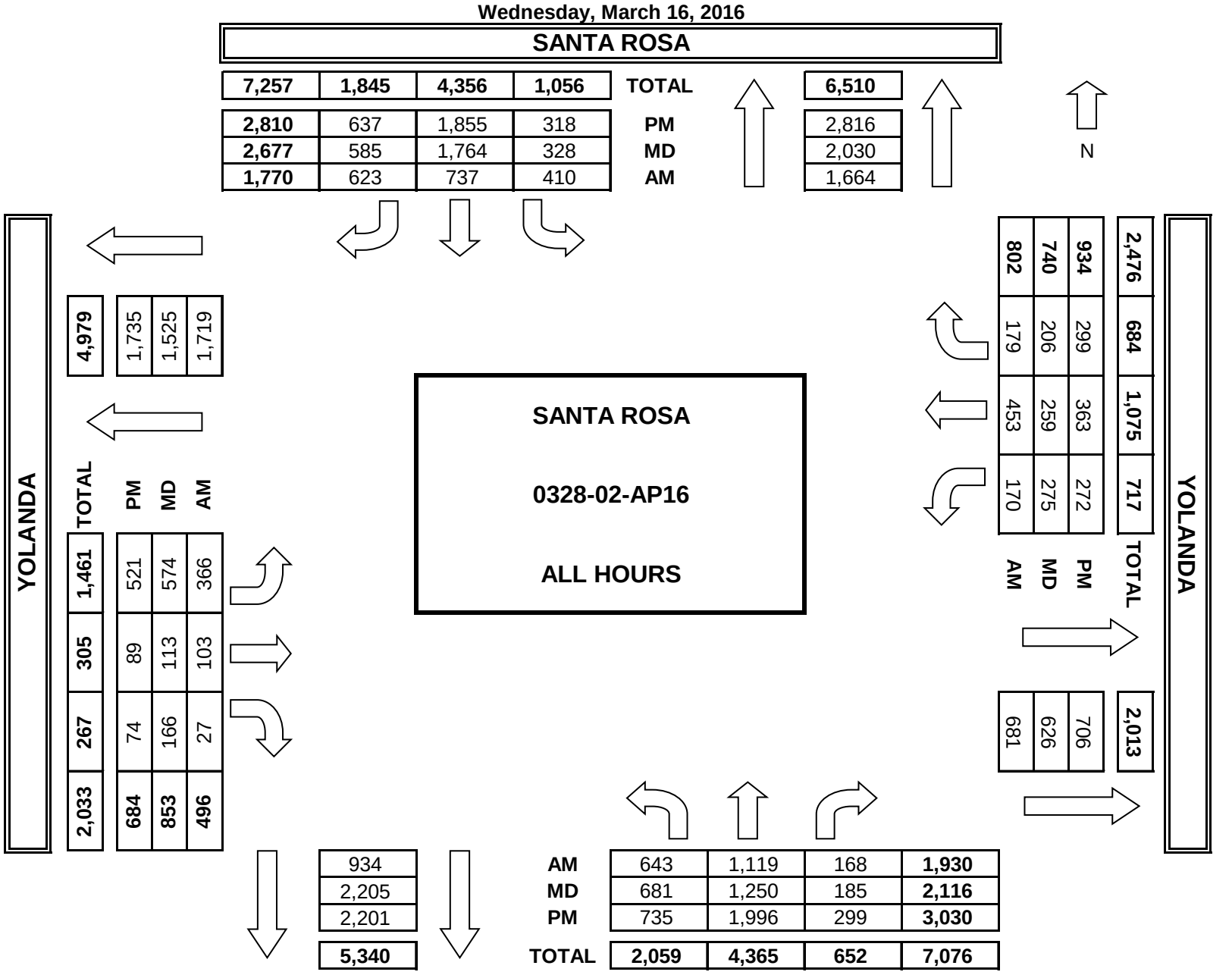
AM / PM / MD / OTHER / OTHER — ▲ N, ◄ W, E ►, S ▼

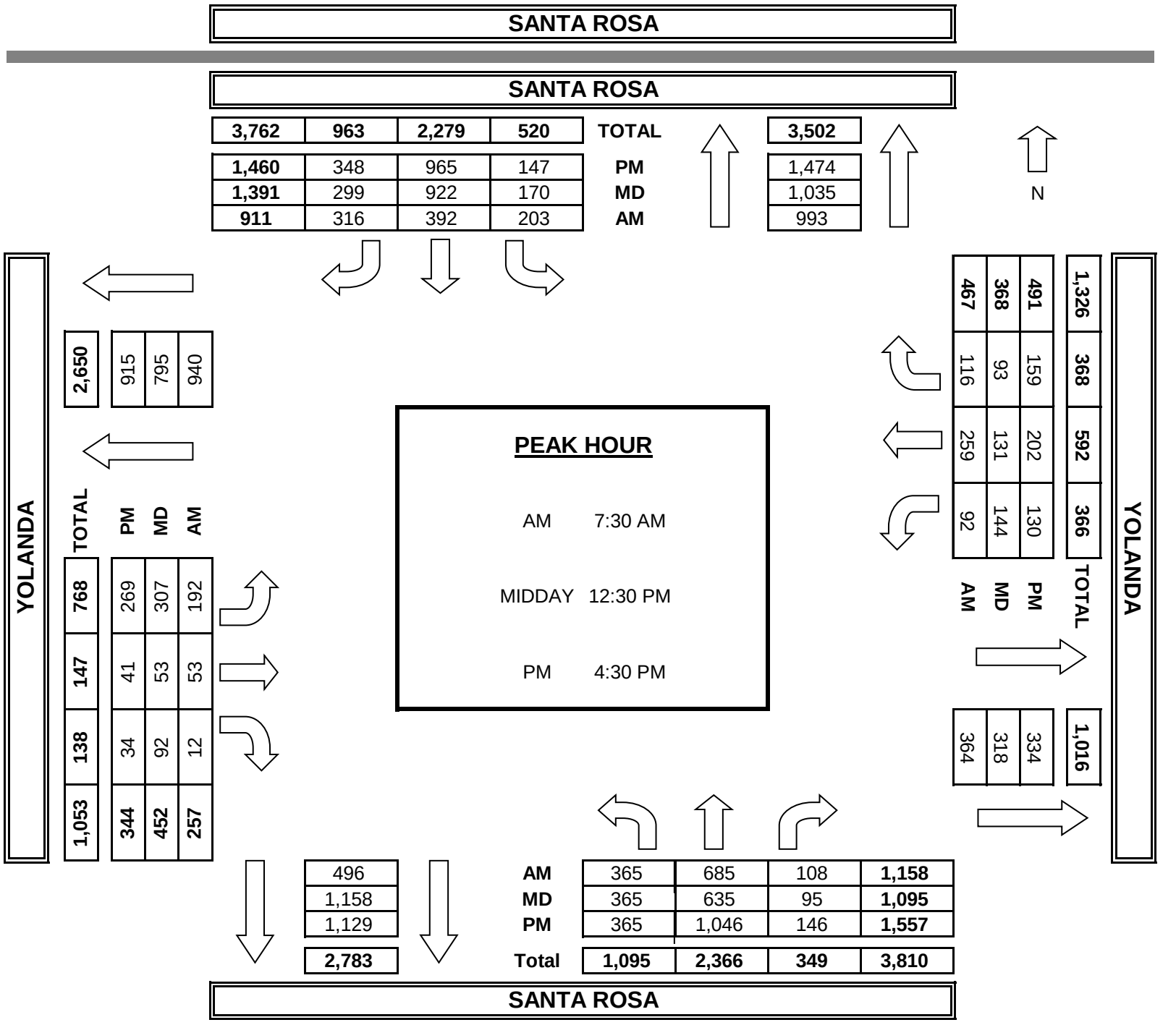
		NORTHBOUND SANTA ROSA			SOUTHBOUND SANTA ROSA			EASTBOUND YOLANDA			WESTBOUND YOLANDA				U-TURNS					PED + BIKE CROSS					PED CROSSING					BIKE CROSSING				
																				LEG OF INTER					LEG OF INTER					LEG OF INTER				
	LANES:	NL 2	NT 2	NR 1	SL 2	ST 2	SR 1	EL 2	ET 1	ER 1	WL 1	WT 1	WR 1	TOTAL	NB X	SB X	EB X	WB X	TTL	N	S	E	W	TTL	N	S	E	W	TTL	N	S	E	W	TTL
AM	6:30 AM													0					0	0	0	0	0	0					0					0
	6:45 AM													0					0	0	0	0	0	0					0					0
	7:00 AM	84	47	10	47	42	51	42	13	3	13	37	10	399	0	0	0	0	0	0	2	2	4	8	0	2	2	3	7	0	0	0	1	1
	7:15 AM	59	80	15	44	80	88	39	7	2	19	45	17	495	0	0	0	0	0	0	1	2	2	5	0	1	2	1	4	0	0	0	1	1
	7:30 AM	99	187	30	50	99	97	32	17	2	18	63	36	730	0	0	0	0	0	0	0	2	2	4	0	0	1	0	1	0	0	1	2	3
	7:45 AM	94	196	32	63	95	71	65	23	5	41	70	30	785	0	0	0	0	0	0	0	2	2	4	0	0	1	1	2	0	0	1	1	2
	8:00 AM	102	145	33	40	92	91	44	5	2	21	73	27	675	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	2	2
	8:15 AM	70	157	13	50	106	57	51	8	3	12	53	23	603	0	0	0	0	0	0	1	3	2	6	0	0	1	1	2	0	1	2	1	4
	8:30 AM	74	183	18	61	120	87	38	10	5	18	61	18	693	0	0	0	0	0	0	0	1	1	2	0	0	1	1	2	0	0	0	0	0
	8:45 AM	61	124	17	55	103	81	55	20	5	28	51	18	618	0	0	0	0	0	0	0	2	0	2	0	0	1	0	1	0	0	1	0	1
	9:00 AM													0					0	0	0	0	0	0					0					0
	9:15 AM													0					0	0	0	0	0	0					0					0
	VOLUMES	643	1,119	168	410	737	623	366	103	27	170	453	179	4,998	0	0	0	0	0	0	4	14	15	33	0	3	9	7	19	0	1	5	8	14
	APPROACH %	33%	58%	9%	23%	42%	35%	74%	21%	5%	21%	56%	22%																					
	APP/DEPART	1,930	/	1,664	1,770	/	934	496	/	681	802	/	1,719	0																					
	BEGIN PEAK HR		7:30 AM																															
	VOLUMES	365	685	108	203	392	316	192	53	12	92	259	116	2,793																				
	APPROACH %	32%	59%	9%	22%	43%	35%	75%	21%	5%	20%	55%	25%																					
	PEAK HR FACTOR		0.899			0.926			0.691			0.828		0.889																					
	APP/DEPART	1,158	/	993	911	/	496	257	/	364	467	/	940	0																					
MIDDAY	11:00 AM													0					0	0	0	0	0	0					0					0
	11:15 AM													0					0	0	0	0	0	0					0					0
	11:30 AM	79	126	25	32	211	78	63	19	22	30	30	31	746	0	2	0	0	2	0	0	5	1	6	0	0	3	0	3	0	0	2	1	3
	11:45 AM	83	175	22	40	177	72	67	10	11	35	37	17	746	0	5	0	0	5	0	0	7	1	8	0	0	3	1	4	0	0	4	0	4
	12:00 PM	79	151	21	41	252	78	63	11	21	30	28	34	809	0	5	0	0	5	0	0	1	1	2	0	0	1	0	1	0	0	0	1	1
	12:15 PM	75	163	22	45	202	58	74	20	20	36	33	31	779	0	0	0	0	0	0	1	2	2	5	0	1	2	1	4	0	0	0	1	1
	12:30 PM	96	119	27	49	259	56	68	12	22	32	25	35	800	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1
	12:45 PM	102	177	25	37	216	74	91	19	23	39	32	19	854	0	2	0	0	2	0	0	2	3	5	0	0	1	1	2	0	0	1	2	3
	1:00 PM	86	167	19	54	229	86	66	13	18	32	32	23	825	0	0	0	0	0	0	0	2	1	3	0	0	0	0	0	0	0	2	1	3
	1:15 PM	81	172	24	30	218	83	82	9	29	41	42	16	827	0	0	0	0	0	0	2	1	3	6	0	2	1	1	4	0	0	0	2	2
	1:30 PM													0					0	0	0	0	0	0					0					0
	1:45 PM													0					0	0	0	0	0	0					0					0
	VOLUMES	681	1,250	185	328	1,764	585	574	113	166	275	259	206	6,386	0	14	0	0	14	0	3	21	12	36	0	3	11	4	18	0	0	10	8	18
	APPROACH %	32%	59%	9%	12%	66%	22%	67%	13%	19%	37%	35%	28%																					
	APP/DEPART	2,116	/	2,030	2,677	/	2,205	853	/	626	740	/	1,525	0																					
	BEGIN PEAK HR		12:30 PM																															
	VOLUMES	365	635	95	170	922	299	307	53	92	144	131	93	3,306																				
	APPROACH %	33%	58%	9%	12%	66%	21%	68%	12%	20%	39%	36%	25%																					
	PEAK HR FACTOR		0.900			0.942			0.850			0.929		0.968																					
	APP/DEPART	1,095	/	1,035	1,391	/	1,158	452	/	318	368	/	795	0																					
PM	3:30 PM													0					0	0	0	0	0	0					0					0
	3:45 PM													0					0	0	0	0	0	0					0					0
	4:00 PM	88	207	32	56	202	79	64	7	12	33	49	36	865	0	4	0	0	4	0	1	8	1	10	0	1	6	1	8	0	0	2	0	2
	4:15 PM	92	248	40	34	242	81	62	13	13	40	32	38	935	0	1	0	0	1	0	2	9	3	14	0	2	7	1	10	0	0	2	2	4
	4:30 PM	81	238	29	40	232	94	81	14	11	37	59	37	953	0	5	0	0	5	1	2	6	2	11	0	1	3	0	4	1	1	3	2	7
	4:45 PM	93	275	37	39	238	73	75	10	13	33	51	46	983	0	7	0	0	7	0	0	3	1	4	0	0	3	0	3	0	0	0	1	1
	5:00 PM	91	267	35	43	225	95	59	9	6	25	43	42	940	0	3	0	0	3	0	0	4	2	6	0	0	3	2	5	0	0	1	0	1
	5:15 PM	100	266	45	25	270	86	54	8	4	35	49	34	976	0	1	0	0	1	0	0	4	2	6	0	0	2	0	2	0	0	2	2	4
	5:30 PM	90	254	35	43	233	62	56	8	5	33	41	30	890	0	4	0	0	4	0	0	2	1	3	0	0	2	1	3	0	0	0	0	0
	5:45 PM	100	241	46	38	213	67	70	20	10	36	39	36	916	0	4	0	0	4	0	1	4	6	11	0	1	4	5	10	0	0	0	1	1
	6:00 PM													0					0	0	0	0	0	0					0					0
	6:15 PM													0					0	0	0	0	0	0					0					0
	VOLUMES	735	1,996	299	318	1,855	637	521	89	74	272	363	299	7,458	0	29	0	0	29	1	6	40	18	65	0	5	30	10	45	1	1	10	8	20
	APPROACH %	24%	66%	10%	11%	66%	23%	76%	13%	11%	29%	39%	32%																					
	APP/DEPART	3,030	/	2,816	2,810	/	2,201	684	/	706	934	/	1,735	0																					
	BEGIN PEAK HR		4:30 PM																															
	VOLUMES	365	1,046	146	147	965	348	269	41	34	130	202	159	3,852																				
	APPROACH %	23%	67%	9%	10%	66%	24%	78%	12%	10%	26%	41%	32%																					
	PEAK HR FACTOR		0.947			0.958			0.811			0.923		0.980																					
	APP/DEPART	1,557	/	1,474	1,460	/	1,129	344	/	334	491	/	915	0																					

PACIFIC TRAFFIC DATA SERVICES

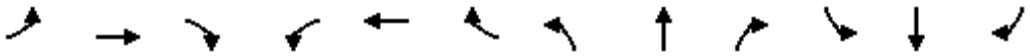
TURNING MOVEMENT COUNTS

Wednesday, March 16, 2016





Appendix C – Existing Conditions Intersections Level of Service Work Sheets



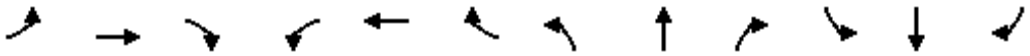
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	3	67	0	185	8	789	129	118	409	5
Future Volume (Veh/h)	2	0	3	67	0	185	8	789	129	118	409	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.42	0.42	0.42	0.75	0.75	0.75	0.77	0.77	0.77	0.74	0.74	0.74
Hourly flow rate (vph)	5	0	7	89	0	247	10	1025	168	159	553	7
Pedestrians		4			1						2	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1413	2092	284	1732	2012	600	564			1194		
vC1, stage 1 conf vol	878	878		1130	1130							
vC2, stage 2 conf vol	534	1214		602	882							
vCu, unblocked vol	1413	2092	284	1732	2012	600	564			1194		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	100	99	50	100	44	99			73		
cM capacity (veh/h)	57	86	710	177	184	443	1000			580		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	12	336	10	683	510	159	369	191
Volume Left	5	89	10	0	0	159	0	0
Volume Right	7	247	0	0	168	0	0	7
cSH	122	603	1000	1700	1700	580	1700	1700
Volume to Capacity	0.10	0.56	0.01	0.40	0.30	0.27	0.22	0.11
Queue Length 95th (ft)	8	86	1	0	0	28	0	0
Control Delay (s)	37.6	28.6	8.6	0.0	0.0	13.5	0.0	0.0
Lane LOS	E	D	A			B		
Approach Delay (s)	37.6	28.6	0.1			3.0		
Approach LOS	E	D						

Intersection Summary				
Average Delay	5.4			
Intersection Capacity Utilization	51.1%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	22	9	260	16	986	56	778
v/c Ratio	0.16	0.05	0.60	0.13	0.42	0.35	0.29
Control Delay	33.6	20.5	19.3	40.9	10.2	50.1	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	20.5	19.3	40.9	10.2	50.1	3.0
Queue Length 50th (ft)	12	2	25	9	97	33	22
Queue Length 95th (ft)	18	7	42	28	271	56	45
Internal Link Dist (ft)		325	343		2785		578
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	228	285	616	216	2364	216	2659
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.03	0.42	0.07	0.42	0.26	0.29

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	2	4	66	5	134	14	837	31	40	526	26
Future Volume (vph)	14	2	4	66	5	134	14	837	31	40	526	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.90		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1655			3086		1770	3515		1770	3511	
Flt Permitted	0.33	1.00			0.86		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	606	1655			2699		1770	3515		1770	3511	
Peak-hour factor, PHF	0.63	0.63	0.63	0.79	0.79	0.79	0.88	0.88	0.88	0.71	0.71	0.71
Adj. Flow (vph)	22	3	6	84	6	170	16	951	35	56	741	37
RTOR Reduction (vph)	0	5	0	0	152	0	0	2	0	0	2	0
Lane Group Flow (vph)	22	4	0	0	108	0	16	984	0	56	776	0
Confl. Peds. (#/hr)			5						7			2
Confl. Bikes (#/hr)			2			7						1
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Effective Green, g (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Actuated g/C Ratio	0.17	0.17			0.10		0.02	0.65		0.08	0.71	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	133	273			278		31	2269		139	2492	
v/s Ratio Prot	c0.00	0.00					0.01	c0.28		c0.03	0.22	
v/s Ratio Perm	0.02				c0.04							
v/c Ratio	0.17	0.01			0.39		0.52	0.43		0.40	0.31	
Uniform Delay, d1	32.0	31.4			37.7		43.8	7.9		39.4	4.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.18	0.46	
Incremental Delay, d2	0.2	0.0			0.3		13.7	0.6		1.9	0.3	
Delay (s)	32.2	31.4			38.0		57.6	8.5		48.2	2.6	
Level of Service	C	C			D		E	A		D	A	
Approach Delay (s)		32.0			38.0			9.2			5.6	
Approach LOS		C			D			A			A	

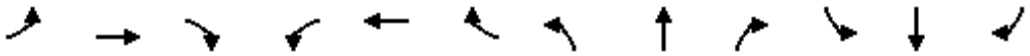
Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	21	6	4	6	1291	6	566
v/c Ratio	0.14	0.04	0.02	0.05	0.41	0.05	0.18
Control Delay	34.8	19.8	25.5	37.6	3.6	44.0	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	19.8	25.5	37.6	3.6	44.0	1.5
Queue Length 50th (ft)	12	1	1	4	1	3	0
Queue Length 95th (ft)	22	8	5	m9	183	m11	59
Internal Link Dist (ft)		219	275		578		558
Turn Bay Length (ft)				90		80	
Base Capacity (vph)	379	438	464	177	3114	177	3111
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.01	0.01	0.03	0.41	0.03	0.18

Intersection Summary

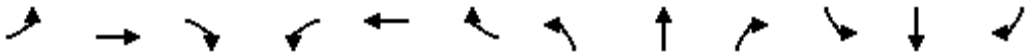
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	1	4	0	1	1	5	1149	0	5	488	4
Future Volume (vph)	16	1	4	0	1	1	5	1149	0	5	488	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.97			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88			0.93		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1762	1586			1701		1770	3539		1770	3533	
Flt Permitted	0.76	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1401	1586			1701		1770	3539		1770	3533	
Peak-hour factor, PHF	0.75	0.75	0.75	0.50	0.50	0.50	0.89	0.89	0.89	0.87	0.87	0.87
Adj. Flow (vph)	21	1	5	0	2	2	6	1291	0	6	561	5
RTOR Reduction (vph)	0	5	0	0	2	0	0	0	0	0	0	0
Lane Group Flow (vph)	21	1	0	0	2	0	6	1291	0	6	566	0
Confl. Peds. (#/hr)	4		1	1		4			4			4
Confl. Bikes (#/hr)			6			3						
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Effective Green, g (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Actuated g/C Ratio	0.07	0.07			0.07		0.01	0.81		0.01	0.81	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	96	109			117		25	2866		25	2861	
v/s Ratio Prot		0.00			0.00		c0.00	c0.36		0.00	0.16	
v/s Ratio Perm	c0.01											
v/c Ratio	0.22	0.01			0.02		0.24	0.45		0.24	0.20	
Uniform Delay, d1	39.6	39.0			39.1		43.9	2.6		43.9	1.9	
Progression Factor	1.00	1.00			1.00		0.94	0.73		1.10	0.41	
Incremental Delay, d2	0.4	0.0			0.0		4.7	0.5		4.8	0.2	
Delay (s)	40.0	39.1			39.1		45.9	2.4		53.0	1.0	
Level of Service	D	D			D		D	A		D	A	
Approach Delay (s)		39.8			39.1			2.6			1.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	2.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

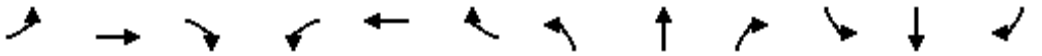
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	278	77	17	111	312	140	406	761	120	218	422	340
v/c Ratio	0.60	0.41	0.06	0.35	0.92	0.35	0.88	0.74	0.22	0.28	0.31	0.41
Control Delay	42.0	43.8	0.4	34.9	72.4	7.9	63.8	39.5	12.4	31.1	20.3	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	43.8	0.4	34.9	72.4	7.9	63.8	39.5	12.4	31.1	20.3	10.5
Queue Length 50th (ft)	77	42	0	53	177	0	128	210	0	53	86	81
Queue Length 95th (ft)	85	62	0	96	#314	35	#208	234	64	89	123	130
Internal Link Dist (ft)		364			383			558			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	537	333	400	341	338	404	461	1183	600	781	1352	870
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.23	0.04	0.33	0.92	0.35	0.88	0.64	0.20	0.28	0.31	0.39

Intersection Summary

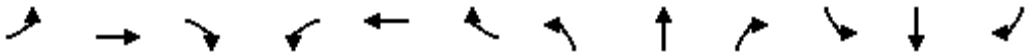
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	192	53	12	92	259	116	365	685	108	203	392	316
Future Volume (vph)	192	53	12	92	259	116	365	685	108	203	392	316
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1540	1770	1863	1557	3433	3539	1558	3433	3539	1567
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1540	1770	1863	1557	3433	3539	1558	3433	3539	1567
Peak-hour factor, PHF	0.69	0.69	0.69	0.83	0.83	0.83	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	278	77	17	111	312	140	406	761	120	218	422	340
RTOR Reduction (vph)	0	0	16	0	0	115	0	0	85	0	0	27
Lane Group Flow (vph)	278	77	1	111	312	25	406	761	35	218	422	313
Confl. Peds. (#/hr)									3			2
Confl. Bikes (#/hr)			6			4			1			
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	12.2	7.9	7.9	20.6	16.3	16.3	12.1	26.0	26.0	20.5	34.4	46.6
Effective Green, g (s)	12.2	7.9	7.9	20.6	16.3	16.3	12.1	26.0	26.0	20.5	34.4	46.6
Actuated g/C Ratio	0.14	0.09	0.09	0.23	0.18	0.18	0.13	0.29	0.29	0.23	0.38	0.52
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	465	163	135	405	337	281	461	1022	450	781	1352	879
v/s Ratio Prot	c0.08	0.04		0.06	c0.17		c0.12	c0.22		0.06	0.12	c0.05
v/s Ratio Perm			0.00			0.02			0.02			0.15
v/c Ratio	0.60	0.47	0.01	0.27	0.93	0.09	0.88	0.74	0.08	0.28	0.31	0.36
Uniform Delay, d1	36.6	39.1	37.5	28.5	36.3	30.7	38.2	29.0	23.3	28.7	19.5	12.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.22	2.60	1.00	1.00	1.00
Incremental Delay, d2	2.1	2.2	0.0	0.1	30.4	0.1	16.5	2.8	0.1	0.9	0.6	0.2
Delay (s)	38.7	41.2	37.5	28.7	66.7	30.8	59.8	38.1	60.6	29.5	20.1	13.1
Level of Service	D	D	D	C	E	C	E	D	E	C	C	B
Approach Delay (s)		39.1			50.3			47.1			19.8	
Approach LOS		D			D			D			B	

Intersection Summary			
HCM 2000 Control Delay	38.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



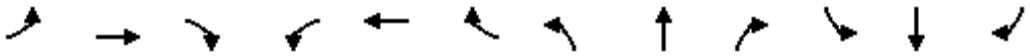
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	6	46	0	77	9	1103	55	95	829	2
Future Volume (Veh/h)	2	0	6	46	0	77	9	1103	55	95	829	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.40	0.40	0.40	0.85	0.85	0.85	0.97	0.97	0.97	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	15	54	0	91	9	1137	57	102	891	2
Pedestrians		9			18						7	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		1			2						1	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1698	2335	456	1866	2308	622	902			1212		
vC1, stage 1 conf vol	1105	1105		1202	1202							
vC2, stage 2 conf vol	594	1230		664	1106							
vCu, unblocked vol	1698	2335	456	1866	2308	622	902			1212		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	97	67	100	78	99			82		
cM capacity (veh/h)	148	118	547	162	162	419	743			562		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	20	145	9	758	436	102	594	299
Volume Left	5	54	9	0	0	102	0	0
Volume Right	15	91	0	0	57	0	0	2
cSH	327	434	743	1700	1700	562	1700	1700
Volume to Capacity	0.06	0.33	0.01	0.45	0.26	0.18	0.35	0.18
Queue Length 95th (ft)	5	36	1	0	0	16	0	0
Control Delay (s)	16.7	24.2	9.9	0.0	0.0	12.8	0.0	0.0
Lane LOS	C	C	A			B		
Approach Delay (s)	16.7	24.2	0.1			1.3		
Approach LOS	C	C						

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	56.7%	ICU Level of Service		B
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	163	42	220	70	1289	114	1025
v/c Ratio	0.62	0.12	0.71	0.49	0.62	0.59	0.46
Control Delay	50.9	18.3	37.6	63.9	18.9	78.6	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.9	18.3	37.6	63.9	18.9	78.6	3.4
Queue Length 50th (ft)	108	9	40	53	330	94	68
Queue Length 95th (ft)	148	32	77	100	480	151	77
Internal Link Dist (ft)		325	343		2785		578
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	290	365	374	177	2074	324	2224
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.12	0.59	0.40	0.62	0.35	0.46

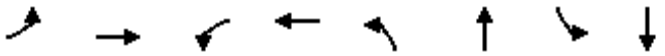
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	12	22	80	8	106	64	1109	77	100	804	98
Future Volume (vph)	132	12	22	80	8	106	64	1109	77	100	804	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.92		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1656			3132		1770	3498		1770	3477	
Flt Permitted	0.34	1.00			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	626	1656			2651		1770	3498		1770	3477	
Peak-hour factor, PHF	0.81	0.81	0.81	0.88	0.88	0.88	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	163	15	27	91	9	120	70	1205	84	114	914	111
RTOR Reduction (vph)	0	21	0	0	111	0	0	3	0	0	7	0
Lane Group Flow (vph)	163	21	0	0	109	0	70	1286	0	114	1018	0
Confl. Peds. (#/hr)			11						2			1
Confl. Bikes (#/hr)						6			1			
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	26.0	26.0			8.9		8.5	71.1		13.0	75.9	
Effective Green, g (s)	26.0	26.0			8.9		8.5	71.1		13.0	75.9	
Actuated g/C Ratio	0.22	0.22			0.07		0.07	0.59		0.11	0.63	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	270	358			196		125	2072		191	2199	
v/s Ratio Prot	c0.07	0.01					0.04	c0.37		c0.06	0.29	
v/s Ratio Perm	c0.06				0.04							
v/c Ratio	0.60	0.06			0.56		0.56	0.62		0.60	0.46	
Uniform Delay, d1	40.8	37.3			53.6		53.9	15.8		51.0	11.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.33	0.22	
Incremental Delay, d2	2.6	0.0			1.9		5.6	1.4		4.6	0.6	
Delay (s)	43.4	37.3			55.6		59.6	17.2		72.4	3.2	
Level of Service	D	D			E		E	B		E	A	
Approach Delay (s)		42.2			55.6			19.3			10.1	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	148	41	11	28	27	1488	30	1163
v/c Ratio	0.75	0.16	0.07	0.13	0.25	0.57	0.27	0.44
Control Delay	70.8	15.0	41.5	16.7	51.5	8.3	60.2	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.8	15.0	41.5	16.7	51.5	8.4	60.2	2.4
Queue Length 50th (ft)	111	2	7	1	0	197	23	66
Queue Length 95th (ft)	148	25	14	9	m35	354	m38	84
Internal Link Dist (ft)		219		275		578		558
Turn Bay Length (ft)					90		80	
Base Capacity (vph)	300	377	299	363	191	2621	206	2621
Starvation Cap Reductn	0	0	0	0	0	72	0	14
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.11	0.04	0.08	0.14	0.58	0.15	0.45

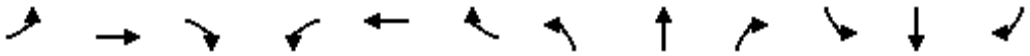
Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	2	30	6	1	14	26	1451	7	28	1046	24
Future Volume (vph)	117	2	30	6	1	14	26	1451	7	28	1046	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1757	1579		1770	1552		1770	3535		1770	3525	
Flt Permitted	0.74	1.00		0.73	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1367	1579		1360	1552		1770	3535		1770	3525	
Peak-hour factor, PHF	0.79	0.79	0.79	0.53	0.53	0.53	0.98	0.98	0.98	0.92	0.92	0.92
Adj. Flow (vph)	148	3	38	11	2	26	27	1481	7	30	1137	26
RTOR Reduction (vph)	0	32	0	0	22	0	0	0	0	0	1	0
Lane Group Flow (vph)	148	9	0	11	6	0	27	1488	0	30	1162	0
Confl. Peds. (#/hr)	5					5			12			3
Confl. Bikes (#/hr)			3			10			1			2
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	17.4	17.4		17.4	17.4		5.0	87.8		5.2	88.0	
Effective Green, g (s)	17.4	17.4		17.4	17.4		5.0	87.8		5.2	88.0	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.04	0.73		0.04	0.73	
Clearance Time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	198	228		197	225		73	2586		76	2585	
v/s Ratio Prot		0.01			0.00		0.02	c0.42		c0.02	0.33	
v/s Ratio Perm	c0.11			0.01								
v/c Ratio	0.75	0.04		0.06	0.03		0.37	0.58		0.39	0.45	
Uniform Delay, d1	49.2	44.1		44.2	44.0		56.0	7.5		55.9	6.4	
Progression Factor	1.00	1.00		1.00	1.00		0.89	0.86		1.04	0.25	
Incremental Delay, d2	12.6	0.0		0.0	0.0		2.5	0.8		2.8	0.5	
Delay (s)	61.8	44.1		44.3	44.0		52.1	7.2		61.1	2.1	
Level of Service	E	D		D	D		D	A		E	A	
Approach Delay (s)		58.0			44.1			8.0			3.6	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

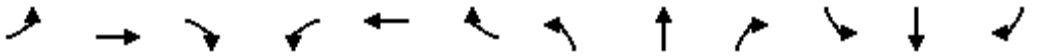
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	332	51	42	141	220	173	384	1101	154	153	1005	363
v/c Ratio	0.77	0.32	0.18	0.39	0.79	0.46	0.83	0.80	0.23	0.21	0.61	0.37
Control Delay	63.8	54.5	1.6	46.4	68.5	10.4	68.5	43.2	13.3	43.2	26.8	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	63.8	54.5	1.6	46.4	68.5	10.4	68.5	43.3	13.3	43.2	26.8	8.9
Queue Length 50th (ft)	129	38	0	93	164	0	140	476	34	52	316	87
Queue Length 95th (ft)	160	64	0	173	250	62	#236	308	61	89	389	146
Internal Link Dist (ft)		364			383			558			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	452	312	353	362	321	410	474	1545	742	727	1642	979
Starvation Cap Reductn	0	0	0	0	0	0	0	41	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.16	0.12	0.39	0.69	0.42	0.81	0.73	0.21	0.21	0.61	0.37

Intersection Summary

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

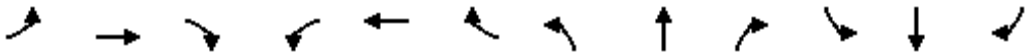


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	269	41	34	130	202	159	365	1046	146	147	965	348
Future Volume (vph)	269	41	34	130	202	159	365	1046	146	147	965	348
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1540	1770	1863	1551	3433	3539	1537	3433	3539	1565
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1540	1770	1863	1551	3433	3539	1537	3433	3539	1565
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	332	51	42	141	220	173	384	1101	154	153	1005	362
RTOR Reduction (vph)	0	0	39	0	0	146	0	0	78	0	0	48
Lane Group Flow (vph)	332	51	3	141	220	27	384	1101	76	153	1005	315
Confl. Peds. (#/hr)			1						11			2
Confl. Bikes (#/hr)			5			6			1			1
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	15.0	9.2	9.2	24.6	18.8	18.8	16.2	46.5	46.5	24.7	55.0	70.0
Effective Green, g (s)	15.0	9.2	9.2	24.6	18.8	18.8	16.2	46.5	46.5	24.7	55.0	70.0
Actuated g/C Ratio	0.12	0.08	0.08	0.21	0.16	0.16	0.13	0.39	0.39	0.21	0.46	0.58
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	429	142	118	362	291	242	463	1371	595	706	1622	963
v/s Ratio Prot	c0.10	0.03		0.08	c0.12		0.11	c0.31		0.04	c0.28	0.04
v/s Ratio Perm			0.00			0.02			0.05			0.16
v/c Ratio	0.77	0.36	0.03	0.39	0.76	0.11	0.83	0.80	0.13	0.22	0.62	0.33
Uniform Delay, d1	50.9	52.6	51.3	41.2	48.4	43.4	50.6	32.7	23.7	39.6	24.6	12.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.20	2.28	1.00	1.00	1.00
Incremental Delay, d2	8.5	1.6	0.1	0.3	10.7	0.2	10.0	3.0	0.1	0.7	1.8	0.2
Delay (s)	59.3	54.2	51.4	41.5	59.1	43.6	65.1	42.3	54.1	40.3	26.4	13.1
Level of Service	E	D	D	D	E	D	E	D	D	D	C	B
Approach Delay (s)		57.9			49.4			48.7			24.6	
Approach LOS		E			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	40.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Appendix D – Existing plus Project Conditions Intersections Level of Service Work Sheets



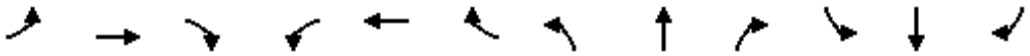
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	3	67	0	185	8	791	129	118	411	5
Future Volume (Veh/h)	2	0	3	67	0	185	8	791	129	118	411	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.42	0.42	0.42	0.75	0.75	0.75	0.77	0.77	0.77	0.74	0.74	0.74
Hourly flow rate (vph)	5	0	7	89	0	247	10	1027	168	159	555	7
Pedestrians		4			1						2	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1416	2096	285	1734	2016	600	566			1196		
vC1, stage 1 conf vol	880	880		1132	1132							
vC2, stage 2 conf vol	536	1216		602	884							
vCu, unblocked vol	1416	2096	285	1734	2016	600	566			1196		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	100	99	50	100	44	99			73		
cM capacity (veh/h)	56	86	709	176	184	442	998			579		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	12	336	10	685	510	159	370	192
Volume Left	5	89	10	0	0	159	0	0
Volume Right	7	247	0	0	168	0	0	7
cSH	121	602	998	1700	1700	579	1700	1700
Volume to Capacity	0.10	0.56	0.01	0.40	0.30	0.27	0.22	0.11
Queue Length 95th (ft)	8	86	1	0	0	28	0	0
Control Delay (s)	38.0	28.7	8.6	0.0	0.0	13.6	0.0	0.0
Lane LOS	E	D	A			B		
Approach Delay (s)	38.0	28.7	0.1			3.0		
Approach LOS	E	D						

Intersection Summary				
Average Delay	5.4			
Intersection Capacity Utilization	51.1%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	22	9	260	16	1018	56	819
v/c Ratio	0.16	0.05	0.60	0.13	0.43	0.35	0.31
Control Delay	33.6	20.5	19.3	40.9	10.3	50.1	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	20.5	19.3	40.9	10.3	50.1	3.0
Queue Length 50th (ft)	12	2	25	9	102	33	24
Queue Length 95th (ft)	18	7	42	28	282	56	47
Internal Link Dist (ft)		325	343		1751		572
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	228	285	616	216	2364	216	2659
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.03	0.42	0.07	0.43	0.26	0.31

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	2	4	66	5	134	14	865	31	40	555	26
Future Volume (vph)	14	2	4	66	5	134	14	865	31	40	555	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.90		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1655			3086		1770	3516		1770	3513	
Flt Permitted	0.33	1.00			0.86		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	606	1655			2699		1770	3516		1770	3513	
Peak-hour factor, PHF	0.63	0.63	0.63	0.79	0.79	0.79	0.88	0.88	0.88	0.71	0.71	0.71
Adj. Flow (vph)	22	3	6	84	6	170	16	983	35	56	782	37
RTOR Reduction (vph)	0	5	0	0	152	0	0	2	0	0	2	0
Lane Group Flow (vph)	22	4	0	0	108	0	16	1016	0	56	817	0
Confl. Peds. (#/hr)			5						7			2
Confl. Bikes (#/hr)			2			7						1
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Effective Green, g (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Actuated g/C Ratio	0.17	0.17			0.10		0.02	0.65		0.08	0.71	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	133	273			278		31	2269		139	2494	
v/s Ratio Prot	c0.00	0.00					0.01	c0.29		c0.03	0.23	
v/s Ratio Perm	0.02				c0.04							
v/c Ratio	0.17	0.01			0.39		0.52	0.45		0.40	0.33	
Uniform Delay, d1	32.0	31.4			37.7		43.8	8.0		39.4	4.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.17	0.46	
Incremental Delay, d2	0.2	0.0			0.3		13.7	0.6		1.9	0.4	
Delay (s)	32.2	31.4			38.0		57.6	8.6		48.2	2.6	
Level of Service	C	C			D		E	A		D	A	
Approach Delay (s)		32.0			38.0			9.4			5.5	
Approach LOS		C			D			A			A	

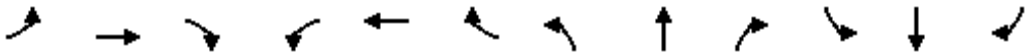
Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	21	6	4	6	1322	6	599
v/c Ratio	0.14	0.04	0.02	0.05	0.42	0.05	0.19
Control Delay	34.8	19.8	25.5	37.6	3.9	44.0	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	19.8	25.5	37.6	3.9	44.0	1.6
Queue Length 50th (ft)	12	1	1	4	2	3	1
Queue Length 95th (ft)	22	8	5	m9	192	m10	63
Internal Link Dist (ft)		219	275		572		564
Turn Bay Length (ft)				90		80	
Base Capacity (vph)	379	438	464	177	3114	177	3111
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.01	0.01	0.03	0.42	0.03	0.19

Intersection Summary

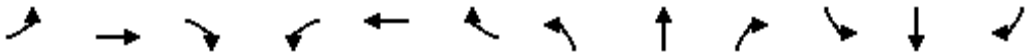
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	1	4	0	1	1	5	1177	0	5	517	4
Future Volume (vph)	16	1	4	0	1	1	5	1177	0	5	517	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.97			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88			0.93		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1762	1586			1701		1770	3539		1770	3534	
Flt Permitted	0.76	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1401	1586			1701		1770	3539		1770	3534	
Peak-hour factor, PHF	0.75	0.75	0.75	0.50	0.50	0.50	0.89	0.89	0.89	0.87	0.87	0.87
Adj. Flow (vph)	21	1	5	0	2	2	6	1322	0	6	594	5
RTOR Reduction (vph)	0	5	0	0	2	0	0	0	0	0	0	0
Lane Group Flow (vph)	21	1	0	0	2	0	6	1322	0	6	599	0
Confl. Peds. (#/hr)	4		1	1		4			4			4
Confl. Bikes (#/hr)			6			3						
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Effective Green, g (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Actuated g/C Ratio	0.07	0.07			0.07		0.01	0.81		0.01	0.81	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	96	109			117		25	2866		25	2862	
v/s Ratio Prot		0.00			0.00		c0.00	c0.37		0.00	0.17	
v/s Ratio Perm	c0.01											
v/c Ratio	0.22	0.01			0.02		0.24	0.46		0.24	0.21	
Uniform Delay, d1	39.6	39.0			39.1		43.9	2.6		43.9	2.0	
Progression Factor	1.00	1.00			1.00		0.94	0.77		1.10	0.42	
Incremental Delay, d2	0.4	0.0			0.0		4.7	0.5		4.8	0.2	
Delay (s)	40.0	39.1			39.1		45.8	2.5		53.1	1.0	
Level of Service	D	D			D		D	A		D	A	
Approach Delay (s)		39.8			39.1			2.7			1.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	2.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		

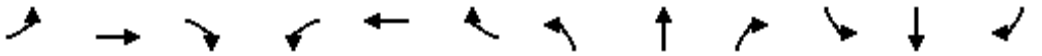
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	278	77	35	113	312	140	416	780	122	218	438	340
v/c Ratio	0.60	0.41	0.12	0.36	0.92	0.35	0.90	0.75	0.23	0.28	0.32	0.41
Control Delay	42.0	43.8	0.8	35.1	72.4	7.9	66.6	39.7	12.5	31.4	20.4	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	43.8	0.8	35.1	72.4	7.9	66.6	39.7	12.5	31.4	20.4	10.5
Queue Length 50th (ft)	77	42	0	54	177	0	131	213	0	54	90	81
Queue Length 95th (ft)	85	62	0	98	#314	35	#215	242	66	89	128	130
Internal Link Dist (ft)		364			383			564			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	537	333	400	341	338	404	461	1183	602	768	1352	870
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.23	0.09	0.33	0.92	0.35	0.90	0.66	0.20	0.28	0.32	0.39

Intersection Summary

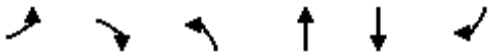
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	192	53	24	94	259	116	374	702	110	203	407	316
Future Volume (vph)	192	53	24	94	259	116	374	702	110	203	407	316
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1540	1770	1863	1557	3433	3539	1558	3433	3539	1567
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1540	1770	1863	1557	3433	3539	1558	3433	3539	1567
Peak-hour factor, PHF	0.69	0.69	0.69	0.83	0.83	0.83	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	278	77	35	113	312	140	416	780	122	218	438	340
RTOR Reduction (vph)	0	0	32	0	0	115	0	0	86	0	0	27
Lane Group Flow (vph)	278	77	3	113	312	25	416	780	36	218	438	313
Confl. Peds. (#/hr)									3			2
Confl. Bikes (#/hr)			6			4			1			
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	12.2	7.9	7.9	20.6	16.3	16.3	12.1	26.4	26.4	20.1	34.4	46.6
Effective Green, g (s)	12.2	7.9	7.9	20.6	16.3	16.3	12.1	26.4	26.4	20.1	34.4	46.6
Actuated g/C Ratio	0.14	0.09	0.09	0.23	0.18	0.18	0.13	0.29	0.29	0.22	0.38	0.52
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	465	163	135	405	337	281	461	1038	457	766	1352	879
v/s Ratio Prot	c0.08	0.04		0.06	c0.17		c0.12	c0.22		0.06	0.12	c0.05
v/s Ratio Perm			0.00			0.02			0.02			0.15
v/c Ratio	0.60	0.47	0.02	0.28	0.93	0.09	0.90	0.75	0.08	0.28	0.32	0.36
Uniform Delay, d1	36.6	39.1	37.5	28.6	36.3	30.7	38.4	28.8	23.0	29.0	19.6	12.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.23	2.65	1.00	1.00	1.00
Incremental Delay, d2	2.1	2.2	0.1	0.1	30.4	0.1	19.4	2.9	0.1	0.9	0.6	0.2
Delay (s)	38.7	41.2	37.6	28.7	66.7	30.8	62.9	38.2	61.0	29.9	20.2	13.1
Level of Service	D	D	D	C	E	C	E	D	E	C	C	B
Approach Delay (s)		39.1			50.2			48.1			19.9	
Approach LOS		D			D			D			B	

Intersection Summary			
HCM 2000 Control Delay	38.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

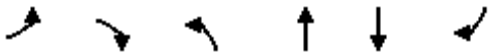
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	0	0	991	610	15
Future Volume (Veh/h)	13	0	0	991	610	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	0	0	1077	663	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1210	340	679			
vC1, stage 1 conf vol	671					
vC2, stage 2 conf vol	538					
vCu, unblocked vol	1210	340	679			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	384	656	909			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	14	359	718	442	237
Volume Left	14	0	0	0	0
Volume Right	0	0	0	0	16
cSH	384	909	1700	1700	1700
Volume to Capacity	0.04	0.00	0.42	0.26	0.14
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	14.7	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	14.7	0.0		0.0	
Approach LOS	B				

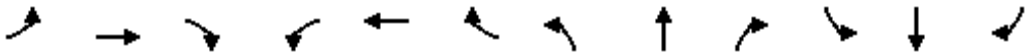
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	2	2	976	598	14
Future Volume (Veh/h)	15	2	2	976	598	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	2	2	1061	650	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1192	332	665			
vC1, stage 1 conf vol	658					
vC2, stage 2 conf vol	534					
vCu, unblocked vol	1192	332	665			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	389	663	920			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	18	356	707	433	232
Volume Left	16	2	0	0	0
Volume Right	2	0	0	0	15
cSH	408	920	1700	1700	1700
Volume to Capacity	0.04	0.00	0.42	0.25	0.14
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	14.2	0.1	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	14.2	0.0		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		



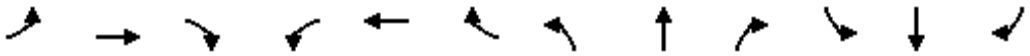
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	6	46	0	77	9	1107	55	95	833	2
Future Volume (Veh/h)	2	0	6	46	0	77	9	1107	55	95	833	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.40	0.40	0.40	0.85	0.85	0.85	0.97	0.97	0.97	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	15	54	0	91	9	1141	57	102	896	2
Pedestrians		4			1						2	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1696	2322	453	1856	2294	602	902			1199		
vC1, stage 1 conf vol	1105	1105		1188	1188							
vC2, stage 2 conf vol	590	1217		667	1106							
vCu, unblocked vol	1696	2322	453	1856	2294	602	902			1199		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	97	68	100	79	99			82		
cM capacity (veh/h)	151	123	552	166	165	441	746			577		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	20	145	9	761	437	102	597	301
Volume Left	5	54	9	0	0	102	0	0
Volume Right	15	91	0	0	57	0	0	2
cSH	331	447	746	1700	1700	577	1700	1700
Volume to Capacity	0.06	0.32	0.01	0.45	0.26	0.18	0.35	0.18
Queue Length 95th (ft)	5	35	1	0	0	16	0	0
Control Delay (s)	16.6	23.2	9.9	0.0	0.0	12.6	0.0	0.0
Lane LOS	C	C	A			B		
Approach Delay (s)	16.6	23.2	0.1			1.3		
Approach LOS	C	C						

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	56.0%	ICU Level of Service		B
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	163	42	220	70	1343	114	1080
v/c Ratio	0.65	0.13	0.60	0.41	0.69	0.57	0.54
Control Delay	41.7	13.6	24.3	45.0	18.7	55.3	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	13.6	24.3	45.0	18.7	55.3	5.7
Queue Length 50th (ft)	78	7	28	38	287	63	77
Queue Length 95th (ft)	107	24	57	78	438	124	62
Internal Link Dist (ft)		325	343		1751		572
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	263	379	544	216	1958	223	2013
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	5	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.11	0.40	0.32	0.69	0.51	0.54

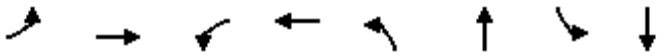
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	12	22	80	8	106	64	1158	77	100	853	98
Future Volume (vph)	132	12	22	80	8	106	64	1158	77	100	853	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.92		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1663			3135		1770	3497		1770	3479	
Flt Permitted	0.34	1.00			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	631	1663			2654		1770	3497		1770	3479	
Peak-hour factor, PHF	0.81	0.81	0.81	0.88	0.88	0.88	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	163	15	27	91	9	120	70	1259	84	114	969	111
RTOR Reduction (vph)	0	21	0	0	108	0	0	4	0	0	8	0
Lane Group Flow (vph)	163	21	0	0	112	0	70	1339	0	114	1072	0
Confl. Peds. (#/hr)			5						7			2
Confl. Bikes (#/hr)			2			7						1
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	21.6	21.6			8.8		7.5	49.7		8.8	51.3	
Effective Green, g (s)	21.6	21.6			8.8		7.5	49.7		8.8	51.3	
Actuated g/C Ratio	0.24	0.24			0.10		0.08	0.55		0.10	0.57	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	275	399			259		147	1931		173	1983	
v/s Ratio Prot	c0.06	0.01					0.04	c0.38		c0.06	0.31	
v/s Ratio Perm	c0.08				0.04							
v/c Ratio	0.59	0.05			0.43		0.48	0.69		0.66	0.54	
Uniform Delay, d1	28.8	26.3			38.2		39.4	14.6		39.2	12.0	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.20	0.35	
Incremental Delay, d2	2.3	0.0			0.4		2.4	2.1		7.9	1.0	
Delay (s)	31.1	26.4			38.7		41.8	16.7		54.7	5.2	
Level of Service	C	C			D		D	B		D	A	
Approach Delay (s)		30.1			38.7			17.9			9.9	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

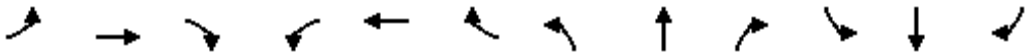
c Critical Lane Group



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	148	41	11	28	27	1538	30	1216
v/c Ratio	0.65	0.14	0.06	0.11	0.20	0.63	0.22	0.48
Control Delay	47.6	11.1	28.0	12.3	36.0	10.0	41.4	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	11.1	28.0	12.3	36.0	10.0	41.4	3.1
Queue Length 50th (ft)	81	1	5	1	15	145	17	18
Queue Length 95th (ft)	107	20	10	8	m24	300	m27	95
Internal Link Dist (ft)		219		275		572		564
Turn Bay Length (ft)					90		80	
Base Capacity (vph)	371	455	368	446	177	2435	177	2510
Starvation Cap Reductn	0	0	0	0	0	26	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.09	0.03	0.06	0.15	0.64	0.17	0.48

Intersection Summary

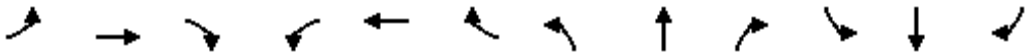
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	2	30	6	1	14	26	1500	7	28	1095	24
Future Volume (vph)	117	2	30	6	1	14	26	1500	7	28	1095	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1762	1572		1768	1573		1770	3536		1770	3525	
Flt Permitted	0.74	1.00		0.73	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1371	1572		1359	1573		1770	3536		1770	3525	
Peak-hour factor, PHF	0.79	0.79	0.79	0.53	0.53	0.53	0.98	0.98	0.98	0.92	0.92	0.92
Adj. Flow (vph)	148	3	38	11	2	26	27	1531	7	30	1190	26
RTOR Reduction (vph)	0	32	0	0	22	0	0	0	0	0	1	0
Lane Group Flow (vph)	148	9	0	11	6	0	27	1538	0	30	1215	0
Confl. Peds. (#/hr)	4		1	1		4			4			4
Confl. Bikes (#/hr)			6			3						
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	14.9	14.9		14.9	14.9		3.3	60.8		4.7	62.2	
Effective Green, g (s)	14.9	14.9		14.9	14.9		3.3	60.8		4.7	62.2	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.04	0.68		0.05	0.69	
Clearance Time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	226	260		224	260		64	2388		92	2436	
v/s Ratio Prot		0.01			0.00		c0.02	c0.43		0.02	0.34	
v/s Ratio Perm	c0.11			0.01								
v/c Ratio	0.65	0.04		0.05	0.02		0.42	0.64		0.33	0.50	
Uniform Delay, d1	35.1	31.5		31.6	31.5		42.4	8.4		41.1	6.6	
Progression Factor	1.00	1.00		1.00	1.00		0.87	0.86		1.01	0.32	
Incremental Delay, d2	5.1	0.0		0.0	0.0		3.4	1.0		1.6	0.5	
Delay (s)	40.3	31.5		31.6	31.5		40.3	8.2		42.9	2.6	
Level of Service	D	C		C	C		D	A		D	A	
Approach Delay (s)		38.4			31.5			8.8			3.6	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

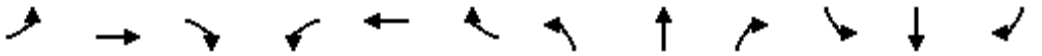
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	332	51	68	145	220	173	401	1133	157	153	1031	363
v/c Ratio	0.67	0.31	0.25	0.36	0.78	0.45	0.83	0.93	0.25	0.23	0.73	0.41
Control Delay	43.8	42.8	2.2	33.2	56.8	9.8	56.6	46.8	13.7	32.2	27.2	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.8	42.8	2.2	33.2	56.8	9.8	56.6	46.8	13.7	32.2	27.2	8.7
Queue Length 50th (ft)	92	28	0	69	120	0	123	368	26	38	264	70
Queue Length 95th (ft)	120	54	0	129	#225	55	#204	#456	m79	66	341	125
Internal Link Dist (ft)		364			383			564			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	537	333	400	401	299	395	481	1213	627	672	1410	915
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.15	0.17	0.36	0.74	0.44	0.83	0.93	0.25	0.23	0.73	0.40

Intersection Summary

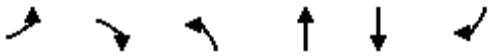
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	269	41	55	133	202	159	381	1076	149	147	990	348
Future Volume (vph)	269	41	55	133	202	159	381	1076	149	147	990	348
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1536	1770	1863	1555	3433	3539	1558	3433	3539	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1536	1770	1863	1555	3433	3539	1558	3433	3539	1568
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	332	51	68	145	220	173	401	1133	157	153	1031	362
RTOR Reduction (vph)	0	0	63	0	0	146	0	0	93	0	0	47
Lane Group Flow (vph)	332	51	5	145	220	27	401	1133	64	153	1031	316
Confl. Peds. (#/hr)									3			2
Confl. Bikes (#/hr)			6			4			1			
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	12.9	6.8	6.8	20.4	14.3	14.3	12.6	30.9	30.9	16.9	35.2	48.1
Effective Green, g (s)	12.9	6.8	6.8	20.4	14.3	14.3	12.6	30.9	30.9	16.9	35.2	48.1
Actuated g/C Ratio	0.14	0.08	0.08	0.23	0.16	0.16	0.14	0.34	0.34	0.19	0.39	0.53
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	492	140	116	401	296	247	480	1215	534	644	1384	905
v/s Ratio Prot	c0.10	0.03		0.08	c0.12		0.12	c0.32		0.04	c0.29	0.05
v/s Ratio Perm			0.00			0.02			0.04			0.15
v/c Ratio	0.67	0.36	0.04	0.36	0.74	0.11	0.84	0.93	0.12	0.24	0.74	0.35
Uniform Delay, d1	36.6	39.5	38.6	29.3	36.1	32.4	37.7	28.5	20.2	31.1	23.5	12.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.14	1.19	2.53	1.00	1.00	1.00
Incremental Delay, d2	3.6	1.6	0.2	0.2	9.7	0.2	9.8	10.7	0.1	0.9	3.7	0.2
Delay (s)	40.2	41.2	38.7	29.5	45.8	32.6	52.6	44.6	51.3	31.9	27.2	12.2
Level of Service	D	D	D	C	D	C	D	D	D	C	C	B
Approach Delay (s)		40.1			37.2			47.1			24.2	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	36.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

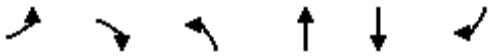
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	0	0	1207	931	24
Future Volume (Veh/h)	24	0	0	1207	931	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	0	0	1312	1012	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1681	519	1038			
vC1, stage 1 conf vol	1025					
vC2, stage 2 conf vol	656					
vCu, unblocked vol	1681	519	1038			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	100	100			
cM capacity (veh/h)	263	502	665			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	26	437	875	675	363
Volume Left	26	0	0	0	0
Volume Right	0	0	0	0	26
cSH	263	665	1700	1700	1700
Volume to Capacity	0.10	0.00	0.51	0.40	0.21
Queue Length 95th (ft)	8	0	0	0	0
Control Delay (s)	20.2	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	20.2	0.0		0.0	
Approach LOS	C				

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	43.4%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	25	4	4	1182	906	25
Future Volume (Veh/h)	25	4	4	1182	906	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	4	4	1285	985	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1649	506	1012			
vC1, stage 1 conf vol	998					
vC2, stage 2 conf vol	650					
vCu, unblocked vol	1649	506	1012			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	99	99			
cM capacity (veh/h)	270	512	681			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	31	432	857	657	355
Volume Left	27	4	0	0	0
Volume Right	4	0	0	0	27
cSH	288	681	1700	1700	1700
Volume to Capacity	0.11	0.01	0.50	0.39	0.21
Queue Length 95th (ft)	9	0	0	0	0
Control Delay (s)	19.0	0.2	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	19.0	0.1		0.0	
Approach LOS	C				

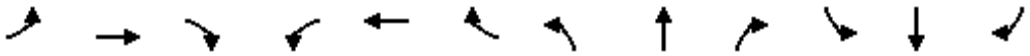
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E

Existing Plus Approved/Pending Projects (Background) Conditions Trip Inventory and Intersections Level of Service Work Sheets

Approved Projects_AM PEAK														
#	**Study Intersection**	**Project Nos**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**
1	Santa Rosa Avenue/Bellevue Avenue	1650	0	0	0	0	1	0	0	0	0	0	0	0
		1846	0	1	0	0	4	0	0	0	0	0	0	0
		2604	0	1	0	0	2	0	0	0	0	0	0	0
		2800	0	0	0	0	0	0	0	0	0	0	0	0
		368	0	1	0	0	0	0	0	0	0	0	0	0
		325	0	1	0	0	3	0	0	0	0	0	0	0
		2532	0	4	0	0	3	0	0	0	0	0	0	0
		Total	**0**	**8**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2	Santa Rosa Avenue/Burt Street	1650	0	0	0	0	1	0	0	0	0	0	0	0
		1846	0	1	0	0	4	0	0	0	0	0	0	0
		2604	0	1	0	0	2	0	0	0	0	0	0	0
		2800	0	0	0	0	0	0	0	0	0	0	0	0
		368	0	1	0	0	0	0	0	0	0	0	0	0
		325	0	1	0	0	3	0	0	0	0	0	0	0
		2532	0	4	0	0	3	0	0	0	0	0	0	0
		Total	**0**	**8**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3	Santa Rosa Avenue/Southside	1650	0	0	0	0	1	0	0	0	0	0	0	0
		1846	0	1	0	0	4	0	0	0	0	0	0	0
		2604	0	1	0	0	2	0	0	0	0	0	0	0
		2800	0	0	0	0	0	0	0	0	0	0	0	0
		368	0	1	0	0	0	0	0	0	0	0	0	0
		325	0	1	0	0	3	0	0	0	0	0	0	0
		2532	0	4	0	0	3	0	0	0	0	0	0	0
		Total	**0**	**8**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4	Santa Rosa Avenue/Yolanda Avenue	1650	0	0	0	0	1	0	1	0	0	0	0	0
		1846	0	0	1	0	0	0	0	8	0	4	17	0
		2604	0	0	1	0	0	0	0	4	0	2	8	11
		2800	0	0	0	0	0	0	0	1	0	0	1	1
		368	0	0	1	7	0	0	0	7	0	0	1	1
		325	0	0	1	9	0	0	0	8	0	3	18	35
		2532	0	4	0	0	3	15	20	0	0	0	0	0
		Total	**0**	**4**	**4**	**16**	**4**	**15**	**21**	**28**	**0**	**9**	**45**	**48**

Approved Projects_PM PEAK														
#	**Study Intersection**	**Projects**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**
1	Santa Rosa Avenue/Bellevue Avenue	1650	0	1	0	0	1	0	0	0	0	0	0	0
		1846	0	4	0	0	3	0	0	0	0	0	0	0
		2604	0	2	0	0	1	0	0	0	0	0	0	0
		2800	0	0	0	0	0	0	0	0	0	0	0	0
		368	0	0	0	0	1	0	0	0	0	0	0	0
		325	0	3	0	0	2	0	0	0	0	0	0	0
		2532	0	3	0	0	3	0	0	0	0	0	0	0
		Total	**0**	**13**	**0**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2	Santa Rosa Avenue/Burt Street	1650	0	1	0	0	1	0	0	0	0	0	0	0
		1846	0	4	0	0	3	0	0	0	0	0	0	0
		2604	0	2	0	0	1	0	0	0	0	0	0	0
		2800	0	0	0	0	0	0	0	0	0	0	0	0
		368	0	0	0	0	1	0	0	0	0	0	0	0
		325	0	3	0	0	2	0	0	0	0	0	0	0
		2532	0	3	0	0	3	0	0	0	0	0	0	0
		Total	**0**	**13**	**0**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3	Santa Rosa Avenue/Southside	1650	0	1	0	0	1	0	0	0	0	0	0	0
		1846	0	4	0	0	3	0	0	0	0	0	0	0
		2604	0	2	0	0	1	0	0	0	0	0	0	0
		2800	0	0	0	0	0	0	0	0	0	0	0	0
		368	0	0	0	0	1	0	0	0	0	0	0	0
		325	0	3	0	0	2	0	0	0	0	0	0	0
		2532	0	3	0	0	3	0	0	0	0	0	0	0
		Total	**0**	**13**	**0**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4	Santa Rosa Avenue/Yolanda Avenue	1650	0	1	0	0	1	0	4	0	0	0	0	0
		1846	0	0	4	0	0	0	0	25	0	3	11	0
		2604	0	0	2	0	0	0	0	10	0	1	5	7
		2800	0	0	0	0	0	0	0	2	0	0	1	1
		368	0	0	0	1	0	0	0	1	0	1	4	8
		325	0	0	3	27	0	0	0	22	0	2	11	20
		2532	0	3	0	0	3	12	17	0	0	0	0	0
		Total	**0**	**4**	**9**	**28**	**4**	**12**	**21**	**60**	**0**	**7**	**32**	**36**



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	3	67	0	185	8	797	129	118	422	5
Future Volume (Veh/h)	2	0	3	67	0	185	8	797	129	118	422	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.42	0.42	0.42	0.75	0.75	0.75	0.77	0.77	0.77	0.74	0.74	0.74
Hourly flow rate (vph)	5	0	7	89	0	247	10	1035	168	159	570	7
Pedestrians		4			1						2	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1435	2120	292	1750	2039	604	581			1204		
vC1, stage 1 conf vol	896	896		1140	1140							
vC2, stage 2 conf vol	540	1224		610	899							
vCu, unblocked vol	1435	2120	292	1750	2039	604	581			1204		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	100	99	49	100	44	99			72		
cM capacity (veh/h)	53	84	701	174	181	440	985			575		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	12	336	10	690	513	159	380	197
Volume Left	5	89	10	0	0	159	0	0
Volume Right	7	247	0	0	168	0	0	7
cSH	116	598	985	1700	1700	575	1700	1700
Volume to Capacity	0.10	0.56	0.01	0.41	0.30	0.28	0.22	0.12
Queue Length 95th (ft)	8	87	1	0	0	28	0	0
Control Delay (s)	39.7	29.1	8.7	0.0	0.0	13.6	0.0	0.0
Lane LOS	E	D	A			B		
Approach Delay (s)	39.7	29.1	0.1			2.9		
Approach LOS	E	D						

Intersection Summary				
Average Delay	5.4			
Intersection Capacity Utilization	51.3%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	22	9	260	16	995	56	796
v/c Ratio	0.16	0.05	0.60	0.13	0.42	0.35	0.30
Control Delay	33.6	20.5	19.3	40.9	10.2	50.6	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	20.5	19.3	40.9	10.2	50.6	2.9
Queue Length 50th (ft)	12	2	25	9	98	33	23
Queue Length 95th (ft)	18	7	42	28	273	56	46
Internal Link Dist (ft)		325	343		2785		578
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	228	285	616	216	2364	216	2659
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.03	0.42	0.07	0.42	0.26	0.30

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	2	4	66	5	134	14	845	31	40	539	26
Future Volume (vph)	14	2	4	66	5	134	14	845	31	40	539	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.90		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1655			3086		1770	3516		1770	3512	
Flt Permitted	0.33	1.00			0.86		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	606	1655			2699		1770	3516		1770	3512	
Peak-hour factor, PHF	0.63	0.63	0.63	0.79	0.79	0.79	0.88	0.88	0.88	0.71	0.71	0.71
Adj. Flow (vph)	22	3	6	84	6	170	16	960	35	56	759	37
RTOR Reduction (vph)	0	5	0	0	152	0	0	2	0	0	2	0
Lane Group Flow (vph)	22	4	0	0	108	0	16	993	0	56	794	0
Confl. Peds. (#/hr)			5						7			2
Confl. Bikes (#/hr)			2			7						1
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Effective Green, g (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Actuated g/C Ratio	0.17	0.17			0.10		0.02	0.65		0.08	0.71	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	133	273			278		31	2269		139	2493	
v/s Ratio Prot	c0.00	0.00					0.01	c0.28		c0.03	0.23	
v/s Ratio Perm	0.02				c0.04							
v/c Ratio	0.17	0.01			0.39		0.52	0.44		0.40	0.32	
Uniform Delay, d1	32.0	31.4			37.7		43.8	7.9		39.4	4.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.19	0.45	
Incremental Delay, d2	0.2	0.0			0.3		13.7	0.6		1.9	0.3	
Delay (s)	32.2	31.4			38.0		57.6	8.5		48.7	2.6	
Level of Service	C	C			D		E	A		D	A	
Approach Delay (s)		32.0			38.0			9.3			5.6	
Approach LOS		C			D			A			A	

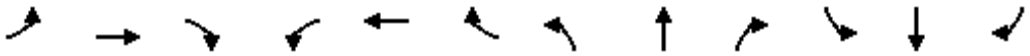
Intersection Summary			
HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	21	6	4	6	1300	6	581
v/c Ratio	0.14	0.04	0.02	0.05	0.42	0.05	0.19
Control Delay	34.8	19.8	25.5	37.8	3.7	42.6	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	19.8	25.5	37.8	3.7	42.6	1.4
Queue Length 50th (ft)	12	1	1	4	1	3	0
Queue Length 95th (ft)	22	8	5	m9	186	m10	63
Internal Link Dist (ft)		219	275		578		558
Turn Bay Length (ft)				90		80	
Base Capacity (vph)	379	438	464	177	3114	177	3111
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.01	0.01	0.03	0.42	0.03	0.19

Intersection Summary

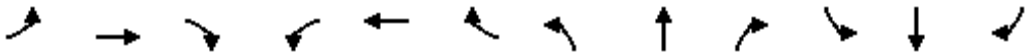
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	1	4	0	1	1	5	1157	0	5	501	4
Future Volume (vph)	16	1	4	0	1	1	5	1157	0	5	501	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.97			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88			0.93		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1762	1586			1701		1770	3539		1770	3534	
Flt Permitted	0.76	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1401	1586			1701		1770	3539		1770	3534	
Peak-hour factor, PHF	0.75	0.75	0.75	0.50	0.50	0.50	0.89	0.89	0.89	0.87	0.87	0.87
Adj. Flow (vph)	21	1	5	0	2	2	6	1300	0	6	576	5
RTOR Reduction (vph)	0	5	0	0	2	0	0	0	0	0	0	0
Lane Group Flow (vph)	21	1	0	0	2	0	6	1300	0	6	581	0
Confl. Peds. (#/hr)	4		1	1		4			4			4
Confl. Bikes (#/hr)			6			3						
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Effective Green, g (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Actuated g/C Ratio	0.07	0.07			0.07		0.01	0.81		0.01	0.81	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	96	109			117		25	2866		25	2862	
v/s Ratio Prot		0.00			0.00		c0.00	c0.37		0.00	0.16	
v/s Ratio Perm	c0.01											
v/c Ratio	0.22	0.01			0.02		0.24	0.45		0.24	0.20	
Uniform Delay, d1	39.6	39.0			39.1		43.9	2.6		43.9	1.9	
Progression Factor	1.00	1.00			1.00		0.94	0.75		1.07	0.38	
Incremental Delay, d2	0.4	0.0			0.0		4.7	0.5		4.8	0.2	
Delay (s)	40.0	39.1			39.1		46.0	2.4		51.5	0.9	
Level of Service	D	D			D		D	A		D	A	
Approach Delay (s)		39.8			39.1			2.6			1.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	2.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

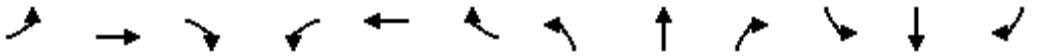


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	309	117	17	122	366	198	406	766	124	235	426	356
v/c Ratio	0.64	0.52	0.05	0.43	1.11	0.49	0.88	0.75	0.23	0.30	0.32	0.42
Control Delay	43.0	44.7	0.3	38.8	121.0	13.7	63.8	39.5	12.3	31.4	20.3	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	44.7	0.3	38.8	121.0	13.7	63.8	39.5	12.3	31.4	20.3	10.6
Queue Length 50th (ft)	86	63	0	60	~249	19	128	210	0	58	87	85
Queue Length 95th (ft)	94	83	0	109	#382	67	#208	236	66	95	124	138
Internal Link Dist (ft)		364			383			558			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	537	333	400	309	329	406	461	1183	603	777	1352	870
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.35	0.04	0.39	1.11	0.49	0.88	0.65	0.21	0.30	0.32	0.41

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

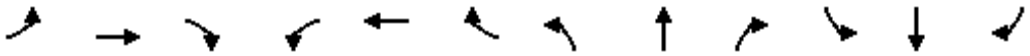
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	213	81	12	101	304	164	365	689	112	219	396	331
Future Volume (vph)	213	81	12	101	304	164	365	689	112	219	396	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1545	1770	1863	1556	3433	3539	1558	3433	3539	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1545	1770	1863	1556	3433	3539	1558	3433	3539	1568
Peak-hour factor, PHF	0.69	0.69	0.69	0.83	0.83	0.83	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	309	117	17	122	366	198	406	766	124	235	426	356
RTOR Reduction (vph)	0	0	15	0	0	132	0	0	88	0	0	26
Lane Group Flow (vph)	309	117	2	122	366	66	406	766	36	235	426	330
Confl. Peds. (#/hr)									3			2
Confl. Bikes (#/hr)			6			4			1			
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	12.6	9.6	9.6	18.9	15.9	15.9	12.1	26.1	26.1	20.4	34.4	47.0
Effective Green, g (s)	12.6	9.6	9.6	18.9	15.9	15.9	12.1	26.1	26.1	20.4	34.4	47.0
Actuated g/C Ratio	0.14	0.11	0.11	0.21	0.18	0.18	0.13	0.29	0.29	0.23	0.38	0.52
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	480	198	164	371	329	274	461	1026	451	778	1352	886
v/s Ratio Prot	c0.09	0.06		c0.07	c0.20		c0.12	c0.22		0.07	0.12	c0.05
v/s Ratio Perm			0.00			0.04			0.02			0.16
v/c Ratio	0.64	0.59	0.01	0.33	1.11	0.24	0.88	0.75	0.08	0.30	0.32	0.37
Uniform Delay, d1	36.6	38.3	36.0	30.2	37.0	31.9	38.2	29.0	23.2	28.9	19.5	12.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.22	2.63	1.00	1.00	1.00
Incremental Delay, d2	3.0	4.7	0.0	0.2	83.4	0.5	16.5	2.8	0.1	1.0	0.6	0.3
Delay (s)	39.5	43.0	36.0	30.4	120.5	32.3	59.9	38.2	61.2	29.9	20.1	13.0
Level of Service	D	D	D	C	F	C	E	D	E	C	C	B
Approach Delay (s)		40.3			79.0			47.2			19.9	
Approach LOS		D			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	44.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



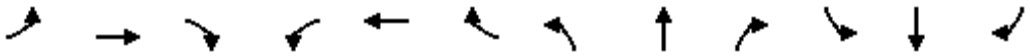
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	6	46	0	77	9	1116	55	95	840	2
Future Volume (Veh/h)	2	0	6	46	0	77	9	1116	55	95	840	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.40	0.40	0.40	0.85	0.85	0.85	0.97	0.97	0.97	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	15	54	0	91	9	1151	57	102	903	2
Pedestrians		9			18						7	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		1			2						1	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1718	2361	462	1886	2334	629	914			1226		
vC1, stage 1 conf vol	1117	1117		1216	1216							
vC2, stage 2 conf vol	600	1244		670	1118							
vCu, unblocked vol	1718	2361	462	1886	2334	629	914			1226		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	97	66	100	78	99			82		
cM capacity (veh/h)	145	115	542	159	159	415	735			555		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	20	145	9	767	441	102	602	303
Volume Left	5	54	9	0	0	102	0	0
Volume Right	15	91	0	0	57	0	0	2
cSH	322	426	735	1700	1700	555	1700	1700
Volume to Capacity	0.06	0.34	0.01	0.45	0.26	0.18	0.35	0.18
Queue Length 95th (ft)	5	37	1	0	0	17	0	0
Control Delay (s)	16.9	24.6	10.0	0.0	0.0	12.9	0.0	0.0
Lane LOS	C	C	A			B		
Approach Delay (s)	16.9	24.6	0.1			1.3		
Approach LOS	C	C						

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	57.1%	ICU Level of Service		B
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	163	42	220	70	1304	114	1037
v/c Ratio	0.62	0.12	0.71	0.49	0.63	0.59	0.47
Control Delay	50.9	18.3	37.6	63.9	19.1	77.8	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.9	18.3	37.6	63.9	19.1	77.8	3.5
Queue Length 50th (ft)	108	9	40	53	337	94	71
Queue Length 95th (ft)	148	32	77	100	488	150	81
Internal Link Dist (ft)		325	343		2785		578
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	290	365	374	177	2074	324	2224
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.12	0.59	0.40	0.63	0.35	0.47

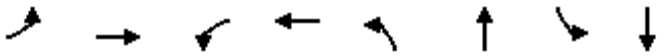
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	12	22	80	8	106	64	1122	77	100	815	98
Future Volume (vph)	132	12	22	80	8	106	64	1122	77	100	815	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.92		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1656			3132		1770	3499		1770	3477	
Flt Permitted	0.34	1.00			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	626	1656			2651		1770	3499		1770	3477	
Peak-hour factor, PHF	0.81	0.81	0.81	0.88	0.88	0.88	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	163	15	27	91	9	120	70	1220	84	114	926	111
RTOR Reduction (vph)	0	21	0	0	111	0	0	3	0	0	6	0
Lane Group Flow (vph)	163	21	0	0	109	0	70	1301	0	114	1031	0
Confl. Peds. (#/hr)			11						2			1
Confl. Bikes (#/hr)						6			1			
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	26.0	26.0			8.9		8.5	71.1		13.0	75.9	
Effective Green, g (s)	26.0	26.0			8.9		8.5	71.1		13.0	75.9	
Actuated g/C Ratio	0.22	0.22			0.07		0.07	0.59		0.11	0.63	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	270	358			196		125	2073		191	2199	
v/s Ratio Prot	c0.07	0.01					0.04	c0.37		c0.06	0.30	
v/s Ratio Perm	c0.06				0.04							
v/c Ratio	0.60	0.06			0.56		0.56	0.63		0.60	0.47	
Uniform Delay, d1	40.8	37.3			53.6		53.9	15.9		51.0	11.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.31	0.23	
Incremental Delay, d2	2.6	0.0			1.9		5.6	1.4		4.5	0.7	
Delay (s)	43.4	37.3			55.6		59.6	17.3		71.5	3.3	
Level of Service	D	D			E		E	B		E	A	
Approach Delay (s)		42.2			55.6			19.5			10.0	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	148	41	11	28	27	1501	30	1175
v/c Ratio	0.75	0.16	0.07	0.13	0.25	0.57	0.27	0.45
Control Delay	70.8	15.0	41.5	16.7	51.4	8.5	60.0	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.8	15.0	41.5	16.7	51.4	8.6	60.0	1.9
Queue Length 50th (ft)	111	2	7	1	0	198	22	69
Queue Length 95th (ft)	148	25	14	9	m34	360	m38	85
Internal Link Dist (ft)		219		275		578		558
Turn Bay Length (ft)					90		80	
Base Capacity (vph)	300	377	299	363	191	2621	206	2621
Starvation Cap Reductn	0	0	0	0	0	71	0	16
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.11	0.04	0.08	0.14	0.59	0.15	0.45

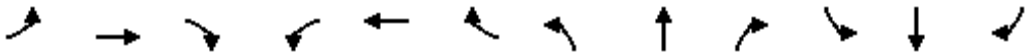
Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	2	30	6	1	14	26	1464	7	28	1057	24
Future Volume (vph)	117	2	30	6	1	14	26	1464	7	28	1057	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1757	1579		1770	1552		1770	3536		1770	3525	
Flt Permitted	0.74	1.00		0.73	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1367	1579		1360	1552		1770	3536		1770	3525	
Peak-hour factor, PHF	0.79	0.79	0.79	0.53	0.53	0.53	0.98	0.98	0.98	0.92	0.92	0.92
Adj. Flow (vph)	148	3	38	11	2	26	27	1494	7	30	1149	26
RTOR Reduction (vph)	0	32	0	0	22	0	0	0	0	0	1	0
Lane Group Flow (vph)	148	9	0	11	6	0	27	1501	0	30	1174	0
Confl. Peds. (#/hr)	5					5			12			3
Confl. Bikes (#/hr)			3			10			1			2
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	17.4	17.4		17.4	17.4		5.0	87.8		5.2	88.0	
Effective Green, g (s)	17.4	17.4		17.4	17.4		5.0	87.8		5.2	88.0	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.04	0.73		0.04	0.73	
Clearance Time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	198	228		197	225		73	2587		76	2585	
v/s Ratio Prot		0.01			0.00		0.02	c0.42		c0.02	0.33	
v/s Ratio Perm	c0.11			0.01								
v/c Ratio	0.75	0.04		0.06	0.03		0.37	0.58		0.39	0.45	
Uniform Delay, d1	49.2	44.1		44.2	44.0		56.0	7.5		55.9	6.4	
Progression Factor	1.00	1.00		1.00	1.00		0.88	0.88		1.04	0.19	
Incremental Delay, d2	12.6	0.0		0.0	0.0		2.5	0.8		2.7	0.5	
Delay (s)	61.8	44.1		44.3	44.0		52.0	7.3		60.9	1.7	
Level of Service	E	D		D	D		D	A		E	A	
Approach Delay (s)		58.0			44.1			8.1			3.2	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

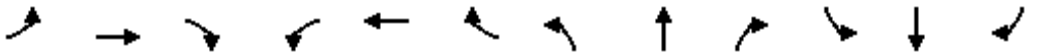
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	358	125	42	149	254	212	384	1105	163	182	1009	375
v/c Ratio	0.82	0.59	0.15	0.48	0.85	0.52	0.84	0.80	0.24	0.27	0.63	0.40
Control Delay	66.5	61.0	1.2	51.2	73.8	13.7	70.4	44.4	13.4	44.6	27.8	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	66.5	61.0	1.2	51.2	73.8	13.7	70.4	44.5	13.4	44.6	27.8	10.3
Queue Length 50th (ft)	140	94	0	103	191	16	141	478	36	63	317	103
Queue Length 95th (ft)	172	132	0	182	#318	88	#236	306	63	104	392	165
Internal Link Dist (ft)		364			383			558			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	452	312	353	309	321	423	466	1545	746	680	1603	952
Starvation Cap Reductn	0	0	0	0	0	0	0	41	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.40	0.12	0.48	0.79	0.50	0.82	0.73	0.22	0.27	0.63	0.39

Intersection Summary

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

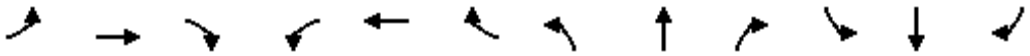


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	101	34	137	234	195	365	1050	155	175	969	360
Future Volume (vph)	290	101	34	137	234	195	365	1050	155	175	969	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1547	1770	1863	1551	3433	3539	1537	3433	3539	1565
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1547	1770	1863	1551	3433	3539	1537	3433	3539	1565
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	358	125	42	149	254	212	384	1105	163	182	1009	375
RTOR Reduction (vph)	0	0	37	0	0	158	0	0	82	0	0	38
Lane Group Flow (vph)	358	125	5	149	254	54	384	1105	81	182	1009	337
Confl. Peds. (#/hr)			1						11			2
Confl. Bikes (#/hr)			5			6			1			1
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	15.3	13.7	13.7	21.0	19.4	19.4	16.0	46.6	46.6	23.7	54.3	69.6
Effective Green, g (s)	15.3	13.7	13.7	21.0	19.4	19.4	16.0	46.6	46.6	23.7	54.3	69.6
Actuated g/C Ratio	0.13	0.11	0.11	0.18	0.16	0.16	0.13	0.39	0.39	0.20	0.45	0.58
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	437	212	176	309	301	250	457	1374	596	678	1601	958
v/s Ratio Prot	c0.10	0.07		0.08	c0.14		0.11	c0.31		0.05	c0.29	0.04
v/s Ratio Perm			0.00			0.04			0.05			0.17
v/c Ratio	0.82	0.59	0.03	0.48	0.84	0.22	0.84	0.80	0.14	0.27	0.63	0.35
Uniform Delay, d1	51.0	50.5	47.2	44.6	48.8	43.7	50.8	32.6	23.7	40.8	25.2	13.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.24	2.30	1.00	1.00	1.00
Incremental Delay, d2	11.4	4.2	0.1	0.4	18.9	0.4	11.2	3.0	0.1	1.0	1.9	0.2
Delay (s)	62.4	54.6	47.3	45.0	67.8	44.1	67.0	43.4	54.5	41.8	27.1	13.5
Level of Service	E	D	D	D	E	D	E	D	D	D	C	B
Approach Delay (s)		59.3			54.1			50.0			25.5	
Approach LOS		E			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	42.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Appendix F – Background plus Project Conditions Intersections Level of Service Work Sheets



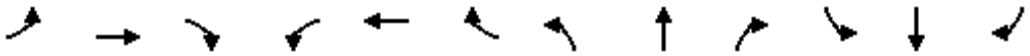
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	3	67	0	185	8	799	129	118	424	5
Future Volume (Veh/h)	2	0	3	67	0	185	8	799	129	118	424	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.42	0.42	0.42	0.75	0.75	0.75	0.77	0.77	0.77	0.74	0.74	0.74
Hourly flow rate (vph)	5	0	7	89	0	247	10	1038	168	159	573	7
Pedestrians		4			1						2	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1440	2126	294	1754	2045	606	584			1207		
vC1, stage 1 conf vol	898	898		1143	1143							
vC2, stage 2 conf vol	541	1227		612	902							
vCu, unblocked vol	1440	2126	294	1754	2045	606	584			1207		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	100	99	49	100	44	99			72		
cM capacity (veh/h)	52	83	700	173	180	439	983			573		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	12	336	10	692	514	159	382	198
Volume Left	5	89	10	0	0	159	0	0
Volume Right	7	247	0	0	168	0	0	7
cSH	114	597	983	1700	1700	573	1700	1700
Volume to Capacity	0.11	0.56	0.01	0.41	0.30	0.28	0.22	0.12
Queue Length 95th (ft)	9	87	1	0	0	28	0	0
Control Delay (s)	40.4	29.2	8.7	0.0	0.0	13.7	0.0	0.0
Lane LOS	E	D	A			B		
Approach Delay (s)	40.4	29.2	0.1			2.9		
Approach LOS	E	D						

Intersection Summary				
Average Delay	5.5			
Intersection Capacity Utilization	51.3%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	22	9	260	16	1027	56	837
v/c Ratio	0.16	0.05	0.60	0.13	0.43	0.35	0.31
Control Delay	33.6	20.5	19.3	40.9	10.4	50.5	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	20.5	19.3	40.9	10.4	50.5	3.0
Queue Length 50th (ft)	12	2	25	9	103	33	24
Queue Length 95th (ft)	18	7	42	28	285	56	47
Internal Link Dist (ft)		325	343		1751		572
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	228	285	616	216	2364	216	2659
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.03	0.42	0.07	0.43	0.26	0.31

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	2	4	66	5	134	14	873	31	40	568	26
Future Volume (vph)	14	2	4	66	5	134	14	873	31	40	568	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.90		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1655			3086		1770	3516		1770	3513	
Flt Permitted	0.33	1.00			0.86		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	606	1655			2699		1770	3516		1770	3513	
Peak-hour factor, PHF	0.63	0.63	0.63	0.79	0.79	0.79	0.88	0.88	0.88	0.71	0.71	0.71
Adj. Flow (vph)	22	3	6	84	6	170	16	992	35	56	800	37
RTOR Reduction (vph)	0	5	0	0	152	0	0	2	0	0	2	0
Lane Group Flow (vph)	22	4	0	0	108	0	16	1025	0	56	835	0
Confl. Peds. (#/hr)			5						7			2
Confl. Bikes (#/hr)			2			7						1
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Effective Green, g (s)	14.9	14.9			9.3		1.6	58.1		7.1	63.9	
Actuated g/C Ratio	0.17	0.17			0.10		0.02	0.65		0.08	0.71	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	133	273			278		31	2269		139	2494	
v/s Ratio Prot	c0.00	0.00					0.01	c0.29		c0.03	0.24	
v/s Ratio Perm	0.02				c0.04							
v/c Ratio	0.17	0.01			0.39		0.52	0.45		0.40	0.33	
Uniform Delay, d1	32.0	31.4			37.7		43.8	8.0		39.4	5.0	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.18	0.45	
Incremental Delay, d2	0.2	0.0			0.3		13.7	0.7		1.9	0.4	
Delay (s)	32.2	31.4			38.0		57.6	8.6		48.5	2.6	
Level of Service	C	C			D		E	A		D	A	
Approach Delay (s)		32.0			38.0			9.4			5.5	
Approach LOS		C			D			A			A	

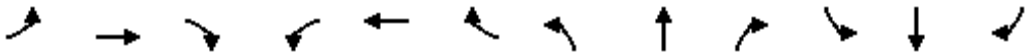
Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	21	6	4	6	1331	6	614
v/c Ratio	0.14	0.04	0.02	0.05	0.43	0.05	0.20
Control Delay	34.8	19.8	25.5	37.8	3.9	43.6	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	19.8	25.5	37.8	3.9	43.6	1.5
Queue Length 50th (ft)	12	1	1	4	2	3	0
Queue Length 95th (ft)	22	8	5	m9	196	m10	67
Internal Link Dist (ft)		219	275		572		564
Turn Bay Length (ft)				90		80	
Base Capacity (vph)	379	438	464	177	3114	177	3111
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.01	0.01	0.03	0.43	0.03	0.20

Intersection Summary

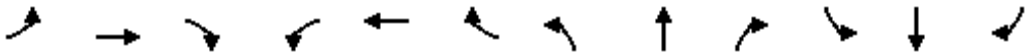
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	1	4	0	1	1	5	1185	0	5	530	4
Future Volume (vph)	16	1	4	0	1	1	5	1185	0	5	530	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.97			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88			0.93		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1762	1586			1701		1770	3539		1770	3534	
Flt Permitted	0.76	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1401	1586			1701		1770	3539		1770	3534	
Peak-hour factor, PHF	0.75	0.75	0.75	0.50	0.50	0.50	0.89	0.89	0.89	0.87	0.87	0.87
Adj. Flow (vph)	21	1	5	0	2	2	6	1331	0	6	609	5
RTOR Reduction (vph)	0	5	0	0	2	0	0	0	0	0	0	0
Lane Group Flow (vph)	21	1	0	0	2	0	6	1331	0	6	614	0
Confl. Peds. (#/hr)	4		1	1		4			4			4
Confl. Bikes (#/hr)			6			3						
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Effective Green, g (s)	6.2	6.2			6.2		1.3	72.9		1.3	72.9	
Actuated g/C Ratio	0.07	0.07			0.07		0.01	0.81		0.01	0.81	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	96	109			117		25	2866		25	2862	
v/s Ratio Prot		0.00			0.00		c0.00	c0.38		0.00	0.17	
v/s Ratio Perm	c0.01											
v/c Ratio	0.22	0.01			0.02		0.24	0.46		0.24	0.21	
Uniform Delay, d1	39.6	39.0			39.1		43.9	2.6		43.9	2.0	
Progression Factor	1.00	1.00			1.00		0.94	0.78		1.09	0.39	
Incremental Delay, d2	0.4	0.0			0.0		4.7	0.5		4.8	0.2	
Delay (s)	40.0	39.1			39.1		45.9	2.5		52.5	0.9	
Level of Service	D	D			D		D	A		D	A	
Approach Delay (s)		39.8			39.1			2.7			1.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	2.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

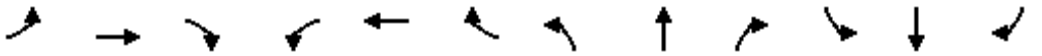


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	309	117	35	124	366	198	416	784	127	235	442	356
v/c Ratio	0.64	0.52	0.11	0.44	1.11	0.49	0.90	0.76	0.23	0.31	0.33	0.42
Control Delay	43.0	44.7	0.7	39.0	121.0	13.7	66.6	39.8	12.4	31.7	20.5	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	44.7	0.7	39.0	121.0	13.7	66.6	39.8	12.4	31.7	20.5	10.6
Queue Length 50th (ft)	86	63	0	62	~249	19	131	213	0	58	91	85
Queue Length 95th (ft)	94	83	0	110	#382	67	#215	244	68	95	129	138
Internal Link Dist (ft)		364			383			564			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	537	333	400	309	329	406	461	1183	605	765	1352	870
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.35	0.09	0.40	1.11	0.49	0.90	0.66	0.21	0.31	0.33	0.41

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

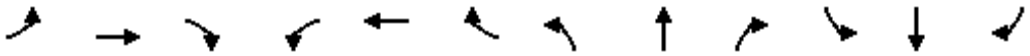
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	213	81	24	103	304	164	374	706	114	219	411	331
Future Volume (vph)	213	81	24	103	304	164	374	706	114	219	411	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1545	1770	1863	1556	3433	3539	1558	3433	3539	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1545	1770	1863	1556	3433	3539	1558	3433	3539	1568
Peak-hour factor, PHF	0.69	0.69	0.69	0.83	0.83	0.83	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	309	117	35	124	366	198	416	784	127	235	442	356
RTOR Reduction (vph)	0	0	31	0	0	132	0	0	90	0	0	26
Lane Group Flow (vph)	309	117	4	124	366	66	416	784	37	235	442	330
Confl. Peds. (#/hr)									3			2
Confl. Bikes (#/hr)			6			4			1			
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	12.6	9.6	9.6	18.9	15.9	15.9	12.1	26.4	26.4	20.1	34.4	47.0
Effective Green, g (s)	12.6	9.6	9.6	18.9	15.9	15.9	12.1	26.4	26.4	20.1	34.4	47.0
Actuated g/C Ratio	0.14	0.11	0.11	0.21	0.18	0.18	0.13	0.29	0.29	0.22	0.38	0.52
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	480	198	164	371	329	274	461	1038	457	766	1352	886
v/s Ratio Prot	c0.09	0.06		c0.07	c0.20		c0.12	c0.22		0.07	0.12	c0.05
v/s Ratio Perm			0.00			0.04			0.02			0.16
v/c Ratio	0.64	0.59	0.02	0.33	1.11	0.24	0.90	0.76	0.08	0.31	0.33	0.37
Uniform Delay, d1	36.6	38.3	36.0	30.2	37.0	31.9	38.4	28.9	23.0	29.1	19.6	12.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.23	2.70	1.00	1.00	1.00
Incremental Delay, d2	3.0	4.7	0.1	0.2	83.4	0.5	19.4	2.9	0.1	1.0	0.6	0.3
Delay (s)	39.5	43.0	36.1	30.4	120.5	32.3	62.9	38.4	62.3	30.2	20.3	13.0
Level of Service	D	D	D	C	F	C	E	D	E	C	C	B
Approach Delay (s)		40.1			78.9			48.4			20.0	
Approach LOS		D			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	44.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



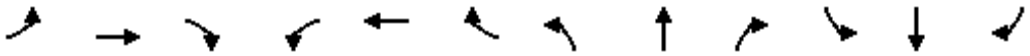
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	6	46	0	77	9	1120	55	95	844	2
Future Volume (Veh/h)	2	0	6	46	0	77	9	1120	55	95	844	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.40	0.40	0.40	0.85	0.85	0.85	0.97	0.97	0.97	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	15	54	0	91	9	1155	57	102	908	2
Pedestrians		4			1						2	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)						2						
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1714	2348	459	1876	2320	609	914			1213		
vC1, stage 1 conf vol	1117	1117		1202	1202							
vC2, stage 2 conf vol	598	1231		673	1118							
vCu, unblocked vol	1714	2348	459	1876	2320	609	914			1213		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	97	67	100	79	99			82		
cM capacity (veh/h)	148	120	547	163	163	437	739			570		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	20	145	9	770	442	102	605	305
Volume Left	5	54	9	0	0	102	0	0
Volume Right	15	91	0	0	57	0	0	2
cSH	326	438	739	1700	1700	570	1700	1700
Volume to Capacity	0.06	0.33	0.01	0.45	0.26	0.18	0.36	0.18
Queue Length 95th (ft)	5	36	1	0	0	16	0	0
Control Delay (s)	16.7	23.7	9.9	0.0	0.0	12.7	0.0	0.0
Lane LOS	C	C	A			B		
Approach Delay (s)	16.7	23.7	0.1			1.3		
Approach LOS	C	C						

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	56.4%	ICU Level of Service		B
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	163	42	220	70	1357	114	1093
v/c Ratio	0.65	0.13	0.60	0.41	0.69	0.57	0.54
Control Delay	41.7	13.6	24.3	45.0	18.9	55.2	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	13.6	24.3	45.0	18.9	55.2	5.6
Queue Length 50th (ft)	78	7	28	38	292	63	80
Queue Length 95th (ft)	107	24	57	78	445	124	62
Internal Link Dist (ft)		325	343		1751		572
Turn Bay Length (ft)	65			150		120	
Base Capacity (vph)	263	379	544	216	1958	223	2013
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	10	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.11	0.40	0.32	0.70	0.51	0.54

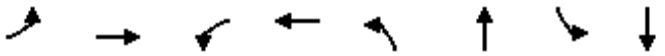
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	12	22	80	8	106	64	1171	77	100	864	98
Future Volume (vph)	132	12	22	80	8	106	64	1171	77	100	864	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.92		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1663			3135		1770	3498		1770	3480	
Flt Permitted	0.34	1.00			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	631	1663			2654		1770	3498		1770	3480	
Peak-hour factor, PHF	0.81	0.81	0.81	0.88	0.88	0.88	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	163	15	27	91	9	120	70	1273	84	114	982	111
RTOR Reduction (vph)	0	21	0	0	108	0	0	4	0	0	8	0
Lane Group Flow (vph)	163	21	0	0	112	0	70	1353	0	114	1085	0
Confl. Peds. (#/hr)			5						7			2
Confl. Bikes (#/hr)			2			7						1
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	21.6	21.6			8.8		7.5	49.7		8.8	51.3	
Effective Green, g (s)	21.6	21.6			8.8		7.5	49.7		8.8	51.3	
Actuated g/C Ratio	0.24	0.24			0.10		0.08	0.55		0.10	0.57	
Clearance Time (s)	3.0	3.0			3.0		3.0	3.9		3.0	3.6	
Vehicle Extension (s)	2.0	2.0			2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	275	399			259		147	1931		173	1983	
v/s Ratio Prot	c0.06	0.01					0.04	c0.39		c0.06	0.31	
v/s Ratio Perm	c0.08				0.04							
v/c Ratio	0.59	0.05			0.43		0.48	0.70		0.66	0.55	
Uniform Delay, d1	28.8	26.3			38.2		39.4	14.7		39.2	12.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.19	0.34	
Incremental Delay, d2	2.3	0.0			0.4		2.4	2.1		7.9	1.0	
Delay (s)	31.1	26.4			38.7		41.8	16.9		54.7	5.1	
Level of Service	C	C			D		D	B		D	A	
Approach Delay (s)		30.1			38.7			18.1			9.8	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

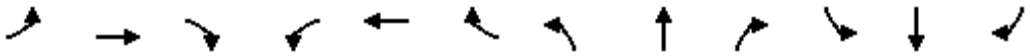
c Critical Lane Group



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	148	41	11	28	27	1551	30	1228
v/c Ratio	0.65	0.14	0.06	0.11	0.20	0.64	0.22	0.49
Control Delay	47.6	11.1	28.0	12.3	35.8	10.1	42.1	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	11.1	28.0	12.3	35.8	10.2	42.1	2.8
Queue Length 50th (ft)	81	1	5	1	15	147	17	18
Queue Length 95th (ft)	107	20	10	8	m24	302	m24	99
Internal Link Dist (ft)		219		275		572		564
Turn Bay Length (ft)					90		80	
Base Capacity (vph)	371	455	368	446	177	2435	177	2510
Starvation Cap Reductn	0	0	0	0	0	26	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.09	0.03	0.06	0.15	0.64	0.17	0.49

Intersection Summary

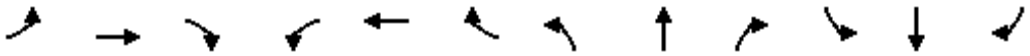
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	2	30	6	1	14	26	1513	7	28	1106	24
Future Volume (vph)	117	2	30	6	1	14	26	1513	7	28	1106	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1762	1572		1768	1573		1770	3536		1770	3525	
Flt Permitted	0.74	1.00		0.73	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1371	1572		1359	1573		1770	3536		1770	3525	
Peak-hour factor, PHF	0.79	0.79	0.79	0.53	0.53	0.53	0.98	0.98	0.98	0.92	0.92	0.92
Adj. Flow (vph)	148	3	38	11	2	26	27	1544	7	30	1202	26
RTOR Reduction (vph)	0	32	0	0	22	0	0	0	0	0	1	0
Lane Group Flow (vph)	148	9	0	11	6	0	27	1551	0	30	1227	0
Confl. Peds. (#/hr)	4		1	1		4			4			4
Confl. Bikes (#/hr)			6			3						
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	14.9	14.9		14.9	14.9		3.3	60.8		4.7	62.2	
Effective Green, g (s)	14.9	14.9		14.9	14.9		3.3	60.8		4.7	62.2	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.04	0.68		0.05	0.69	
Clearance Time (s)	3.0	3.0		3.0	3.0		3.0	3.6		3.0	3.6	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	226	260		224	260		64	2388		92	2436	
v/s Ratio Prot		0.01			0.00		c0.02	c0.44		0.02	0.35	
v/s Ratio Perm	c0.11			0.01								
v/c Ratio	0.65	0.04		0.05	0.02		0.42	0.65		0.33	0.50	
Uniform Delay, d1	35.1	31.5		31.6	31.5		42.4	8.4		41.1	6.6	
Progression Factor	1.00	1.00		1.00	1.00		0.87	0.86		1.03	0.28	
Incremental Delay, d2	5.1	0.0		0.0	0.0		3.3	1.0		1.5	0.5	
Delay (s)	40.3	31.5		31.6	31.5		40.1	8.3		43.8	2.4	
Level of Service	D	C		C	C		D	A		D	A	
Approach Delay (s)		38.4			31.5			8.8			3.4	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

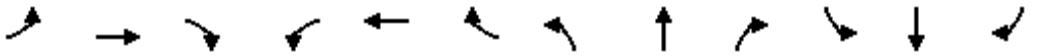
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	358	125	68	152	254	212	401	1137	166	182	1035	375
v/c Ratio	0.71	0.54	0.21	0.48	0.86	0.50	0.86	0.95	0.27	0.28	0.75	0.43
Control Delay	45.0	44.7	1.5	39.5	64.6	9.5	60.0	48.7	13.7	33.0	27.8	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	44.7	1.5	39.5	64.6	9.5	60.0	48.7	13.7	33.0	27.8	9.8
Queue Length 50th (ft)	100	68	0	77	142	0	123	371	28	46	265	82
Queue Length 95th (ft)	129	104	0	145	#274	60	#203	#458	m82	76	343	139
Internal Link Dist (ft)		364			383			564			519	
Turn Bay Length (ft)			115	80		130	200		200	185		240
Base Capacity (vph)	537	333	400	318	303	430	464	1197	626	649	1388	895
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.38	0.17	0.48	0.84	0.49	0.86	0.95	0.27	0.28	0.75	0.42

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	101	55	140	234	195	381	1080	158	175	994	360
Future Volume (vph)	290	101	55	140	234	195	381	1080	158	175	994	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1548	1770	1863	1555	3433	3539	1558	3433	3539	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1548	1770	1863	1555	3433	3539	1558	3433	3539	1568
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	358	125	68	152	254	212	401	1137	166	182	1035	375
RTOR Reduction (vph)	0	0	59	0	0	178	0	0	99	0	0	36
Lane Group Flow (vph)	358	125	9	152	254	34	401	1137	67	182	1035	339
Confl. Peds. (#/hr)									3			2
Confl. Bikes (#/hr)			6			4			1			
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases			2			6			8			4
Actuated Green, G (s)	13.2	11.3	11.3	16.2	14.3	14.3	12.2	30.5	30.5	17.0	35.3	48.5
Effective Green, g (s)	13.2	11.3	11.3	16.2	14.3	14.3	12.2	30.5	30.5	17.0	35.3	48.5
Actuated g/C Ratio	0.15	0.13	0.13	0.18	0.16	0.16	0.14	0.34	0.34	0.19	0.39	0.54
Clearance Time (s)	3.9	3.6	3.6	3.9	3.6	3.6	3.6	3.9	3.9	3.6	3.9	3.9
Vehicle Extension (s)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	503	233	194	318	296	247	465	1199	527	648	1388	912
v/s Ratio Prot	c0.10	0.07		0.09	c0.14		0.12	c0.32		0.05	c0.29	0.05
v/s Ratio Perm			0.01			0.02			0.04			0.16
v/c Ratio	0.71	0.54	0.04	0.48	0.86	0.14	0.86	0.95	0.13	0.28	0.75	0.37
Uniform Delay, d1	36.6	36.9	34.6	33.1	36.9	32.5	38.1	29.0	20.6	31.3	23.5	12.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.14	1.17	2.57	1.00	1.00	1.00
Incremental Delay, d2	4.7	2.4	0.1	0.4	21.0	0.3	12.5	12.8	0.1	1.1	3.7	0.3
Delay (s)	41.3	39.3	34.7	33.5	57.9	32.8	55.9	46.6	52.9	32.3	27.2	12.2
Level of Service	D	D	C	C	E	C	E	D	D	C	C	B
Approach Delay (s)		40.0			43.3			49.4			24.2	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	38.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

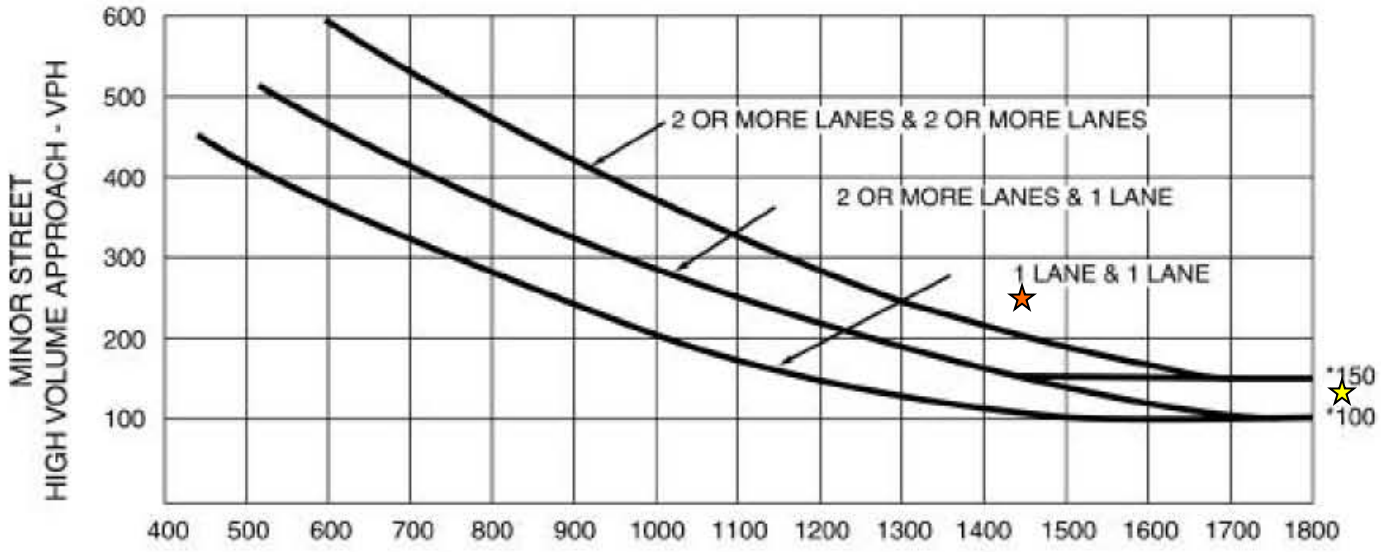
Appendix G – Signal Warrant Analysis for Santa Rosa Avenue and Bellevue Avenue

Peak Hour Warrant (Urban Areas)

Intersection #1: Santa Rosa Avenue/Bellevue Avenue
Scenario: Existing Conditions

Figure 4C-3. Warrant 3, Peak Hour

Minor Street Volume = 252 (123) VPH



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Major Street Volume = 1458 (2093) VPH

★ **AM peak hour**
★ **PM peak hour**

A signal is warranted for A.M. & P.M. Peak Hour

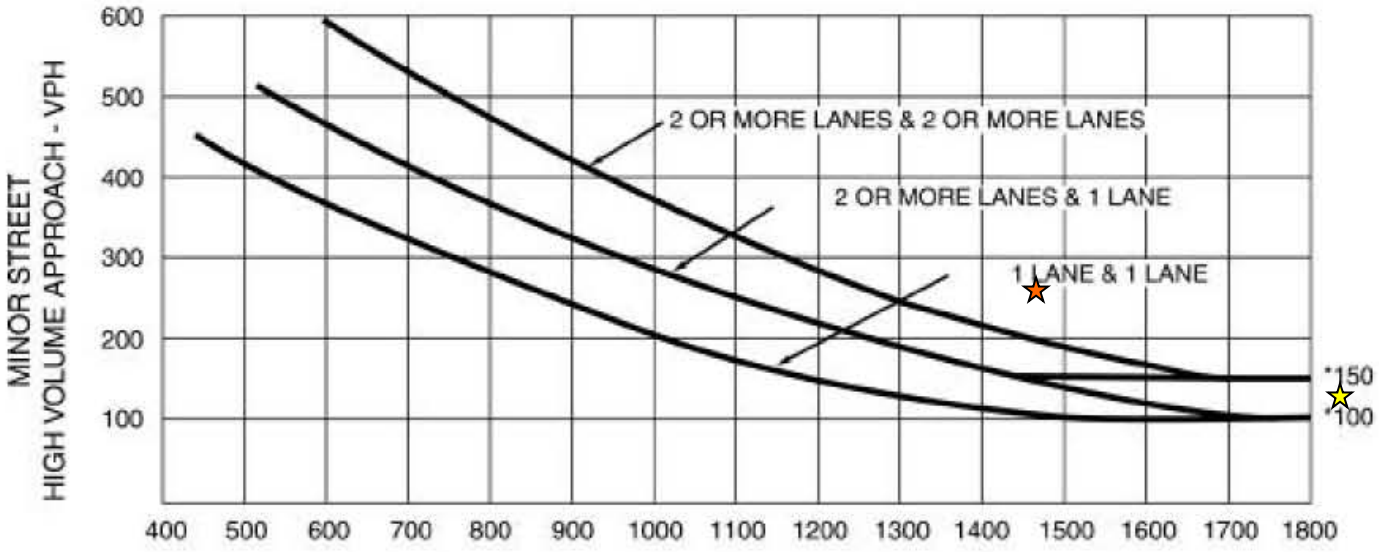
Source: CA MUTCD 2014, Chapter 4C – Traffic Control Signal Needs Studies, Part 4 - Highway Traffic Signals, Figure 4C-3

Peak Hour Warrant (Urban Areas)

Intersection #1: Santa Rosa Avenue/Bellevue Avenue
Scenario: Existing Plus Project Conditions

Figure 4C-3. Warrant 3, Peak Hour

Minor Street Volume = 252 (123) VPH



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Major Street Volume = 1462 (2101) VPH

AM peak hour
PM peak hour

A signal is warranted for A.M. & P.M. Peak Hour

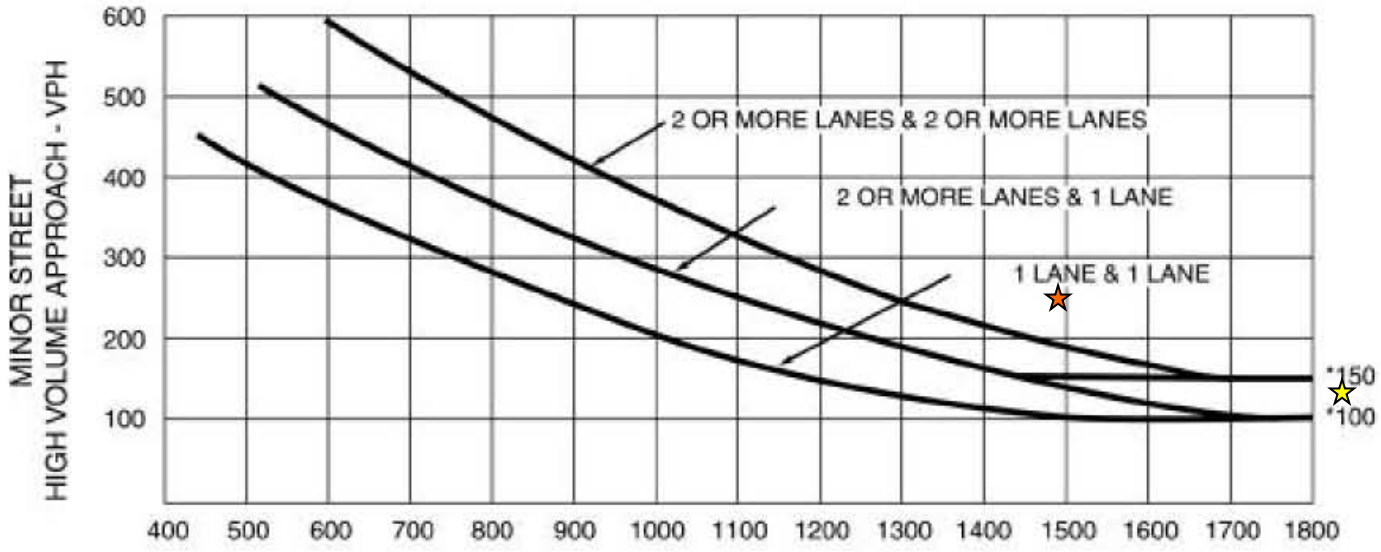
Source: CA MUTCD 2014, Chapter 4C – Traffic Control Signal Needs Studies, Part 4 - Highway Traffic Signals, Figure 4C-3

Peak Hour Warrant (Urban Areas)

Intersection #1: Santa Rosa Avenue/Bellevue Avenue
Scenario: Background Conditions

Figure 4C-3. Warrant 3, Peak Hour

Minor Street Volume = 252 (123) VPH



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Major Street Volume = 1499 (2117) VPH

AM peak hour
PM peak hour

A signal is warranted for A.M. & P.M. Peak Hour

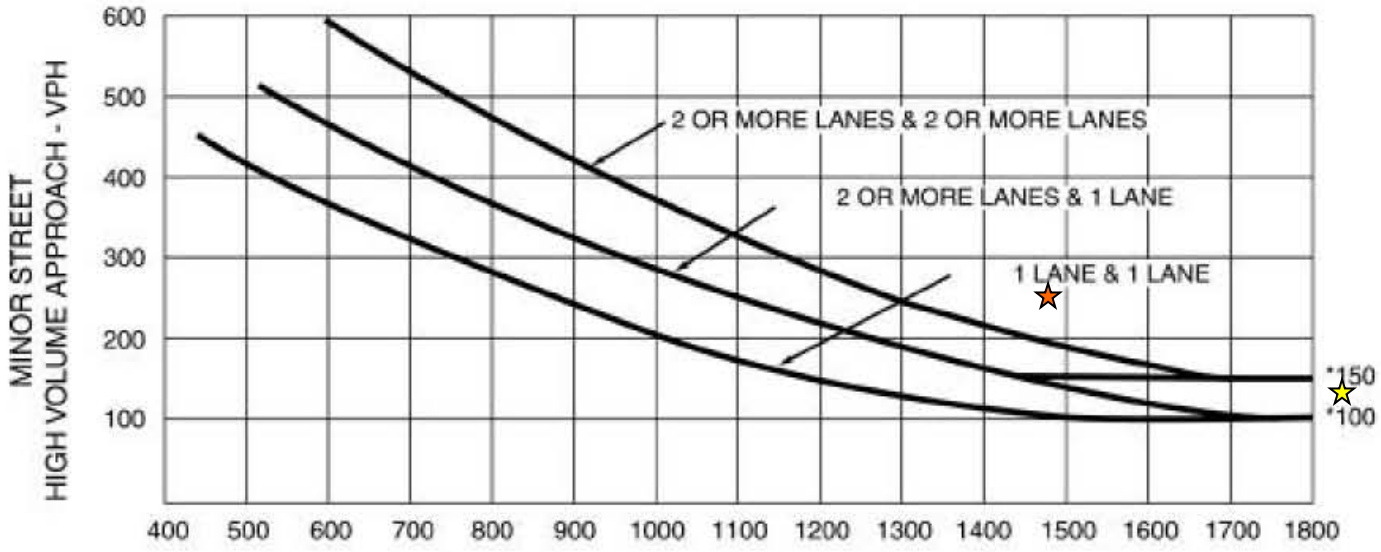
Source: CA MUTCD 2014, Chapter 4C – Traffic Control Signal Needs Studies, Part 4 - Highway Traffic Signals, Figure 4C-3

Peak Hour Warrant (Urban Areas)

Intersection #1: Santa Rosa Avenue/Bellevue Avenue
Scenario: Background Plus Project Conditions

Figure 4C-3. Warrant 3, Peak Hour

Minor Street Volume = 252 (123) VPH



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Major Street Volume = 1483 (2125) VPH

AM peak hour
PM peak hour

A signal is warranted for A.M. & P.M. Peak Hour

Source: CA MUTCD 2014, Chapter 4C – Traffic Control Signal Needs Studies, Part 4 - Highway Traffic Signals, Figure 4C-3