

# Hercules Hill Town

## Traffic Impact Analysis Report

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## Table of Contents

<b>1. INTRODUCTION.....</b>	<b>1</b>
PROJECT DESCRIPTION .....	1
STUDY METHODOLOGY .....	3
DIRECTIONAL CONVENTION .....	4
COUNTY MODEL UTILIZATION.....	4
<b>2. ANALYSIS METHODOLOGY .....</b>	<b>5</b>
LEVEL OF SERVICE DEFINITION .....	5
STANDARDS OF SIGNIFICANCE .....	6
<b>3. EXISTING CONDITIONS.....</b>	<b>7</b>
ROADWAY NETWORK.....	7
TRANSIT NETWORK AND SERVICES .....	7
PEDESTRIAN FACILITIES .....	8
BICYCLE FACILITIES .....	8
PARKING FACILITIES .....	9
ROADWAY NETWORK AND TRAFFIC VOLUMES .....	9
EXISTING INTERSECTION LEVEL OF SERVICE .....	9
<b>4. PROJECT CONDITIONS.....</b>	<b>15</b>
PROJECT DESCRIPTION .....	15
TRIP GENERATION.....	15
PROJECT TRIP DISTRIBUTION .....	17
EXISTING PLUS PROJECT CONDITIONS .....	20
RECOMMENDED PROJECT IMPROVEMENTS.....	23
<b>5. BACKGROUND CONDITIONS .....</b>	<b>24</b>
APPROVED PROJECTS .....	24
ROADWAY NETWORK AND TRAFFIC VOLUMES .....	25
BACKGROUND CONDITIONS INTERSECTION LEVEL OF SERVICE.....	25
BACKGROUND PLUS PROJECT CONDITIONS .....	29
RECOMMENDED PROJECT IMPROVEMENTS.....	33
<b>6. CUMULATIVE (2040) CONDITIONS.....</b>	<b>34</b>
FORECAST METHODOLOGY.....	34
CUMULATIVE ROADWAY NETWORK .....	34
CUMULATIVE PROJECT TRIP GENERATION.....	36
CUMULATIVE AND CUMULATIVE PLUS PROJECT INTERSECTION ANALYSIS .....	36



**7. SUMMARY AND CONCLUSIONS ..... 39**  
IMPACTS TO INTERSECTION OPERATIONS ..... 39  
RECOMMENDED PROJECT IMPROVEMENTS..... 39  
COMPARISON TO 2009 DEIR FINDINGS ..... 39

**Appendices**

- APPENDIX A TURNING MOVEMENT COUNTS
- APPENDIX B SYNCHRO SIGNAL TIMING SHEETS
- APPENDIX C SYNCHRO LOS WORKSHEETS
- APPENDIX D RECOMMENDED PROJECT IMPROVEMENT CONCEPTUAL DIAGRAMS
- APPENDIX E BACKGROUND TRIP DISTRIBUTION FIGURES

### List of Figures

FIGURE 1. REGION MAP ..... 1

FIGURE 2. STUDY INTERSECTIONS ..... 3

FIGURE 3. PUBLIC TRANSIT NETWORK IN THE STUDY AREA ..... 8

FIGURE 4. EXISTING AND PROPOSED BICYCLE FACILITIES IN HERCULES ..... 9

FIGURE 5. EXISTING INTERSECTION LANE GEOMETRICS ..... 11

FIGURE 6. EXISTING INTERSECTION PEAK HOUR VOLUMES ..... 12

FIGURE 7. PROJECT TRIP DISTRIBUTION ..... 18

FIGURE 8. PROJECT VOLUMES AT STUDY INTERSECTIONS ..... 19

FIGURE 9. BACKGROUND PROJECT LOCATIONS ..... 25

FIGURE 10. BACKGROUND INTERSECTION PEAK HOUR VOLUMES ..... 26

FIGURE 11. BACKGROUND PLUS PROJECT INTERSECTION PEAK HOUR VOLUMES ..... 30

FIGURE 12. CUMULATIVE PLUS PROJECT INTERSECTION PEAK HOUR VOLUMES ..... 35

### List of Tables

TABLE 1. INTERSECTION LEVEL OF SERVICE CRITERIA ..... 5

TABLE 2. EXISTING CONDITIONS LOS SUMMARY (SIGNALIZED) ..... 13

TABLE 3. EXISTING CONDITIONS LOS SUMMARY (UNSIGNALIZED) ..... 14

TABLE 4. 2019 PROJECT TRIP GENERATION ..... 16

TABLE 5. 2009 TIA – HILL TOWN PROJECT TRIP GENERATION ..... 16

TABLE 6. EXISTING PLUS PROJECT LOS SUMMARY (SIGNALIZED) ..... 21

TABLE 7. EXISTING PLUS PROJECT LOS SUMMARY (UNSIGNALIZED) ..... 22

TABLE 8. EXISTING PLUS PROJECT LOS SUMMARY WITH PROJECT IMPROVEMENTS ..... 23

TABLE 9. BACKGROUND CONDITIONS LOS SUMMARY (SIGNALIZED) ..... 27

TABLE 10. BACKGROUND CONDITIONS LOS SUMMARY (UNSIGNALIZED) ..... 28

TABLE 11. BACKGROUND PLUS PROJECT LOS SUMMARY (SIGNALIZED) ..... 31

TABLE 12. BACKGROUND PLUS PROJECT LOS SUMMARY (UNSIGNALIZED) ..... 32

TABLE 13. LOS SUMMARY FOR IMPACTED INTERSECTIONS IN BACKGROUND PLUS PROJECT  
CONDITIONS ..... 33

TABLE 14. CUMULATIVE CONDITIONS LOS SUMMARY (SIGNALIZED) ..... 37

TABLE 15. CUMULATIVE PLUS PROJECT LOS SUMMARY (UNSIGNALIZED) ..... 38

# 1. INTRODUCTION

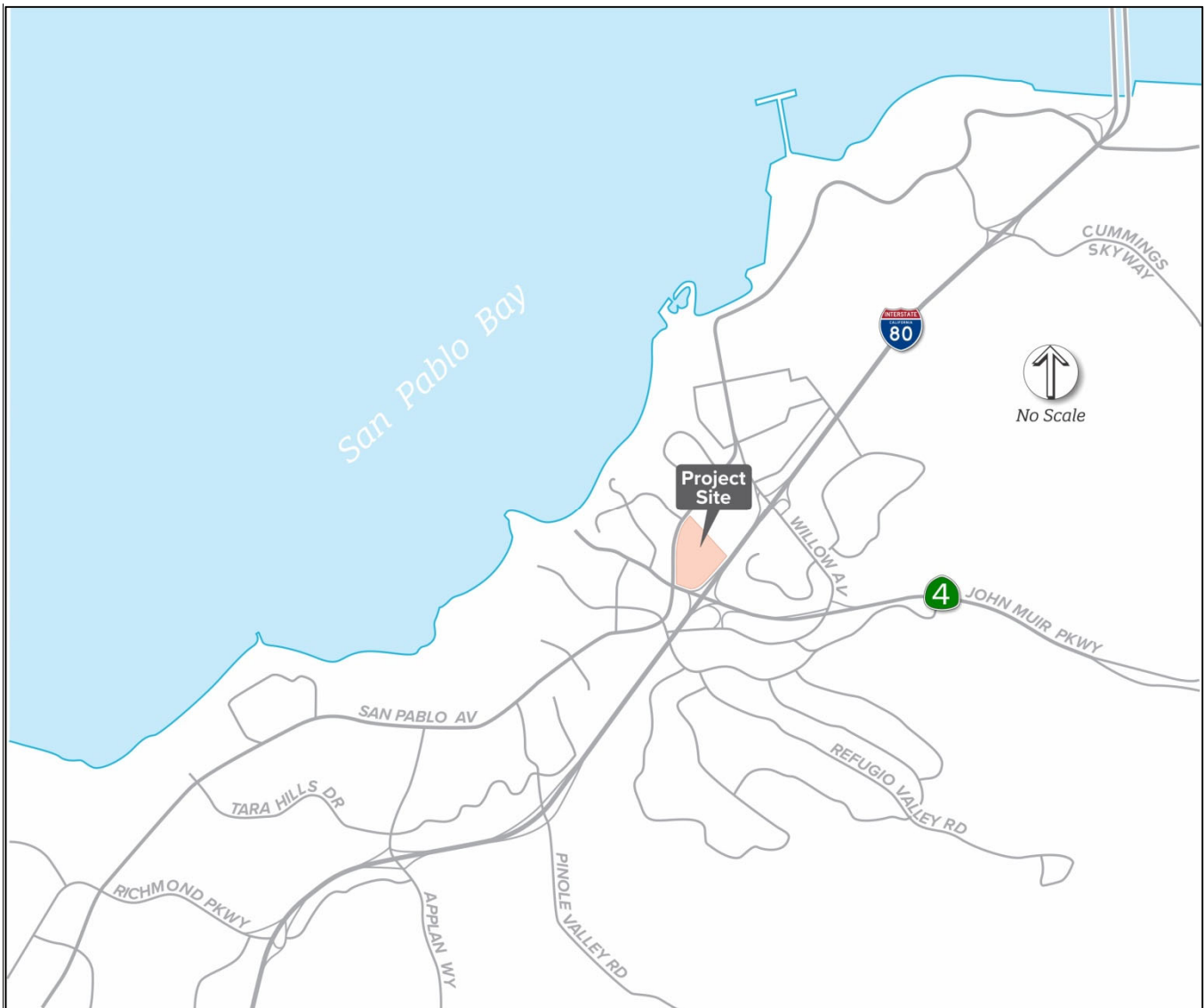
## Project Description

This report provides an evaluation of traffic and transportation issues related to the proposed Hercules Hill Town project. The project involves the construction of a 44.25-acre commercial-residential development including 599 dwelling units on the northeast corner of John Muir Parkway and San Pablo Avenue. The residential portion of the project will consist of different types of housing to include townhomes, courtyard apartments, and podium units. The site will also feature 4,200 square feet of commercial and retail space.

The site, located at parcel 404-040-064, consists of an abandoned petroleum tank farm and a storm water treatment facility with detention basins, a cell tower, and other vacant lands. North of the site is the Victoria by the Bay residential development and to the south is a Safeway Shopping Center. The site is bounded on the east by I-80, on the south by SR-4/John Muir Parkway, and on the west by San Pablo Avenue.

The regional location of the site is shown below in **Figure 1**.

**Figure 1. Region Map**



This analysis includes seventeen study intersections nearby to the project site as shown in **Figure 2**.

1. Willow Avenue / Parker Avenue & San Pablo Avenue - Unincorporated County (Signalized)
2. Willow Avenue & Hawthorne Drive – City of Hercules (Signalized)
3. Willow Avenue & I-80 SB Off-Ramp – Caltrans (Signalized)
4. Willow Avenue & I-80 NB On/Off-Ramps – Caltrans (Signalized)
5. Willow Avenue & Canterbury / Viewpointe Boulevard – City of Hercules (All Way Stop Controlled -AWSC)
6. Willow Avenue & SR-4 WB Off-Ramp – Caltrans (AWSC)
7. San Pablo Avenue & Victoria Crescent – City of Hercules (Signalized)
8. San Pablo Avenue & Linus Pauling Drive – City of Hercules (Two Way Stop Controlled - TWSC)
9. San Pablo Avenue & Future Hill Town Driveway – City of Hercules (Does Not Exist)
10. John Muir Parkway & Alfred Nobel Drive – City of Hercules (TWSC)
11. San Pablo Avenue & John Muir Parkway – City of Hercules, Route of Regional Significance (Signalized)
12. San Pablo Avenue & Market Hill – City of Hercules, Route of Regional Significance (Signalized)
13. San Pablo Avenue & Sycamore Avenue – City of Hercules, Route of Regional Significance (Signalized)
14. San Pablo Avenue & Tsushima Street – City of Hercules, Route of Regional Significance (TWSC)
15. San Pablo Avenue & Hercules Avenue – City of Hercules, Route of Regional Significance (Signalized)
16. Willow Avenue & Sycamore Avenue – City of Hercules, Route of Regional Significance (Signalized)
17. Willow Avenue & I-80 NB Off-Ramp/SR-4 EB On-Ramp – Caltrans (AWSC)

**Figure 2. Study Intersections**



## Study Methodology

This study was prepared according to Contra Costa Transportation Authority (CCTA), the West County Action Plan, and local guidelines. Traffic conditions were reviewed at all study intersections during weekday AM and PM peak periods (7:00-9:00 AM and 4:00-6:00 PM respectively).

This report also presents field observations to document intersection geometry, parking demand, and pedestrian, bicycle, and transit access relevant to the site.

A general description of the transportation facilities in the project vicinity and a summary of transportation operations within the study area will be made for the following scenarios:

- **Existing Conditions** – Using volumes as observed on August 29<sup>th</sup>, 2019, while school was in session.
- **Existing plus Project Conditions** – Existing Conditions plus Project generated trips.

- **Background Conditions** - Existing Conditions plus estimated traffic added by approved but not yet completed or occupied projects<sup>1</sup> citywide.
- **Background plus Project Conditions** – Background Conditions plus Project generated trips.
- **Cumulative Conditions (2040)** - As assumed in the General Plan Circulation Element (March 2018) minus project trips. The county model as prepared for the General Plan Circulation Element anticipates the full buildout of the project site.
- **Cumulative plus Project Conditions (2040)** – Cumulative Conditions plus Project (buildout as included in the General Plan).

## Directional Convention

For the purpose of this study, I-80, San Pablo Avenue north of Sycamore Avenue, and Willow Avenue north of John Muir Parkway (SR-4) are referenced to be aligned in the north-south direction. John Muir Parkway (SR-4), San Pablo Avenue south of Sycamore Avenue, Sycamore Avenue and Willow Avenue south of Muir Parkway (SR-4) are referenced to be aligned in the east-west direction.

## County Model Utilization

The CCTA County Transportation Model was used to forecast turning movement volumes for Cumulative Conditions. The Furness process was used to calculate forecasted turning movement volumes by inputting link volumes from the model and existing turning movement counts. This is the same methodology used to forecast future intersection volumes in the 2018 Hercules General Plan Circulation Element.

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<sup>1</sup> The list of approved projects and corresponding project trips information was obtained from the City of Hercules on September 16, 2019 and have been depicted on Figure 9 contained herein.



## 2. ANALYSIS METHODOLOGY

To evaluate traffic conditions as well as provide a basis for comparison of conditions before and after the addition of project-generated traffic to the street system, intersection Level of Service (LOS) analysis was evaluated at all sixteen of the existing study intersections. Signal timing sheets (signal timing plans for signalized intersections) were provided by the City and Caltrans staff and are attached to this analysis.

### Level of Service Definition

Traffic level of service (LOS) is a measurement of traffic operations and flow characteristics. LOS A represents free-flow conditions with little to no delays. LOS E represents the opposite end of the LOS range or conditions at capacity, and LOS F represents over saturation with excessive delays. Two sets of LOS calculation methodology were used in the study to be consistent with the methodology used in the 2009 Draft EIR<sup>2</sup> originally prepared for this project, both utilizing Synchro 10.0 software for calculations. The first is for signalized intersections (CCTA-adopted method), where traffic LOS is determined based on the volume-to-capacity (V/C) ratio for the intersection as a whole. The other is for non-signalized intersections (Highway Capacity Manual method) where traffic LOS is determined based on delays for approaches controlled by either by stop signs or yield signs. **Table 1** defines the v/c and delay associated with each LOS for signalized and unsignalized intersections.

**Table 1. Intersection Level of Service Criteria**

Level of Service (LOS)	Signalized	Unsignalized
	Intersection v/c ratio	Total Delay Per Vehicle (seconds) <i>Worst Approach</i>
A	0.0 – 0.60	< 10
B	0.61 – 0.70	> 10 and < 15
C	0.71 – 0.80	> 15 and < 25
D	0.81 – 0.90	> 25 and < 35
E	0.91 – 1.00	> 35 and < 50
F	> 1.00	> 50

*Source: Updated 2009 Redevelopment Plan Draft EIR, 2009*

<sup>2</sup> The consistent methodology is outdated based on current City of Hercules policy, however it is consistent with the Hill Town Development Agreement

## Standards of Significance

Significance criteria are used to establish thresholds of impact. The current LOS policy adopted by the City of Hercules as documented in the City of Hercules General Plan Circulation Element (adopted February 27, 2018) is the established threshold for CEQA impact analysis.

**Policy 1.A** is to maintain LOS D or better at all intersections along arterials, collectors and local roads during the AM and PM peak periods shown in Table 4-2 of Section 4 of the Hercules General Plan Circulation Element. The table identifies significance criteria to determine project impacts as follows for arterials, collectors, and local roads:

- If intersection LOS worsens from LOS D or better to LOS E or LOS F
- If an intersection is already at LOS E or worse and average delay increases by more than 4.0 seconds
- At unsignalized crossings, average wait time for bicyclists and pedestrians to cross safely increases by more than 30 seconds

In addition, San Pablo Avenue, south of the intersection with SR-4/John Muir Parkway, is categorized as a Route of Regional Significance (RRS) in the West County Action Plan and the policy herein states that signalized intersections are to remain LOS E or better. Unsignalized intersections along San Pablo Avenue are subject to the standards for the intersecting roadway, which would be LOS D or better in this case.

For the purposes of this analysis, consistent with the Hill Town Development Agreement, the standards of significance that are used for local roadways and approaches are consistent with what was used in the 2009 EIR document and consistent with the Growth Management Element adopted to comply with Contra Costa County Measure C. The existing 4.0 second threshold to determine impacts of already deficient intersections and average pedestrian and bicycle wait time standard did not exist and therefore will not apply in the analysis below.

### 3. EXISTING CONDITIONS

This section provides an evaluation of traffic and transportation issues related to the existing state of the study area. A description of the existing transportation facilities in terms of the roadway network, intersections, transit service, bicycle facilities, pedestrian facilities and parking is provided below.

#### Roadway Network

This section describes the regional roadway network serving the project study area as well as the local access routes serving the project site.

##### Regional Facilities

The project area is surrounded by two regional routes: Interstate 80 (I-80) and State Route 4 (SR-4)/John Muir Parkway. These facilities fall under the jurisdiction of Caltrans for maintenance and operations.

- **I-80** is an eight-lane freeway that runs north-south to the east of the study area and provides access to and from Sacramento County to San Francisco. Exits serving the study sites are located at Willow Avenue and at John Muir Parkway.
- **SR-4/John Muir Parkway** is an east-west four-lane principal arterial the stretches across Contra Costa County, connecting to the Hercules waterfront residential areas.

##### Local Facilities

Locally, the study area is bordered by John Muir Parkway to the south and San Pablo Avenue to the west. Both of these facilities are major arterials. San Pablo Avenue runs parallel with I-80 in the north-south direction. This arterial connects to the interstate from John Muir Parkway. Several local streets run within this area, connecting single family homes and commercial zones.

##### Routes of Regional Significance

Routes of Regional Significance (RRS) are routes that are very important transportation corridors in the region. Generally, the road connects two or more regions within a county, may connect regions between counties, carries significant amount of through-traffic and provides access to regional highways or transit facilities. The threshold of significance at intersections along RRS differ from local jurisdiction standards; signalized intersections operating at LOS E are considered acceptable. Specifically, for the purposes of analysis in this study and to remain consistent with the 2009 EIR, San Pablo Avenue (south of SR-4/John Muir Parkway) is considered a Route of Regional Significance.

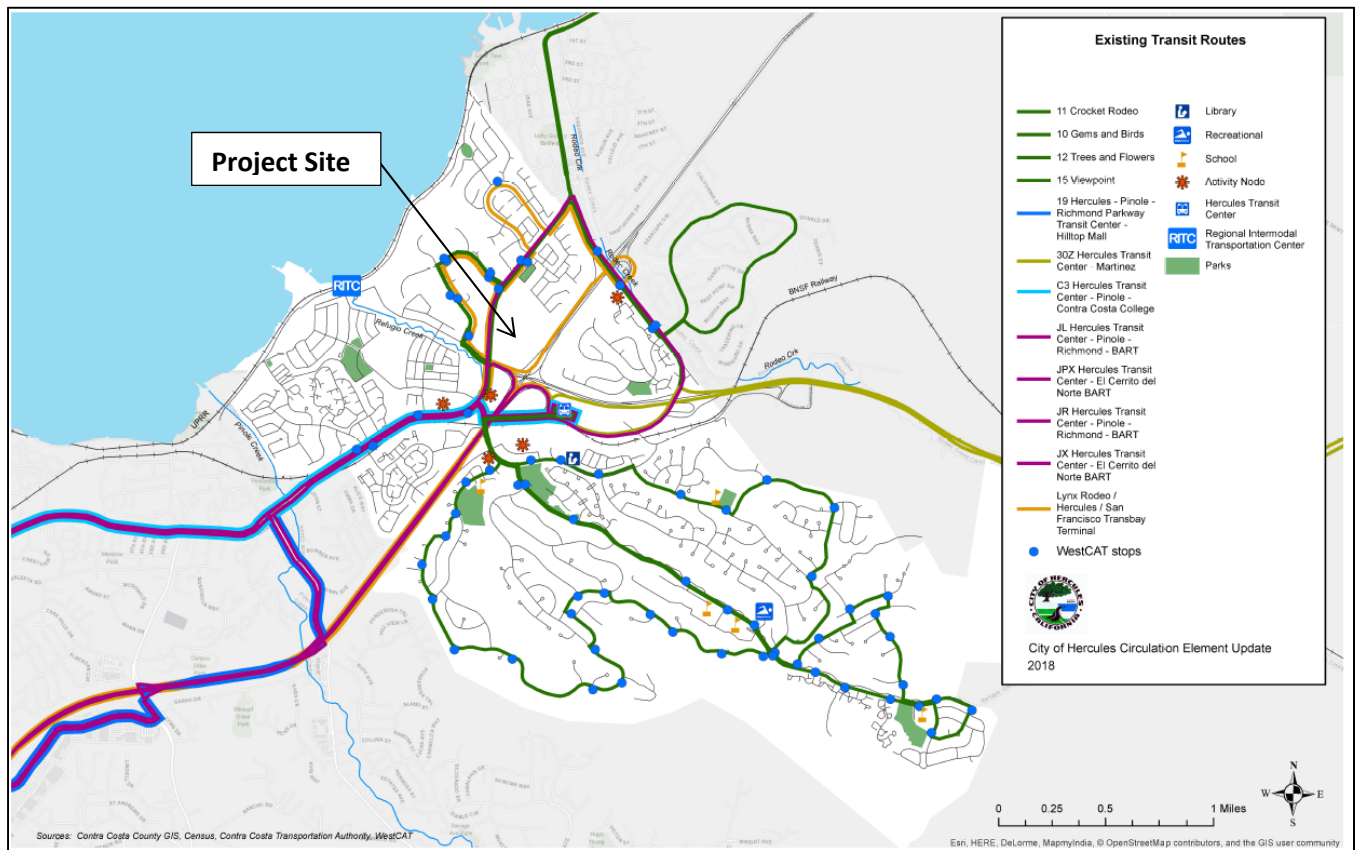
#### Transit Network and Services

##### Regional Services

The study area benefits from regional transit access from the Hercules Transit Center located on Willow Avenue southeast of the project location. The Hercules Transit Center connects to the El Cerrito Del Norte Bay Area Rapid Transit (BART) station via the JR/JL and JX/JPX bus lines. In addition, the Lynx bus line connects from the center to San Francisco's Transbay Terminal. Due to the regional nature of these services, they are mainly used for work commutes outside the city. In addition, there are a number of local transit lines that connect different areas of Hercules as well as other parts of Contra Costa County. Existing transit service routes in the study area are detailed in

Figure 3.

**Figure 3. Public Transit Network in the Study Area**



Source: Hercules General Plan Circulation Element 2018

## Pedestrian Facilities

From Google Earth it was found that San Pablo Avenue is connected by sidewalks on at least one side of the street from Victoria Crescent to Hercules Avenue. Willow Avenue is similarly connected with gaps between Palm Avenue and the I-80/SR-4 ramps as well as between Hawthorne Drive and I-80 SB off-ramp. Each of the signalized study intersections has crosswalks with pedestrian signal heads. The one-way-stop-controlled intersection of John Muir Parkway and Alfred Nobel Drive lacks painted crosswalks for pedestrians.

## Bicycle Facilities

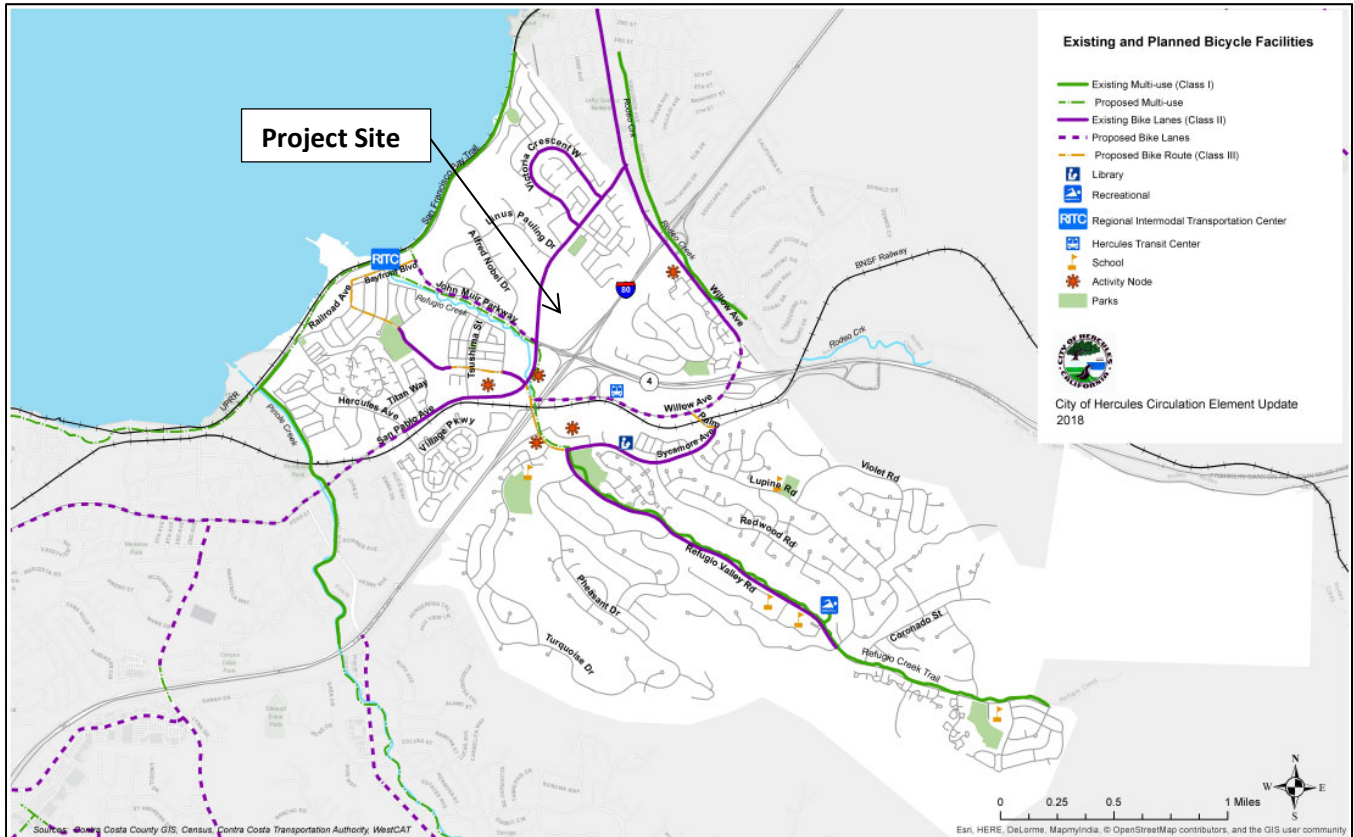
The City of Hercules General Plan Circulation Element indicates bicycle facilities near the project. The existing bicycle network consists of three classifications of facilities:

- Multi-Use Path (Class I) – completely separated, with paved right of way (shared with pedestrians) which excludes general motor vehicle traffic.
- Bike Lanes (Class II) – provides a striped and stenciled lane for one-way bike travel on a street or highway
- Bike Routes (Class III) – a shared use roadway with motor vehicle traffic and is identified by signage or permanent markings.

In the vicinity of the project site, Class II bicycle lanes are provided on both sides of San Pablo Avenue. A Class I bicycle path exists north of the study area parallel to Willow Avenue along Rodeo Creek. Willow Avenue has

existing bike lanes north of Mariner’s Pointe and there are proposed bike lanes to Sycamore Avenue. As per the 2018 Hercules General Plan Circulation Element proposed bikeways in the study area are depicted in **Figure 4**.

**Figure 4. Existing and Proposed Bicycle Facilities in Hercules**



Source: Hercules General Plan Circulation Element 2018

## Parking Facilities

There is off-street parking available at transit centers, school parking lots, recreational facility parking lots, city hall and library lots. Each of the residential neighborhoods has street parking available.

## Roadway Network and Traffic Volumes

Turning movement counts at the eight study intersections were collected on August 29<sup>th</sup>, 2019 for the weekday AM (7:00 - 9:00 AM) and PM (4:00 - 6:00 PM) peak periods. Detailed count information can be found in **Appendix A**. Existing conditions lane configurations and traffic volumes are presented in **Figure 5** and **Figure 6**, respectively.

## Existing Intersection Level of Service

Existing intersection LOS was calculated consistent with the methodologies used in the 2009 DEIR and described in Chapter 2, using the Synchro software package (Version 10.0). Signal timing sheets that were used for they Synchro analysis are from the *Program for Arterial System Synchronization West Contra Costa County* by Kimley Horn from 2019 and are summarized in **Appendix B**. Results for signalized intersections are shown in **Table 2** where the standard for signalized intersections is v/c less than or equal to 0.90 (or 1.00 for San Pablo Avenue



and Willow Avenue). Results for unsignalized intersections are shown in **Table 3** where the standard for delay is less than 35 seconds. Detailed calculations are provided in **Appendix C**.

**Figure 5. Existing Intersection Lane Geometrics**

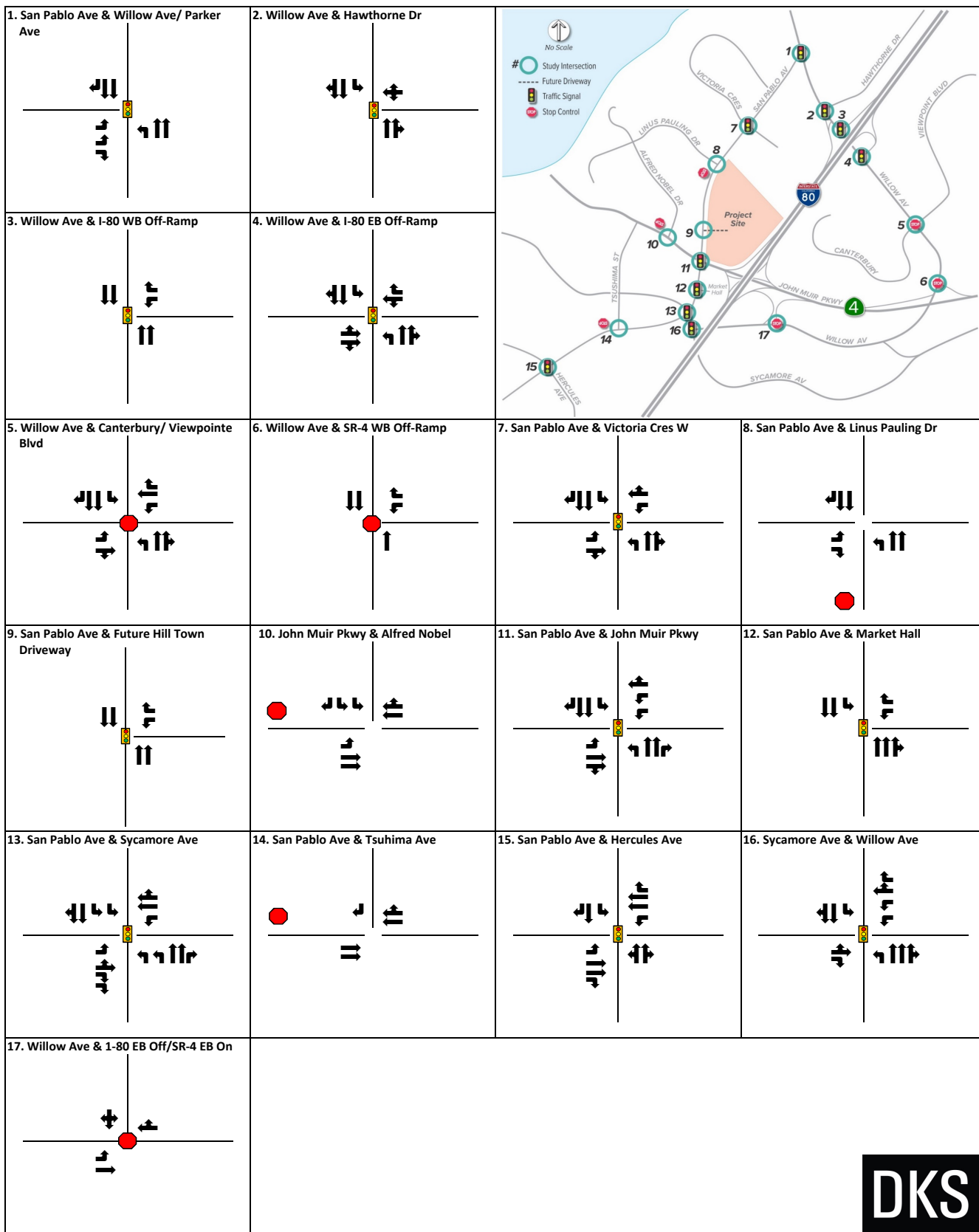
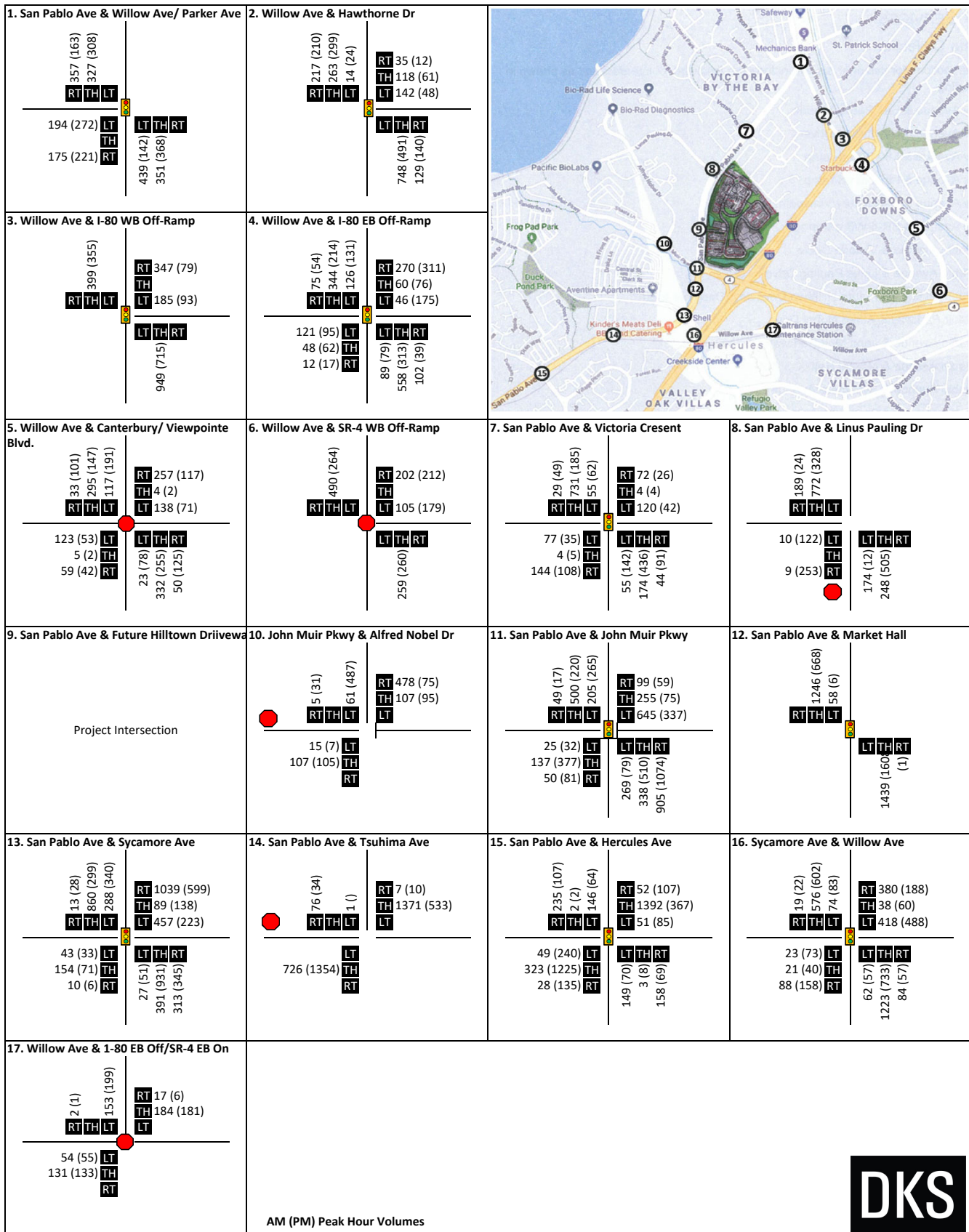




Figure 6. Existing Intersection Peak Hour Volumes





**Table 2. Existing Conditions LOS Summary (Signalized)**

Intersection (Jurisdiction)	Control	AM Peak Hour		PM Peak Hour	
		V/C	LOS	V/C	LOS
<b>Signalized Intersections</b>					
1 Willow Avenue/ Parker Avenue & San Pablo Avenue (Unincorporated County)	Signal	0.73	C	0.55	A
2 Willow Avenue & Hawthorne Drive (City of Hercules)	Signal	0.58	A	0.55	A
3 Willow Avenue & I-80 SB Off-Ramp (Caltrans)	Signal	0.68	B	0.40	A
4 Willow Avenue & I-80 NB On/Off-Ramps (Caltrans)	Signal	0.59	A	0.42	A
7 San Pablo Avenue & Victoria Crescent (City of Hercules)	Signal	0.48	A	0.39	A
11 San Pablo Avenue & John Muir Parkway (City of Hercules, RRS)	Signal	0.76	C	0.83	D
12 San Pablo Avenue & Market Hill (City of Hercules, RRS)	Signal	0.43	A	0.41	A
13 San Pablo Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.68	B	0.63	B
15 San Pablo Avenue & Hercules Avenue (City of Hercules, RRS)	Signal	0.73	C	0.61	B
16 Willow Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.58	A	0.54	A

Source: DKS Associates, 2019.

Notes: V/C (Volume/Capacity), LOS: Level of Service

Intersections operating below acceptable LOS are in **bold**.

**Table 3. Existing Conditions LOS Summary (Unsignalized)**

Intersection (Jurisdiction)	Control	Worst Approach Direction	AM Peak Hour		PM Peak Hour	
			Delay (sec)	LOS	Delay (sec)	LOS
<b>Unsignalized Intersections</b>						
5 Willow Avenue & Canterbury/ Viewpointe Boulevard (City of Hercules)	AWSC		21.9	C	13.3	B
6 Willow Avenue & SR-4 WB Off-Ramp (Caltrans)	AWSC		14.6	B	11.9	B
8 San Pablo Avenue & Linus Pauling Drive (City of Hercules)	TWSC	EB	<b>49.0</b>	<b>E</b>	21.0	C
9 San Pablo Avenue & Future Project Driveway (City of Hercules)	Project Intersection		n/a		n/a	
10 John Muir Parkway & Alfred Nobel Drive (City of Hercules, RRS)	TWSC	SB	13.0	B	14.4	B
14 San Pablo Avenue & Tsushima Street (City of Hercules, RRS)	TWSC	SB	20.5	C	10.4	B
17 Willow Avenue & I-80 NB Off- Ramp/SR-4 EB On-Ramp (Caltrans)	AWSC		9.9	A	10.1	B

**Source: DKS Associates, 2019.**

Notes: Average Delay (AWSC/Signalized); Worst Approach Delay (TWSC) (seconds per vehicle), LOS: Level of Service

Intersections operating below acceptable LOS are in **bold**.

Approach direction is provided for TWSC intersections where delay is reported for the worst approach.

Based on intersection level-of-service standards outlined by the City of Hercules General Plan, the following intersection operates worse than acceptable standards under Existing Conditions:

- San Pablo Avenue and Linus Pauling Drive: LOS E (AM)

## 4. PROJECT CONDITIONS

### Project Description

The proposed project consists predominantly of residential dwelling units with a small retail component. The residential portion of the project will be 599 dwelling units, consisting of different types of housing to include: townhomes, courtyard townhomes, and podium units. The site will also feature 4,200 square feet of commercial and retail space.

### Trip Generation

Trip generation of the proposed project was based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10<sup>th</sup> Edition (2017), as summarized in **Table 4**, for the AM and PM peak hours respectively. For the purposes of this analysis, ITE Land Use Code number 220 (multi-family housing; low rise) was assumed for the mix of housing provided. Additionally, ITE land Use Code 936 (coffee shop; no drive through) was assumed for the commercial portion of the site. While the commercial portion of this site does not have a confirmed vendor and could include a range of uses, including a community market, retail or food/drink vendor, the coffee shop land use was assumed for this analysis to ensure a conservative estimate of trips generated so as to avoid revisiting the analysis if a higher intensity use was approved. In accordance with the Trip Generation Handbook (part of the 10<sup>th</sup> Edition) a reduction in commercial trips due to internal and “pass-by” trips was assumed. This reduction is due to the assumption that approximately 50% of the vehicle trips entering the commercial portion of the site would either be generated from within the project site or have already been on the study roadways and would divert to access the new commercial use assumed as part of the proposed project. This assumption is consistent with the analysis in the 2009 EIR. The table shows that accounting for the reduction of commercial pass-by trips, there are a total of 487 AM peak hour trips (171 inbound and 316 outbound) and 411 PM peak hour trips (249 inbound and 162 outbound) to and from the project site.

**Table 5** shows the trip generation calculations that were used in the 2009 Hill Town EIR, as prepared by PHA Transportation Consultants. There are three major reasons why trip generation has changed. First, the project description has changed in the reduction of 41 multi-family housing units and the addition of 200 square feet of retail. Secondly, the land use references have been updated to reflect the latest ITE Trip Generation Manual standards. In doing so, we identified land uses with the most comparable trip generation to the original study. In the case of Condo/Townhouses, Land Use Code 930 no longer exists. Rather than using ITE Code 933 (which only had one data point), we used ITE Code 936 to represent retail as the trip generation rates were closest to the 2009 land use. Finally, the 10% reduction in trips originally allocated to public transit use was removed as the assumption relied on implementation of additional transit facilities which have not occurred.



**Table 4. 2019 Project Trip Generation**

Land Use	Units /ksf <sup>1</sup>	Daily Trips		AM Peak Hour Trips					PM Peak Hour Trips						
		Rate	Trips	Rate	Enter		Exit		Total Trips	Rate	Enter		Exit		Total Trips
					%	Trips	%	Trips			%	Trips	%	Trips	
Multifamily Housing: Low-Rise (ITE 220)	599	7.32	4,385	0.46	23%	63	77%	212	275	0.56	63%	211	37%	124	335
Coffee Shop: No Drive Through (ITE 936)	4.2	754.5	3,169	101.1	51%	217	49%	208	425	36.31	50%	76	50%	76	152
Pass-by/Internal Reduction			-1,585			-108		-104	-212			-38		-38	-76
<i>Subtotal</i>			1,585			108		104	212			38		38	76
<b>Net New Trips</b>			<b>5,969</b>			<b>171</b>		<b>316</b>	<b>487</b>			<b>249</b>		<b>162</b>	<b>411</b>

Notes:

<sup>1</sup> ksf = thousand square feet

Source: ITE Trip Generation Manual 10th Edition

DKS Associates, 2019

**Table 5. 2009 TIA – Hill Town Project Trip Generation**

Land Use	Units /ksf <sup>1</sup>	Daily Trips		AM Peak Hour Trips					PM Peak Hour Trips						
		Rate	Trips	Rate	Enter		Exit		Total Trips	Rate	Enter		Exit		Total Trips
					%	Trips	%	Trips			%	Trips	%	Trips	
Condo/Townhouse (ITE 230)	640	5.86	3,750	0.44	17%	48	83%	234	282	0.52	67%	223	33%	110	333
(-) Public Transit Use 10%			-370			-5		-23	-28			-22		-11	-33
<i>Subtotal</i>			3,380			43		210	253			201		99	300
Retail (Coffee Shop - ITE 933)	4	201.5	806	101.1	51%	206	49%	198	405	36.31	50%	67	50%	48	144
(-) Pass-by/ Internal 50%			-402			-103		-99	-202			-33		-24	-57
<i>Subtotal</i>			1,208			103		99	202			33		24	57
<b>Net Trips</b>			<b>3,784</b>			<b>117</b>		<b>282</b>	<b>399</b>			<b>234</b>		<b>123</b>	<b>357</b>

Notes:

<sup>1</sup> ksf = thousand square feet

Source: ITE Trip Generation Manual 7th Edition

PHA Transportation Consultants, 2009

## Project Trip Distribution

Project-generated trips were assigned to the roadway network based on access points, trip distribution assumptions and likely travel patterns. The portion of the total project-generated trips that were assumed to travel through each study intersection was used for the intersection LOS analysis under each project condition. The project site can be accessed or egressed through four major gateways:

- Intersection 1: San Pablo Avenue & Willow Avenue/ Parker Avenue
- Intersections 3 and 4: I-80 Ramps & Willow Avenue
- Intersection 11: San Pablo Avenue & John Muir Parkway (SR 4)
- Intersection 15: San Pablo Avenue & Hercules Avenue.

**Figure 7** shows the estimated trip distribution percentages (excluding pass-by and internalized trips) for both the residential (in black) and non-residential (in blue) land uses. The figure shows that for the residential portion of the site, approximately 45% of trips travel to/ from the south, approximately 35% of trips travel to/ from the east, approximately 10% of trips travel to/ from the north, and approximately 10% travel to/ from the west. The figure shows that for the non-residential portion of the site, 40% of trips travel to/ from the north, approximately 40% of trips travel to/ from the south, and approximately 20% of trips travel to/ from the west.

**Figure 7. Project Trip Distribution**

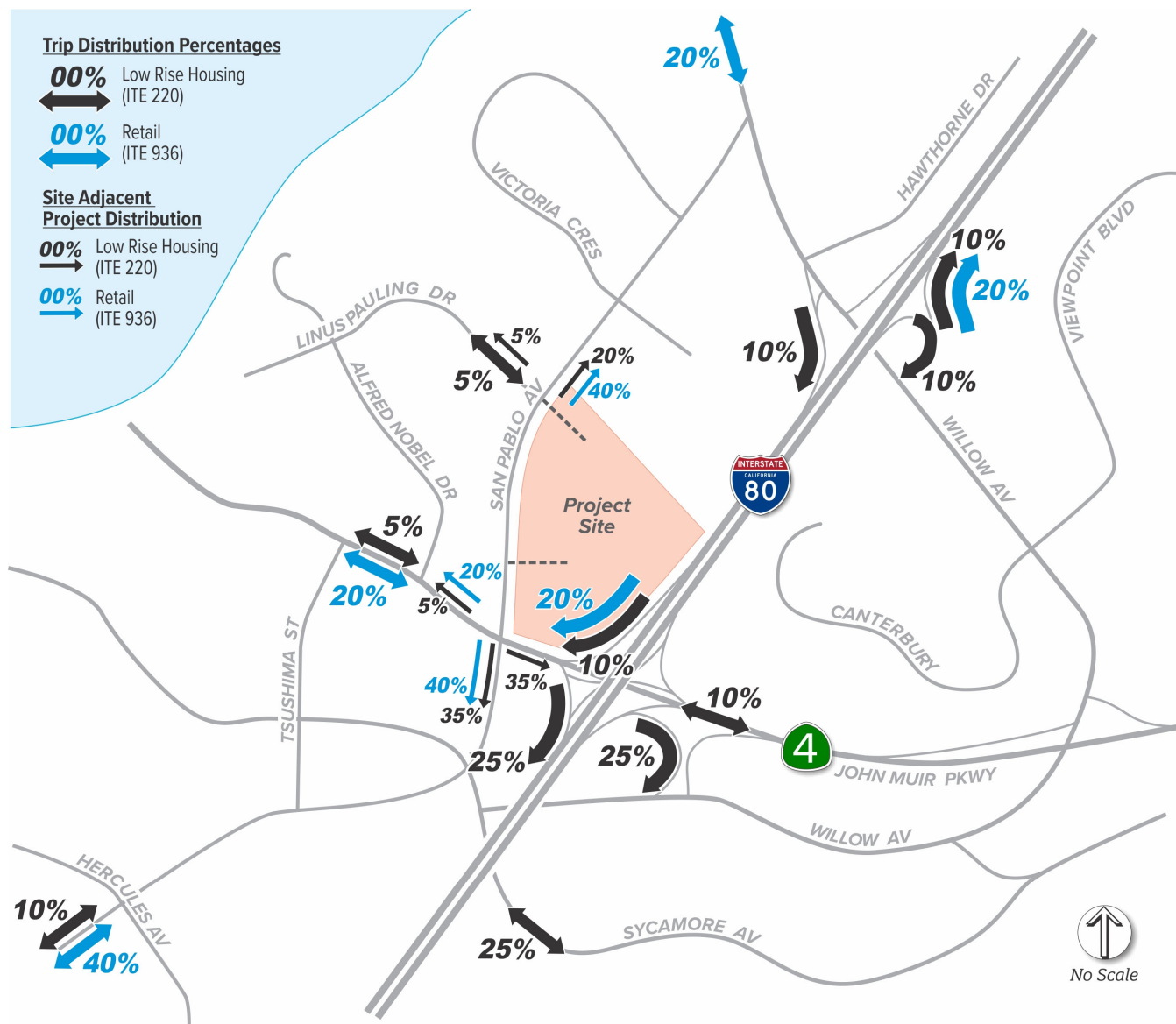
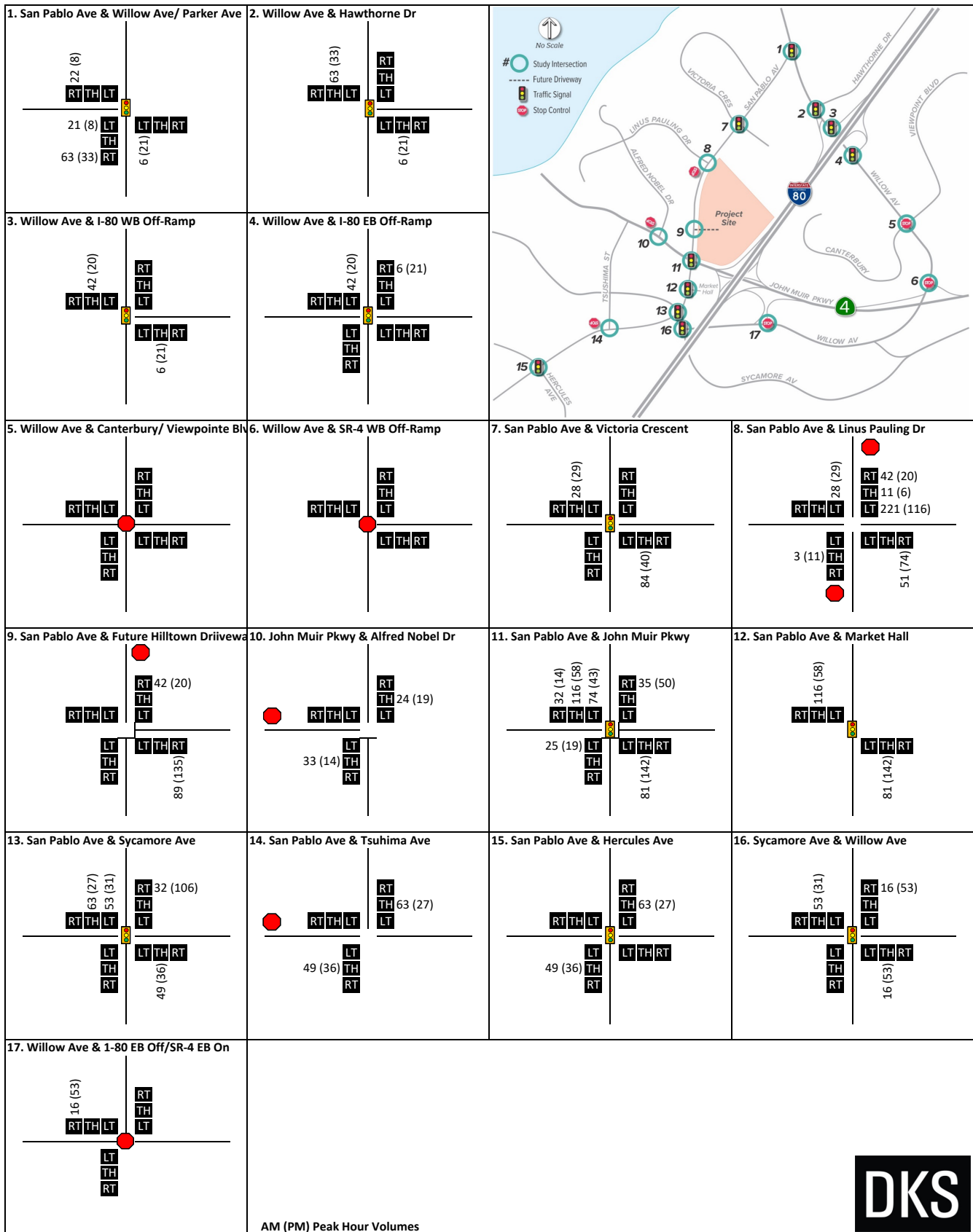


Figure 8. Project Volumes at Project Intersections



## Existing plus Project Conditions

Project-generated trips, as obtained from trip assignment in the previous section, were added to the existing traffic volumes to obtain existing plus project traffic volumes as summarized in **Figure 8**.

### Existing plus Project Intersection Level of Service

The results of the level of service analysis under Existing plus Project traffic conditions are summarized in **Table 6** and **Table 7**. All worksheets are provided in **Appendix C**. With the addition of project generated trips, the following intersections are operating worse than the LOS standard:

- Intersection 8: San Pablo Avenue and Linus Pauling Drive: LOS F (AM)

The addition of project trips results in operations at the intersection of San Pablo Avenue & Linus Pauling, which also operates as the main driveway of the proposed project, to become deficient during the AM peak hour. As a result, the following intersection represents a *potentially significant impact*:

- Intersection 8: San Pablo Avenue and Linus Pauling Drive: LOS F (AM)



**Table 6. Existing plus Project LOS Summary (Signalized)**

Intersection (Jurisdiction)	Control	AM Peak Hour				PM Peak Hour			
		Existing		Ex. + Project		Existing		Ex. + Project	
		V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
1 Willow Avenue/ Parker Avenue & San Pablo Avenue (Unincorporated County)	Signal	0.73	C	0.77	C	0.55	A	0.57	A
2 Willow Avenue & Hawthorne Drive (City of Hercules)	Signal	0.58	A	0.59	A	0.55	A	0.57	A
3 Willow Avenue & I-80 SB Off-Ramp (Caltrans)	Signal	0.68	B	0.68	B	0.40	A	0.41	A
4 Willow Avenue & I-80 NB On/Off-Ramps (Caltrans)	Signal	0.59	A	0.59	A	0.42	A	0.58	A
7 San Pablo Avenue & Victoria Crescent (City of Hercules)	Signal	0.48	A	0.49	A	0.39	A	0.40	A
11 San Pablo Avenue & John Muir Parkway (City of Hercules, RRS)	Signal	0.76	C	0.82	D	0.83	D	0.84	D
12 San Pablo Avenue & Market Hill (City of Hercules, RRS)	Signal	0.43	A	0.47	A	0.41	A	0.44	A
13 San Pablo Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.68	B	0.73	C	0.63	B	0.66	B
15 San Pablo Avenue & Hercules Avenue (City of Hercules, RRS)	Signal	0.73	C	0.75	C	0.61	B	0.62	B
16 Willow Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.58	A	0.58	A	0.54	A	0.55	A

Source: DKS Associates, 2019.

Notes: V/C (Volume/Capacity), LOS: Level of Service

Intersections operating below acceptable LOS are in **bold**.

**Table 7. Existing plus Project LOS Summary (Unsignalized)**

Intersection (Jurisdiction)	Control	AM Peak Hour				PM Peak Hour			
		Existing		Ex. + Project		Existing		Ex. + Project	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
5 Willow Avenue & Canterbury/ Viewpointe Boulevard (City of Hercules)	AWSC	21.9	C	21.9	C	13.3	B	13.3	B
6 Willow Avenue & SR-4 WB Off-Ramp (Caltrans)	AWSC	14.6	B	14.6	B	11.9	B	11.9	B
8 San Pablo Avenue & Linus Pauling Drive (City of Hercules)	TWSC	<b>49.0</b>	<b>E</b>	<b>&gt;300</b>	<b>F</b>	21.0	C	<b>119.2</b>	<b>E</b>
9 San Pablo Avenue & Future Project Driveway (City of Hercules)	TWSC	N/A		10.1	B	N/A		10.6	B
10 John Muir Parkway & Alfred Nobel Drive (City of Hercules, RRS)	TWSC	13.7	B	13.7	B	16.9	C	16.9	C
14 San Pablo Avenue & Tsushima Street (City of Hercules, RRS)	TWSC	20.5	C	21.8	C	10.4	B	10.5	B
17 Willow Avenue & I-80 NB Off-Ramp/SR-4 EB On-Ramp (Caltrans)	AWSC	9.9	A	10.1	B	10.1	B	10.6	B

Source: DKS Associates, 2019.

Notes: Average Delay (AWSC/Signalized); Worst Approach Delay (TWSC) (seconds per vehicle), LOS: Level of Service

**Bold** intersections do not meet LOS standards, **Shaded** intersections show potentially significant project impacts

## Recommended Project Improvements

Recommended mitigation projects for the intersection with potentially significant impacts are described below with conceptual diagrams provided in **Appendix D**.

**Intersection 8: San Pablo Avenue and Linus Pauling Drive** – Signalize intersection (this project will not be funded by impact fees). **This mitigation was already indicated in the 2009 EIR and General Plan Circulation Element and does not represent a new finding.**

**Table 8. Existing plus Project LOS Summary with Project Improvements**

Intersection	Mitigated Control	AM Peak Hour				PM Peak Hour			
		Existing		Ex+P + Mitigation		Existing		Ex+P + Mitigation	
		Delay (sec)	LOS	V/C	LOS	Delay (sec)	LOS	V/C	LOS
8 San Pablo Avenue & Linus Pauling Drive (City of Hercules)	Signal	<b>49.0</b>	<b>E</b>	0.77	C	21.0	C	0.57	A

**Source: DKS Associates, 2019.**

Notes: Average Delay (AWSC/Signalized); Worst Approach Delay (TWSC) (seconds per vehicle), V/C (Volume/Capacity), LOS: Level of Service

**Bold** intersections do not meet LOS standards, **Shaded** intersections show potentially significant project impacts

With the above mitigation incorporated with the project, all project impacts have been removed resulting in a **less than significant impact**.

## 5. BACKGROUND CONDITIONS

This scenario is based on the Existing Conditions with the addition of traffic from approved projects within the vicinity of the site. Background traffic conditions represent development completed within the next three to five years, just before the completion of the proposed development. This chapter describes the methodology used to determine background traffic volumes and traffic conditions.

### Approved Projects

Background traffic volumes for the study intersections were identified by adding the trips generated by nearby approved but not yet completed/occupied projects to the existing traffic volumes of the study intersections.

There are seven approved developments that have the potential to impact the traffic conditions within the study area and the study intersections. These projects are currently under construction or will be constructed in the next few years. Traffic volumes produced by these projects are incorporated into the Background Conditions and include:

1. **Muir Pointe:** The project is a new neighborhood of single-family homes located in the Bayside planned community on San Pablo Bay adjacent to the Regional Intermodal Transportation Center. Only 25 units remain unoccupied at the time of the traffic counts, most of the traffic from this project is already using the transportation network.
2. **Regional Intermodal Transportation Center:** The Regional Intermodal Transportation Center will combine several modes of public transportation.
3. **Bayfront:** The 42.36-acre project site is a transit-oriented, mixed-use neighborhood that includes a variety of dwelling types and businesses. The project is bounded generally by San Pablo Bay, Hercules Point and the Union Pacific Railroad line on the north; the Northshore Business Park to the east; the Baywood, Promenade and Bayside housing developments to the south; and San Pablo Bay to the west. The overall project is entitled to construct up to 134,000 square feet of flex space, 90,000 square feet of retail, 115,000 square feet of office, and 1,392 multi-family units.
4. **Willow Avenue Commercial Center:** This project consists of a self-storage facility, containing 846 storage units in five buildings ranging in height from one- to three-stories, as well as potential automotive service center that includes a car wash, an oil change facility, and a tire store/automobile shop. The project is proposed on a currently vacant 7.1-acre site on the southeast side of Willow Avenue, across from Valley Bible Church, south of Hwy 4, north of the BNSF Rail Line, and northeast of Palm Avenue.
5. **Sycamore Crossing:** The 12.88-acre Project Site is proposed to be developed with a mixed-use commercial and residential project. The Project Site is located in the City of Hercules along the south side of Sycamore Avenue on the northwest side of San Pablo Avenue east of Tsushima Street.
6. **Sycamore North Project/Aventine Mixed-Use:** The project includes 147 multi-family housing units which have already been built and approximately 8,500 square feet of commercial, 120 condos, a 105 room hotel, and a pharmacy. This is a mixed-use project. A small amount of retail space is yet to be developed on the site. The project site is located north of Sycamore Crossing and west of San Pablo Avenue.
7. **Safeway at Market Hall:** In 2017, the City approved to develop the former BART park-and-ride lot at the Market Hall site on San Pablo Avenue with a Safeway shopping center, including a grocery store, fuel center, bank, and coffee shop with drive-through services. The project broke ground in 2019 and is expected to open in late 2020.

Background project locations are depicted in **Figure 9**.

For this analysis, it is assumed that the transportation network under the Background Conditions and the Existing Conditions will remain mostly the same. The intersection of San Pablo Avenue & Tsushima Street intersection (#14) will be signalized and will have left-turn lanes along the southbound and eastbound approaches as part of the Sycamore Crossing development. All other intersections and roadway segments will remain the same.

## Roadway Network and Traffic Volumes

The traffic studies of approved projects were referred to for their respective trip generation estimates, if available. Estimated trips from the approved projects were distributed and assigned through the affected study intersections based on the trip distribution assumptions present in the traffic studies or based on known travel patterns in the study area. All study intersections were affected by the addition of trips from approved developments.

Background traffic volumes are shown in **Figure 10**. A full breakdown of trip generation and trip distribution to study intersections can be found in **Appendix E**.

## Background Conditions Intersection Level of Service

With the addition of approved nearby projects, the following intersections are expected to operate worse than the level of service standards as summarized in **Table 9** and **Table 10**.

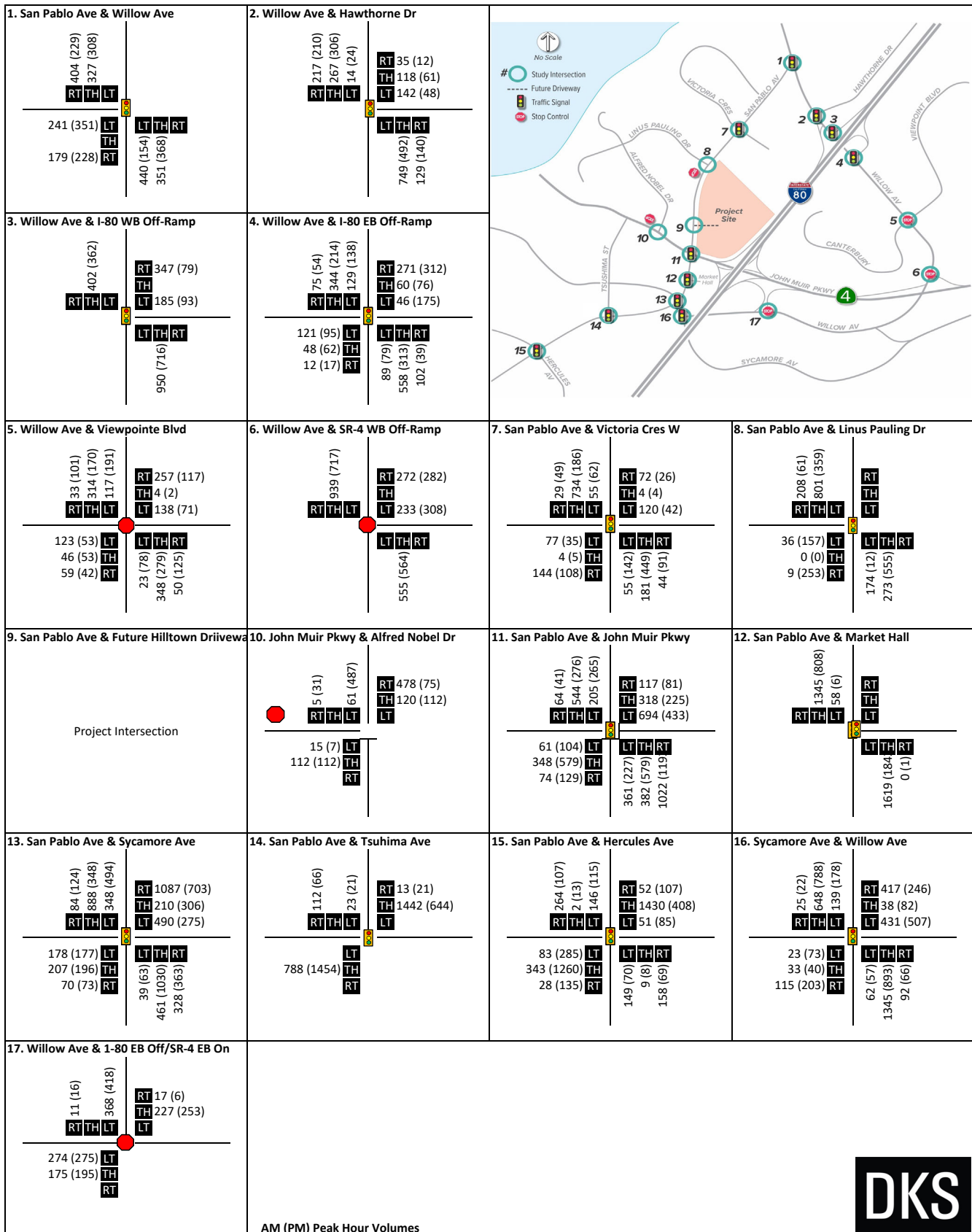
All worksheets are provided in **Appendix C**.

- Intersection 6: Willow Avenue & SR-4 WB Off Ramp: LOS F/F (AM/PM)
- Intersection 8: San Pablo Avenue & Linus Pauling Drive: LOS F (AM)

**Figure 9. Background Project Locations**



Figure 10. Background Intersection Peak Hour Volumes



**Table 9. Background Conditions LOS Summary (Signalized)**

Intersection (Jurisdiction)	Control	AM Peak Hour		PM Peak Hour	
		V/C	LOS	V/C	LOS
<b>Signalized Intersections</b>					
1 Willow Avenue/ Parker Avenue & San Pablo Avenue (Unincorporated County)	Signal	0.77	C	0.60	A
2 Willow Avenue & Hawthorne Drive (City of Hercules)	Signal	0.58	A	0.40	A
3 Willow Avenue & I-80 SB Off-Ramp (Caltrans)	Signal	0.68	B	0.42	A
4 Willow Avenue & I-80 NB On/Off-Ramps (Caltrans)	Signal	0.60	A	0.58	A
7 San Pablo Avenue & Victoria Crescent (City of Hercules)	Signal	0.48	A	0.39	A
11 San Pablo Avenue & John Muir Parkway (City of Hercules, RRS)	Signal	0.87	D	0.94	E
12 San Pablo Avenue & Market Hill (City of Hercules, RRS)	Signal	0.46	A	0.47	A
13 San Pablo Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.90	D	0.93	E
14 San Pablo Avenue & Tsushima Street (City of Hercules, RRS)	Signal	0.66	B	0.63	B
15 San Pablo Avenue & Hercules Avenue (City of Hercules, RRS)	Signal	0.77	C	0.65	B
16 Willow Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.68	B	0.64	B

Source: DKS Associates, 2019.

Notes: V/C (Volume/Capacity), LOS: Level of Service

Intersections operating below acceptable LOS are in **bold**.

**Table 10. Background Conditions LOS Summary (Unsignalized)**

Intersection	Control	Approach Direction	AM Peak Hour		PM Peak Hour	
			Delay (sec)	LOS	Delay (sec)	LOS
5 Willow Avenue & Canterbury/ Viewpointe Boulevard (City of Hercules)	AWSC		25.0	C	14.7	B
6 Willow Avenue & SR-4 WB Off-Ramp (Caltrans)	AWSC		<b>140.2</b>	<b>F</b>	<b>72.0</b>	<b>F</b>
8 San Pablo Avenue & Linus Pauling Drive (City of Hercules)	TWSC	EB	<b>81.6</b>	<b>F</b>	30.2	D
9 San Pablo Avenue & Future Project Driveway (City of Hercules)	n/a		n/a		n/a	
10 John Muir Parkway & Alfred Nobel Drive (City of Hercules, RRS)	TWSC	SB	13.0	B	14.4	B
17 Willow Avenue & I-80 NB Off- Ramp/SR-4 EB On-Ramp (Caltrans)	AWSC		28.6	D	24.2	C

**Source: DKS Associates, 2019.**

Notes: Average Delay (AWSC/Signalized); Worst Approach Delay (TWSC) (seconds per vehicle), LOS: Level of Service

Intersections operating below acceptable LOS are in **bold**.

Approach direction is provided for TWSC intersections where delay is reported for the worst approach.



## Background plus Project Conditions

Project-generated trips, as previously shown in **Figure 8**, were added to the background traffic volumes to obtain background plus project volumes. **Figure 11** shows the background plus project turning movement volumes at the study intersections.

### Background plus Project Intersection Analysis

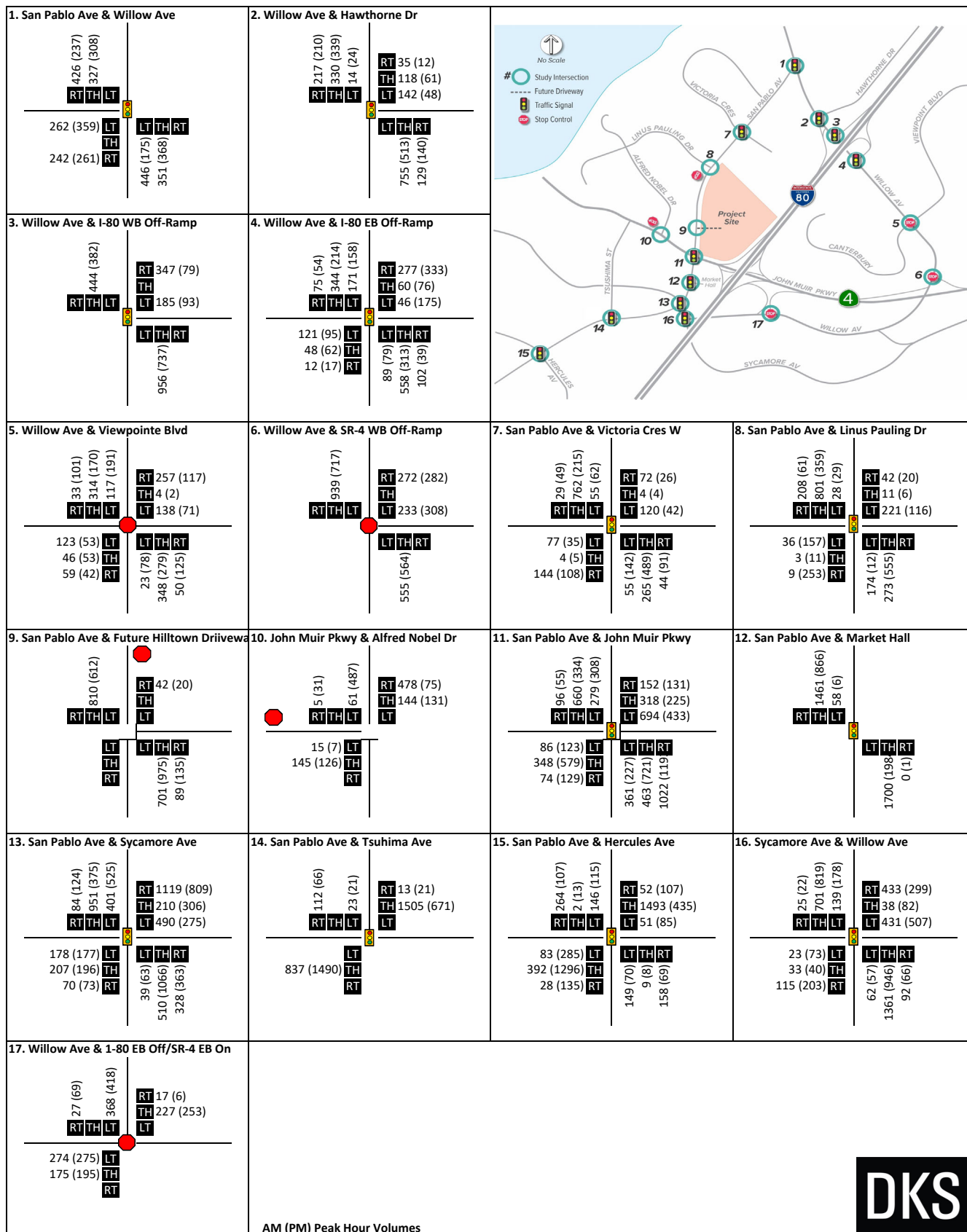
The results of the LOS analysis under Background plus Project Conditions are summarized in **Table 11** and **Table 12**. All worksheets are provided in **Appendix C**. With the addition of project generated trips, the following intersections are expected to operate worse than the LOS standard:

- Intersection 6: Willow Avenue & SR-4 WB Off Ramp: LOS F/F (AM/PM)
- Intersection 8: San Pablo Avenue and Linus Pauling Drive: LOS F/F (AM/PM)

The intersection of Willow Avenue & SB SR-4 WB off-Ramp was already operating at LOS F and there was no increase in delay. Therefore, the impact at that intersection is *less than significant*. The other intersection operating worse than the LOS standard became deficient with the addition of project trips. As a result, the following intersection represents a *potentially significant impact*:

- Intersection 8: San Pablo Avenue and Linus Pauling Drive: LOS F/F (AM/PM)

Figure 11. Background plus Project Intersection Peak Hour Volumes



**Table 11. Background plus Project LOS Summary (Signalized)**

Intersection (Jurisdiction)	Control	AM Peak Hour				PM Peak Hour			
		Background		Background + Project		Background		Background + Project	
		V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
1 Willow Avenue/ Parker Avenue & San Pablo Avenue (Unincorporated County)	Signal	0.77	C	0.81	D	0.60	A	0.62	B
2 Willow Avenue & Hawthorne Drive (City of Hercules)	Signal	0.58	A	0.59	A	0.40	A	0.41	A
3 Willow Avenue & I-80 SB Off-Ramp (Caltrans)	Signal	0.68	B	0.68	B	0.42	A	0.47	A
4 Willow Avenue & I-80 NB On/Off-Ramps (Caltrans)	Signal	0.60	A	0.59	A	0.58	A	0.58	A
7 San Pablo Avenue & Victoria Crescent (City of Hercules)	Signal	0.48	A	0.49	A	0.39	A	0.43	A
11 San Pablo Avenue & John Muir Parkway (City of Hercules, RRS)	Signal	0.87	D	0.95	E	0.94	E	0.96	E
12 San Pablo Avenue & Market Hill (City of Hercules, RRS)	Signal	0.46	A	0.50	A	0.47	A	0.50	A
13 San Pablo Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.90	D	0.96	E	0.93	E	0.95	E
14 San Pablo Avenue & Tsushima Street (City of Hercules, RRS)	Signal	0.66	B	0.68	B	0.63	B	0.70	B
15 San Pablo Avenue & Hercules Avenue (City of Hercules, RRS)	Signal	0.77	C	0.79	C	0.65	B	0.66	B
16 Willow Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.68	B	0.69	B	0.64	B	0.65	B

Source: DKS Associates, 2019.

Notes: V/C (Volume/Capacity), LOS: Level of Service

Intersections operating below acceptable LOS are in **bold**.

**Table 12. Background plus Project LOS Summary (Unsignalized)**

Intersection	Control	AM Peak Hour				PM Peak Hour			
		Background		Background + Project		Background		Background + Project	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
5 Willow Avenue & Canterbury/ Viewpointe Boulevard (City of Hercules)	AWSC	25.0	C	25.0	C	14.7	B	14.7	B
6 Willow Avenue & SR-4 WB Off-Ramp (Caltrans)	AWSC	<b>140.2</b>	<b>F</b>	<b>140.2</b>	<b>F</b>	<b>72.0</b>	<b>F</b>	<b>72.0</b>	<b>F</b>
8 San Pablo Avenue & Linus Pauling Drive (City of Hercules)	TWSC	<b>81.6</b>	<b>F</b>	<b>&gt;300</b>	<b>F</b>	30.2	D	<b>169.5</b>	<b>F</b>
9 San Pablo Avenue & Future Project Driveway (City of Hercules)	TWSC	n/a		11.3	B	n/a		12.6	B
10 John Muir Parkway & Alfred Nobel Drive (City of Hercules, RRS)	TWSC	13.0	B	13.8	B	14.4	B	16.0	C
17 Willow Avenue & I-80 NB Off-Ramp/SR-4 EB On-Ramp (Caltrans)	AWSC	28.6	D	33.2	D	24.2	C	31.9	D

Source: DKS Associates, 2019.

Notes: Average Delay (AWSC/Signalized); Worst Approach Delay (TWSC) (seconds per vehicle), LOS: Level of Service

**Bold** intersections do not meet LOS standards, **Shaded** intersections show potentially significant project impacts

## Recommended Project Improvements

The recommended mitigation for the intersection with potentially significant impacts caused by the project are described below with conceptual diagrams provided in **Appendix D**.

Intersection 8: San Pablo Avenue and Linus Pauling Drive – Signalize intersection. ***This mitigation was indicated in the 2009 EIR and General Plan Circulation Element and does not represent a new finding.***

**Table 13. LOS Summary for Impacted Intersections in Background plus Project Conditions**

Intersection	Mitigated Control	AM Peak Hour				PM Peak Hour			
		Background		Background + Project Mitigated		Background		Background + Project Mitigated	
		Delay (sec)	LOS	V/C	LOS	Delay (sec)	LOS	V/C	LOS
8 San Pablo Avenue & Linus Pauling Drive (City of Hercules)	Signal	<b>81.6</b>	<b>F</b>	0.81	D	30.2	D	0.62	B

**Source: DKS Associates, 2019.**

Notes: Average Delay (AWSC/Signalized); Worst Approach Delay (TWSC) (seconds per vehicle), V/C (Volume/Capacity), LOS: Level of Service

**Bold** intersections do not meet LOS standards, **Shaded** intersections show potentially significant project impacts

With the above mitigations, all project impacts have been removed resulting in a ***less than significant impact***.

## 6. CUMULATIVE (2040) CONDITIONS

This chapter discusses Cumulative (2040) Conditions, with and without the effect of the proposed project. Cumulative Conditions are consistent with development assumptions presented in the City of Hercules Circulation Element. Project-generated trips, as previously shown in **Figure 8**, were added to the cumulative traffic volumes to obtain Cumulative plus Project volumes. **Figure 12** shows the cumulative plus project turning movement volumes at the study intersections.

### Forecast Methodology

Intersection turning movements used in this analysis were developed as part of the Circulation Element Update, adopted in March 2018. The assumptions included in the model are consistent with development and growth assumptions as presented in the CCTA Travel Demand Model and adjusted to meet local land use expectations. The model used in the Circulation Element assumed an equivalent level of development at the proposed project site. As a result, Project trips are already assumed under Cumulative Conditions. In order to analyze the level of impact due to the proposed development, project trips were subtracted from Cumulative Conditions to represent baseline conditions with the forecast model as prepared in the general plan representing Cumulative plus Project Conditions.

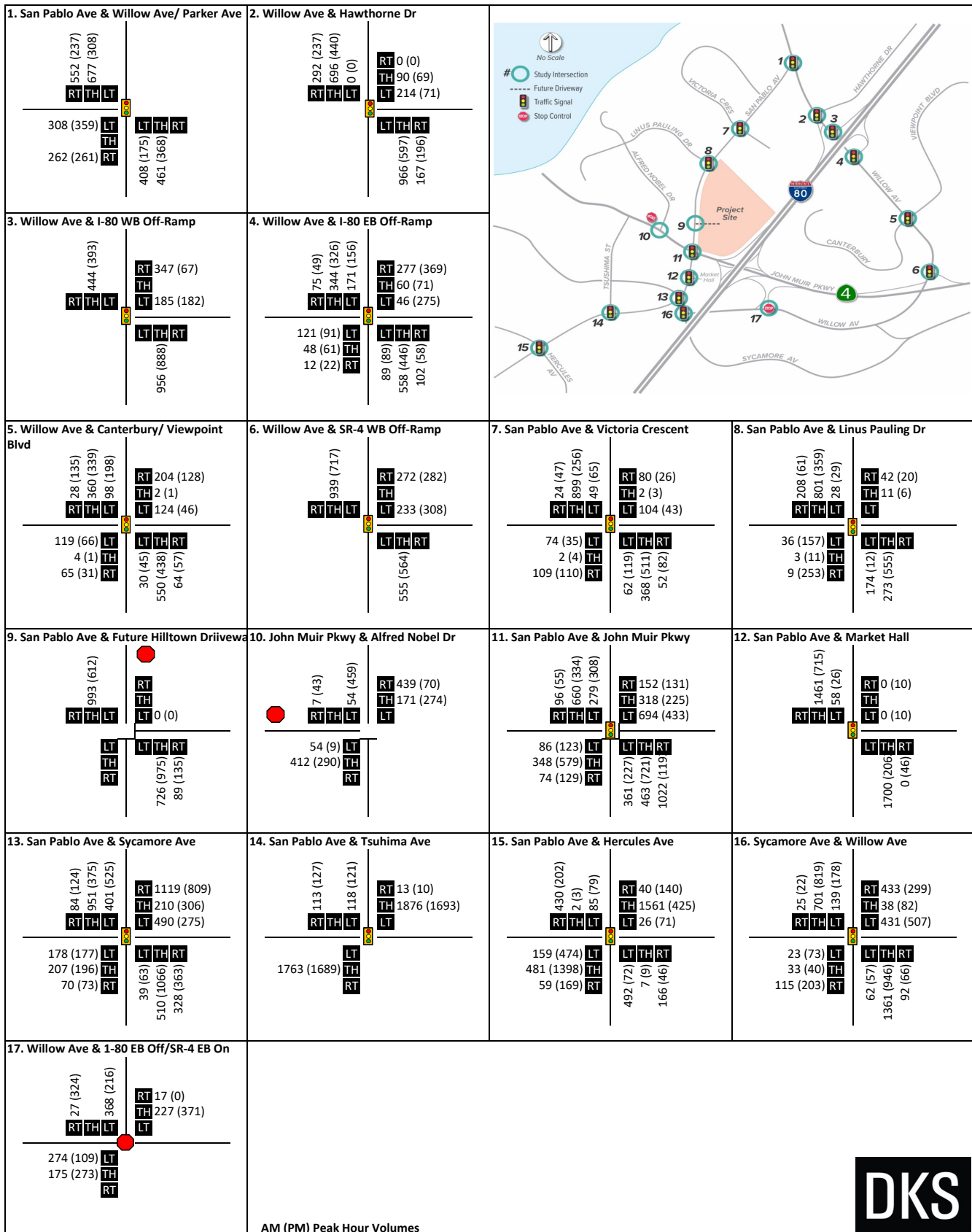
### Cumulative Roadway Network

In addition to the changes to the intersection of San Pablo Avenue & Tsushima Street identified in the Background Conditions, the following changes to the network were identified in the Hercules Circulation Element (2018):

- Sycamore Avenue between Willow Avenue and San Pablo Avenue (Study Intersections #13 and #16) shall be widened from a six-lane to a seven-lane cross-section. The widening would extend the existing lane configuration storage lengths with the westbound left-turn lane at Willow Avenue & Sycamore Avenue intersection extended to 300 feet, and the traffic signals at San Pablo Avenue & Sycamore Avenue and at Willow Avenue & Sycamore Avenue would be optimized.
- The Willow Avenue/I-80/SR 4 Ramps intersection (Study Intersection #17) shall be signalized, a 300-foot westbound right-turn pocket from Willow Avenue onto the SR 4 eastbound on-ramp shall be installed, and the Willow Avenue eastbound left-turn lane to the SR 4 eastbound on-ramp shall be extended to 300 feet. This will happen in coordination with the removal and relocation of the existing EB SR-4 ramps at Willow Avenue.
- A second right-turn lane shall be provided from northbound San Pablo Avenue to eastbound John Muir Parkway (Study Intersection #11). The second right-turn lane shall be extended along the PNR frontage (along Market Hall) to the San Pablo Avenue/PNR Driveway intersection. EB (eastbound) John Muir Parkway shall be widened to four lanes from San Pablo Avenue to the SR 4 and I-80 ramps. This widened segment of John Muir Parkway would allow the two NB (northbound) San Pablo Avenue right-turn lanes to have exclusive receiving lanes that serve the I-80 westbound on-ramp (this would also require widening the I-80 westbound on-ramp from one to two lanes).
- The San Pablo Avenue and Linus Pauling Drive intersection (Study Intersection #8) shall be signalized.

According to the City of Hercules, the mitigation measures described above are planned and expected to be funded and constructed by 2040, whether or not the current Project receives approval from the City. Therefore, the improvements listed above are assumed in the Cumulative and Cumulative plus Project Conditions.

Figure 12. Cumulative plus Project Intersection Peak Hour Volumes



## Cumulative Project Trip Generation

The Hercules Circulation Element analysis assumes a large amount of development at the proposed location. The land use represented in the model is slightly larger than the project description. This means that the cumulative model assumes the complete buildout of this project. As a result, the output from the model is considered to reflect Cumulative plus Project volumes. The increment assumed for the project was therefore removed from the 2040 model output and used to represent the Cumulative No Project scenario.

## Cumulative and Cumulative plus Project Intersection Analysis

The results of the LOS analysis under Cumulative and Cumulative plus Project Conditions are summarized in **Table 14** and **Table 15**. All worksheets are provided in **Appendix C**. With the improvements associated with Cumulative Conditions, the following intersections are expected to operate worse than the LOS standard:

- Intersection 1: Willow Avenue & San Pablo Avenue: LOS E (AM)
- Intersection 15: San Pablo Avenue & Hercules Avenue: LOS F (AM)
- Intersection 17: Willow Avenue & I-80 NB Off-Ramp/SR-4 EB On-Ramp: LOS E (PM)

With the addition of the project trips, the same intersections are expected to operate worse than the LOS standard:

- Intersection 1: Willow Avenue & San Pablo Avenue: LOS F (AM)
- Intersection 15: San Pablo Avenue & Hercules Avenue: LOS F (AM)
- Intersection 17: Willow Avenue & I-80 NB Off-Ramp/SR-4 EB On-Ramp: LOS E (PM)

These three intersections operate worse than the LOS standard with and without the project. Therefore, under Cumulative Conditions, the project has a ***less than significant impact***.



**Table 14. Cumulative Conditions LOS Summary (Signalized)**

Intersection (Jurisdiction)	Control	AM Peak Hour				PM Peak Hour			
		Cumulative		Cumulative + Project		Cumulative		Cumulative + Project	
		V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
1 Willow Avenue/ Parker Ave & San Pablo Avenue (Unincorporated County)	Signal	<b>0.97</b>	<b>E</b>	<b>1.01</b>	<b>F</b>	0.60	A	0.61	B
2 Willow Avenue & Hawthorne Drive (City of Hercules)	Signal	0.59	A	0.65	B	0.40	A	0.47	A
3 Willow Avenue & I-80 SB Off-Ramp (Caltrans)	Signal	0.68	B	0.68	B	0.53	A	0.53	A
4 Willow Avenue & I-80 NB On/Off-Ramps (Caltrans)	Signal	0.60	A	0.59	A	0.69	B	0.68	B
5 Willow Avenue & Canterbury/ Viewpointe Blvd (City of Hercules)	Signal	0.51	A	0.50	A	0.46	A	0.46	A
6 Willow Avenue & SR-4 WB Off-Ramp (Caltrans)	Signal	0.73	C	0.73	C	0.69	B	0.69	B
7 San Pablo Avenue & Victoria Crescent (City of Hercules)	Signal	0.49	A	0.50	A	0.39	A	0.40	A
8 San Pablo Avenue & Linus Pauling Drive (City of Hercules)	Signal	0.63	B	0.67	B	0.54	A	0.56	A
11 San Pablo Avenue & John Muir Parkway (City of Hercules, RRS)	Signal	0.87	D	0.95	E	0.88	D	0.93	E
12 San Pablo Avenue & Market Hill (City of Hercules, RRS)	Signal	0.46	A	0.50	A	0.50	A	0.53	A
13 San Pablo Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.96	E	0.96	E	0.81	D	0.88	D
14 San Pablo Avenue & Tsushima Street (City of Hercules, RRS)	Signal	0.93	E	0.95	E	.92	E	0.93	E
15 San Pablo Avenue & Hercules Avenue (City of Hercules, RRS)	Signal	<b>1.10</b>	<b>F</b>	<b>1.12</b>	<b>F</b>	0.64	B	0.64	B
16 Willow Avenue & Sycamore Avenue (City of Hercules, RRS)	Signal	0.68	B	0.69	B	0.64	B	0.65	B

Source: DKS Associates, 2019.

Notes: V/C (Volume/Capacity), LOS: Level of Service

Intersections operating below acceptable LOS are in **bold**.

**Table 15. Cumulative plus Project LOS Summary (Unsignalized)**

Intersection	Control	AM Peak Hour				PM Peak Hour			
		Cumulative		Cumulative + Project		Cumulative		Cumulative + Project	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
9 San Pablo Avenue & Future Project Driveway (City of Hercules)	TWSC	n/a		11.4	B	n/a		12.6	B
10 John Muir Parkway & Alfred Nobel Drive (City of Hercules, RRS)	TWSC	18.1	C	19.3	C	28.4	D	31.9	D
17 Willow Avenue & I-80 NB Off-Ramp/SR-4 EB On-Ramp (Caltrans)	AWSC	28.6	D	33.2	D	<b>37.5</b>	<b>E</b>	<b>48.7</b>	<b>E</b>

Source: DKS Associates, 2019.

Notes: Average Delay (AWSC/Signalized); Worst Approach Delay (TWSC) (seconds per vehicle), LOS: Level of Service

**Bold** intersections do not meet LOS standards, **Shaded** intersections show potentially significant project impacts

## 7. SUMMARY AND CONCLUSIONS

### Impacts to Intersection Operations

The plus Project scenarios for each time period has varying degrees of potential impacts on the transportation network. In all, the following intersections have potentially significant impacts with the addition of the project:

- Intersection 8: San Pablo Avenue & Linus Pauling Drive: Existing (AM), Background (AM/PM)

### Recommended Project Improvements

Recommended mitigation projects for the intersections with potentially significant impacts for each condition are described below with conceptual diagrams provided in **Appendix D**.

#### Existing plus Project

- Intersection 8: San Pablo Avenue and Linus Pauling Drive (AM/PM): Signalize intersection. ***This mitigation was already indicated in the 2009 EIR and General Plan Circulation Element and does not represent a new finding.***

#### Background plus Project

- Intersection 8: San Pablo Avenue and Linus Pauling Drive (AM/PM): Signalize intersection. ***This mitigation was indicated in the 2009 EIR and General Plan Circulation Element and does not represent a new finding.***

#### Cumulative plus Project

There are no potentially significant impacts in the Cumulative plus Project scenario.

### Comparison to 2009 DEIR Findings

This analysis matches the methodology used in the 2009 EIR, consistent with the Hill Town Development Agreement. The updated analysis did not identify any new significant impacts or mitigations that were not previously identified in the 2009 EIR. As a result, there are no new findings associated with the 2019 project description or conditions.

# **Appendix A**

## **Turning Movement Counts**



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Location: 1 WILLOW AVE & SAN PABLO AVE AM

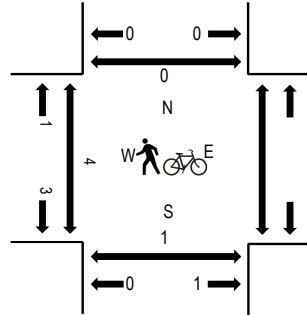
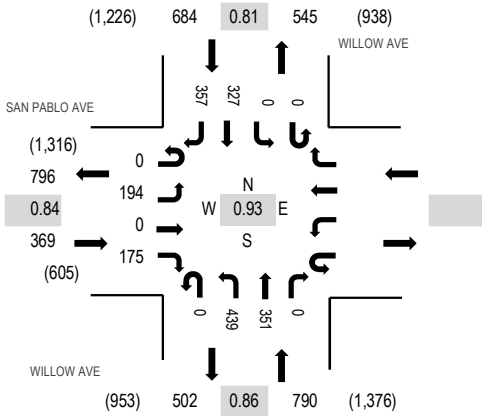
Date: Tuesday, August 27, 2019

Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 08:00 AM - 08:15 AM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	SAN PABLO AVE Eastbound				Westbound			WILLOW AVE Northbound			WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left			Thru	Right	West	East	South
7:00 AM	0	13	0	26					0	58	58	0	0	0	69	33	257	1,488	0	2	0
7:15 AM	1	30	0	33					0	85	54	0	0	0	65	59	327	1,726	1	0	0
7:30 AM	0	64	0	43					0	125	66	0	0	0	68	72	438	1,843	0	0	0
7:45 AM	0	68	0	42					0	99	76	0	0	0	76	105	466	1,819	0	1	0
8:00 AM	0	28	0	56					0	104	90	0	0	0	109	108	495	1,719	1	0	0
8:15 AM	0	34	0	34					0	111	119	0	0	0	74	72	444		2	0	0
8:30 AM	0	26	0	29					0	87	109	0	0	0	95	68	414		0	0	0
8:45 AM	0	40	0	38					0	72	63	0	0	0	96	57	366		0	1	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0					0	0	2	0	0	0	5	0	7
Lights	0	190	0	171					0	429	342	0	0	0	317	352	1,801
Mediums	0	4	0	4					0	10	7	0	0	0	5	5	35
Total	0	194	0	175					0	439	351	0	0	0	327	357	1,843



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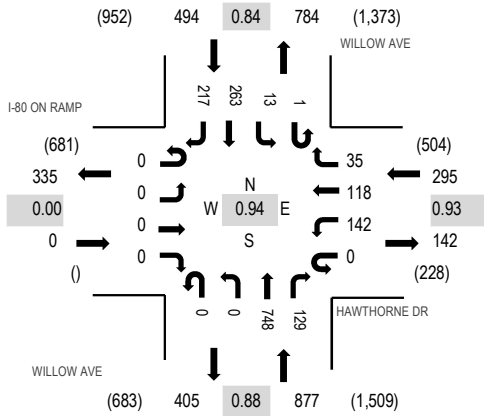
Location: 2 WILLOW AVE & HAWTHORNE DR AM

Date: Tuesday, August 27, 2019

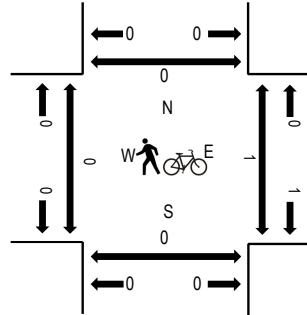
Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 08:00 AM - 08:15 AM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	I-80 ON RAMP Eastbound				HAWTHORNE DR Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	0	0	0	0	18	37	8	0	0	111	22	0	1	32	60	289	1,459	0	1	0	0
7:15 AM	0	0	0	0	0	21	44	7	0	0	141	26	0	5	45	52	341	1,613	0	0	0	0
7:30 AM	0	0	0	0	0	39	37	13	0	0	170	46	1	1	50	58	415	1,666	0	0	0	0
7:45 AM	0	0	0	0	0	40	40	9	0	0	164	45	0	1	65	50	414	1,604	0	0	0	0
8:00 AM	0	0	0	0	0	47	25	9	0	0	184	20	0	4	89	65	443	1,506	0	0	0	0
8:15 AM	0	0	0	0	0	16	16	4	0	0	230	18	0	7	59	44	394		0	1	0	0
8:30 AM	0	0	0	0	0	12	11	8	0	1	179	9	0	3	68	62	353		0	1	0	0
8:45 AM	0	0	0	0	0	13	19	11	0	0	124	19	0	1	69	60	316		0	0	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3	6
Lights	0	0	0	0	0	141	118	35	0	0	729	127	1	13	258	208	1,630
Mediums	0	0	0	0	0	1	0	0	0	0	17	2	0	0	4	6	30
Total	0	0	0	0	0	142	118	35	0	0	748	129	1	13	263	217	1,666



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Location: 3 WILLOW AVE & I-80 OFF RAMP AM

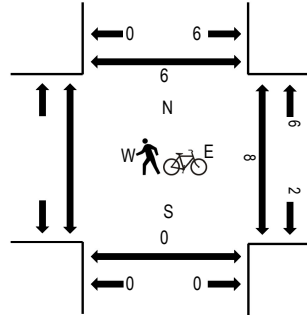
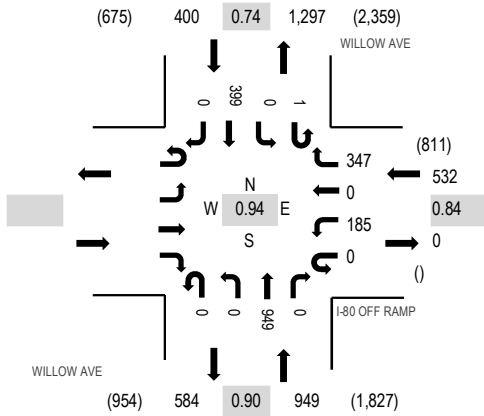
Date: Tuesday, August 27, 2019

Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 08:00 AM - 08:15 AM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	Eastbound				I-80 OFF RAMP Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM					0	28	0	45	0	0	212	0	0	0	0	47	0	332	1,602	0	0	4
7:15 AM					0	30	0	70	0	0	185	0	0	0	0	65	0	350	1,770	2	0	3
7:30 AM					0	29	0	88	0	0	222	0	0	0	0	85	0	424	1,881	4	0	1
7:45 AM					0	71	0	88	0	0	234	0	1	0	0	102	0	496	1,840	1	0	0
8:00 AM					0	55	0	87	0	0	222	0	0	0	0	136	0	500	1,711	1	0	3
8:15 AM					0	30	0	84	0	0	271	0	0	0	0	76	0	461		2	0	2
8:30 AM					0	16	0	43	0	0	246	0	0	0	0	78	0	383		3	0	1
8:45 AM					0	21	0	26	0	0	235	0	0	0	0	85	0	367		3	0	0

**Peak Rolling Hour Flow Rates**

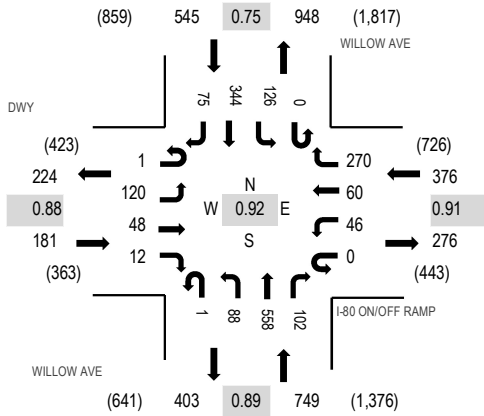
Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks					0	0	0	0	0	0	5	0	0	0	1	0	6
Lights					0	181	0	344	0	0	926	0	1	0	393	0	1,845
Mediums					0	4	0	3	0	0	18	0	0	0	5	0	30
Total					0	185	0	347	0	0	949	0	1	0	399	0	1,881



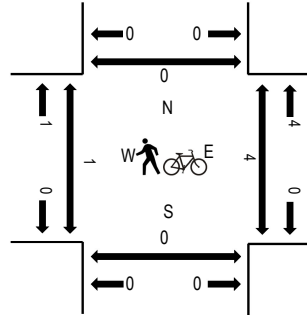
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Location: 4 WILLOW AVE & I-80 ON/OFF RAMP AM  
Date: Tuesday, August 27, 2019  
Peak Hour: 07:30 AM - 08:30 AM  
Peak 15-Minutes: 07:45 AM - 08:00 AM

### Peak Hour - Motorized Vehicles



### Peak Hour - Pedestrians/Bicycles in Crosswalk



Note: Total study counts contained in parentheses.

### Traffic Counts - Motorized Vehicles

Interval Start Time	DWY Eastbound				I-80 ON/OFF RAMP Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	31	7	1	0	13	8	47	0	20	132	11	0	12	34	15	331	1,614	0	0	0	0
7:15 AM	0	30	13	4	0	9	17	40	0	17	106	23	0	24	33	14	330	1,744	0	2	0	0
7:30 AM	1	28	17	2	0	4	16	64	0	28	138	44	0	42	51	16	451	1,851	0	1	0	0
7:45 AM	0	31	17	3	0	14	15	73	0	17	142	33	0	44	95	18	502	1,822	0	1	0	0
8:00 AM	0	28	8	2	0	7	12	60	0	23	124	15	0	26	130	26	461	1,710	0	1	0	0
8:15 AM	0	33	6	5	0	21	17	73	1	20	154	10	0	14	68	15	437		1	1	0	0
8:30 AM	0	35	10	8	0	18	7	81	0	30	136	8	0	22	48	19	422		0	0	0	0
8:45 AM	0	29	8	6	0	19	12	79	0	12	123	9	0	20	45	28	390		0	2	0	0

### Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	4
Lights	1	119	47	12	0	46	59	257	1	88	549	101	0	125	338	74	1,817
Mediums	0	1	1	0	0	0	1	10	0	0	9	1	0	1	6	0	30
Total	1	120	48	12	0	46	60	270	1	88	558	102	0	126	344	75	1,851





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Location: 5 WILLOW AVE & VIEWPOINTE BLVD AM

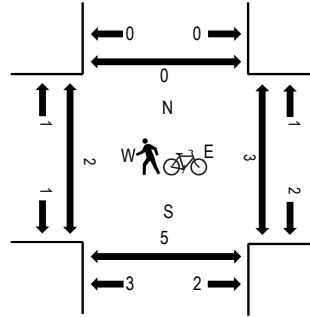
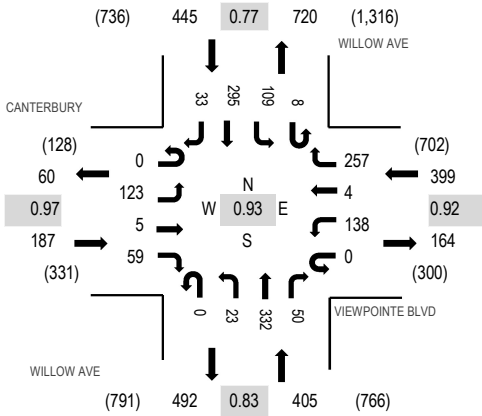
Date: Tuesday, August 27, 2019

Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 08:00 AM - 08:15 AM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	CANTERBURY Eastbound				VIEWPOINTE BLVD Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	29	0	13	0	19	0	71	0	5	54	4	0	17	33	4	249	1,220	2	1	1	0
7:15 AM	0	25	1	20	0	34	0	71	0	3	49	12	0	19	43	9	286	1,355	0	3	2	1
7:30 AM	0	29	2	17	0	31	3	84	0	3	71	5	1	12	46	3	307	1,436	0	1	1	0
7:45 AM	0	36	1	11	0	38	1	72	0	2	82	10	4	38	74	9	378	1,434	1	1	1	0
8:00 AM	0	29	2	12	0	40	0	58	0	7	70	15	2	26	109	14	384	1,315	0	0	2	0
8:15 AM	0	29	0	19	0	29	0	43	0	11	109	20	1	33	66	7	367		1	1	0	0
8:30 AM	0	19	0	13	0	13	1	33	0	9	112	20	1	26	43	15	305		0	1	0	1
8:45 AM	0	18	0	6	0	20	0	41	1	5	73	14	0	23	41	17	259		0	0	2	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lights	0	123	4	59	0	136	4	251	0	23	329	49	8	106	293	30	1,415
Mediums	0	0	1	0	0	2	0	6	0	0	3	1	0	3	2	3	21
<b>Total</b>	0	123	5	59	0	138	4	257	0	23	332	50	8	109	295	33	1,436



Location: 6 WILLOW AVE & SR-4 OFF RAMP AM

Date: Tuesday, August 27, 2019

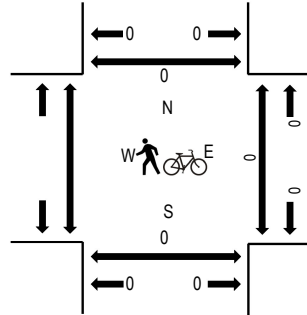
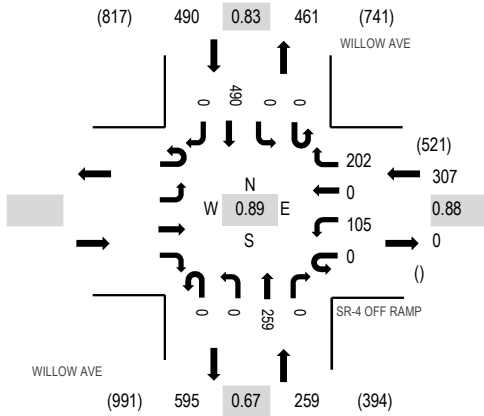
Peak Hour: 07:45 AM - 08:45 AM

Peak 15-Minutes: 08:15 AM - 08:30 AM

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**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	Eastbound				SR-4 OFF RAMP Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM					0	12	0	29	0	0	28	0	0	0	72	0	141	740	1	0	0	
7:15 AM					0	14	0	24	0	0	33	0	0	0	92	0	163	867	0	0	0	
7:30 AM					0	21	0	36	0	0	35	0	0	0	88	0	180	1,002	0	0	0	
7:45 AM					0	28	0	50	0	0	40	0	0	0	138	0	256	1,056	0	0	0	
8:00 AM					0	28	0	45	0	0	41	0	0	0	154	0	268	992	0	0	0	
8:15 AM					0	27	0	60	0	0	81	0	0	0	130	0	298		0	0	0	
8:30 AM					0	22	0	47	0	0	97	0	0	0	68	0	234		0	0	0	
8:45 AM					0	22	0	56	0	0	39	0	0	0	75	0	192		1	0	0	

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks					0	0	0	2	0	0	0	0	0	0	1	0	3
Lights					0	101	0	198	0	0	253	0	0	0	487	0	1,039
Mediums					0	4	0	2	0	0	6	0	0	0	2	0	14
Total					0	105	0	202	0	0	259	0	0	0	490	0	1,056



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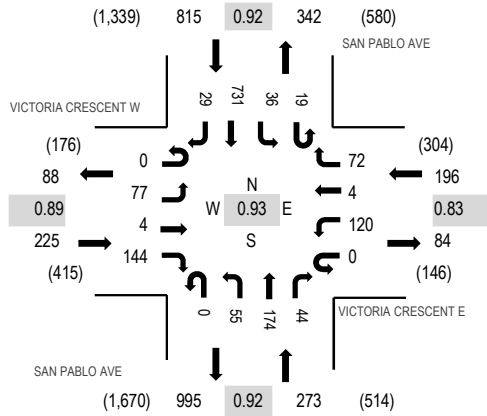
Location: 7 SAN PABLO AVE & VICTORIA CRESCENT E AM

Date: Tuesday, August 27, 2019

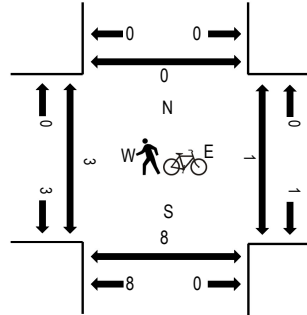
Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 08:00 AM - 08:15 AM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	VICTORIA CRESCENT W Eastbound				VICTORIA CRESCENT E Westbound				SAN PABLO AVE Northbound				SAN PABLO AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	5	0	40	0	25	1	8	0	9	14	4	2	0	93	6	207	1,274	0	0	1	0
7:15 AM	0	19	0	46	0	22	0	12	0	16	28	10	5	2	135	2	297	1,472	0	0	0	0
7:30 AM	0	24	0	31	0	35	3	22	0	12	48	7	2	9	182	1	376	1,509	0	0	2	0
7:45 AM	0	21	3	36	0	31	0	17	0	6	53	9	5	8	198	7	394	1,416	1	0	3	0
8:00 AM	0	21	1	48	0	35	1	20	0	12	33	13	9	13	186	13	405	1,298	0	0	0	0
8:15 AM	0	11	0	29	0	19	0	13	0	25	40	15	3	6	165	8	334		2	1	3	0
8:30 AM	0	15	0	25	0	13	0	5	0	21	41	17	3	11	122	10	283		0	0	9	3
8:45 AM	0	12	0	28	0	11	0	11	1	17	54	9	4	9	114	6	276		3	0	2	7

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lights	0	76	4	137	0	120	4	72	0	52	168	43	19	36	719	29	1,479
Mediums	0	1	0	7	0	0	0	0	0	3	6	1	0	0	12	0	30
Total	0	77	4	144	0	120	4	72	0	55	174	44	19	36	731	29	1,509



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Location: 8 SAN PABLO AVE & LINUS PAULING DR AM

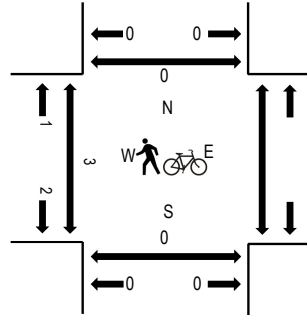
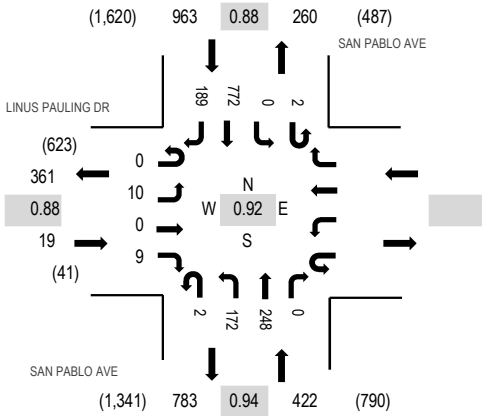
Date: Tuesday, August 27, 2019

Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 08:00 AM - 08:15 AM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	LINUS PAULING DR				SAN PABLO AVE				SAN PABLO AVE				Total	Rolling Hour	Pedestrian Crossings			
	Eastbound		Westbound		Northbound		Southbound		West	East	South	North						
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right							U-Turn	Left	Thru	Right
7:00 AM	0	2	0	2	0	21	29	0	0	0	131	22	207	1,164	0	0	0	
7:15 AM	0	2	0	2	0	18	51	0	0	0	165	27	265	1,340	1	0	0	
7:30 AM	0	0	0	1	2	24	63	0	1	0	187	48	326	1,404	0	0	0	
7:45 AM	0	1	0	3	0	46	65	0	1	0	199	51	366	1,366	2	0	0	
8:00 AM	0	3	0	3	0	53	50	0	0	0	225	49	383	1,287	0	0	0	
8:15 AM	0	6	0	2	0	49	70	0	0	0	161	41	329		1	0	0	
8:30 AM	0	2	0	4	2	53	70	0	0	0	125	32	288		2	0	0	
8:45 AM	0	3	0	5	0	56	68	0	0	0	122	33	287		3	0	0	

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	1					0	0	0	0	0	0	0	0	1
Lights	0	8	0	8					2	170	244	0	2	0	757	186	1,377
Mediums	0	2	0	0					0	2	4	0	0	0	15	3	26
Total	0	10	0	9					2	172	248	0	2	0	772	189	1,404



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Location: 10 ALFRED NOVEL DR & JOIN MUIR PKWY AM

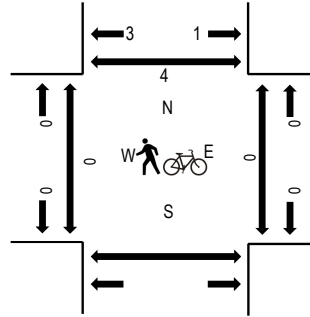
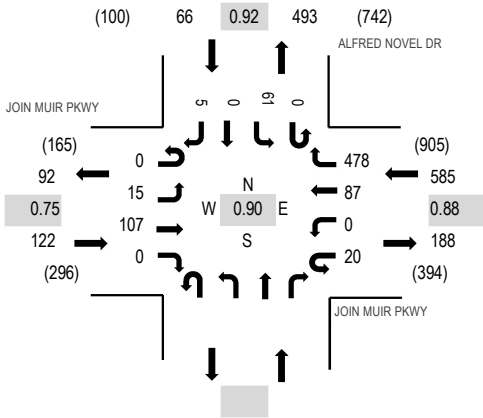
Date: Tuesday, August 27, 2019

Peak Hour: 08:00 AM - 09:00 AM

Peak 15-Minutes: 08:45 AM - 09:00 AM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	JOIN MUIR PKWY Eastbound				JOIN MUIR PKWY Westbound				Northbound			ALFRED NOVEL DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	1	37	0	0	0	18	40				0	10	0	0	106	528	0	0	0	
7:15 AM	0	2	27	0	2	0	21	51				0	7	0	0	110	602	0	0	0	
7:30 AM	1	2	46	0	2	0	10	49				0	6	0	3	119	684	0	0	0	
7:45 AM	0	3	55	0	6	0	20	101				0	8	0	0	193	751	0	0	1	
8:00 AM	0	2	37	0	4	0	13	106				0	17	0	1	180	773	0	0	0	
8:15 AM	0	3	24	0	10	0	32	110				0	11	0	2	192		0	0	0	
8:30 AM	0	1	24	0	5	0	21	117				0	17	0	1	186		0	0	2	
8:45 AM	0	9	22	0	1	0	21	145				0	16	0	1	215		0	0	2	

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	1	0					0	1	0	0	2
Lights	0	14	104	0	18	0	83	473					0	54	0	5	751
Mediums	0	1	3	0	2	0	3	5					0	6	0	0	20
Total	0	15	107	0	20	0	87	478					0	61	0	5	773



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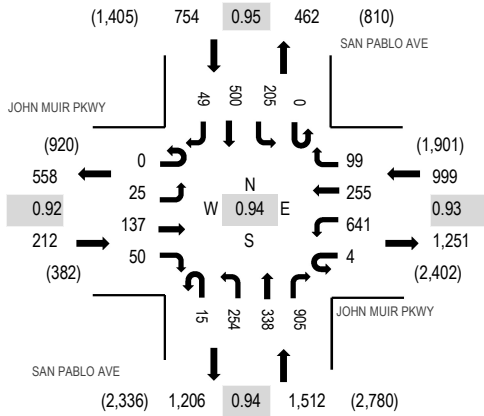
Location: 11 SAN PABLO AVE & JOHN MUIR PKWY AM

Date: Tuesday, August 27, 2019

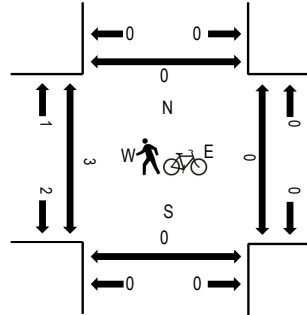
Peak Hour: 07:45 AM - 08:45 AM

Peak 15-Minutes: 07:45 AM - 08:00 AM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	JOHN MUIR PKWY Eastbound				JOHN MUIR PKWY Westbound				SAN PABLO AVE Northbound				SAN PABLO AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	1	36	8	0	174	39	12	0	18	39	200	0	46	74	5	652	3,115	1	0	0	0
7:15 AM	0	6	19	9	0	177	25	12	2	39	54	205	0	55	113	8	724	3,314	1	0	1	0
7:30 AM	0	9	39	7	0	179	27	18	1	29	64	229	0	63	144	5	814	3,475	1	0	0	0
7:45 AM	0	15	37	9	0	175	68	25	0	66	75	244	0	58	142	11	925	3,477	2	0	0	0
8:00 AM	0	5	39	16	2	163	58	23	1	50	71	207	0	58	147	11	851	3,353	0	0	0	0
8:15 AM	0	2	37	9	1	154	70	25	8	65	93	235	0	50	118	18	885		1	0	0	0
8:30 AM	0	3	24	16	1	149	59	26	6	73	99	219	0	39	93	9	816		0	0	0	0
8:45 AM	0	3	21	12	0	149	60	30	2	98	100	188	0	50	79	9	801		1	0	1	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	1	0	0	7	0	0	0	0	0	4	0	0	0	0	12
Lights	0	25	132	45	4	627	251	98	15	250	332	879	0	204	487	49	3,398
Mediums	0	0	4	5	0	7	4	1	0	4	6	22	0	1	13	0	67
Total	0	25	137	50	4	641	255	99	15	254	338	905	0	205	500	49	3,477



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Location: 12 SAN PABLO AVE & MARKET HALL DWY AM

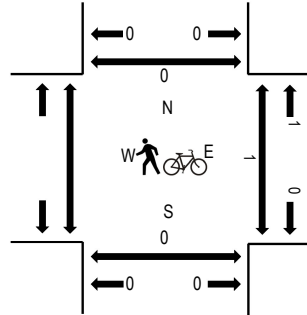
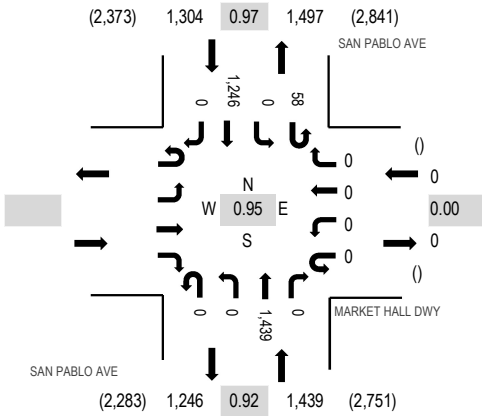
Date: Tuesday, August 27, 2019

Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 07:45 AM - 08:00 AM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	MARKET HALL DWY				SAN PABLO AVE				SAN PABLO AVE				Total	Rolling Hour	Pedestrian Crossings						
	Eastbound		Westbound		Northbound		Southbound		Northbound		Southbound				West	East	South	North			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right					
7:00 AM					0	0	0	0	0	0	261	0	3	0	251	0	515	2,491	0	0	0
7:15 AM					0	0	0	0	0	0	285	0	10	0	300	0	595	2,640	1	0	0
7:30 AM					0	0	0	0	0	0	319	0	9	0	334	0	662	2,743	0	0	0
7:45 AM					0	0	0	0	0	0	383	0	19	0	317	0	719	2,723	0	0	0
8:00 AM					0	0	0	0	0	0	329	0	16	0	319	0	664	2,633	0	0	0
8:15 AM					0	0	0	0	0	0	408	0	14	0	276	0	698		1	0	0
8:30 AM					0	0	0	0	3	0	378	0	16	0	245	0	642		0	0	0
8:45 AM					0	0	0	0	2	0	383	0	8	0	236	0	629		2	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks					0	0	0	0	0	0	3	0	0	0	7	0	10
Lights					0	0	0	0	0	0	1,396	0	58	0	1,204	0	2,658
Mediums					0	0	0	0	0	0	40	0	0	0	35	0	75
Total					0	0	0	0	0	0	1,439	0	58	0	1,246	0	2,743



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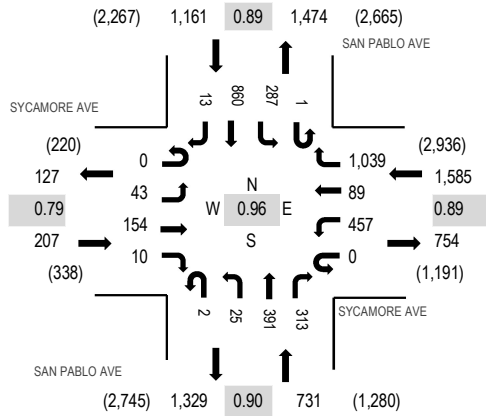
Location: 13 SAN PABLO AVE & SYCAMORE AVE AM

Date: Tuesday, August 27, 2019

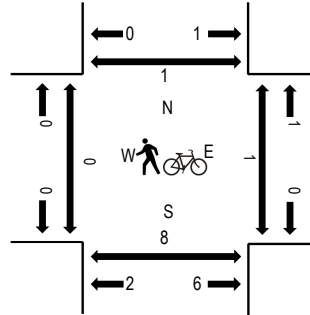
Peak Hour: 07:45 AM - 08:45 AM

Peak 15-Minutes: 08:15 AM - 08:30 AM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	SYCAMORE AVE Eastbound				SYCAMORE AVE Westbound				SAN PABLO AVE Northbound				SAN PABLO AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	11	25	2	0	103	14	156	0	4	76	44	0	44	186	1	666	3,241	1	0	3	1
7:15 AM	0	9	18	5	0	134	16	196	0	1	74	44	0	31	256	1	785	3,466	0	0	1	1
7:30 AM	0	14	14	4	0	128	10	186	0	1	104	44	0	53	291	5	854	3,642	1	0	2	0
7:45 AM	0	21	43	3	0	101	11	274	0	6	101	75	0	79	220	2	936	3,684	0	0	2	0
8:00 AM	0	5	59	2	0	93	21	213	1	3	94	93	0	91	210	6	891	3,580	0	0	3	0
8:15 AM	0	8	39	1	0	118	26	278	0	4	104	94	0	66	220	3	961		0	1	3	0
8:30 AM	0	9	13	4	0	145	31	274	1	12	92	51	1	51	210	2	896		0	0	0	1
8:45 AM	0	7	14	8	0	120	30	258	0	5	100	52	0	54	179	5	832		0	0	1	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	2	0	0	4	0	0	0	6	0	12
Lights	0	42	154	10	0	435	87	1,013	2	24	375	298	1	271	840	13	3,565
Mediums	0	1	0	0	0	22	2	24	0	1	12	15	0	16	14	0	107
Total	0	43	154	10	0	457	89	1,039	2	25	391	313	1	287	860	13	3,684





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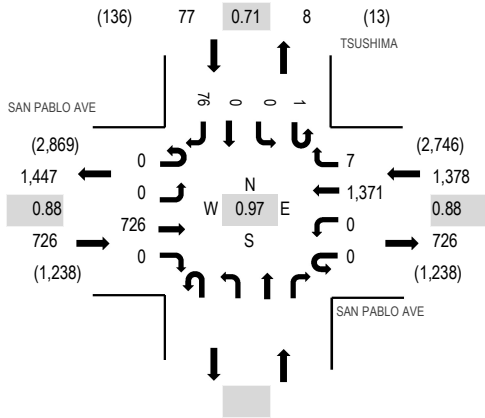
Location: 14 TSUSHIMA & SAN PABLO AVE AM

Date: Tuesday, August 27, 2019

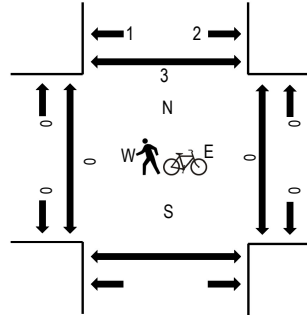
Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 08:15 AM - 08:30 AM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	SAN PABLO AVE Eastbound				SAN PABLO AVE Westbound				Northbound			TSUSHIMA Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	0	114	0	0	0	290	0				0	0	0	14	418	2,045	0	0	1	
7:15 AM	0	0	114	0	0	0	404	0				0	0	0	17	535	2,151	0	0	0	
7:30 AM	0	0	138	0	0	0	374	0				0	0	0	28	540	2,181	0	0	2	
7:45 AM	0	0	183	0	0	0	347	6				1	0	0	15	552	2,147	0	0	1	
8:00 AM	0	0	208	0	0	0	297	1				0	0	0	18	524	2,075	0	0	0	
8:15 AM	0	0	197	0	0	0	353	0				0	0	0	15	565		0	0	0	
8:30 AM	0	0	146	0	0	0	345	4				0	0	0	11	506		0	0	0	
8:45 AM	0	0	138	0	0	0	324	1				0	0	0	17	480		0	0	0	

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	2	0	0	0	6	0					0	0	0	0	8
Lights	0	0	695	0	0	0	1,332	7					1	0	0	75	2,110
Mediums	0	0	29	0	0	0	33	0					0	0	0	1	63
Total	0	0	726	0	0	0	1,371	7					1	0	0	76	2,181



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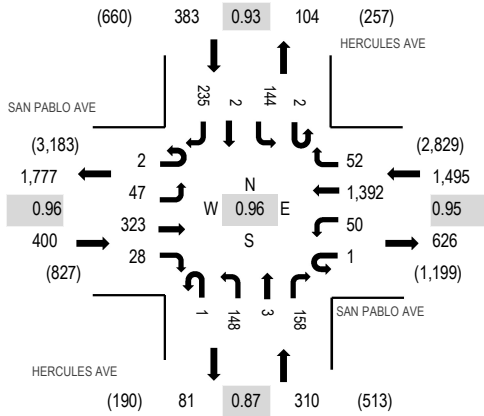
Location: 15 HERCULES AVE & SAN PABLO AVE AM

Date: Tuesday, August 27, 2019

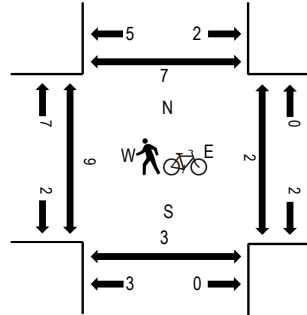
Peak Hour: 07:15 AM - 08:15 AM

Peak 15-Minutes: 07:45 AM - 08:00 AM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	SAN PABLO AVE Eastbound				SAN PABLO AVE Westbound				HERCULES AVE Northbound				HERCULES AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	11	56	4	0	8	278	9	0	38	1	23	0	32	2	49	511	2,450	2	2	2	3
7:15 AM	0	9	58	8	0	11	372	9	0	36	1	23	1	29	0	65	622	2,588	2	0	1	0
7:30 AM	0	12	64	11	0	11	350	10	0	47	2	40	0	31	1	65	644	2,573	1	1	1	2
7:45 AM	1	11	103	7	0	11	347	14	0	39	0	37	1	41	0	61	673	2,509	1	0	0	3
8:00 AM	1	15	98	2	1	17	323	19	1	26	0	58	0	43	1	44	649	2,379	3	1	1	2
8:15 AM	1	12	107	7	1	16	305	22	0	15	1	41	1	46	0	32	607		0	3	3	0
8:30 AM	0	23	91	10	0	24	295	28	0	17	2	26	0	27	2	35	580		3	1	0	0
8:45 AM	0	17	81	7	0	29	293	26	0	20	0	19	0	23	0	28	543		0	2	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	1	6
Lights	2	46	298	28	1	50	1,359	48	1	148	3	158	2	143	2	231	2,520
Mediums	0	1	25	0	0	0	28	4	0	0	0	0	0	1	0	3	62
Total	2	47	323	28	1	50	1,392	52	1	148	3	158	2	144	2	235	2,588



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Location: 16 SYCAMORE AVE & WILLOW AVE AM

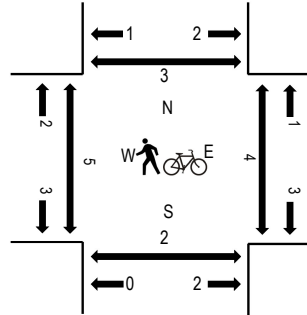
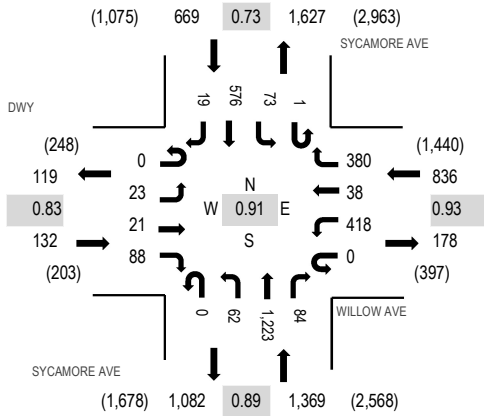
Date: Tuesday, August 27, 2019

Peak Hour: 07:45 AM - 08:45 AM

Peak 15-Minutes: 08:15 AM - 08:30 AM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	DWY Eastbound				WILLOW AVE Westbound				SYCAMORE AVE Northbound				SYCAMORE AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	4	6	12	0	59	11	65	0	17	210	35	0	24	77	6	526	2,300	0	1	0	0
7:15 AM	0	6	12	8	0	49	6	60	0	15	264	28	2	21	58	5	534	2,580	1	2	0	1
7:30 AM	0	0	2	5	0	77	10	61	0	13	266	29	0	26	84	6	579	2,871	3	1	0	1
7:45 AM	0	11	5	24	0	96	9	98	0	21	229	14	0	14	135	5	661	3,006	1	1	0	1
8:00 AM	0	3	7	25	0	130	8	75	0	15	280	28	0	24	208	3	806	2,986	2	0	0	0
8:15 AM	0	5	5	28	0	117	6	103	0	10	349	20	1	16	163	2	825		2	2	0	2
8:30 AM	0	4	4	11	0	75	15	104	0	16	365	22	0	19	70	9	714		0	1	0	0
8:45 AM	0	4	2	10	0	86	13	107	0	19	287	16	0	18	71	8	641		2	1	0	1

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2
Lights	0	23	21	88	0	407	36	355	0	62	1,198	77	1	56	567	18	2,909
Mediums	0	0	0	0	0	10	2	25	0	0	24	7	0	17	9	1	95
Total	0	23	21	88	0	418	38	380	0	62	1,223	84	1	73	576	19	3,006



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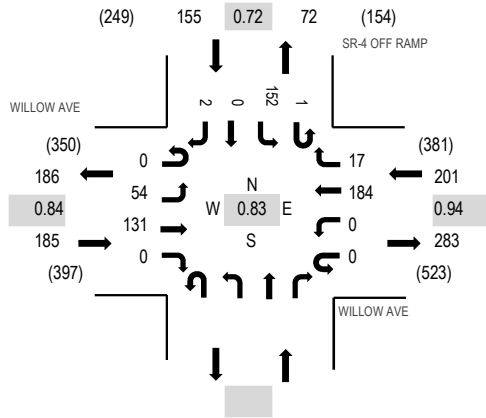
Location: 17 SR-4 OFF RAMP & WILLOW AVE AM

Date: Tuesday, August 27, 2019

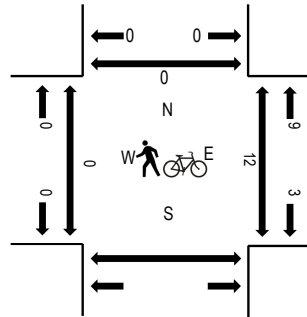
Peak Hour: 08:00 AM - 09:00 AM

Peak 15-Minutes: 08:00 AM - 08:15 AM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	WILLOW AVE Eastbound				WILLOW AVE Westbound				Northbound			SR-4 OFF RAMP Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South
7:00 AM	0	19	44	0	0	0	51	5					0	22	0	0	141	486	0	1	0
7:15 AM	0	19	39	0	0	0	30	5					0	22	0	0	115	508	0	10	0
7:30 AM	0	18	38	0	0	0	42	3					0	19	0	0	120	521	0	1	0
7:45 AM	0	9	26	0	0	0	40	4					0	30	0	1	110	531	0	4	0
8:00 AM	0	20	38	0	0	0	44	7					0	54	0	0	163	541	0	2	0
8:15 AM	0	12	28	0	0	0	49	5					0	34	0	0	128		0	2	0
8:30 AM	0	12	29	0	0	0	52	1					1	34	0	1	130		0	6	0
8:45 AM	0	10	36	0	0	0	39	4					0	30	0	1	120		0	2	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0					0	0	0	0	0
Lights	0	53	108	0	0	0	155	14					1	146	0	2	479
Mediums	0	1	23	0	0	0	29	3					0	6	0	0	62
Total	0	54	131	0	0	0	184	17					1	152	0	2	541



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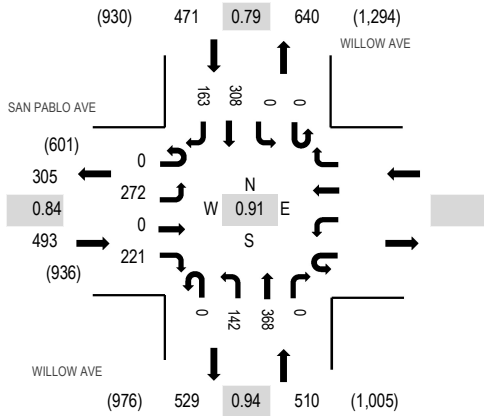
Location: 1 WILLOW AVE & SAN PABLO AVE PM

Date: Tuesday, August 27, 2019

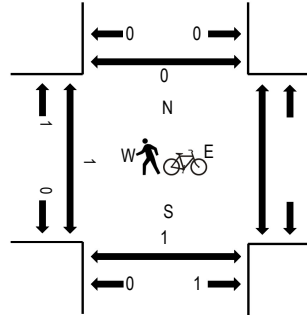
Peak Hour: 04:30 PM - 05:30 PM

Peak 15-Minutes: 05:00 PM - 05:15 PM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	SAN PABLO AVE Eastbound				Westbound			WILLOW AVE Northbound			WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru Right	U-Turn	Left	Thru Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	68	0	42				0	30	92	0	0	0	74	47	353	1,419	0	0	0
4:15 PM	0	64	0	34				0	29	99	0	0	0	75	41	342	1,471	0	0	0
4:30 PM	0	59	0	66				0	29	85	0	0	0	103	51	393	1,474	0	0	0
4:45 PM	0	58	0	44				0	36	96	0	0	0	56	41	331	1,443	0	0	0
5:00 PM	0	86	0	63				0	47	90	0	0	0	76	43	405	1,452	1	1	0
5:15 PM	0	69	0	48				0	30	97	0	0	0	73	28	345		0	0	0
5:30 PM	0	85	0	43				0	36	85	0	0	0	72	41	362		0	0	0
5:45 PM	0	65	0	42				0	28	96	0	0	0	65	44	340		0	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0					0	0	1	0	0	0	0	0	1
Lights	0	270	0	218					0	134	362	0	0	0	305	157	1,446
Mediums	0	2	0	3					0	8	5	0	0	0	3	6	27
Total	0	272	0	221					0	142	368	0	0	0	308	163	1,474



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Location: 2 WILLOW AVE & HAWTHORNE DR PM

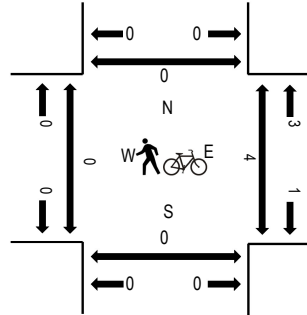
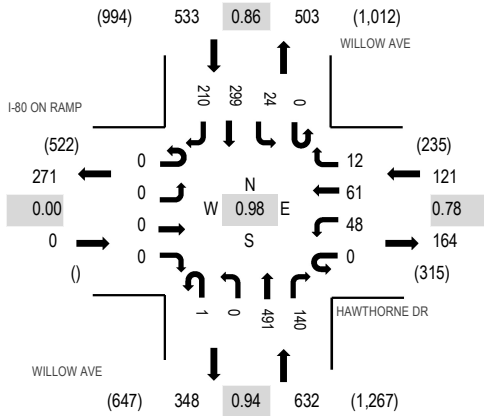
Date: Tuesday, August 27, 2019

Peak Hour: 04:30 PM - 05:30 PM

Peak 15-Minutes: 05:15 PM - 05:30 PM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	I-80 ON RAMP Eastbound				HAWTHORNE DR Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	0	0	0	6	17	1	0	0	124	34	0	3	68	51	304	1,247	0	1	0	0
4:15 PM	0	0	0	0	0	11	15	4	0	0	131	35	0	2	59	50	307	1,264	0	1	0	0
4:30 PM	0	0	0	0	0	12	15	1	0	0	104	29	0	6	88	61	316	1,286	0	1	0	0
4:45 PM	0	0	0	0	0	12	16	3	1	0	135	38	0	5	73	37	320	1,268	0	0	0	0
5:00 PM	0	0	0	0	0	9	11	3	0	0	126	31	0	6	73	62	321	1,249	0	1	0	0
5:15 PM	0	0	0	0	0	15	19	5	0	0	126	42	0	7	65	50	329		0	1	0	0
5:30 PM	0	0	0	0	0	10	18	0	0	0	121	34	0	5	73	37	298		0	0	0	0
5:45 PM	0	0	0	0	0	9	21	2	0	0	126	30	0	8	63	42	301		0	1	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Lights	0	0	0	0	0	48	60	12	1	0	478	139	0	23	296	208	1,265
Mediums	0	0	0	0	0	0	1	0	0	0	12	1	0	1	3	2	20
<b>Total</b>	0	0	0	0	0	48	61	12	1	0	491	140	0	24	299	210	1,286



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Location: 3 WILLOW AVE & I-80 OFF RAMP PM

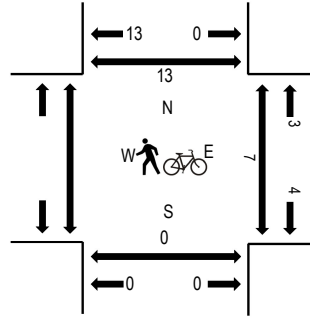
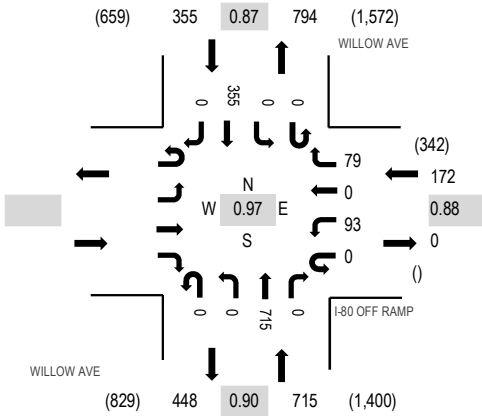
Date: Tuesday, August 27, 2019

Peak Hour: 04:30 PM - 05:30 PM

Peak 15-Minutes: 05:15 PM - 05:30 PM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	I-80 OFF RAMP				WILLOW AVE				WILLOW AVE				Total	Rolling Hour	Pedestrian Crossings							
	Eastbound		Westbound		Northbound		Southbound		Northbound		Southbound				West	East	South	North				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right						
4:00 PM					0	24	0	28	0	0	167	0	0	0	0	73	0	292	1,202	3	0	0
4:15 PM					0	12	0	32	0	0	177	0	0	0	0	72	0	293	1,214	2	0	0
4:30 PM					0	23	0	16	0	0	157	0	0	0	0	102	0	298	1,242	2	0	3
4:45 PM					0	25	0	29	0	0	183	0	0	0	0	82	0	319	1,233	0	0	1
5:00 PM					0	26	0	15	0	0	174	0	0	0	0	89	0	304	1,199	3	0	6
5:15 PM					0	19	0	19	0	0	201	0	0	0	0	82	0	321		0	0	3
5:30 PM					0	26	0	14	0	0	166	0	0	0	0	83	0	289		2	0	2
5:45 PM					0	15	0	19	0	0	175	0	0	0	0	76	0	285		0	0	5

**Peak Rolling Hour Flow Rates**

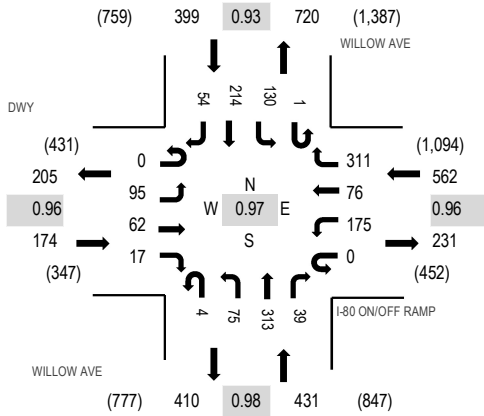
Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks					0	0	0	0	0	0	1	0	0	0	0	0	1
Lights					0	92	0	79	0	0	698	0	0	0	351	0	1,220
Mediums					0	1	0	0	0	0	16	0	0	0	4	0	21
Total					0	93	0	79	0	0	715	0	0	0	355	0	1,242



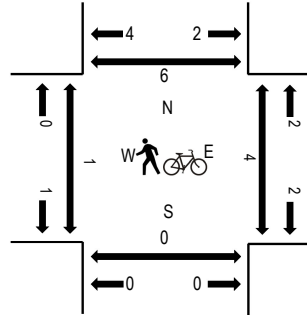
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Location: 4 WILLOW AVE & I-80 ON/OFF RAMP PM  
Date: Tuesday, August 27, 2019  
Peak Hour: 04:45 PM - 05:45 PM  
Peak 15-Minutes: 05:00 PM - 05:15 PM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	DWY				I-80 ON/OFF RAMP				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	20	22	5	0	33	21	74	2	19	74	6	0	26	54	7	363	1,510	1	2	0	2
4:15 PM	0	25	12	4	0	43	30	72	0	22	81	11	0	30	33	17	380	1,550	0	0	0	0
4:30 PM	0	27	13	10	0	37	21	68	0	16	60	13	0	41	54	14	374	1,555	0	0	0	0
4:45 PM	0	33	14	1	0	52	17	77	1	23	69	10	0	25	55	16	393	1,566	1	0	0	1
5:00 PM	0	23	16	5	0	41	21	81	2	22	76	8	0	38	58	12	403	1,537	0	0	0	0
5:15 PM	0	23	21	6	0	39	15	79	1	15	85	9	0	33	45	14	385		0	0	0	0
5:30 PM	0	16	11	5	0	43	23	74	0	15	83	12	1	34	56	12	385		0	2	0	5
5:45 PM	0	14	12	9	0	39	23	71	0	21	81	10	0	25	44	15	364		0	0	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	3
Lights	0	94	60	16	0	173	73	306	4	75	301	39	1	129	209	54	1,534
Mediums	0	1	0	1	0	2	3	4	0	0	12	0	0	1	5	0	29
Total	0	95	62	17	0	175	76	311	4	75	313	39	1	130	214	54	1,566





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Location: 5 WILLOW AVE & VIEWPOINTE BLVD PM

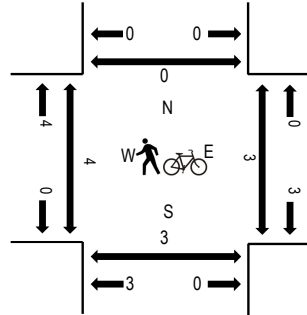
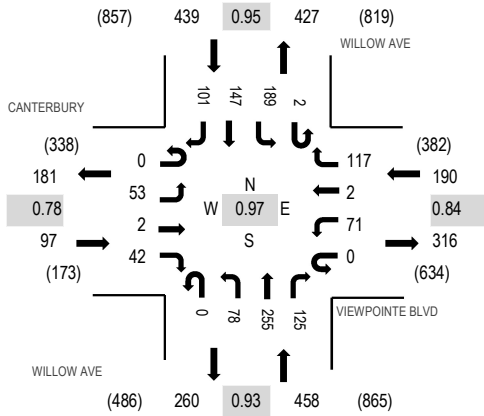
Date: Tuesday, August 27, 2019

Peak Hour: 04:45 PM - 05:45 PM

Peak 15-Minutes: 05:30 PM - 05:45 PM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	CANTERBURY Eastbound				VIEWPOINTE BLVD Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	11	1	6	0	18	1	35	0	15	50	30	2	46	35	22	272	1,102	0	0	0	0
4:15 PM	0	13	1	9	0	11	1	33	0	11	61	35	2	46	29	17	269	1,108	1	1	0	0
4:30 PM	0	7	1	8	0	17	2	26	0	16	47	24	0	49	35	28	260	1,140	0	0	0	0
4:45 PM	0	16	1	14	0	22	0	24	0	15	67	33	0	53	28	28	301	1,184	0	0	0	0
5:00 PM	0	12	0	12	0	16	0	29	0	15	62	27	1	39	40	25	278	1,175	3	1	1	0
5:15 PM	0	16	0	9	0	8	1	33	0	23	62	39	1	45	41	23	301		0	1	1	0
5:30 PM	0	9	1	7	0	25	1	31	0	25	64	26	0	52	38	25	304		1	1	1	0
5:45 PM	0	14	1	4	0	18	0	30	0	22	60	36	1	48	36	22	292		1	0	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lights	0	53	1	42	0	71	2	113	0	78	247	123	2	184	146	101	1,163
Mediums	0	0	1	0	0	0	0	4	0	0	8	2	0	5	1	0	21
<b>Total</b>	0	53	2	42	0	71	2	117	0	78	255	125	2	189	147	101	1,184



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Location: 6 WILLOW AVE & SR-4 OFF RAMP PM

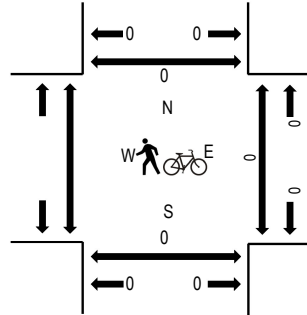
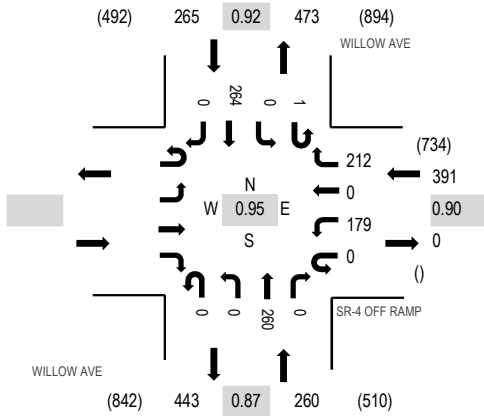
Date: Tuesday, August 27, 2019

Peak Hour: 04:45 PM - 05:45 PM

Peak 15-Minutes: 05:15 PM - 05:30 PM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	Eastbound				SR-4 OFF RAMP Westbound				WILLOW AVE Northbound				WILLOW AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM					0	38	0	36	0	0	63	0	0	0	51	0	188	836	1	0	0	
4:15 PM					0	44	0	47	0	0	61	0	0	0	53	0	205	854	0	0	0	
4:30 PM					0	51	0	35	0	0	55	0	0	0	65	0	206	889	0	0	0	
4:45 PM					0	42	0	48	0	0	75	0	0	0	72	0	237	916	0	0	0	
5:00 PM					0	36	0	48	0	0	55	0	0	0	67	0	206	900	0	0	0	
5:15 PM					0	53	0	56	0	0	72	0	0	0	59	0	240		0	0	0	
5:30 PM					0	48	0	60	0	0	58	0	1	0	66	0	233		0	0	0	
5:45 PM					0	39	0	53	0	0	71	0	0	0	58	0	221		0	0	0	

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks					0	1	0	0	0	0	0	0	0	0	0	0	1
Lights					0	176	0	210	0	0	251	0	1	0	262	0	900
Mediums					0	2	0	2	0	0	9	0	0	0	2	0	15
Total					0	179	0	212	0	0	260	0	1	0	264	0	916



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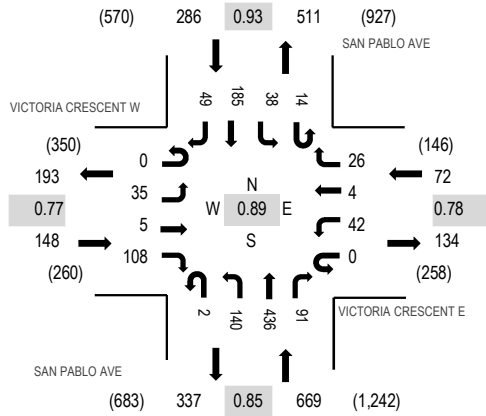
Location: 7 SAN PABLO AVE & VICTORIA CRESCENT E PM

Date: Tuesday, August 27, 2019

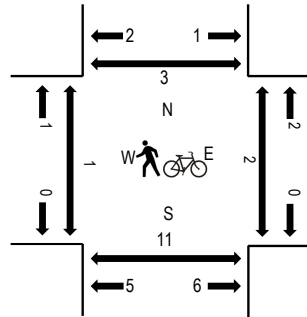
Peak Hour: 05:00 PM - 06:00 PM

Peak 15-Minutes: 05:00 PM - 05:15 PM

### Peak Hour - Motorized Vehicles



### Peak Hour - Pedestrians/Bicycles in Crosswalk



Note: Total study counts contained in parentheses.

### Traffic Counts - Motorized Vehicles

Interval Start Time	VICTORIA CRESCENT W Eastbound				VICTORIA CRESCENT E Westbound				SAN PABLO AVE Northbound				SAN PABLO AVE Southbound				Total	Rolling Hour	Pedestrian Crossings				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North	
4:00 PM	0	3	0	24	0	11	0	5	0	25	94	22	0	1	7	60	9	261	1,043	1	0	4	0
4:15 PM	0	10	1	18	0	8	1	4	0	28	79	20	0	0	7	50	11	237	1,111	1	0	2	0
4:30 PM	0	5	0	24	0	9	2	5	0	36	106	17	5	9	56	5	279	1,146	0	0	1	0	
4:45 PM	0	6	2	19	0	23	0	6	0	32	85	29	2	10	44	8	266	1,152	0	0	1	0	
5:00 PM	0	9	2	24	0	8	2	11	1	39	134	22	2	14	53	8	329	1,175	0	0	5	0	
5:15 PM	0	12	2	34	0	16	1	8	1	30	91	14	2	9	40	12	272		0	2	0	3	
5:30 PM	0	8	0	24	0	6	0	2	0	26	115	28	4	7	49	16	285		1	0	3	0	
5:45 PM	0	6	1	26	0	12	1	5	0	45	96	27	6	8	43	13	289		0	0	3	0	

### Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Lights	0	35	4	102	0	42	4	26	2	137	431	90	14	38	177	48	1,150
Mediums	0	0	1	6	0	0	0	0	0	3	5	1	0	0	6	1	23
Total	0	35	5	108	0	42	4	26	2	140	436	91	14	38	185	49	1,175



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Location: 8 SAN PABLO AVE & LINUS PAULING DR PM

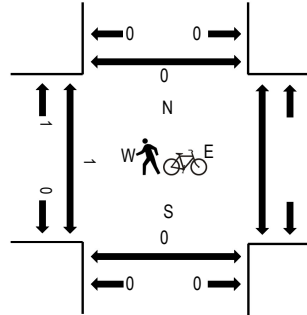
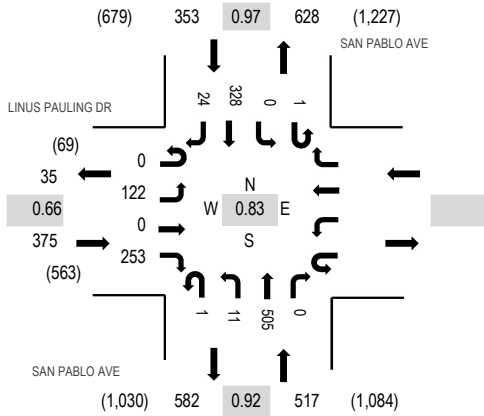
Date: Tuesday, August 27, 2019

Peak Hour: 04:30 PM - 05:30 PM

Peak 15-Minutes: 05:00 PM - 05:15 PM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	LINUS PAULING DR				SAN PABLO AVE				SAN PABLO AVE				Total	Rolling Hour	Pedestrian Crossings			
	Eastbound		Westbound		Northbound		Southbound		Total	West	East	South			North			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right								U-Turn	Left	Thru
4:00 PM	0	15	0	45	0	9	119	0	0	0	88	5	281	1,124	0	0	0	
4:15 PM	0	12	0	24	1	4	120	0	0	0	71	3	235	1,218	1	0	0	
4:30 PM	0	41	0	76	0	2	117	0	0	0	86	5	327	1,245	0	0	0	
4:45 PM	0	15	0	49	0	4	125	0	0	0	82	6	281	1,217	0	0	0	
5:00 PM	0	50	0	92	0	3	145	0	1	0	79	5	375	1,202	1	0	0	
5:15 PM	0	16	0	36	1	2	118	0	0	0	81	8	262		0	0	0	
5:30 PM	0	16	0	44	0	1	158	0	0	0	78	2	299		1	0	0	
5:45 PM	0	6	0	26	1	1	153	0	0	0	70	9	266		1	0	0	

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0					0	0	0	0	0	0	0	0	0
Lights	0	120	0	253					1	11	503	0	1	0	324	18	1,231
Mediums	0	2	0	0					0	0	2	0	0	0	4	6	14
Total	0	122	0	253					1	11	505	0	1	0	328	24	1,245



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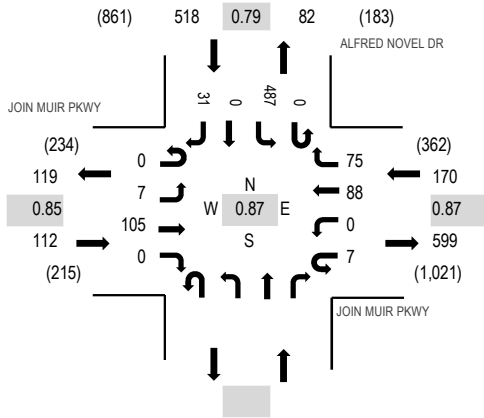
Location: 10 ALFRED NOVEL DR & JOIN MUIR PKWY PM

Date: Tuesday, August 27, 2019

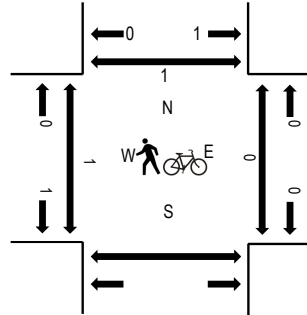
Peak Hour: 04:30 PM - 05:30 PM

Peak 15-Minutes: 04:30 PM - 04:45 PM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	JOIN MUIR PKWY Eastbound				JOIN MUIR PKWY Westbound				ALFRED NOVEL DR Northbound				ALFRED NOVEL DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	1	1	29	0	2	0	16	26	0	77	0	5	157	718	0	0	0	0	0			
4:15 PM	0	1	14	0	0	0	30	25	0	84	0	3	157	785	0	0	0	0				
4:30 PM	0	3	30	0	4	0	24	24	0	131	0	14	230	800	1	0	0	0				
4:45 PM	0	1	23	0	0	0	19	22	0	105	0	4	174	750	0	0	0	0				
5:00 PM	0	3	22	0	2	0	26	8	0	152	0	11	224	720	0	0	0	0				
5:15 PM	0	0	30	0	1	0	19	21	0	99	0	2	172	0	0	0	1	0				
5:30 PM	0	1	32	0	0	0	26	16	0	102	0	3	180	0	0	0	0	0				
5:45 PM	0	5	19	0	1	0	25	25	1	62	0	6	144	0	0	0	0	2				

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	
Lights	0	7	104	0	7	0	88	72	0	479	0	31	788				
Mediums	0	0	1	0	0	0	0	2	0	7	0	0	10				
Total	0	7	105	0	7	0	88	75	0	487	0	31	800				



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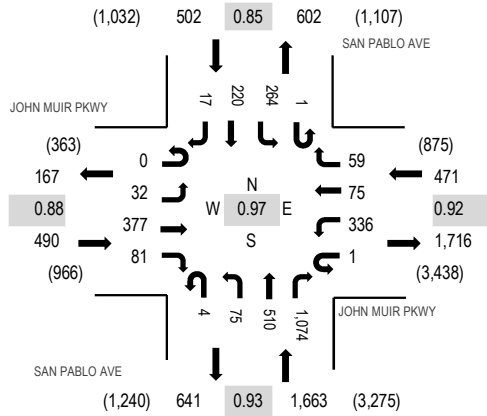
Location: 11 SAN PABLO AVE & JOHN MUIR PKWY PM

Date: Tuesday, August 27, 2019

Peak Hour: 05:00 PM - 06:00 PM

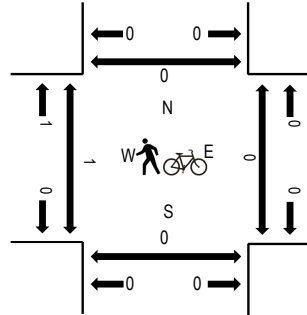
Peak 15-Minutes: 05:30 PM - 05:45 PM

**Peak Hour - Motorized Vehicles**



Note: Total study counts contained in parentheses.

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



**Traffic Counts - Motorized Vehicles**

Interval Start Time	JOHN MUIR PKWY Eastbound				JOHN MUIR PKWY Westbound				SAN PABLO AVE Northbound				SAN PABLO AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	11	76	12	0	53	9	11	0	27	119	301	0	75	61	7	762	3,022	0	1	0	0
4:15 PM	0	2	88	17	0	77	25	9	0	24	107	284	0	47	38	7	725	3,055	0	0	0	0
4:30 PM	0	8	112	19	0	85	19	13	0	26	96	253	0	80	73	8	792	3,101	0	0	0	0
4:45 PM	0	4	104	23	0	77	13	13	0	26	112	237	0	65	64	5	743	3,114	1	0	0	0
5:00 PM	0	9	122	26	1	66	16	18	0	15	126	226	0	97	71	2	795	3,126	0	0	0	0
5:15 PM	0	8	97	19	0	95	21	10	4	15	105	281	0	60	52	4	771		0	0	0	0
5:30 PM	0	10	97	17	0	87	14	15	0	22	140	286	0	59	53	5	805		0	0	0	0
5:45 PM	0	5	61	19	0	88	24	16	0	23	139	281	1	48	44	6	755		1	0	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	1	0	0	1	1	0	0	0	0	1	0	0	1	0	5
Lights	0	32	371	78	1	334	74	59	4	73	503	1,058	1	263	214	17	3,082
Mediums	0	0	5	3	0	1	0	0	0	2	7	15	0	1	5	0	39
Total	0	32	377	81	1	336	75	59	4	75	510	1,074	1	264	220	17	3,126



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Location: 12 SAN PABLO AVE & MARKET HALL DWY PM

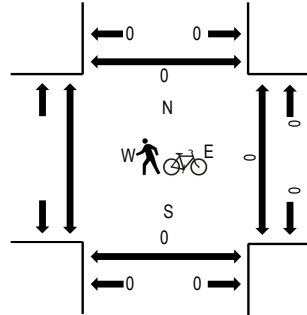
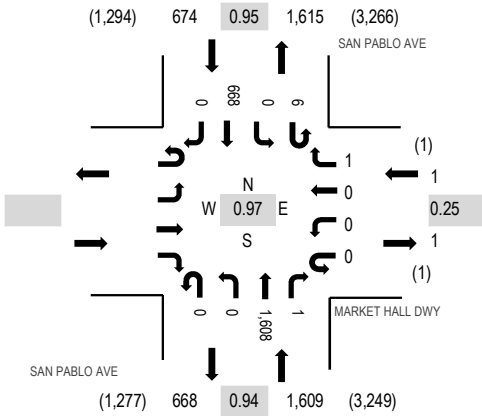
Date: Tuesday, August 27, 2019

Peak Hour: 05:00 PM - 06:00 PM

Peak 15-Minutes: 05:30 PM - 05:45 PM

**Peak Hour - Motorized Vehicles**

**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	MARKET HALL DWY				SAN PABLO AVE				SAN PABLO AVE				Total	Rolling Hour	Pedestrian Crossings						
	Eastbound		Westbound		Northbound		Southbound		U-Turn	Left	Thru	Right			West	East	South	North			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right					U-Turn	Left					Thru	Right	
4:00 PM					0	0	0	0	0	0	438	0	2	0	127	0	567	2,260	0	0	0
4:15 PM					0	0	0	0	0	0	420	0	4	0	135	0	559	2,218	0	0	0
4:30 PM					0	0	0	0	0	0	380	0	1	0	178	0	559	2,247	0	0	0
4:45 PM					0	0	0	0	0	0	402	0	4	0	169	0	575	2,277	0	0	0
5:00 PM					0	0	0	1	0	0	357	1	3	0	163	0	525	2,284	0	0	0
5:15 PM					0	0	0	0	0	0	402	0	0	0	186	0	588		0	0	0
5:30 PM					0	0	0	0	0	0	426	0	1	0	162	0	589		0	0	0
5:45 PM					0	0	0	0	0	0	423	0	2	0	157	0	582		0	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks					0	0	0	0	0	0	2	0	0	0	2	0	4
Lights					0	0	0	1	0	0	1,586	1	6	0	656	0	2,250
Mediums					0	0	0	0	0	0	20	0	0	0	10	0	30
Total					0	0	0	1	0	0	1,608	1	6	0	668	0	2,284



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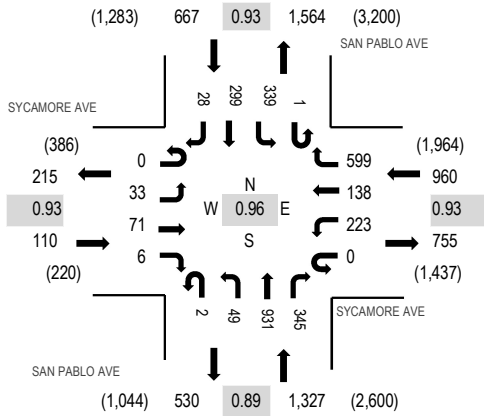
Location: 13 SAN PABLO AVE & SYCAMORE AVE PM

Date: Tuesday, August 27, 2019

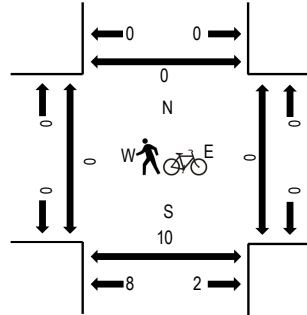
Peak Hour: 04:45 PM - 05:45 PM

Peak 15-Minutes: 04:45 PM - 05:00 PM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	SYCAMORE AVE Eastbound				SYCAMORE AVE Westbound				SAN PABLO AVE Northbound				SAN PABLO AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	12	10	3	0	49	30	186	0	7	241	73	0	69	55	7	742	3,008	0	2	1	0
4:15 PM	0	14	13	1	0	58	28	163	0	9	228	95	0	63	64	6	742	2,995	0	0	2	0
4:30 PM	0	10	15	1	0	42	22	151	0	3	222	90	0	78	91	5	730	3,030	0	0	2	1
4:45 PM	0	3	21	2	0	62	42	163	0	16	230	84	0	84	78	9	794	3,064	0	0	3	0
5:00 PM	0	8	20	2	0	57	39	150	1	6	208	79	0	82	70	7	729	3,059	0	0	2	0
5:15 PM	0	8	18	1	0	59	31	142	1	13	233	85	0	94	82	10	777		0	0	0	0
5:30 PM	0	14	12	1	0	45	26	144	0	14	260	97	1	79	69	2	764		0	0	5	0
5:45 PM	0	13	15	3	0	63	35	177	1	15	219	70	0	91	83	4	789		1	0	5	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3
Lights	0	32	71	6	0	211	138	588	2	49	925	332	1	331	296	28	3,010
Mediums	0	1	0	0	0	12	0	11	0	0	4	13	0	7	3	0	51
Total	0	33	71	6	0	223	138	599	2	49	931	345	1	339	299	28	3,064





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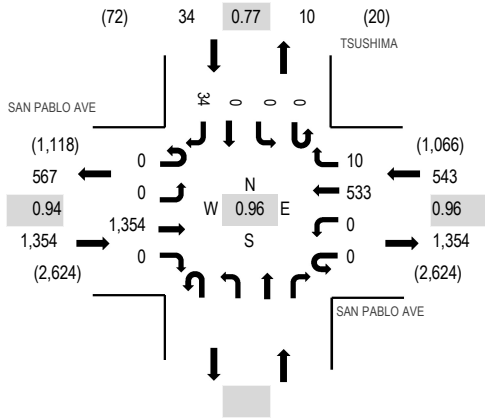
Location: 14 TSUSHIMA & SAN PABLO AVE PM

Date: Tuesday, August 27, 2019

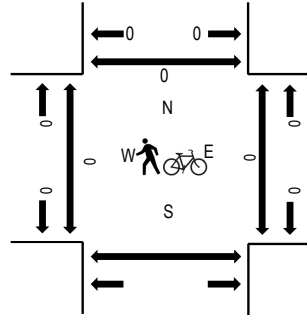
Peak Hour: 05:00 PM - 06:00 PM

Peak 15-Minutes: 05:15 PM - 05:30 PM

**Peak Hour - All Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts**

Interval Start Time	SAN PABLO AVE Eastbound				SAN PABLO AVE Westbound				Northbound			TSUSHIMA Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	332	0	0	0	116	2				0	0	0	8	458	1,831	0	0	0	
4:15 PM	0	0	303	0	0	0	124	2				0	0	0	8	437	1,815	0	0	0	
4:30 PM	0	0	320	0	0	0	131	5				0	0	0	14	470	1,880	0	2	1	
4:45 PM	0	0	315	0	0	0	142	1				0	0	0	8	466	1,901	0	0	0	
5:00 PM	0	0	298	0	0	0	131	0				0	0	0	13	442	1,931	0	0	0	
5:15 PM	0	0	359	0	0	0	135	3				0	0	0	5	502		0	0	0	
5:30 PM	0	0	360	0	0	0	117	5				0	0	0	9	491		0	0	0	
5:45 PM	0	0	337	0	0	0	150	2				0	0	0	7	496		0	0	0	

**Peak Rolling Hour Flow Rates**

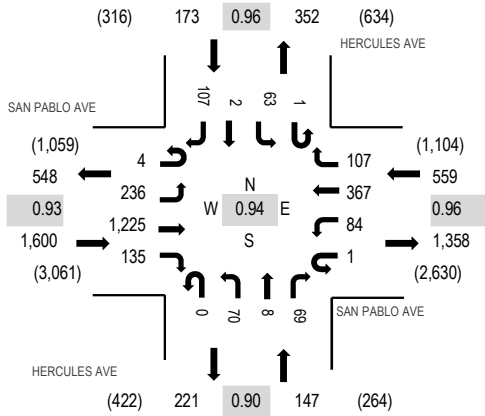
Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	1	0	0	0	0	0					0	0	0	0	1
Lights	0	0	1,336	0	0	0	520	10					0	0	0	34	1,900
Mediums	0	0	17	0	0	0	13	0					0	0	0	0	30
Total	0	0	1,354	0	0	0	533	10					0	0	0	34	1,931



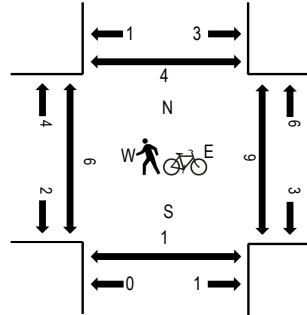
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Location: 15 HERCULES AVE & SAN PABLO AVE PM  
Date: Tuesday, August 27, 2019  
Peak Hour: 05:00 PM - 06:00 PM  
Peak 15-Minutes: 05:45 PM - 06:00 PM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	SAN PABLO AVE Eastbound				SAN PABLO AVE Westbound				HERCULES AVE Northbound				HERCULES AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	48	304	28	0	20	81	23	0	5	1	20	0	8	1	24	563	2,266	0	0	0	0
4:15 PM	2	39	271	23	2	15	83	28	0	18	0	19	0	13	1	24	538	2,247	1	3	4	0
4:30 PM	1	43	296	32	0	21	100	22	0	13	0	14	0	10	3	25	580	2,363	0	8	0	0
4:45 PM	0	51	288	35	0	21	103	26	0	13	1	13	0	14	1	19	585	2,408	0	4	1	1
5:00 PM	2	42	259	24	0	20	85	31	0	17	1	21	0	20	0	22	544	2,479	2	1	0	0
5:15 PM	1	61	331	35	1	20	94	32	0	12	3	19	1	10	1	33	654		1	4	0	1
5:30 PM	1	62	331	34	0	16	87	20	0	18	2	13	0	16	0	25	625		1	0	0	0
5:45 PM	0	71	304	42	0	28	101	24	0	23	2	16	0	17	1	27	656		1	4	1	3

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Lights	4	236	1,207	135	1	83	355	106	0	69	8	69	1	63	2	107	2,446
Mediums	0	0	16	0	0	1	12	1	0	1	0	0	0	0	0	0	31
Total	4	236	1,225	135	1	84	367	107	0	70	8	69	1	63	2	107	2,479



Location: 16 SYCAMORE AVE & WILLOW AVE PM

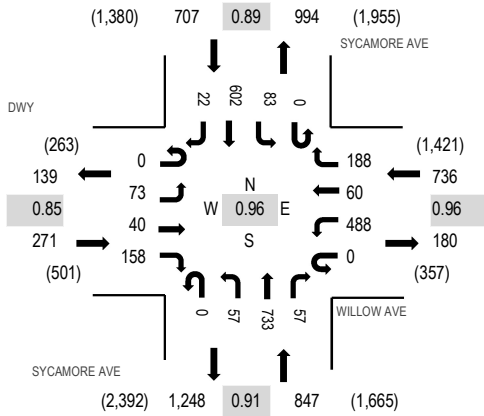
Date: Tuesday, August 27, 2019

Peak Hour: 05:00 PM - 06:00 PM

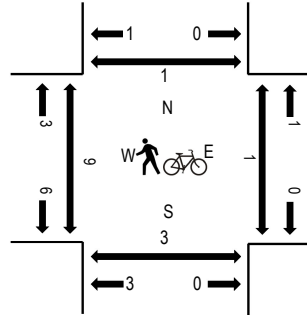
Peak 15-Minutes: 05:15 PM - 05:30 PM

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**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	DWY Eastbound				WILLOW AVE Westbound				SYCAMORE AVE Northbound				SYCAMORE AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	19	14	36	0	114	16	39	0	17	190	12	0	19	129	6	611	2,406	1	1	0	1
4:15 PM	0	12	6	42	0	110	9	54	0	8	183	9	2	23	142	5	605	2,393	1	1	0	1
4:30 PM	0	8	10	27	0	120	8	45	0	12	159	11	0	18	143	11	572	2,458	2	1	0	1
4:45 PM	0	13	14	29	0	108	13	49	0	12	188	17	0	24	144	7	618	2,531	1	2	0	2
5:00 PM	0	18	8	29	0	122	15	50	0	7	183	8	0	19	132	7	598	2,561	5	1	3	1
5:15 PM	0	18	15	47	0	128	16	48	0	23	165	12	0	24	171	3	670		0	0	0	0
5:30 PM	0	17	14	49	0	115	19	37	0	12	186	19	0	19	151	7	645		2	0	0	0
5:45 PM	0	20	3	33	0	123	10	53	0	15	199	18	0	21	148	5	648		2	0	0	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Lights	0	73	39	157	0	483	60	173	0	57	727	52	0	68	601	21	2,511
Mediums	0	0	1	1	0	5	0	15	0	0	6	5	0	13	1	1	48
Total	0	73	40	158	0	488	60	188	0	57	733	57	0	83	602	22	2,561



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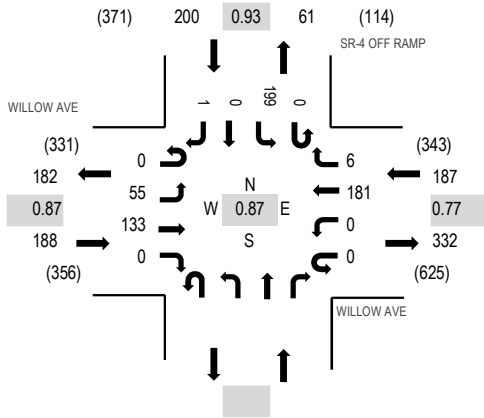
Location: 17 SR-4 OFF RAMP & WILLOW AVE PM

Date: Tuesday, August 27, 2019

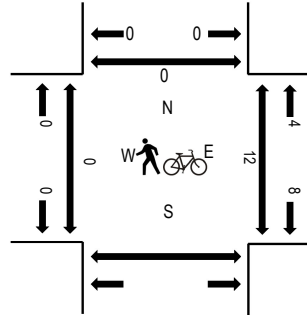
Peak Hour: 04:45 PM - 05:45 PM

Peak 15-Minutes: 05:15 PM - 05:30 PM

**Peak Hour - Motorized Vehicles**



**Peak Hour - Pedestrians/Bicycles in Crosswalk**



Note: Total study counts contained in parentheses.

**Traffic Counts - Motorized Vehicles**

Interval Start Time	WILLOW AVE Eastbound				WILLOW AVE Westbound				Northbound			SR-4 OFF RAMP Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South
4:00 PM	0	11	30	0	0	0	40	1					0	37	0	0	119	503	0	7	0
4:15 PM	0	13	30	0	0	0	29	3					0	42	0	0	117	513	0	1	0
4:30 PM	0	12	33	0	0	0	37	1					0	45	0	0	128	562	0	7	0
4:45 PM	0	14	40	0	0	0	38	1					0	46	0	0	139	575	0	1	0
5:00 PM	0	11	23	0	0	0	46	2					0	47	0	0	129	567	0	8	0
5:15 PM	0	14	35	0	0	0	61	2					0	54	0	0	166		0	2	0
5:30 PM	0	16	35	0	0	0	36	1					0	52	0	1	141		0	1	0
5:45 PM	0	9	30	0	0	0	43	2					1	46	0	0	131		0	1	0

**Peak Rolling Hour Flow Rates**

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	1	0	0	0	0	0					0	1	0	0	2
Lights	0	52	114	0	0	0	163	3					0	186	0	1	519
Mediums	0	3	18	0	0	0	18	3					0	12	0	0	54
Total	0	55	133	0	0	0	181	6					0	199	0	1	575

**Appendix B**  
**Synchro Signal Timing Sheets**

**West Contra Costa County 2018/19 PASS Signal Timing Project**

**Fine-Tuned Weekday Time-of-Day Schedule**

**San Pablo Avenue**

Intersection			Days of week	0:00	5:00	6:00	6:30	7:00	7:15	7:30	8:00	8:30	8:45	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	14:45	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:15	19:30	20:00	21:00	22:00	23:00			
San Pablo Avenue	at	John Muir Parkway - SR-4	M-F											Free											140 - P4		150 - Plan 3													Free				
San Pablo Avenue	at	Market Drive/Transit Center	M-F											Free											70 - P4		75 - Plan 3														Free			
San Pablo Avenue	at	Sycamore Avenue	M-F											Free											140 - P4		150 - Plan 3														Free			
San Pablo Avenue	at	Hercules Avenue	M-F											Free											140 - P4		150 - Plan 3														Free			
San Pablo Avenue	at	John Street	M-F																																							Free		
San Pablo Avenue	at	Pinole Valley Road	M-F	Free				100 - Plan 1						Free		75 - Plan 2	Free		90 - Plan 4		100 - Plan 3																					Free		
San Pablo Avenue	at	Fernandez Avenue	M-F	Free				100 - Plan 1						Free		75 - Plan 2	Free		90 - Plan 4		100 - Plan 3																						Free	
San Pablo Avenue	at	Tennent Avenue	M-F	Free				100 - Plan 1						Free		75 - Plan 2	Free		90 - Plan 4		100 - Plan 3																						Free	
San Pablo Avenue	at	Oak Ridge Road	M-F	Free				100 - Plan 1						Free		75 - Plan 2	Free		90 - Plan 4		100 - Plan 3																						Free	
San Pablo Avenue	at	Appian Way	M-F	Free				100 - Plan 1						Free					90 - Plan 4		100 - Plan 3																						Free	
San Pablo Avenue	at	Sunnyview Drive	M-F	Free				100 - Plan 1						Free					90 - Plan 4		100 - Plan 3																						Free	
San Pablo Avenue	at	Pinole Shores Drive	M-F	Free				130 - Plan 1						Free					130 - Plan 4		130 - Plan 3																						Free	
San Pablo Avenue	at	Belmont Way-Del Monte Dr.	M-F	Free				130 - Plan 1						Free					130 - Plan 4		130 - Plan 3																						Free	
San Pablo Avenue	at	Tara Hills Drive	M-F	Free				130 - Plan 1						Free					130 - Plan 3																								Free	
San Pablo Avenue	at	Rumill Boulevard	M-F	Free				110 - Plan 1						Free		102 - Plan 2			110 - Plan 4		116 - Plan 3																						Free	
San Pablo Avenue	at	El Portal Drive/Broadway St.	M-F	Free				110 - Plan 1						Free		102 - Plan 2			110 - Plan 4		116 - Plan 3																						Free	
San Pablo Avenue	at	Laurie Lane	M-F	Free				110 - Plan 1						Free		102 - Plan 2			110 - Plan 4		116 - Plan 3																						Free	
San Pablo Avenue	at	23rd Street/Road 20	M-F																Free																									
San Pablo Avenue	at	Van Ness Street	M-F	Free				124 - Plan 1						Free		106 - Plan 2	Free		110 - Plan 4		120 - Plan 3																						Free	
San Pablo Avenue	at	Church Lane	M-F	Free				124 - Plan 1						Free		106 - Plan 2	Free		110 - Plan 4		120 - Plan 3																						Free	
San Pablo Avenue	at	Evergreen Terrace/Gateway Ave	M-F	Free				124 - Plan 1						Free		106 - Plan 2	Free		110 - Plan 4		120 - Plan 3																						Free	
San Pablo Avenue	at	Vale Road	M-F	Free				124 - Plan 1						Free		106 - Plan 2	Free		110 - Plan 4		120 - Plan 3																						Free	
San Pablo Avenue	at	San Pablo Dam Road	M-F																Free																									
San Pablo Avenue	at	Central Avenue	M-F	Free				125 - Plan 1								124 - Plan 2			130 - Plan 3		124 - Plan 2																						Free	
			FT Wed	Free				125 - Plan 1								124 - Plan 2			140 - Plan 16		130 - P17																						Free	
San Pablo Avenue	at	Fairmount Avenue	M-F	Free				125 - Plan 1								124 - Plan 2			130 - Plan 3		124 - Plan 2																						Free	
			FT Wed	Free				125 - Plan 1								124 - Plan 2			140 - Plan 16		130 - P17																						Free	
San Pablo Avenue	at	Carlson Boulevard	M-F	Free				125 - Plan 1								124 - Plan 2			130 - Plan 3		124 - Plan 2																						Free	
			FT Wed	Free				125 - Plan 1								124 - Plan 2			140 - Plan 16		130 - P17																						Free	

Note: Cycle Lengths shown are in seconds

Free = Signal operating uncoordinated

**Bold Text = Cycle/Pattern Change during Fine-Tuning**

**Bold Outline = Schedule Change with Recommendations**

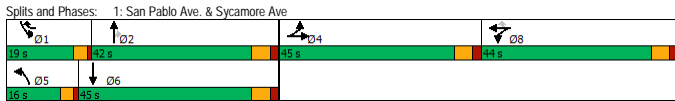
**Bold Outline = Schedule Change during Fine-Tuning**

1: San Pablo Ave. & Sycamore Ave  
Timings

Fine-Tuned Timing  
AM PEAK

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	41	149	472	119	1070	29	407	319	342	728
Future Volume (vph)	41	149	472	119	1070	29	407	319	342	728
Turn Type	Split	NA	Split	NA	pm+ov	Prot	NA	Perm	Prot	NA
Protected Phases	4	4	8	8	1	5	2	2	1	6
Permitted Phases					8			2		
Detector Phase	4	4	8	8	1	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	4.0	4.0	4.0	4.0	8.0	8.0	4.0	8.0
Minimum Split (s)	45.0	45.0	44.0	44.0	8.0	16.0	42.0	42.0	8.0	41.0
Total Split (s)	45.0	45.0	44.0	44.0	19.0	16.0	42.0	42.0	19.0	45.0
Total Split (%)	30.0%	30.0%	29.3%	29.3%	12.7%	10.7%	28.0%	28.0%	12.7%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	3.0	4.4	4.4	3.0	4.4
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	1.0	2.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	4.0	6.4	6.4	4.0	6.4
Lead/Lag					Lead	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	Min	Min	None	Min	None
Act Effcd Green (s)	17.8	17.8	31.3	31.3	48.9	7.9	26.9	26.9	15.5	39.8
Actuated g/C Ratio	0.16	0.16	0.27	0.27	0.43	0.07	0.23	0.23	0.14	0.35
v/c Ratio	0.17	0.35	0.76	0.76	0.76	0.14	0.57	0.57	0.81	0.67
Control Delay	45.6	43.7	51.8	51.6	11.9	58.9	43.2	7.9	65.0	38.6
Queue Delay	0.0	0.0	0.7	0.8	0.1	0.0	0.0	0.0	0.0	0.3
Total Delay	45.6	43.7	52.6	52.4	11.9	58.9	43.2	7.9	65.0	38.9
LOS	D	D	D	D	B	E	D	A	E	D
Approach Delay	44.1		26.4			28.9				47.1
Approach LOS	D		C			C				D

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 114.6	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 33.7	Intersection LOS: C
Intersection Capacity Utilization 77.4%	ICU Level of Service D
Analysis Period (min) 15	

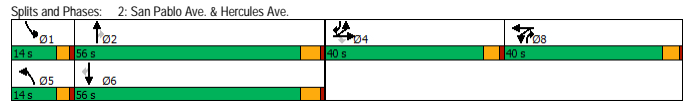


2: San Pablo Ave. & Hercules Ave.  
Timings

Fine-Tuned Timing  
AM PEAK

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	208	2	222	12	32	315	20	46	1150	68
Future Volume (vph)	208	2	222	12	32	315	20	46	1150	68
Turn Type	Split	NA	Perm	NA	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	4	4	4	8	5	2	8	1	6	4
Permitted Phases				4			2			
Detector Phase	4	4	4	8	5	2	8	1	6	4
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	10.0	4.0	4.0	10.0	4.0
Minimum Split (s)	40.0	40.0	40.0	40.0	14.0	31.0	40.0	14.0	35.0	40.0
Total Split (s)	40.0	40.0	40.0	40.0	14.0	56.0	40.0	14.0	56.0	40.0
Total Split (%)	26.7%	26.7%	26.7%	26.7%	9.3%	37.3%	26.7%	9.3%	37.3%	26.7%
Yellow Time (s)	3.6	3.6	3.6	3.6	3.0	4.4	3.6	3.0	4.4	3.6
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.0	5.4	4.6	4.0	5.4	4.6
Lead/Lag					Lead	Lag		Lead	Lag	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	Min	None	None	Min	None
Act Effcd Green (s)	19.7	19.7	19.7	15.8	6.8	49.7	66.3	7.5	52.6	73.1
Actuated g/C Ratio	0.18	0.18	0.18	0.14	0.06	0.45	0.60	0.07	0.48	0.67
v/c Ratio	0.73	0.01	0.51	0.67	0.31	0.21	0.02	0.42	0.74	0.07
Control Delay	58.1	41.0	9.3	36.2	64.0	22.7	0.8	66.7	30.5	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.1	41.0	9.3	36.2	64.0	22.7	0.8	66.7	30.5	4.2
LOS	E	D	A	D	E	C	A	E	C	A
Approach Delay	32.9		36.2			25.0				30.4
Approach LOS	C		D			C				C

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 109.7	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 30.9	Intersection LOS: C
Intersection Capacity Utilization 74.4%	ICU Level of Service D
Analysis Period (min) 15	

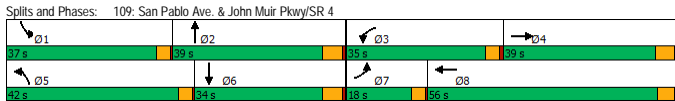


109: San Pablo Ave. & John Muir Pkwy/SR 4  
Timings

Fine-Tuned Timing  
AM PEAK

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	29	139	608	259	278	337	908	196	442
Future Volume (vph)	29	139	608	259	278	337	908	196	442
Turn Type	Prot	NA	Prot	NA	Prot	NA	Free	Prot	NA
Protected Phases	7	4	3	8	5	2		1	6
Permitted Phases							Free		
Detector Phase	7	4	3	8	5	2		1	6
Switch Phase									
Minimum Initial (s)	14.0	10.0	11.0	10.0	13.0	10.0		13.0	10.0
Minimum Split (s)	18.0	33.0	22.0	15.0	25.0	16.0		20.0	33.0
Total Split (s)	18.0	39.0	35.0	56.0	42.0	39.0		37.0	34.0
Total Split (%)	12.0%	26.0%	23.3%	37.3%	28.0%	26.0%		24.7%	22.7%
Yellow Time (s)	3.0	4.1	3.0	3.7	3.0	4.4		3.0	4.4
All-Red Time (s)	0.5	1.0	1.0	1.0	0.5	1.0		0.5	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	3.5	5.1	4.0	4.7	3.5	5.4		3.5	5.4
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag		Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Min		None	Min
Act Effcd Green (s)	14.6	16.7	28.3	40.3	25.1	30.5	115.0	20.8	26.1
Actuated g/C Ratio	0.13	0.15	0.25	0.35	0.22	0.27	1.00	0.18	0.23
v/c Ratio	0.16	0.45	0.80	0.63	0.79	0.39	0.64	0.74	0.76
Control Delay	55.6	42.2	51.0	39.4	59.5	38.5	2.0	61.3	50.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.6	42.2	51.0	39.4	59.5	38.5	2.0	61.3	50.0
LOS	E	D	D	D	E	D	A	E	D
Approach Delay	44.0		46.6			20.6			53.2
Approach LOS	D		D			C			D

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 115	
Natural Cycle: 115	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 36.5	Intersection LOS: D
Intersection Capacity Utilization 74.0%	ICU Level of Service D
Analysis Period (min) 15	

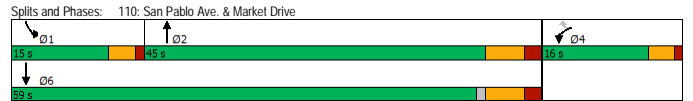


110: San Pablo Ave. & Market Drive  
Timings

Fine-Tuned Timing  
AM PEAK

Lane Group	WBR	NBT	SBT	Ø1
Lane Configurations	←	←	←	
Traffic Volume (vph)	1	1513	1087	
Future Volume (vph)	1	1513	1087	
Turn Type	Perm	NA	NA	
Protected Phases		2	6	1
Permitted Phases	4			
Detector Phase	4	2	6	
Switch Phase				
Minimum Initial (s)	4.0	6.0	5.0	4.0
Minimum Split (s)	14.0	30.0	12.0	14.0
Total Split (s)	16.0	45.0	59.0	15.0
Total Split (%)	21.1%	59.2%	77.6%	20%
Yellow Time (s)	3.0	4.4	4.4	3.0
All-Red Time (s)	1.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.4	6.4	
Lead/Lag		Lag		Lead
Lead-Lag Optimize?				
Recall Mode	None	Min	Min	None
Act Effcd Green (s)	5.7	46.8	46.8	
Actuated g/C Ratio	0.12	0.96	0.96	
v/c Ratio	0.01	0.35	0.37	
Control Delay	0.0	1.0	1.2	
Queue Delay	0.0	0.0	0.0	
Total Delay	0.0	1.0	1.2	
LOS	A	A	A	
Approach Delay		1.0	1.2	
Approach LOS		A	A	

Intersection Summary	
Cycle Length: 76	
Actuated Cycle Length: 49	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.37	
Intersection Signal Delay: 1.0	Intersection LOS: A
Intersection Capacity Utilization 41.3%	ICU Level of Service A
Analysis Period (min) 15	

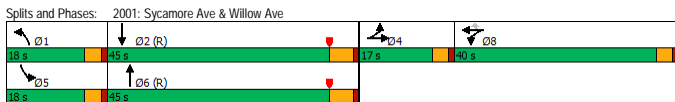


Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↕	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	20	451	44	395	77	1274	67	692
Future Volume (vph)	20	451	44	395	77	1274	67	692
Turn Type	NA	Split	NA	Perm	Prot	NA	Prot	NA
Protected Phases	4	8	8	8	1	6	5	2
Permitted Phases				8				
Detector Phase	4	8	8	8	1	6	5	2
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	7.0	11.0	8.0
Minimum Split (s)	14.0	40.0	40.0	40.0	15.0	27.0	15.0	39.0
Total Split (s)	17.0	40.0	40.0	40.0	18.0	45.0	18.0	45.0
Total Split (%)	14.2%	33.3%	33.3%	33.3%	15.0%	37.5%	15.0%	37.5%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	4.4	3.0	4.4
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	5.4	4.0	5.4
Lead/Lag				Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)	11.7	25.4	25.4	25.4	11.6	56.6	11.9	53.9
Actuated g/C Ratio	0.10	0.21	0.21	0.21	0.10	0.47	0.10	0.45
v/c Ratio	0.71	0.67	0.52	0.47	0.54	0.68	0.49	0.58
Control Delay	49.6	47.7	16.0	7.6	80.1	12.4	60.7	28.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
Total Delay	49.6	47.7	16.0	7.6	80.1	12.4	60.7	30.4
LOS	D	D	B	A	F	B	E	C
Approach Delay	49.6	30.0			16.1			32.9
Approach LOS	D	C			B			C

**Intersection Summary**

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 82 (68%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow  
 Natural Cycle: 110  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.71  
 Intersection Signal Delay: 25.4  
 Intersection Capacity Utilization 71.5%  
 Analysis Period (min) 15

Intersection LOS: C  
 ICU Level of Service C

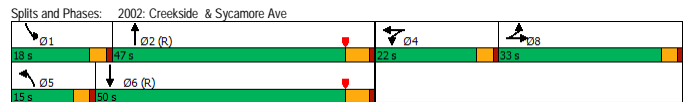


Lane Group	EBT	WBL	WBT	NBT	SBL	SBT	Ø5
Lane Configurations	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	0	19	0	1390	133	1090	
Future Volume (vph)	0	19	0	1390	133	1090	
Turn Type	NA	Split	NA	NA	Prot	NA	
Protected Phases	8	4	4	2	1	6	5
Permitted Phases							
Detector Phase	8	4	4	2	1	6	
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	8.0	10.0	7.0	10.0
Minimum Split (s)	33.0	20.0	20.0	37.0	18.0	28.0	14.0
Total Split (s)	33.0	22.0	22.0	47.0	18.0	50.0	15.0
Total Split (%)	27.5%	18.3%	18.3%	39.2%	15.0%	41.7%	13%
Yellow Time (s)	3.0	3.0	3.0	4.4	3.0	4.4	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	5.4	4.0	5.4	
Lead/Lag				Lag	Lead	Lag	Lead
Lead-Lag Optimize?							
Recall Mode	None	None	None	C-Max	None	C-Max	None
Act Effct Green (s)	13.8	10.0	10.0	73.0	17.0	94.0	
Actuated g/C Ratio	0.12	0.08	0.08	0.61	0.14	0.78	
v/c Ratio	0.01	0.21	0.28	0.78	0.69	0.51	
Control Delay	0.0	55.1	1.1	18.3	65.4	7.6	
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	
Total Delay	0.0	55.1	1.1	18.4	65.4	7.7	
LOS	A	E	A	B	E	A	
Approach Delay			9.2	18.4		13.9	
Approach LOS			A	B		B	

**Intersection Summary**

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 77 (64%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 140  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.78  
 Intersection Signal Delay: 15.8  
 Intersection Capacity Utilization 67.3%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service C



Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	841	263	40	1052	349	61
Future Volume (vph)	841	263	40	1052	349	61
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	2		1	6	4	4
Permitted Phases		2				4
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	7.0	7.0	9.0	7.0	9.0	9.0
Minimum Split (s)	40.0	40.0	16.0	20.0	37.0	37.0
Total Split (s)	58.0	58.0	17.0	75.0	45.0	45.0
Total Split (%)	48.3%	48.3%	14.2%	62.5%	37.5%	37.5%
Yellow Time (s)	4.4	4.4	3.0	4.4	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	4.0	5.4	4.0	4.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	62.7	62.7	9.4	73.5	37.1	37.1
Actuated g/C Ratio	0.52	0.52	0.08	0.61	0.31	0.31
v/c Ratio	0.60	0.39	0.35	0.58	0.90	0.16
Control Delay	16.0	5.6	62.6	8.7	60.0	6.4
Queue Delay	0.4	0.4	0.0	3.0	0.0	0.0
Total Delay	16.4	6.0	62.6	11.7	60.0	6.4
LOS	B	A	E	B	E	A
Approach Delay	13.9			13.6	52.0	
Approach LOS	B			B	D	

**Intersection Summary**

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 75 (63%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 95  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.90  
 Intersection Signal Delay: 20.4  
 Intersection Capacity Utilization 60.4%  
 Analysis Period (min) 15

Intersection LOS: C  
 ICU Level of Service B

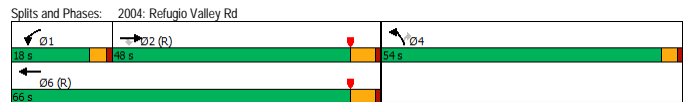


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	225	672	123	267	855	167
Future Volume (vph)	225	672	123	267	855	167
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	2		1	6	4	4
Permitted Phases		2				4
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	7.0	7.0	9.0	7.0	10.0	10.0
Minimum Split (s)	34.0	34.0	18.0	20.0	32.0	32.0
Total Split (s)	48.0	48.0	18.0	66.0	54.0	54.0
Total Split (%)	40.0%	40.0%	15.0%	55.0%	45.0%	45.0%
Yellow Time (s)	4.4	4.4	3.0	4.4	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	4.0	5.4	4.0	4.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	48.1	48.1	12.7	64.9	45.7	45.7
Actuated g/C Ratio	0.40	0.40	0.11	0.54	0.38	0.38
v/c Ratio	0.22	0.80	0.76	0.16	0.86	0.30
Control Delay	13.9	24.8	77.3	14.8	41.5	4.3
Queue Delay	0.0	49.8	0.0	0.0	4.5	0.0
Total Delay	13.9	74.6	77.3	14.8	46.0	4.3
LOS	B	E	E	B	D	A
Approach Delay	59.4			34.6	39.2	
Approach LOS	E			C	D	

**Intersection Summary**

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 100 (83%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 85  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.86  
 Intersection Signal Delay: 46.8  
 Intersection Capacity Utilization 66.4%  
 Analysis Period (min) 15

Intersection LOS: D  
 ICU Level of Service C



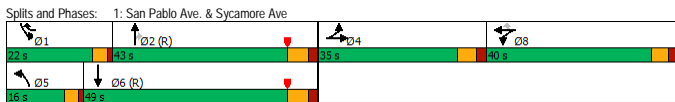


1: San Pablo Ave. & Sycamore Ave  
Timings

Fine-Tuned Timing  
Afternoon School

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	
Lane Configurations	↑↑		↑↑		↑↑		↑↑		↑↑	
Traffic Volume (vph)	51	66	308	142	871	56	803	295	324	
Future Volume (vph)	51	66	308	142	871	56	803	295	324	
Turn Type	Split	NA	Split	NA	pm+ov	Prot	NA	Perm	Prot	
Protected Phases	4	4	8	8	1	5	2	1	6	
Permitted Phases					8		2			
Detector Phase	4	4	8	8	1	5	2	1	6	
Switch Phase										
Minimum Initial (s)	10.0	10.0	4.0	4.0	4.0	4.0	8.0	8.0	4.0	
Minimum Split (s)	35.0	35.0	40.0	40.0	22.0	15.0	42.0	22.0	41.0	
Total Split (s)	35.0	35.0	40.0	40.0	22.0	16.0	43.0	22.0	49.0	
Total Split (%)	25.0%	25.0%	28.6%	28.6%	15.7%	11.4%	30.7%	15.7%	35.0%	
Yellow Time (s)	4.0	4.0	3.6	3.6	3.0	3.0	4.4	4.4	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	1.0	2.0	2.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	5.6	5.6	4.0	4.0	6.4	6.4	4.0	
Lead/Lag					Lead	Lead	Lag	Lag	Lead	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	18.7	18.7	28.2	28.2	51.7	9.1	49.2	21.9	64.2	
Actuated g/C Ratio	0.13	0.13	0.20	0.20	0.37	0.06	0.35	0.16	0.46	
v/c Ratio	0.28	0.21	0.75	0.74	0.72	0.30	0.76	0.48	0.65	
Control Delay	54.7	46.1	65.8	65.2	16.7	95.6	28.9	6.5	53.3	
Queue Delay	0.0	0.0	0.6	0.7	0.0	0.0	0.0	0.0	0.0	
Total Delay	54.7	46.1	66.4	66.0	16.7	95.6	28.9	6.5	53.3	
LOS	D	D	E	E	B	F	C	A	D	
Approach Delay	49.5		33.5		26.4		40.0			
Approach LOS	D		C		C		D			

**Intersection Summary**  
 Cycle Length: 140  
 Actuated Cycle Length: 140  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 140  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.76  
 Intersection Signal Delay: 32.7  
 Intersection Capacity Utilization 90.8%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service E

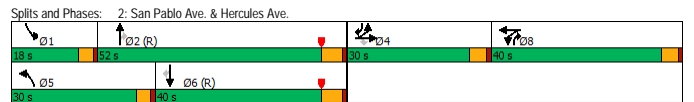


2: San Pablo Ave. & Hercules Ave.  
Timings

Fine-Tuned Timing  
Afternoon School

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↑↑		↑↑		↑↑		↑↑		↑↑		
Traffic Volume (vph)	80	3	63	7	212	1150	116	144	646	129	
Future Volume (vph)	80	3	63	7	212	1150	116	144	646	129	
Turn Type	Split	NA	Perm	NA	Prot	NA	pm+ov	Prot	NA	pm+ov	
Protected Phases	4	4	4	8	5	2	8	1	6	4	
Permitted Phases					4		2				
Detector Phase	4	4	4	8	5	2	8	1	6	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	10.0	4.0	4.0	10.0	4.0	
Minimum Split (s)	30.0	30.0	30.0	40.0	25.0	31.0	40.0	18.0	35.0	30.0	
Total Split (s)	30.0	30.0	30.0	40.0	30.0	52.0	40.0	18.0	40.0	30.0	
Total Split (%)	21.4%	21.4%	21.4%	28.6%	21.4%	37.1%	28.6%	12.9%	28.6%	21.4%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.0	4.4	3.6	3.0	4.4	3.6	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.0	5.4	4.6	4.0	5.4	4.6	
Lead/Lag					Lead	Lag		Lead	Lag		
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	C-Min	None	None	C-Min	None	
Act Effct Green (s)	13.4	13.4	13.4	17.6	21.8	70.7	89.1	19.7	68.6	82.8	
Actuated g/C Ratio	0.10	0.10	0.10	0.13	0.16	0.50	0.64	0.14	0.49	0.59	
v/c Ratio	0.67	0.02	0.35	0.32	0.81	0.68	0.12	0.69	0.44	0.16	
Control Delay	79.9	54.7	8.0	23.3	78.3	32.3	2.2	60.0	39.2	8.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	79.9	54.7	8.0	23.3	78.3	32.3	2.2	60.0	39.2	8.1	
LOS	E	D	A	C	E	C	A	E	D	A	
Approach Delay	48.3		23.3		36.5		38.1				
Approach LOS	D		C		D		D				

**Intersection Summary**  
 Cycle Length: 140  
 Actuated Cycle Length: 140  
 Offset: 89 (64%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 140  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.81  
 Intersection Signal Delay: 37.3  
 Intersection Capacity Utilization 67.6%  
 Analysis Period (min) 15  
 Intersection LOS: D  
 ICU Level of Service C

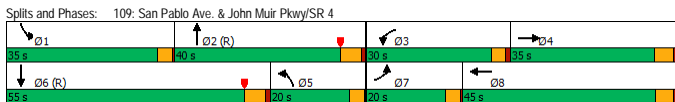


109: San Pablo Ave. & John Muir Pkwy/SR 4  
Timings

Fine-Tuned Timing  
Afternoon School

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	
Lane Configurations	↑↑		↑↑		↑↑		↑↑		↑↑	
Traffic Volume (vph)	26	217	270	70	128	459	1187	158	251	
Future Volume (vph)	26	217	270	70	128	459	1187	158	251	
Turn Type	Prot	NA	Prot	NA	Prot	NA	Free	Prot	NA	
Protected Phases	7	4	3	8	5	2		1	6	
Permitted Phases								Free		
Detector Phase	7	4	3	8	5	2		1	6	
Switch Phase										
Minimum Initial (s)	14.0	10.0	11.0	10.0	13.0	10.0		13.0	10.0	
Minimum Split (s)	17.5	33.0	22.0	15.5	18.0	16.0		25.0	33.0	
Total Split (s)	20.0	35.0	30.0	45.0	20.0	40.0		35.0	55.0	
Total Split (%)	14.3%	25.0%	21.4%	32.1%	14.3%	28.6%		25.0%	39.3%	
Yellow Time (s)	3.0	4.1	3.0	3.7	3.0	4.4		3.0	4.4	
All-Red Time (s)	0.5	1.0	1.0	1.0	0.5	1.0		0.5	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	5.1	4.0	4.7	3.5	5.4		3.5	5.4	
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	14.0	17.8	16.3	28.0	16.5	69.9	140.0	18.1	71.4	
Actuated g/C Ratio	0.10	0.13	0.12	0.20	0.12	0.50	1.00	0.13	0.51	
v/c Ratio	0.16	0.66	0.73	0.33	0.68	0.29	0.83	0.74	0.16	
Control Delay	60.1	59.7	70.9	41.8	60.6	13.7	16.8	77.0	19.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	60.1	59.7	70.9	41.8	60.6	13.7	16.8	77.0	19.6	
LOS	E	E	E	D	E	B	B	E	B	
Approach Delay	59.8		62.3		19.1		40.5			
Approach LOS	E		E		B		D			

**Intersection Summary**  
 Cycle Length: 140  
 Actuated Cycle Length: 140  
 Offset: 137 (98%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 110  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 31.9  
 Intersection Capacity Utilization 57.4%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service B

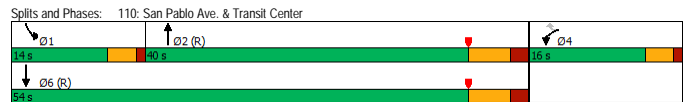


110: San Pablo Ave. & Transit Center  
Timings

Fine-Tuned Timing  
Afternoon School

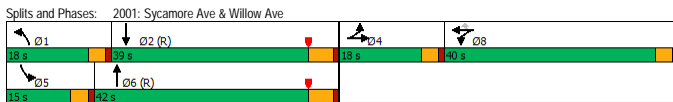
Lane Group	WBR	NBT	SBL	SBT
Lane Configurations	↑↑		↑↑	
Traffic Volume (vph)	2	1780	2	590
Future Volume (vph)	2	1780	2	590
Turn Type	Perm	NA	Prot	NA
Protected Phases	4	2	1	6
Permitted Phases				
Detector Phase	4	2	1	6
Switch Phase				
Minimum Initial (s)	4.0	6.0	4.0	5.0
Minimum Split (s)	16.0	30.0	14.0	12.0
Total Split (s)	16.0	40.0	14.0	54.0
Total Split (%)	22.9%	57.1%	20.0%	77.1%
Yellow Time (s)	3.0	4.4	3.0	4.4
All-Red Time (s)	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.4	4.0	6.4
Lead/Lag		Lag	Lead	
Lead-Lag Optimize?				
Recall Mode	None	C-Max	None	C-Max
Act Effct Green (s)	5.5	65.0	4.6	66.8
Actuated g/C Ratio	0.08	0.93	0.07	0.95
v/c Ratio	0.01	0.42	0.02	0.18
Control Delay	0.0	0.9	38.0	0.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	0.0	1.0	38.0	0.5
LOS	A	A	D	A
Approach Delay	1.0		0.6	
Approach LOS	A		A	

**Intersection Summary**  
 Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 8 (11%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.42  
 Intersection Signal Delay: 0.9  
 Intersection Capacity Utilization 46.4%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service A



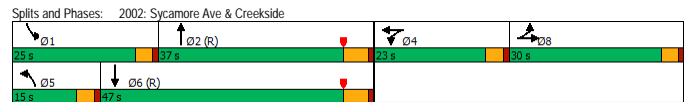
Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↕	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	25	549	66	206	124	1150	39	616
Future Volume (vph)	25	549	66	206	124	1150	39	616
Turn Type	NA	Split	NA	Perm	Prot	NA	Prot	NA
Protected Phases	4	8	8	8	1	6	5	2
Permitted Phases				8				
Detector Phase	4	8	8	8	1	6	5	2
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	7.0	11.0	8.0
Minimum Split (s)	16.0	40.0	40.0	40.0	18.0	27.0	15.0	39.0
Total Split (s)	18.0	40.0	40.0	40.0	18.0	42.0	15.0	39.0
Total Split (%)	15.7%	34.8%	34.8%	34.8%	15.7%	36.5%	13.0%	33.9%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	4.4	3.0	4.4
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	5.4	4.0	5.4
Lead/Lag				Lead	Lag	Lead	Lag	
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)	12.8	27.8	27.8	27.8	12.8	51.9	11.0	44.1
Actuated g/C Ratio	0.11	0.24	0.24	0.24	0.11	0.45	0.10	0.38
v/c Ratio	0.79	0.72	0.35	0.30	0.69	0.61	0.25	0.53
Control Delay	55.3	44.7	24.7	6.7	80.7	19.6	52.3	30.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Total Delay	55.3	44.7	24.7	6.7	80.7	19.6	52.3	31.4
LOS	E	D	C	A	F	B	D	C
Approach Delay	55.3		35.2			25.0		32.6
Approach LOS	E		D			C		C

**Intersection Summary**  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 113 (98%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow  
 Natural Cycle: 115  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.79  
 Intersection Signal Delay: 31.2  
 Intersection Capacity Utilization 76.7%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service D



Lane Group	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	2	55	5	11	1069	222	994
Future Volume (vph)	2	55	5	11	1069	222	994
Turn Type	NA	Split	NA	Prot	NA	Prot	NA
Protected Phases	8	4	4	5	2	1	6
Permitted Phases							
Detector Phase	8	4	4	5	2	1	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	8.0	10.0	7.0
Minimum Split (s)	33.0	20.0	20.0	14.0	37.0	22.0	28.0
Total Split (s)	30.0	23.0	23.0	15.0	37.0	25.0	47.0
Total Split (%)	26.1%	20.0%	20.0%	13.0%	32.2%	21.7%	40.9%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.4	3.0	4.4
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	5.4	4.0	5.4
Lead/Lag				Lead	Lag	Lead	Lag
Lead-Lag Optimize?							
Recall Mode	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)	13.5	11.6	11.6	10.0	55.8	19.4	76.4
Actuated g/C Ratio	0.12	0.10	0.10	0.09	0.49	0.17	0.66
v/c Ratio	0.23	0.35	0.70	0.08	0.71	0.83	0.48
Control Delay	34.7	52.8	15.5	58.5	25.2	61.1	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.8	0.0	0.0
Total Delay	34.7	52.8	15.5	58.5	25.9	61.1	10.7
LOS	C	D	B	E	C	E	B
Approach Delay	34.7		22.1		26.3		19.8
Approach LOS	C		C		C		B

**Intersection Summary**  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 2 (2%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 115  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 23.0  
 Intersection Capacity Utilization 76.5%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service D



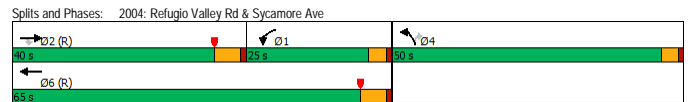
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	817	240	31	742	351	62
Future Volume (vph)	817	240	31	742	351	62
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	4	4
Permitted Phases		2				4
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	7.0	7.0	9.0	7.0	9.0	9.0
Minimum Split (s)	40.0	40.0	14.0	20.0	37.0	37.0
Total Split (s)	58.0	58.0	17.0	75.0	40.0	40.0
Total Split (%)	50.4%	50.4%	14.8%	65.2%	34.8%	34.8%
Yellow Time (s)	4.4	4.4	3.0	4.4	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	4.0	5.4	4.0	4.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	68.9	68.9	9.1	76.8	28.8	28.8
Actuated g/C Ratio	0.60	0.60	0.08	0.67	0.25	0.25
v/c Ratio	0.42	0.26	0.24	0.35	0.83	0.15
Control Delay	7.9	3.1	66.2	3.4	56.7	7.9
Queue Delay	0.1	0.2	0.0	0.5	0.0	0.0
Total Delay	8.0	3.4	66.2	3.9	56.7	7.9
LOS	A	A	E	A	E	A
Approach Delay	6.9			6.4	49.4	
Approach LOS	A			A	D	

**Intersection Summary**  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 11 (10%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 95  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 14.3  
 Intersection Capacity Utilization 55.6%  
 Analysis Period (min) 15  
 Intersection LOS: B  
 ICU Level of Service B



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	255	563	146	231	539	188
Future Volume (vph)	255	563	146	231	539	188
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	4	4
Permitted Phases		2				4
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	7.0	7.0	9.0	7.0	10.0	10.0
Minimum Split (s)	34.0	34.0	18.0	20.0	32.0	32.0
Total Split (s)	40.0	40.0	25.0	65.0	50.0	50.0
Total Split (%)	34.8%	34.8%	21.7%	56.5%	43.5%	43.5%
Yellow Time (s)	4.4	4.4	3.0	4.4	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	4.0	5.4	4.0	4.0
Lead/Lag	Lead	Lead	Lead			
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	51.2	51.2	21.0	76.2	29.4	29.4
Actuated g/C Ratio	0.45	0.45	0.18	0.66	0.26	0.26
v/c Ratio	0.18	0.61	0.61	0.13	0.77	0.41
Control Delay	7.4	9.0	52.3	8.0	45.5	6.1
Queue Delay	0.0	1.5	0.0	0.0	0.0	0.0
Total Delay	7.4	10.5	52.3	8.0	45.5	6.1
LOS	A	B	D	A	D	A
Approach Delay	9.5			25.1	35.3	
Approach LOS	A			C	D	

**Intersection Summary**  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 14 (12%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 85  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.77  
 Intersection Signal Delay: 23.0  
 Intersection Capacity Utilization 58.4%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service B



**Appendix C**  
**Synchro LOS Worksheets**

**Existing AM  
Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	194	175	439	351	327	357
Future Volume (vph)	194	175	439	351	327	357
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.93		1.00	1.00	0.92	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3297		1805	3610	3266	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3297		1805	3610	3266	
Peak-hour factor, PHF	0.84	0.84	0.86	0.86	0.81	0.81
Adj. Flow (vph)	231	208	510	408	404	441
RTOR Reduction (vph)	93	0	0	0	100	0
Lane Group Flow (vph)	346	0	510	408	745	0
Confl. Peds. (#/hr)		1	4			4
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	18.5		42.5	80.6	34.1	
Effective Green, g (s)	18.5		42.5	80.6	34.1	
Actuated g/C Ratio	0.17		0.39	0.74	0.31	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	561		706	2679	1025	
v/s Ratio Prot	c0.10		c0.28	0.11	c0.23	
v/s Ratio Perm						
v/c Ratio	0.62		0.72	0.15	0.73	
Uniform Delay, d1	41.8		28.0	4.1	33.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.3		3.1	0.0	2.8	
Delay (s)	44.1		31.2	4.1	35.9	
Level of Service	D		C	A	D	
Approach Delay (s)	44.1			19.1	35.9	
Approach LOS	D			B	D	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			30.5		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			108.6		Sum of lost time (s)	17.5
Intersection Capacity Utilization			68.0%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave













11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↕			↕		↕	↕		
Traffic Volume (vph)	0	0	0	142	118	35	0	748	129	14	263	217	
Future Volume (vph)	0	0	0	142	118	35	0	748	129	14	263	217	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5		4.0	5.5		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frbp, ped/bikes					1.00			1.00		1.00	1.00		
Flpb, ped/bikes					1.00			1.00		1.00	1.00		
Frt					0.98			0.98		1.00	0.93		
Flt Protected					0.98			1.00		0.95	1.00		
Satd. Flow (prot)					1825			3519		1787	3332		
Flt Permitted					0.98			1.00		0.95	1.00		
Satd. Flow (perm)					1825			3519		1787	3332		
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.84	0.84	0.84	
Adj. Flow (vph)	0	0	0	153	127	38	0	850	147	17	313	258	
RTOR Reduction (vph)	0	0	0	0	4	0	0	7	0	0	111	0	
Lane Group Flow (vph)	0	0	0	0	314	0	0	990	0	17	460	0	
Confl. Peds. (#/hr)									1	1			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					19.9			32.7		2.2	38.9		
Effective Green, g (s)					19.9			32.7		2.2	38.9		
Actuated g/C Ratio					0.29			0.48		0.03	0.57		
Clearance Time (s)					4.0			5.5		4.0	5.5		
Vehicle Extension (s)					3.0			4.0		3.0	4.0		
Lane Grp Cap (vph)					531			1684		57	1897		
v/s Ratio Prot					c0.17			c0.28		0.01	c0.14		
v/s Ratio Perm													
v/c Ratio					0.59			0.59		0.30	0.24		
Uniform Delay, d1					20.7			12.9		32.3	7.3		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					1.8			0.6		2.9	0.1		
Delay (s)					22.5			13.5		35.2	7.4		
Level of Service					C			B		D	A		
Approach Delay (s)		0.0			22.5			13.5			8.2		
Approach LOS		A			C			B			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			13.4		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.58										
Actuated Cycle Length (s)			68.3		Sum of lost time (s)					13.5			
Intersection Capacity Utilization			48.9%		ICU Level of Service					A			
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis  
 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	185	347	949	0	0	399
Future Volume (vph)	185	347	949	0	0	399
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1589	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1589	3574			3610
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.74	0.74
Adj. Flow (vph)	220	413	1054	0	0	539
RTOR Reduction (vph)	0	27	0	0	0	0
Lane Group Flow (vph)	220	386	1054	0	0	539
Confl. Peds. (#/hr)		6		8	8	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	16.3	16.3	21.4			21.4
Effective Green, g (s)	16.3	16.3	21.4			21.4
Actuated g/C Ratio	0.34	0.34	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	619	545	1610			1626
v/s Ratio Prot	0.12		c0.29			0.15
v/s Ratio Perm		c0.24				
v/c Ratio	0.36	0.71	0.65			0.33
Uniform Delay, d1	11.7	13.5	10.2			8.4
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	3.4	1.0			0.1
Delay (s)	11.8	17.0	11.1			8.6
Level of Service	B	B	B			A
Approach Delay (s)	15.2		11.1			8.6
Approach LOS	B		B			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			11.7		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.68			
Actuated Cycle Length (s)			47.5		Sum of lost time (s)	9.8
Intersection Capacity Utilization			56.5%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↕	↗	↘	↕↕		↘	↕↕	
Traffic Volume (vph)	121	48	12	46	60	270	89	558	102	126	344	75
Future Volume (vph)	121	48	12	46	60	270	89	558	102	126	344	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes		1.00			1.00	1.00	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		0.99			1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3228			1841	1599	1805	3514		1805	3505	
Flt Permitted		0.75			0.76	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2505			1427	1599	1805	3514		1805	3505	
Peak-hour factor, PHF	0.88	0.88	0.88	0.91	0.91	0.91	0.89	0.89	0.89	0.75	0.75	0.75
Adj. Flow (vph)	138	55	14	51	66	297	100	627	115	168	459	100
RTOR Reduction (vph)	0	6	0	0	0	243	0	16	0	0	18	0
Lane Group Flow (vph)	0	201	0	0	117	54	100	726	0	168	541	0
Confl. Peds. (#/hr)							1		4	4		1
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)		8.0			7.6	7.6	4.8	12.9		6.3	14.4	
Effective Green, g (s)		8.0			7.6	7.6	4.8	12.9		6.3	14.4	
Actuated g/C Ratio		0.19			0.18	0.18	0.12	0.31		0.15	0.35	
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		480			260	291	207	1087		272	1210	
v/s Ratio Prot							0.06	c0.21		c0.09	0.15	
v/s Ratio Perm		0.08			c0.08	0.03						
v/c Ratio		0.42			0.45	0.19	0.48	0.67		0.62	0.45	
Uniform Delay, d1		14.8			15.2	14.4	17.3	12.5		16.6	10.6	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.5	0.1	0.6	1.2		2.9	0.1	
Delay (s)		15.0			15.6	14.5	17.9	13.8		19.5	10.7	
Level of Service		B			B	B	B	B		B	B	
Approach Delay (s)		15.0			14.9			14.2			12.7	
Approach LOS		B			B			B			B	

Intersection Summary		
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.59	B
Actuated Cycle Length (s)	41.7	Sum of lost time (s)
Intersection Capacity Utilization	55.4%	14.9
Analysis Period (min)	15	ICU Level of Service
		B
c Critical Lane Group		



# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	4	144	120	4	72	55	174	44	55	731	29
Future Volume (vph)	77	4	144	120	4	72	55	174	44	55	731	29
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.86		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1594		1797	1630		1805	3485		1805	3610	1575
Flt Permitted	0.70	1.00		0.63	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1325	1594		1200	1630		1805	3485		1805	3610	1575
Peak-hour factor, PHF	0.89	0.89	0.89	0.83	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	4	162	145	5	87	60	189	48	60	795	32
RTOR Reduction (vph)	0	119	0	0	64	0	0	19	0	0	0	18
Lane Group Flow (vph)	87	47	0	145	28	0	60	218	0	60	795	14
Confl. Peds. (#/hr)			8	8			3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	15.7	15.7		15.7	15.7		4.3	26.5		4.1	26.3	26.3
Effective Green, g (s)	15.7	15.7		15.7	15.7		4.3	26.5		4.1	26.3	26.3
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.07	0.45		0.07	0.44	0.44
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	350	422		317	431		130	1557		124	1601	698
v/s Ratio Prot		0.03			0.02		c0.03	0.06		0.03	c0.22	
v/s Ratio Perm	0.07			c0.12								0.01
v/c Ratio	0.25	0.11		0.46	0.07		0.46	0.14		0.48	0.50	0.02
Uniform Delay, d1	17.2	16.5		18.2	16.3		26.4	9.7		26.6	11.8	9.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		1.4	0.1		1.9	0.1		1.1	0.5	0.0
Delay (s)	17.7	16.7		19.7	16.4		28.3	9.8		27.7	12.3	9.3
Level of Service	B	B		B	B		C	A		C	B	A
Approach Delay (s)		17.0			18.4			13.5			13.2	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.6				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			59.3				Sum of lost time (s)				13.0	
Intersection Capacity Utilization			57.0%				ICU Level of Service				B	
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	137	50	645	255	99	269	338	905	205	500	49
Future Volume (vph)	25	137	50	645	255	99	269	338	905	205	500	49
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.96		1.00	0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3419		3467	1802		1805	3610	1615	1805	3556	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3419		3467	1802		1805	3610	1615	1805	3556	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	27	149	54	694	274	106	286	360	963	216	526	52
RTOR Reduction (vph)	0	27	0	0	9	0	0	0	0	0	5	0
Lane Group Flow (vph)	27	176	0	694	371	0	286	360	963	216	573	0
Confl. Peds. (#/hr)							3					3
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	7.4	17.6		28.5	37.7		22.8	28.4	110.0	19.0	24.6	
Effective Green, g (s)	7.4	17.6		28.5	37.7		22.8	28.4	110.0	19.0	24.6	
Actuated g/C Ratio	0.07	0.16		0.26	0.34		0.21	0.26	1.00	0.17	0.22	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	120	547		898	617		374	932	1615	311	795	
v/s Ratio Prot	0.02	0.05		c0.20	0.21		c0.16	0.10		0.12	c0.16	
v/s Ratio Perm									c0.60			
v/c Ratio	0.23	0.32		0.77	0.60		0.76	0.39	0.60	0.69	0.72	
Uniform Delay, d1	48.6	40.9		37.8	29.9		41.1	33.6	0.0	42.8	39.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.3		3.8	2.4		8.1	0.4	1.6	5.3	3.5	
Delay (s)	48.9	41.3		41.6	32.4		49.2	34.0	1.6	48.1	43.0	
Level of Service	D	D		D	C		D	C	A	D	D	
Approach Delay (s)		42.2			38.3			17.3			44.4	
Approach LOS		D			D			B			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			30.7				HCM 2000 Level of Service		C			
HCM 2000 Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			110.0				Sum of lost time (s)		17.5			
Intersection Capacity Utilization			74.2%				ICU Level of Service		D			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave & Market Dr

11/25/2019


























Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↑↑↑		↶	↑↑
Traffic Volume (vph)	0	0	1439	0	58	1246
Future Volume (vph)	0	0	1439	0	58	1246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frbp, ped/bikes			1.00		1.00	1.00
Flpb, ped/bikes			1.00		1.00	1.00
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.97	0.97
Adj. Flow (vph)	0	0	1564	0	60	1285
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1564	0	60	1285
Confl. Peds. (#/hr)				1	1	
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			62.1		5.5	75.6
Effective Green, g (s)			62.1		5.5	75.6
Actuated g/C Ratio			0.82		0.07	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4260		130	3574
v/s Ratio Prot			0.30		0.03	c0.36
v/s Ratio Perm						
v/c Ratio			0.37		0.46	0.36
Uniform Delay, d1			1.7		33.6	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.2		2.6	0.3
Delay (s)			2.0		36.2	0.3
Level of Service			A		D	A
Approach Delay (s)	0.0		2.0			1.9
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			1.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.43			
Actuated Cycle Length (s)			75.6		Sum of lost time (s)	12.0
Intersection Capacity Utilization			37.8%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

























11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	154	10	457	89	1039	27	391	313	288	860	13
Future Volume (vph)	43	154	10	457	89	1039	27	391	313	288	860	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3571		1715	1746	2817	1787	3574	1565	3467	3566	
Flt Permitted	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3571		1715	1746	2817	1787	3574	1565	3467	3566	
Peak-hour factor, PHF	0.79	0.79	0.79	0.89	0.89	0.89	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	54	195	13	513	100	1167	30	434	348	324	966	15
RTOR Reduction (vph)	0	3	0	0	0	508	0	0	254	0	1	0
Lane Group Flow (vph)	54	205	0	303	310	659	30	434	94	324	980	0
Confl. Peds. (#/hr)	1		8	8		1			1	1		
Confl. Bikes (#/hr)			1			1			10			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	15.5	15.5		30.1	30.1	45.5	5.2	30.7	30.7	15.4	40.9	
Effective Green, g (s)	15.5	15.5		30.1	30.1	45.5	5.2	30.7	30.7	15.4	40.9	
Actuated g/C Ratio	0.14	0.14		0.26	0.26	0.40	0.05	0.27	0.27	0.14	0.36	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	246	486		454	462	1127	81	965	422	469	1282	
v/s Ratio Prot	0.03	c0.06		0.18	c0.18	0.08	0.02	0.12		c0.09	c0.27	
v/s Ratio Perm						0.15			0.06			
v/c Ratio	0.22	0.42		0.67	0.67	0.58	0.37	0.45	0.22	0.69	0.76	
Uniform Delay, d1	43.7	45.0		37.3	37.4	26.7	52.7	34.5	32.2	46.9	32.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.3	1.7		5.8	5.8	0.9	3.9	0.9	0.8	4.7	3.6	
Delay (s)	45.0	46.6		43.1	43.2	27.6	56.5	35.4	33.0	51.6	35.7	
Level of Service	D	D		D	D	C	E	D	C	D	D	
Approach Delay (s)		46.3			33.0			35.2			39.7	
Approach LOS		D			C			D			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			36.3				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			113.7				Sum of lost time (s)			22.0		
Intersection Capacity Utilization			74.2%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	49	323	28	51	1392	52	149	3	158	146	2	235	
Future Volume (vph)	49	323	28	51	1392	52	149	3	158	146	2	235	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98		0.99		1.00	1.00	0.98	
Flpb, ped/bikes	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		0.92		1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1805	3610	1589	1805	3610	1585		3147		1805	1900	1585	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (perm)	1805	3610	1589	1805	3610	1585		3147		1805	1900	1585	
Peak-hour factor, PHF	0.96	0.96	0.96	0.95	0.95	0.95	0.87	0.87	0.87	0.93	0.93	0.93	
Adj. Flow (vph)	51	336	29	54	1465	55	171	3	182	157	2	253	
RTOR Reduction (vph)	0	0	15	0	0	29	0	155	0	0	0	217	
Lane Group Flow (vph)	51	336	14	54	1465	26	0	201	0	157	2	36	
Confl. Peds. (#/hr)	7		3	3		7	3		7	2		9	
Confl. Bikes (#/hr)			2			1			5				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm	
Protected Phases	5	2		1	6		8	8		4	4		
Permitted Phases			2			6						4	
Actuated Green, G (s)	5.8	40.7	40.7	6.0	40.9	40.9		9.8		12.2	12.2	12.2	
Effective Green, g (s)	5.8	40.7	40.7	6.0	40.9	40.9		9.8		12.2	12.2	12.2	
Actuated g/C Ratio	0.07	0.47	0.47	0.07	0.48	0.48		0.11		0.14	0.14	0.14	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	122	1714	754	126	1722	756		359		256	270	225	
v/s Ratio Prot	0.03	0.09		c0.03	c0.41			c0.06		c0.09	0.00		
v/s Ratio Perm			0.01			0.02						0.02	
v/c Ratio	0.42	0.20	0.02	0.43	0.85	0.03		0.56		0.61	0.01	0.16	
Uniform Delay, d1	38.3	13.0	11.9	38.2	19.7	11.9		35.9		34.5	31.6	32.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.8	0.0	0.0	0.9	4.1	0.0		1.1		3.0	0.0	0.1	
Delay (s)	39.2	13.0	11.9	39.1	23.8	11.9		37.0		37.6	31.6	32.4	
Level of Service	D	B	B	D	C	B		D		D	C	C	
Approach Delay (s)		16.2			23.9			37.0			34.4		
Approach LOS		B			C			D			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			26.0			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio			0.73										
Actuated Cycle Length (s)			85.7			Sum of lost time (s)			17.0				
Intersection Capacity Utilization			81.5%			ICU Level of Service			D				
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↖	↗	↖↗	↖	↗	↖	↖↗↘		↖	↗↘		
Traffic Volume (vph)	23	21	88	418	38	380	62	1223	84	74	576	19	
Future Volume (vph)	23	21	88	418	38	380	62	1223	84	74	576	19	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.88	0.85	1.00	0.99		1.00	1.00		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1851	1585	3502	1562	1510	1805	5127		1805	3590		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1851	1585	3502	1562	1510	1805	5127		1805	3590		
Peak-hour factor, PHF	0.83	0.83	0.83	0.93	0.93	0.93	0.89	0.89	0.89	0.73	0.73	0.73	
Adj. Flow (vph)	28	25	106	449	41	409	70	1374	94	101	789	26	
RTOR Reduction (vph)	0	0	97	0	151	178	0	5	0	0	2	0	
Lane Group Flow (vph)	0	53	9	449	78	43	70	1463	0	101	813	0	
Confl. Peds. (#/hr)	3		2	2		3	5		4	4		5	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		10.4	10.4	23.4	23.4	23.4	11.4	57.2		12.0	57.8		
Effective Green, g (s)		10.4	10.4	23.4	23.4	23.4	11.4	57.2		12.0	57.8		
Actuated g/C Ratio		0.09	0.09	0.19	0.19	0.19	0.10	0.48		0.10	0.48		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		160	137	682	304	294	171	2443		180	1729		
v/s Ratio Prot		c0.03		c0.13	0.05		0.04	c0.29		c0.06	0.23		
v/s Ratio Perm			0.01			0.03							
v/c Ratio		0.33	0.07	0.66	0.26	0.15	0.41	0.60		0.56	0.47		
Uniform Delay, d1		51.5	50.3	44.6	40.9	40.0	51.1	23.0		51.5	20.8		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.2	0.2	2.3	0.4	0.2	0.6	1.1		2.4	0.9		
Delay (s)		52.8	50.6	46.9	41.4	40.3	51.7	24.1		53.9	21.8		
Level of Service		D	D	D	D	D	D	C		D	C		
Approach Delay (s)		51.3			43.9			25.3			25.3		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			31.2		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.58										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			66.3%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

**Existing AM  
Unsignalized**

HCM 6th AWSC  
5: Viewpoint Blvd & Willow Ave

09/17/2019

Intersection	
Intersection Delay, s/veh	21.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↑	↵	↵	↕		↵	↕	
Traffic Vol, veh/h	123	5	59	138	4	257	23	332	50	117	295	33
Future Vol, veh/h	123	5	59	138	4	257	23	332	50	117	295	33
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.83	0.83	0.83	0.77	0.77	0.77
Heavy Vehicles, %	0	0	0	1	1	1	0	0	0	0	0	0
Mvmt Flow	127	5	61	150	4	279	28	400	60	152	383	43
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	16.7	23.5	23.8	20.9
HCM LOS	C	C	C	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	69%	0%	8%	0%	100%	0%	0%	100%	75%
Vol Right, %	0%	0%	31%	0%	92%	0%	0%	100%	0%	0%	25%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	23	221	161	123	64	138	4	257	117	197	131
LT Vol	23	0	0	123	0	138	0	0	117	0	0
Through Vol	0	221	111	0	5	0	4	0	0	197	98
RT Vol	0	0	50	0	59	0	0	257	0	0	33
Lane Flow Rate	28	267	194	127	66	150	4	279	152	255	171
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.073	0.667	0.472	0.357	0.165	0.404	0.011	0.657	0.393	0.624	0.408
Departure Headway (Hd)	9.523	9.011	8.787	10.124	8.979	9.686	9.177	8.466	9.31	8.798	8.617
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	376	400	410	355	399	372	390	427	386	411	418
Service Time	7.292	6.779	6.555	7.894	6.749	7.45	6.941	6.229	7.074	6.561	6.381
HCM Lane V/C Ratio	0.074	0.667	0.473	0.358	0.165	0.403	0.01	0.653	0.394	0.62	0.409
HCM Control Delay	13	28.2	19.2	18.4	13.5	18.9	12	26.1	18	25.2	17.2
HCM Lane LOS	B	D	C	C	B	C	B	D	C	D	C
HCM 95th-tile Q	0.2	4.7	2.5	1.6	0.6	1.9	0	4.6	1.8	4.1	1.9



Intersection	
Intersection Delay, s/veh	14.6
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	105	202	259	0	0	490
Future Vol, veh/h	105	202	259	0	0	490
Peak Hour Factor	0.88	0.88	0.67	0.67	0.83	0.83
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	119	230	387	0	0	590
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	12.7	19.7	12.4
HCM LOS	B	C	B

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	259	105	202	245	245
LT Vol	0	105	0	0	0
Through Vol	259	0	0	245	245
RT Vol	0	0	202	0	0
Lane Flow Rate	387	119	230	295	295
Geometry Grp	4	7	7	7	7
Degree of Util (X)	0.65	0.244	0.391	0.505	0.363
Departure Headway (Hd)	6.049	7.35	6.128	6.157	4.428
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	595	488	585	584	809
Service Time	4.098	5.106	3.883	3.911	2.181
HCM Lane V/C Ratio	0.65	0.244	0.393	0.505	0.365
HCM Control Delay	19.7	12.5	12.8	15.1	9.7
HCM Lane LOS	C	B	B	C	A
HCM 95th-tile Q	4.7	0.9	1.8	2.8	1.7

# HCM 6th Signalized Intersection Summary

## 7: Victoria Cres W & San Pablo Ave

09/20/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	4	144	120	4	72	55	174	44	55	731	29
Future Volume (veh/h)	77	4	144	120	4	72	55	174	44	55	731	29
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	87	4	162	145	5	87	60	189	48	60	795	32
Peak Hour Factor	0.89	0.89	0.89	0.83	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	447	11	429	378	24	418	82	1205	299	82	1519	675
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.05	0.42	0.42	0.05	0.42	0.42
Sat Flow, veh/h	1316	39	1564	1232	88	1523	1810	2865	710	1810	3610	1604
Grp Volume(v), veh/h	87	0	166	145	0	92	60	117	120	60	795	32
Grp Sat Flow(s),veh/h/ln	1316	0	1602	1232	0	1610	1810	1805	1769	1810	1805	1604
Q Serve(g_s), s	2.7	0.0	4.2	5.4	0.0	2.2	1.6	2.0	2.1	1.6	8.2	0.6
Cycle Q Clear(g_c), s	4.9	0.0	4.2	9.6	0.0	2.2	1.6	2.0	2.1	1.6	8.2	0.6
Prop In Lane	1.00		0.98	1.00		0.95	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	447	0	440	378	0	442	82	759	744	82	1519	675
V/C Ratio(X)	0.19	0.00	0.38	0.38	0.00	0.21	0.73	0.15	0.16	0.73	0.52	0.05
Avail Cap(c_a), veh/h	848	0	928	754	0	933	867	1334	1308	867	2668	1186
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.9	0.0	14.7	18.6	0.0	14.0	23.6	9.0	9.0	23.6	10.8	8.6
Incr Delay (d2), s/veh	0.3	0.0	0.8	0.9	0.0	0.3	9.0	0.2	0.2	4.7	0.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	1.5	1.5	0.0	0.8	0.8	0.7	0.7	0.7	2.7	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.2	0.0	15.5	19.5	0.0	14.3	32.6	9.2	9.2	28.3	11.4	8.6
LnGrp LOS	B	A	B	B	A	B	C	A	A	C	B	A
Approach Vol, veh/h		253			237			297			887	
Approach Delay, s/veh		15.7			17.5			13.9			12.4	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	26.1		17.7	6.3	26.1		17.7				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	24.0	37.0		29.0	24.0	37.0		29.0				
Max Q Clear Time (g_c+I1), s	3.6	4.1		6.9	3.6	10.2		11.6				
Green Ext Time (p_c), s	0.1	2.7		1.9	0.1	10.9		1.4				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				13.9								
HCM 6th LOS				B								

Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↵	↶	↵	↑↑	↑↑	↶
Traffic Vol, veh/h	10	9	174	248	772	189
Future Vol, veh/h	10	9	174	248	772	189
Conflicting Peds, #/hr	0	0	3	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	125	0	175	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	94	94	88	88
Heavy Vehicles, %	5	5	0	0	0	0
Mvmt Flow	11	10	185	264	877	215

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1382	442	1095	0	-	0
Stage 1	880	-	-	-	-	-
Stage 2	502	-	-	-	-	-
Critical Hdwy	6.9	7	4.1	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.55	3.35	2.2	-	-	-
Pot Cap-1 Maneuver	131	555	645	-	-	-
Stage 1	359	-	-	-	-	-
Stage 2	565	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	93	554	643	-	-	-
Mov Cap-2 Maneuver	93	-	-	-	-	-
Stage 1	255	-	-	-	-	-
Stage 2	564	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	31.3	5.3	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	643	-	93	554	-	-
HCM Lane V/C Ratio	0.288	-	0.122	0.018	-	-
HCM Control Delay (s)	12.8	-	49	11.6	-	-
HCM Lane LOS	B	-	E	B	-	-
HCM 95th %tile Q(veh)	1.2	-	0.4	0.1	-	-

HCM Unsignalized Intersection Capacity Analysis  
 10: John Muir Pkwy & Alfred Nobel Dr

09/18/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↵	↑↑	↑↑		↵↵		
Traffic Volume (veh/h)	15	107	107	478	61	5	
Future Volume (Veh/h)	15	107	107	478	61	5	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.75	0.75	0.88	0.88	0.92	0.92	
Hourly flow rate (vph)	20	143	122	543	66	5	
Pedestrians					4		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	669				509	336	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	669				509	336	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	98				86	99	
cM capacity (veh/h)	927				481	657	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	20	72	72	81	584	44	27
Volume Left	20	0	0	0	0	44	22
Volume Right	0	0	0	0	543	0	5
cSH	927	1700	1700	1700	1700	481	506
Volume to Capacity	0.02	0.04	0.04	0.05	0.34	0.09	0.05
Queue Length 95th (ft)	2	0	0	0	0	8	4
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	13.2	12.5
Lane LOS	A					B	B
Approach Delay (s)	1.1			0.0		13.0	
Approach LOS						B	
Intersection Summary							
Average Delay			1.2				
Intersection Capacity Utilization			28.8%		ICU Level of Service		A
Analysis Period (min)			15				

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	726	1371	7	1	76
Future Vol, veh/h	0	726	1371	7	1	76
Conflicting Peds, #/hr	3	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	71	71
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	825	1558	8	1	107

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	1978 786
Stage 1	-	-	-	-	1565 -
Stage 2	-	-	-	-	413 -
Critical Hdwy	-	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	-	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	0	-	-	-	55 339
Stage 1	0	-	-	-	161 -
Stage 2	0	-	-	-	642 -
Platoon blocked, %	-	-	-	-	
Mov Cap-1 Maneuver	-	-	-	-	55 338
Mov Cap-2 Maneuver	-	-	-	-	55 -
Stage 1	-	-	-	-	161 -
Stage 2	-	-	-	-	641 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	20.5
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	338
HCM Lane V/C Ratio	-	-	-	0.317
HCM Control Delay (s)	-	-	-	20.5
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	1.3

HCM 6th AWSC  
17: Willow Ave & SR-4 EB On-Ramp

09/17/2019

Intersection	
Intersection Delay, s/veh	9.9
Intersection LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	54	131	184	17	153	2
Future Vol, veh/h	54	131	184	17	153	2
Peak Hour Factor	0.84	0.84	0.94	0.94	0.72	0.72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	64	156	196	18	213	3
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	9.5	9.8	10.4
HCM LOS	A	A	B

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	99%
Vol Thru, %	0%	100%	92%	0%
Vol Right, %	0%	0%	8%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	54	131	201	155
LT Vol	54	0	0	153
Through Vol	0	131	184	0
RT Vol	0	0	17	2
Lane Flow Rate	64	156	214	215
Geometry Grp	7	7	5	2
Degree of Util (X)	0.103	0.228	0.285	0.306
Departure Headway (Hd)	5.773	5.269	4.798	5.123
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	618	678	746	698
Service Time	3.528	3.024	2.851	3.178
HCM Lane V/C Ratio	0.104	0.23	0.287	0.308
HCM Control Delay	9.2	9.6	9.8	10.4
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.3	0.9	1.2	1.3

**Existing PM  
Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	272	221	142	368	308	163
Future Volume (vph)	272	221	142	368	308	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.93		1.00	1.00	0.95	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3312		1805	3610	3408	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3312		1805	3610	3408	
Peak-hour factor, PHF	0.84	0.84	0.94	0.94	0.79	0.79
Adj. Flow (vph)	324	263	151	391	390	206
RTOR Reduction (vph)	72	0	0	0	35	0
Lane Group Flow (vph)	515	0	151	391	561	0
Confl. Peds. (#/hr)		1	1			1
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	19.7		12.4	38.2	21.8	
Effective Green, g (s)	19.7		12.4	38.2	21.8	
Actuated g/C Ratio	0.29		0.18	0.57	0.32	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	968		332	2046	1102	
v/s Ratio Prot	c0.16		c0.08	0.11	c0.16	
v/s Ratio Perm						
v/c Ratio	0.53		0.45	0.19	0.51	
Uniform Delay, d1	20.0		24.5	7.1	18.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.7		0.4	0.1	0.5	
Delay (s)	20.7		24.9	7.2	19.0	
Level of Service	C		C	A	B	
Approach Delay (s)	20.7			12.1	19.0	
Approach LOS	C			B	B	

### Intersection Summary


















HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	17.5
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	48	61	12	0	491	140	24	299	210	
Future Volume (vph)	0	0	0	48	61	12	0	491	140	24	299	210	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5		4.0	5.5		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frbp, ped/bikes					1.00			0.99		1.00	1.00		
Flpb, ped/bikes					1.00			1.00		1.00	1.00		
Frt					0.99			0.97		1.00	0.94		
Flt Protected					0.98			1.00		0.95	1.00		
Satd. Flow (prot)					1836			3471		1805	3387		
Flt Permitted					0.98			1.00		0.95	1.00		
Satd. Flow (perm)					1836			3471		1805	3387		
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.94	0.94	0.94	0.86	0.86	0.86	
Adj. Flow (vph)	0	0	0	62	78	15	0	522	149	28	348	244	
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	96	0	
Lane Group Flow (vph)	0	0	0	0	152	0	0	657	0	28	496	0	
Confl. Peds. (#/hr)									4	4			
Confl. Bikes (#/hr)						1							
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					10.7			24.4		2.6	31.0		
Effective Green, g (s)					10.7			24.4		2.6	31.0		
Actuated g/C Ratio					0.21			0.48		0.05	0.61		
Clearance Time (s)					4.0			5.5		4.0	5.5		
Vehicle Extension (s)					3.0			4.0		3.0	4.0		
Lane Grp Cap (vph)					383			1654		91	2050		
v/s Ratio Prot					c0.08			c0.19		0.02	c0.15		
v/s Ratio Perm													
v/c Ratio					0.40			0.40		0.31	0.24		
Uniform Delay, d1					17.5			8.7		23.4	4.7		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					0.7			0.2		1.9	0.1		
Delay (s)					18.1			8.9		25.4	4.8		
Level of Service					B			A		C	A		
Approach Delay (s)		0.0			18.1			8.9			5.7		
Approach LOS		A			B			A			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			8.5		HCM 2000 Level of Service						A		
HCM 2000 Volume to Capacity ratio			0.40										
Actuated Cycle Length (s)			51.2		Sum of lost time (s)						13.5		
Intersection Capacity Utilization			34.5%		ICU Level of Service						A		
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	93	79	715	0	0	355
Future Volume (vph)	93	79	715	0	0	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1585	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1585	3574			3610
Peak-hour factor, PHF	0.88	0.88	0.90	0.90	0.87	0.87
Adj. Flow (vph)	106	90	794	0	0	408
RTOR Reduction (vph)	0	70	0	0	0	0
Lane Group Flow (vph)	106	20	794	0	0	408
Confl. Peds. (#/hr)		13		7	7	
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	6.5	6.5	13.2			13.2
Effective Green, g (s)	6.5	6.5	13.2			13.2
Actuated g/C Ratio	0.22	0.22	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	397	349	1599			1615
v/s Ratio Prot	c0.06		c0.22			0.11
v/s Ratio Perm		0.01				
v/c Ratio	0.27	0.06	0.50			0.25
Uniform Delay, d1	9.5	9.1	5.8			5.1
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	0.0	0.2			0.1
Delay (s)	9.7	9.1	6.0			5.2
Level of Service	A	A	A			A
Approach Delay (s)	9.4		6.0			5.2
Approach LOS	A		A			A




















### Intersection Summary

HCM 2000 Control Delay	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	29.5	Sum of lost time (s)	9.8
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	62	17	175	76	311	79	313	39	131	214	54
Future Volume (vph)	95	62	17	175	76	311	79	313	39	131	214	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes		1.00			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	
Frt		0.99			1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3196			1836	1589	1805	3541		1805	3492	
Flt Permitted		0.72			0.68	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2351			1287	1589	1805	3541		1805	3492	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.98	0.98	0.98	0.93	0.93	0.93
Adj. Flow (vph)	99	65	18	182	79	324	81	319	40	141	230	58
RTOR Reduction (vph)	0	9	0	0	0	228	0	12	0	0	25	0
Lane Group Flow (vph)	0	173	0	0	261	96	81	347	0	141	263	0
Confl. Peds. (#/hr)	6					6	1		4	4		1
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)		13.1			12.7	12.7	3.3	9.5		5.6	11.8	
Effective Green, g (s)		13.1			12.7	12.7	3.3	9.5		5.6	11.8	
Actuated g/C Ratio		0.31			0.30	0.30	0.08	0.22		0.13	0.28	
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		721			382	472	139	787		236	965	
v/s Ratio Prot							0.04	c0.10		c0.08	0.08	
v/s Ratio Perm		0.07			c0.20	0.06						
v/c Ratio		0.24			0.68	0.20	0.58	0.44		0.60	0.27	
Uniform Delay, d1		11.1			13.2	11.2	19.0	14.3		17.5	12.1	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			4.0	0.1	4.0	0.1		2.7	0.1	
Delay (s)		11.1			17.2	11.3	23.0	14.5		20.2	12.1	
Level of Service		B			B	B	C	B		C	B	
Approach Delay (s)		11.1			13.9			16.0			14.8	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.4				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			42.7			Sum of lost time (s)				14.9		
Intersection Capacity Utilization			52.5%			ICU Level of Service				A		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								 			 	
Traffic Volume (vph)	35	5	108	42	4	26	142	436	91	62	185	49
Future Volume (vph)	35	5	108	42	4	26	142	436	91	62	185	49
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	0.87		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1801	1599		1796	1632		1805	3503		1787	3574	1565
Flt Permitted	0.73	1.00		0.66	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1389	1599		1256	1632		1805	3503		1787	3574	1565
Peak-hour factor, PHF	0.77	0.77	0.77	0.78	0.78	0.78	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	45	6	140	54	5	33	167	513	107	67	199	53
RTOR Reduction (vph)	0	118	0	0	28	0	0	14	0	0	0	32
Lane Group Flow (vph)	45	28	0	54	10	0	167	606	0	67	199	21
Confl. Peds. (#/hr)	3		11	11		3	1		2	2		1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	7.2	7.2		7.2	7.2		7.8	22.5		3.9	18.6	18.6
Effective Green, g (s)	7.2	7.2		7.2	7.2		7.8	22.5		3.9	18.6	18.6
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.17	0.48		0.08	0.40	0.40
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	214	247		194	252		302	1691		149	1426	624
v/s Ratio Prot		0.02			0.01		c0.09	c0.17		0.04	0.06	
v/s Ratio Perm	0.03			c0.04								0.01
v/c Ratio	0.21	0.11		0.28	0.04		0.55	0.36		0.45	0.14	0.03
Uniform Delay, d1	17.2	16.9		17.4	16.8		17.8	7.5		20.3	8.9	8.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		1.1	0.1		1.8	0.3		0.8	0.1	0.0
Delay (s)	17.9	17.2		18.5	16.8		19.6	7.8		21.1	9.0	8.6
Level of Service	B	B		B	B		B	A		C	A	A
Approach Delay (s)		17.4			17.8			10.3			11.5	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			12.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			46.6				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			41.9%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↕↗		↖↗	↖		↖	↕↖	↖	↖	↕↖	
Traffic Volume (vph)	32	377	81	337	75	59	79	510	1074	265	220	17
Future Volume (vph)	32	377	81	337	75	59	79	510	1074	265	220	17
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3479		3467	1757		1805	3610	1615	1805	3568	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3479		3467	1757		1805	3610	1615	1805	3568	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	36	428	92	366	82	64	85	548	1155	312	259	20
RTOR Reduction (vph)	0	14	0	0	21	0	0	0	0	0	3	0
Lane Group Flow (vph)	36	506	0	366	125	0	85	548	1155	312	276	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	11.2	26.8		19.1	33.7		16.5	49.9	140.0	27.7	61.1	
Effective Green, g (s)	11.2	26.8		19.1	33.7		16.5	49.9	140.0	27.7	61.1	
Actuated g/C Ratio	0.08	0.19		0.14	0.24		0.12	0.36	1.00	0.20	0.44	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	142	665		472	422		212	1286	1615	357	1557	
v/s Ratio Prot	0.02	0.15		0.11	0.07		0.05	0.15		c0.17	0.08	
v/s Ratio Perm									c0.72			
v/c Ratio	0.25	0.76		0.78	0.30		0.40	0.43	0.72	0.87	0.18	
Uniform Delay, d1	60.5	53.6		58.4	43.4		57.2	34.2	0.0	54.5	24.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	5.1		7.1	0.8		0.5	1.0	2.7	19.8	0.2	
Delay (s)	60.8	58.7		65.5	44.3		57.6	35.2	2.7	74.3	24.3	
Level of Service	E	E		E	D		E	D	A	E	C	
Approach Delay (s)		58.8			59.5			15.3			50.7	
Approach LOS		E			E			B			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			35.0				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			17.5			
Intersection Capacity Utilization			70.1%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave & Market Dr

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↶↷		↶	↷
Traffic Volume (vph)	0	0	1608	1	6	668
Future Volume (vph)	0	0	1608	1	6	668
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	0	1711	1	6	703
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1712	0	6	703
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			68.9		1.3	78.2
Effective Green, g (s)			68.9		1.3	78.2
Actuated g/C Ratio			0.88		0.02	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4570		29	3574
v/s Ratio Prot			c0.33		0.00	c0.20
v/s Ratio Perm						
v/c Ratio			0.37		0.21	0.20
Uniform Delay, d1			0.8		37.9	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.2		3.5	0.1
Delay (s)			1.1		41.5	0.1
Level of Service			A		D	A
Approach Delay (s)	0.0		1.1			0.5
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	0.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	78.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

























11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕		↖	↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (vph)	33	71	6	223	138	599	51	931	345	340	299	28
Future Volume (vph)	33	71	6	223	138	599	51	931	345	340	299	28
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	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	1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3564		1681	1774	2842	1787	3574	1583	3502	3564	
Flt Permitted	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3564		1681	1774	2842	1787	3574	1583	3502	3564	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	35	76	6	240	148	644	57	1046	388	366	322	30
RTOR Reduction (vph)	0	5	0	0	0	422	0	0	175	0	3	0
Lane Group Flow (vph)	35	77	0	190	198	222	57	1046	213	366	349	0
Confl. Peds. (#/hr)			10	10								
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	1%	1%	2%	0%	0%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	11.6	11.6		24.7	24.7	48.2	9.4	58.2	58.2	23.5	72.3	
Effective Green, g (s)	11.6	11.6		24.7	24.7	48.2	9.4	58.2	58.2	23.5	72.3	
Actuated g/C Ratio	0.08	0.08		0.18	0.18	0.34	0.07	0.42	0.42	0.17	0.52	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	149	295		296	312	978	119	1485	658	587	1840	
v/s Ratio Prot	0.02	c0.02		c0.11	0.11	0.04	0.03	c0.29		c0.10	0.10	
v/s Ratio Perm						0.04			0.13			
v/c Ratio	0.23	0.26		0.64	0.63	0.23	0.48	0.70	0.32	0.62	0.19	
Uniform Delay, d1	60.0	60.2		53.5	53.5	32.6	62.9	33.8	27.6	54.1	18.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.23	0.77	0.93	1.00	1.00	
Incremental Delay, d2	2.3	1.3		7.6	6.9	0.2	3.6	2.5	1.2	2.3	0.2	
Delay (s)	62.3	61.5		61.1	60.4	32.8	81.3	28.4	26.7	56.5	18.4	
Level of Service	E	E		E	E	C	F	C	C	E	B	
Approach Delay (s)		61.8			43.3			30.0			37.8	
Approach LOS		E			D			C			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			36.8				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			76.2%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
 15: San Pablo Ave & Hercules Ave

11/25/2019
























													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	240	1225	135	85	367	107	70	8	69	64	2	107	
Future Volume (vph)	240	1225	135	85	367	107	70	8	69	64	2	107	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98		0.98		1.00	1.00	0.98	
Flpb, ped/bikes	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		0.93		1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (perm)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584	
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.90	0.90	0.90	0.96	0.96	0.96	
Adj. Flow (vph)	258	1317	145	89	382	111	78	9	77	67	2	111	
RTOR Reduction (vph)	0	0	23	0	0	47	0	72	0	0	0	103	
Lane Group Flow (vph)	258	1317	122	89	382	64	0	92	0	67	2	8	
Confl. Peds. (#/hr)	4		1	1		4	6		9	9		6	
Confl. Bikes (#/hr)			1						5				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm	
Protected Phases	5	2		1	6		8	8		4	4		
Permitted Phases			2			6						4	
Actuated Green, G (s)	24.5	93.8	93.8	11.3	80.6	80.6		8.3		9.6	9.6	9.6	
Effective Green, g (s)	24.5	93.8	93.8	11.3	80.6	80.6		8.3		9.6	9.6	9.6	
Actuated g/C Ratio	0.18	0.67	0.67	0.08	0.58	0.58		0.06		0.07	0.07	0.07	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	315	2418	1066	145	2078	913		190		123	130	108	
v/s Ratio Prot	c0.14	c0.36		0.05	0.11			c0.03		c0.04	0.00		
v/s Ratio Perm			0.08			0.04						0.00	
v/c Ratio	0.82	0.54	0.11	0.61	0.18	0.07		0.48		0.54	0.02	0.07	
Uniform Delay, d1	55.6	12.0	8.3	62.2	14.1	13.1		63.8		63.1	60.8	61.0	
Progression Factor	1.00	1.00	1.00	1.06	1.46	3.06		1.00		1.00	1.00	1.00	
Incremental Delay, d2	14.5	0.9	0.2	5.2	0.2	0.1		0.7		2.6	0.0	0.1	
Delay (s)	70.1	12.9	8.5	71.5	20.7	40.3		64.5		65.7	60.8	61.1	
Level of Service	E	B	A	E	C	D		E		E	E	E	
Approach Delay (s)		21.1			32.2			64.5			62.8		
Approach LOS		C			C			E			E		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			29.1									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.61										
Actuated Cycle Length (s)			140.0									Sum of lost time (s)	17.0
Intersection Capacity Utilization			64.3%									ICU Level of Service	C
Analysis Period (min)			15										
c Critical Lane Group													



# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	73	40	158	488	60	188	57	733	57	83	602	22	
Future Volume (vph)	73	40	158	488	60	188	57	733	57	83	602	22	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	1.00	0.99	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.92	0.85	1.00	0.99		1.00	0.99		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1840	1582	3502	1650	1514	1805	5119		1805	3587		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1840	1582	3502	1650	1514	1805	5119		1805	3587		
Peak-hour factor, PHF	0.85	0.85	0.85	0.96	0.96	0.96	0.91	0.91	0.91	0.89	0.89	0.89	
Adj. Flow (vph)	86	47	186	508	62	196	63	805	63	93	676	25	
RTOR Reduction (vph)	0	0	166	0	40	99	0	6	0	0	2	0	
Lane Group Flow (vph)	0	133	20	508	94	26	63	862	0	93	699	0	
Confl. Peds. (#/hr)	1		3	3		1	5			4	1	9	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		12.3	12.3	23.9	23.9	23.9	8.6	50.4		11.4	53.2		
Effective Green, g (s)		12.3	12.3	23.9	23.9	23.9	8.6	50.4		11.4	53.2		
Actuated g/C Ratio		0.11	0.11	0.21	0.21	0.21	0.07	0.44		0.10	0.46		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		196	169	727	342	314	134	2243		178	1659		
v/s Ratio Prot		c0.07		c0.15	0.06		0.03	0.17		c0.05	c0.19		
v/s Ratio Perm			0.01			0.02							
v/c Ratio		0.68	0.12	0.70	0.27	0.08	0.47	0.38		0.52	0.42		
Uniform Delay, d1		49.4	46.4	42.2	38.3	36.7	51.0	21.8		49.2	20.6		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		9.0	0.3	2.9	0.4	0.1	0.9	0.5		1.3	0.8		
Delay (s)		58.4	46.8	45.2	38.7	36.8	52.0	22.3		50.5	21.4		
Level of Service		E	D	D	D	D	D	C		D	C		
Approach Delay (s)		51.6			42.7			24.3			24.8		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			32.6		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.54										
Actuated Cycle Length (s)			115.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			65.3%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

**Existing PM  
Unisgnalized**

HCM 6th AWSC  
5: Viewpoint Blvd & Willow Ave

09/17/2019

Intersection	
Intersection Delay, s/veh	13.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↑	↵	↵	↕		↵	↕	
Traffic Vol, veh/h	53	2	42	71	2	117	78	255	125	191	147	101
Future Vol, veh/h	53	2	42	71	2	117	78	255	125	191	147	101
Peak Hour Factor	0.78	0.78	0.78	0.84	0.84	0.84	0.93	0.93	0.93	0.95	0.95	0.95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	68	3	54	85	2	139	84	274	134	201	155	106
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	12	12.7	13.6	13.7
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	40%	0%	5%	0%	100%	0%	0%	100%	33%
Vol Right, %	0%	0%	60%	0%	95%	0%	0%	100%	0%	0%	67%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	78	170	210	53	44	71	2	117	191	98	150
LT Vol	78	0	0	53	0	71	0	0	191	0	0
Through Vol	0	170	85	0	2	0	2	0	0	98	49
RT Vol	0	0	125	0	42	0	0	117	0	0	101
Lane Flow Rate	84	183	226	68	56	85	2	139	201	103	158
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.177	0.359	0.418	0.16	0.114	0.195	0.005	0.274	0.426	0.204	0.291
Departure Headway (Hd)	7.585	7.079	6.658	8.454	7.286	8.302	7.798	7.093	7.623	7.117	6.64
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	473	508	540	425	491	433	459	506	472	504	542
Service Time	5.326	4.82	4.399	6.204	5.036	6.051	5.547	4.842	5.364	4.858	4.381
HCM Lane V/C Ratio	0.178	0.36	0.419	0.16	0.114	0.196	0.004	0.275	0.426	0.204	0.292
HCM Control Delay	12	13.8	14.1	12.8	11	13.1	10.6	12.5	15.9	11.7	12.1
HCM Lane LOS	B	B	B	B	B	B	B	B	C	B	B
HCM 95th-tile Q	0.6	1.6	2	0.6	0.4	0.7	0	1.1	2.1	0.8	1.2

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	179	212	260	0	0	264
Future Vol, veh/h	179	212	260	0	0	264
Peak Hour Factor	0.90	0.90	0.87	0.87	0.92	0.92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	199	236	299	0	0	287
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	11.9	14.2	9.5
HCM LOS	B	B	A

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	260	179	212	132	132
LT Vol	0	179	0	0	0
Through Vol	260	0	0	132	132
RT Vol	0	0	212	0	0
Lane Flow Rate	299	199	236	143	143
Geometry Grp	4	7	7	7	7
Degree of Util (X)	0.484	0.363	0.35	0.245	0.176
Departure Headway (Hd)	5.835	6.568	5.355	6.15	4.423
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	619	549	671	584	809
Service Time	3.867	4.297	3.084	3.886	2.159
HCM Lane V/C Ratio	0.483	0.362	0.352	0.245	0.177
HCM Control Delay	14.2	13	11	10.9	8.1
HCM Lane LOS	B	B	B	B	A
HCM 95th-tile Q	2.6	1.6	1.6	1	0.6

Intersection						
Int Delay, s/veh	5.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	122	253	12	505	328	24
Future Vol, veh/h	122	253	12	505	328	24
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	125	0	175	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	66	66	92	92	97	97
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	185	383	13	549	338	25

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	640	170	364	0	-	0
Stage 1	339	-	-	-	-	-
Stage 2	301	-	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	412	851	1206	-	-	-
Stage 1	699	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	407	850	1205	-	-	-
Mov Cap-2 Maneuver	407	-	-	-	-	-
Stage 1	691	-	-	-	-	-
Stage 2	730	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.4	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1205	-	407	850	-	-
HCM Lane V/C Ratio	0.011	-	0.454	0.451	-	-
HCM Control Delay (s)	8	-	21	12.7	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	2.3	2.4	-	-

HCM Unsignalized Intersection Capacity Analysis  
 10: John Muir Pkwy & Alfred Nobel Dr

09/18/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↵	↑↑	↑↑		↵↵		
Traffic Volume (veh/h)	7	105	95	75	487	31	
Future Volume (Veh/h)	7	105	95	75	487	31	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.85	0.85	0.87	0.87	0.79	0.79	
Hourly flow rate (vph)	8	124	109	86	616	39	
Pedestrians					1		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	196				231	98	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	196				231	98	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	99				16	96	
cM capacity (veh/h)	1388				737	944	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	8	62	62	73	122	411	244
Volume Left	8	0	0	0	0	411	205
Volume Right	0	0	0	0	86	0	39
cSH	1388	1700	1700	1700	1700	737	764
Volume to Capacity	0.01	0.04	0.04	0.04	0.07	0.56	0.32
Queue Length 95th (ft)	0	0	0	0	0	87	35
Control Delay (s)	7.6	0.0	0.0	0.0	0.0	15.8	11.9
Lane LOS	A					C	B
Approach Delay (s)	0.5			0.0		14.4	
Approach LOS						B	
Intersection Summary							
Average Delay			9.6				
Intersection Capacity Utilization			27.3%		ICU Level of Service		A
Analysis Period (min)			15				

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	1354	533	10	0	34
Future Vol, veh/h	0	1354	533	10	0	34
Conflicting Peds, #/hr	0	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	96	96	77	77
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	0	1440	555	10	0	44

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	286
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	6.9
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	3.3
Pot Cap-1 Maneuver	0	-	-	-	0 717
Stage 1	0	-	-	-	0 -
Stage 2	0	-	-	-	0 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	715
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	715
HCM Lane V/C Ratio	-	-	-	0.062
HCM Control Delay (s)	-	-	-	10.4
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↘		↘	
Traffic Vol, veh/h	55	133	181	6	199	1
Future Vol, veh/h	55	133	181	6	199	1
Peak Hour Factor	0.87	0.87	0.77	0.77	0.93	0.93
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	63	153	235	8	214	1
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	9.5	10.2	10.6
HCM LOS	A	B	B

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	99%
Vol Thru, %	0%	100%	97%	0%
Vol Right, %	0%	0%	3%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	55	133	187	200
LT Vol	55	0	0	199
Through Vol	0	133	181	0
RT Vol	0	0	6	1
Lane Flow Rate	63	153	243	215
Geometry Grp	7	7	5	2
Degree of Util (X)	0.102	0.225	0.326	0.311
Departure Headway (Hd)	5.808	5.304	4.832	5.205
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	614	673	741	686
Service Time	3.571	3.066	2.89	3.267
HCM Lane V/C Ratio	0.103	0.227	0.328	0.313
HCM Control Delay	9.2	9.6	10.2	10.6
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	0.3	0.9	1.4	1.3



# **Existing Plus Project AM Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	TT		T	TT	TT	
Traffic Volume (vph)	215	238	445	351	327	379
Future Volume (vph)	215	238	445	351	327	379
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.92		1.00	1.00	0.92	
Flt Protected	0.98		0.95	1.00	1.00	
Satd. Flow (prot)	3274		1805	3610	3257	
Flt Permitted	0.98		0.95	1.00	1.00	
Satd. Flow (perm)	3274		1805	3610	3257	
Peak-hour factor, PHF	0.84	0.84	0.86	0.86	0.81	0.81
Adj. Flow (vph)	256	283	517	408	404	468
RTOR Reduction (vph)	110	0	0	0	105	0
Lane Group Flow (vph)	429	0	517	408	767	0
Confl. Peds. (#/hr)		1	4			4
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	22.5		42.5	84.1	37.6	
Effective Green, g (s)	22.5		42.5	84.1	37.6	
Actuated g/C Ratio	0.19		0.37	0.72	0.32	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	634		660	2614	1054	
v/s Ratio Prot	c0.13		c0.29	0.11	c0.24	
v/s Ratio Perm						
v/c Ratio	0.68		0.78	0.16	0.73	
Uniform Delay, d1	43.4		32.7	5.0	34.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	3.1		5.6	0.0	2.7	
Delay (s)	46.5		38.3	5.0	37.4	
Level of Service	D		D	A	D	
Approach Delay (s)	46.5			23.6	37.4	
Approach LOS	D			C	D	

### Intersection Summary

HCM 2000 Control Delay	34.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	116.1	Sum of lost time (s)	17.5
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↕			↕		↕	↕		
Traffic Volume (vph)	0	0	0	142	118	35	0	754	129	14	326	217	
Future Volume (vph)	0	0	0	142	118	35	0	754	129	14	326	217	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5		4.0	5.5		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frb, ped/bikes					1.00			1.00		1.00	1.00		
Flpb, ped/bikes					1.00			1.00		1.00	1.00		
Frt					0.98			0.98		1.00	0.94		
Flt Protected					0.98			1.00		0.95	1.00		
Satd. Flow (prot)					1825			3520		1787	3360		
Flt Permitted					0.98			1.00		0.95	1.00		
Satd. Flow (perm)					1825			3520		1787	3360		
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.84	0.84	0.84	
Adj. Flow (vph)	0	0	0	153	127	38	0	857	147	17	388	258	
RTOR Reduction (vph)	0	0	0	0	4	0	0	7	0	0	95	0	
Lane Group Flow (vph)	0	0	0	0	314	0	0	997	0	17	551	0	
Confl. Peds. (#/hr)									1	1			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					19.9			32.8		2.2	39.0		
Effective Green, g (s)					19.9			32.8		2.2	39.0		
Actuated g/C Ratio					0.29			0.48		0.03	0.57		
Clearance Time (s)					4.0			5.5		4.0	5.5		
Vehicle Extension (s)					3.0			4.0		3.0	4.0		
Lane Grp Cap (vph)					530			1687		57	1915		
v/s Ratio Prot					c0.17			c0.28		0.01	c0.16		
v/s Ratio Perm													
v/c Ratio					0.59			0.59		0.30	0.29		
Uniform Delay, d1					20.8			12.9		32.3	7.6		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					1.8			0.7		2.9	0.1		
Delay (s)					22.6			13.6		35.3	7.7		
Level of Service					C			B		D	A		
Approach Delay (s)		0.0			22.6			13.6			8.4		
Approach LOS		A			C			B			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			13.3		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.59										
Actuated Cycle Length (s)			68.4		Sum of lost time (s)					13.5			
Intersection Capacity Utilization			49.1%		ICU Level of Service					A			
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	185	347	955	0	0	441
Future Volume (vph)	185	347	955	0	0	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1589	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1589	3574			3610
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.74	0.74
Adj. Flow (vph)	220	413	1061	0	0	596
RTOR Reduction (vph)	0	26	0	0	0	0
Lane Group Flow (vph)	220	387	1061	0	0	596
Confl. Peds. (#/hr)		6		8	8	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	16.3	16.3	21.7			21.7
Effective Green, g (s)	16.3	16.3	21.7			21.7
Actuated g/C Ratio	0.34	0.34	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	615	541	1622			1638
v/s Ratio Prot	0.12		c0.30			0.17
v/s Ratio Perm		c0.24				
v/c Ratio	0.36	0.71	0.65			0.36
Uniform Delay, d1	11.8	13.7	10.1			8.5
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	3.7	1.0			0.1
Delay (s)	12.0	17.4	11.1			8.7
Level of Service	B	B	B			A
Approach Delay (s)	15.5		11.1			8.7
Approach LOS	B		B			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			11.7		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.68			
Actuated Cycle Length (s)			47.8		Sum of lost time (s)	9.8
Intersection Capacity Utilization			56.7%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019


























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↕	↗	↘	↕↕		↘	↕↕	
Traffic Volume (vph)	121	48	12	46	60	276	89	558	102	168	344	75
Future Volume (vph)	121	48	12	46	60	276	89	558	102	168	344	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes		1.00			1.00	1.00	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		0.99			1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3228			1841	1599	1805	3513		1805	3505	
Flt Permitted		0.75			0.76	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2505			1427	1599	1805	3513		1805	3505	
Peak-hour factor, PHF	0.88	0.88	0.88	0.91	0.91	0.91	0.89	0.89	0.89	0.75	0.75	0.75
Adj. Flow (vph)	138	55	14	51	66	303	100	627	115	224	459	100
RTOR Reduction (vph)	0	7	0	0	0	254	0	16	0	0	17	0
Lane Group Flow (vph)	0	200	0	0	117	49	100	726	0	224	542	0
Confl. Peds. (#/hr)							1		4	4		1
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)		8.0			7.6	7.6	5.2	14.8		9.6	19.2	
Effective Green, g (s)		8.0			7.6	7.6	5.2	14.8		9.6	19.2	
Actuated g/C Ratio		0.17			0.16	0.16	0.11	0.32		0.20	0.41	
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		427			231	259	200	1108		369	1434	
v/s Ratio Prot							0.06	c0.21		c0.12	c0.15	
v/s Ratio Perm		0.08			c0.08	0.03						
v/c Ratio		0.47			0.51	0.19	0.50	0.66		0.61	0.38	
Uniform Delay, d1		17.5			17.9	17.0	19.6	13.8		16.9	9.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.6	0.1	0.7	1.1		1.9	0.1	
Delay (s)		17.8			18.6	17.1	20.3	14.9		18.9	9.7	
Level of Service		B			B	B	C	B		B	A	
Approach Delay (s)		17.8			17.5			15.6			12.4	
Approach LOS		B			B			B			B	

Intersection Summary		
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.59	B
Actuated Cycle Length (s)	46.9	Sum of lost time (s)
Intersection Capacity Utilization	55.7%	14.9
Analysis Period (min)	15	ICU Level of Service
		B
c Critical Lane Group		

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								 			 	
Traffic Volume (vph)	77	4	144	120	4	72	55	258	44	55	759	29
Future Volume (vph)	77	4	144	120	4	72	55	258	44	55	759	29
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.86		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1594		1797	1630		1805	3520		1805	3610	1575
Flt Permitted	0.70	1.00		0.63	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1325	1594		1194	1630		1805	3520		1805	3610	1575
Peak-hour factor, PHF	0.89	0.89	0.89	0.83	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	4	162	145	5	87	60	280	48	60	825	32
RTOR Reduction (vph)	0	119	0	0	64	0	0	11	0	0	0	18
Lane Group Flow (vph)	87	47	0	145	28	0	60	317	0	60	825	14
Confl. Peds. (#/hr)			8	8			3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	15.8	15.8		15.8	15.8		4.3	27.3		4.1	27.1	27.1
Effective Green, g (s)	15.8	15.8		15.8	15.8		4.3	27.3		4.1	27.1	27.1
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.07	0.45		0.07	0.45	0.45
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	347	418		313	427		128	1596		122	1625	709
v/s Ratio Prot		0.03			0.02		c0.03	0.09		0.03	c0.23	
v/s Ratio Perm	0.07			c0.12								0.01
v/c Ratio	0.25	0.11		0.46	0.07		0.47	0.20		0.49	0.51	0.02
Uniform Delay, d1	17.5	16.9		18.6	16.7		26.9	9.9		27.0	11.8	9.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		1.5	0.1		2.0	0.1		1.1	0.5	0.0
Delay (s)	18.0	17.0		20.1	16.7		28.8	10.0		28.2	12.3	9.2
Level of Service	B	B		C	B		C	B		C	B	A
Approach Delay (s)		17.4			18.8			12.9			13.2	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.5				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			60.2				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			57.8%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	137	50	645	255	134	269	419	905	279	616	81
Future Volume (vph)	50	137	50	645	255	134	269	419	905	279	616	81
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.96		1.00	0.95		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3419		3467	1784		1805	3610	1615	1805	3541	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3419		3467	1784		1805	3610	1615	1805	3541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	54	149	54	694	274	144	286	446	963	294	648	85
RTOR Reduction (vph)	0	27	0	0	13	0	0	0	0	0	6	0
Lane Group Flow (vph)	54	176	0	694	405	0	286	446	963	294	727	0
Confl. Peds. (#/hr)							3					3
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	10.7	20.2		28.8	37.3		23.6	29.9	118.8	23.4	29.7	
Effective Green, g (s)	10.7	20.2		28.8	37.3		23.6	29.9	118.8	23.4	29.7	
Actuated g/C Ratio	0.09	0.17		0.24	0.31		0.20	0.25	1.00	0.20	0.25	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	160	581		840	560		358	908	1615	355	885	
v/s Ratio Prot	0.03	0.05		c0.20	c0.23		0.16	0.12		c0.16	c0.21	
v/s Ratio Perm									c0.60			
v/c Ratio	0.34	0.30		0.83	0.72		0.80	0.49	0.60	0.83	0.82	
Uniform Delay, d1	50.7	43.1		42.6	36.2		45.3	38.0	0.0	45.8	42.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.3		6.4	5.6		11.0	0.6	1.6	14.0	6.5	
Delay (s)	51.2	43.4		49.0	41.8		56.4	38.5	1.6	59.8	48.5	
Level of Service	D	D		D	D		E	D	A	E	D	
Approach Delay (s)		45.1			46.3			20.6			51.7	
Approach LOS		D			D			C			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			36.9				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			118.8				Sum of lost time (s)			17.5		
Intersection Capacity Utilization			80.2%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019































Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↵	↑↑↑		↵	↑↑
Traffic Volume (vph)	0	0	1520	0	58	1362
Future Volume (vph)	0	0	1520	0	58	1362
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frbp, ped/bikes			1.00		1.00	1.00
Flpb, ped/bikes			1.00		1.00	1.00
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.97	0.97
Adj. Flow (vph)	0	0	1652	0	60	1404
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1652	0	60	1404
Confl. Peds. (#/hr)				1	1	
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			62.1		5.5	75.6
Effective Green, g (s)			62.1		5.5	75.6
Actuated g/C Ratio			0.82		0.07	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4260		130	3574
v/s Ratio Prot			0.32		0.03	c0.39
v/s Ratio Perm						
v/c Ratio			0.39		0.46	0.39
Uniform Delay, d1			1.8		33.6	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		2.6	0.3
Delay (s)			2.0		36.2	0.3
Level of Service			A		D	A
Approach Delay (s)	0.0		2.0			1.8
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			1.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			75.6		Sum of lost time (s)	12.0
Intersection Capacity Utilization			41.0%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
 13: Sycamore Ave & San Pablo Ave
























11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 				 		 		 	 	
Traffic Volume (vph)	43	154	10	457	89	1071	27	440	313	341	923	13
Future Volume (vph)	43	154	10	457	89	1071	27	440	313	341	923	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3571		1715	1746	2817	1787	3574	1565	3467	3567	
Flt Permitted	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3571		1715	1746	2817	1787	3574	1565	3467	3567	
Peak-hour factor, PHF	0.79	0.79	0.79	0.89	0.89	0.89	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	54	195	13	513	100	1203	30	489	348	383	1037	15
RTOR Reduction (vph)	0	3	0	0	0	497	0	0	252	0	1	0
Lane Group Flow (vph)	54	205	0	303	310	706	30	489	96	383	1051	0
Confl. Peds. (#/hr)	1		8	8		1			1	1		
Confl. Bikes (#/hr)			1			1			10			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	15.6	15.6		30.4	30.4	45.7	5.2	31.8	31.8	15.3	41.9	
Effective Green, g (s)	15.6	15.6		30.4	30.4	45.7	5.2	31.8	31.8	15.3	41.9	
Actuated g/C Ratio	0.14	0.14		0.26	0.26	0.40	0.05	0.28	0.28	0.13	0.36	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	244	483		452	461	1118	80	987	432	460	1298	
v/s Ratio Prot	0.03	c0.06		0.18	c0.18	0.08	0.02	0.14		c0.11	c0.29	
v/s Ratio Perm						0.17			0.06			
v/c Ratio	0.22	0.42		0.67	0.67	0.63	0.38	0.50	0.22	0.83	0.81	
Uniform Delay, d1	44.3	45.6		37.9	37.9	27.9	53.4	34.9	32.1	48.7	33.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.3	1.7		5.9	5.9	1.3	4.0	1.1	0.7	12.7	4.6	
Delay (s)	45.6	47.3		43.8	43.8	29.2	57.4	36.0	32.9	61.3	37.6	
Level of Service	D	D		D	D	C	E	D	C	E	D	
Approach Delay (s)		47.0			34.2			35.5			43.9	
Approach LOS		D			C			D			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			38.4				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			115.1				Sum of lost time (s)				22.0	
Intersection Capacity Utilization			76.3%				ICU Level of Service				D	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	372	28	51	1455	52	149	3	158	146	2	235
Future Volume (vph)	49	372	28	51	1455	52	149	3	158	146	2	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98		0.99		1.00	1.00	0.98
Flpb, ped/bikes	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		0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1589	1805	3610	1585		3147		1805	1900	1585
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1589	1805	3610	1585		3147		1805	1900	1585
Peak-hour factor, PHF	0.96	0.96	0.96	0.95	0.95	0.95	0.87	0.87	0.87	0.93	0.93	0.93
Adj. Flow (vph)	51	388	29	54	1532	55	171	3	182	157	2	253
RTOR Reduction (vph)	0	0	15	0	0	29	0	155	0	0	0	217
Lane Group Flow (vph)	51	388	14	54	1532	26	0	201	0	157	2	36
Confl. Peds. (#/hr)	7		3	3		7	3		7	2		9
Confl. Bikes (#/hr)			2			1			5			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6						4
Actuated Green, G (s)	5.8	40.7	40.7	6.0	40.9	40.9		9.8		12.2	12.2	12.2
Effective Green, g (s)	5.8	40.7	40.7	6.0	40.9	40.9		9.8		12.2	12.2	12.2
Actuated g/C Ratio	0.07	0.47	0.47	0.07	0.48	0.48		0.11		0.14	0.14	0.14
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	122	1714	754	126	1722	756		359		256	270	225
v/s Ratio Prot	0.03	0.11		c0.03	c0.42			c0.06		c0.09	0.00	
v/s Ratio Perm			0.01			0.02						0.02
v/c Ratio	0.42	0.23	0.02	0.43	0.89	0.03		0.56		0.61	0.01	0.16
Uniform Delay, d1	38.3	13.2	11.9	38.2	20.4	11.9		35.9		34.5	31.6	32.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	0.0	0.0	0.9	5.9	0.0		1.1		3.0	0.0	0.1
Delay (s)	39.2	13.3	11.9	39.1	26.3	11.9		37.0		37.6	31.6	32.4
Level of Service	D	B	B	D	C	B		D		D	C	C
Approach Delay (s)		16.0			26.2			37.0			34.4	
Approach LOS		B			C			D			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			27.0				HCM 2000 Level of Service				C	
HCM 2000 Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			85.7				Sum of lost time (s)				17.0	
Intersection Capacity Utilization			83.2%				ICU Level of Service				E	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↖	↗	↖↗	↖	↗	↖	↖↗↘		↖	↖↗		
Traffic Volume (vph)	23	21	88	418	38	396	62	1239	84	74	629	19	
Future Volume (vph)	23	21	88	418	38	396	62	1239	84	74	629	19	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.88	0.85	1.00	0.99		1.00	1.00		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1851	1585	3502	1560	1510	1805	5128		1805	3592		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1851	1585	3502	1560	1510	1805	5128		1805	3592		
Peak-hour factor, PHF	0.83	0.83	0.83	0.93	0.93	0.93	0.89	0.89	0.89	0.73	0.73	0.73	
Adj. Flow (vph)	28	25	106	449	41	426	70	1392	94	101	862	26	
RTOR Reduction (vph)	0	0	97	0	157	185	0	5	0	0	2	0	
Lane Group Flow (vph)	0	53	9	449	80	45	70	1481	0	101	886	0	
Confl. Peds. (#/hr)	3		2	2		3	5		4	4		5	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		10.4	10.4	23.6	23.6	23.6	11.4	57.0		12.0	57.6		
Effective Green, g (s)		10.4	10.4	23.6	23.6	23.6	11.4	57.0		12.0	57.6		
Actuated g/C Ratio		0.09	0.09	0.20	0.20	0.20	0.10	0.48		0.10	0.48		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		160	137	688	306	296	171	2435		180	1724		
v/s Ratio Prot		c0.03		c0.13	0.05		0.04	c0.29		c0.06	0.25		
v/s Ratio Perm			0.01			0.03							
v/c Ratio		0.33	0.07	0.65	0.26	0.15	0.41	0.61		0.56	0.51		
Uniform Delay, d1		51.5	50.3	44.4	40.8	39.9	51.1	23.3		51.5	21.5		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.2	0.2	2.2	0.5	0.2	0.6	1.1		2.4	1.1		
Delay (s)		52.8	50.6	46.7	41.3	40.2	51.7	24.4		53.9	22.6		
Level of Service		D	D	D	D	D	D	C		D	C		
Approach Delay (s)		51.3			43.6			25.6			25.8		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			31.4		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.58										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			66.6%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

# **Existing Plus Project AM Unsignalized**

Intersection	
Intersection Delay, s/veh	21.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷	↶	↶	↷		↶	↷	
Traffic Vol, veh/h	123	5	59	138	4	257	23	332	50	117	295	33
Future Vol, veh/h	123	5	59	138	4	257	23	332	50	117	295	33
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.83	0.83	0.83	0.77	0.77	0.77
Heavy Vehicles, %	0	0	0	1	1	1	0	0	0	0	0	0
Mvmt Flow	127	5	61	150	4	279	28	400	60	152	383	43
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	16.7	23.5	23.8	20.9
HCM LOS	C	C	C	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	69%	0%	8%	0%	100%	0%	0%	100%	75%
Vol Right, %	0%	0%	31%	0%	92%	0%	0%	100%	0%	0%	25%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	23	221	161	123	64	138	4	257	117	197	131
LT Vol	23	0	0	123	0	138	0	0	117	0	0
Through Vol	0	221	111	0	5	0	4	0	0	197	98
RT Vol	0	0	50	0	59	0	0	257	0	0	33
Lane Flow Rate	28	267	194	127	66	150	4	279	152	255	171
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.073	0.667	0.472	0.357	0.165	0.404	0.011	0.657	0.393	0.624	0.408
Departure Headway (Hd)	9.523	9.011	8.787	10.124	8.979	9.686	9.177	8.466	9.31	8.798	8.617
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	376	400	410	355	399	372	390	427	386	411	418
Service Time	7.292	6.779	6.555	7.894	6.749	7.45	6.941	6.229	7.074	6.561	6.381
HCM Lane V/C Ratio	0.074	0.667	0.473	0.358	0.165	0.403	0.01	0.653	0.394	0.62	0.409
HCM Control Delay	13	28.2	19.2	18.4	13.5	18.9	12	26.1	18	25.2	17.2
HCM Lane LOS	B	D	C	C	B	C	B	D	C	D	C
HCM 95th-tile Q	0.2	4.7	2.5	1.6	0.6	1.9	0	4.6	1.8	4.1	1.9

Intersection	
Intersection Delay, s/veh	14.6
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	105	202	259	0	0	490
Future Vol, veh/h	105	202	259	0	0	490
Peak Hour Factor	0.88	0.88	0.67	0.67	0.83	0.83
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	119	230	387	0	0	590
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	12.7	19.7	12.4
HCM LOS	B	C	B

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	259	105	202	245	245
LT Vol	0	105	0	0	0
Through Vol	259	0	0	245	245
RT Vol	0	0	202	0	0
Lane Flow Rate	387	119	230	295	295
Geometry Grp	4	7	7	7	7
Degree of Util (X)	0.65	0.244	0.391	0.505	0.363
Departure Headway (Hd)	6.049	7.35	6.128	6.157	4.428
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	595	488	585	584	809
Service Time	4.098	5.106	3.883	3.911	2.181
HCM Lane V/C Ratio	0.65	0.244	0.393	0.505	0.365
HCM Control Delay	19.7	12.5	12.8	15.1	9.7
HCM Lane LOS	C	B	B	C	A
HCM 95th-tile Q	4.7	0.9	1.8	2.8	1.7

HCM 6th TWSC  
8: Linus Pauling Dr & San Pablo Ave

10/09/2019

Intersection												
Int Delay, s/veh	75.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↕	↕	↖	↗	↖
Traffic Vol, veh/h	10	3	9	221	11	42	174	248	51	28	772	189
Future Vol, veh/h	10	3	9	221	11	42	174	248	51	28	772	189
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	0	0	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	0	-	-	175	-	175	200	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	92	88	92	92	92	94	94	92	92	88	88
Heavy Vehicles, %	5	2	5	2	2	2	0	0	2	2	0	0
Mvmt Flow	11	3	10	240	12	46	185	264	55	30	877	215

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1448	1629	442	1134	1789	132	1095	0	0	319	0	0
Stage 1	940	940	-	634	634	-	-	-	-	-	-	-
Stage 2	508	689	-	500	1155	-	-	-	-	-	-	-
Critical Hdwy	7.6	6.54	7	7.54	6.54	6.94	4.1	-	-	4.14	-	-
Critical Hdwy Stg 1	6.6	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.6	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.55	4.02	3.35	3.52	4.02	3.32	2.2	-	-	2.22	-	-
Pot Cap-1 Maneuver	90	101	555	~ 157	80	893	645	-	-	1238	-	-
Stage 1	278	340	-	434	471	-	-	-	-	-	-	-
Stage 2	508	445	-	521	269	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	55	70	554	~ 114	56	893	643	-	-	1238	-	-
Mov Cap-2 Maneuver	55	70	-	~ 114	56	-	-	-	-	-	-	-
Stage 1	198	331	-	309	335	-	-	-	-	-	-	-
Stage 2	331	317	-	494	262	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	52.5	\$ 480.4	4.7	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	643	-	-	55	207	114	218	1238	-	-
HCM Lane V/C Ratio	0.288	-	-	0.207	0.065	2.107	0.264	0.025	-	-
HCM Control Delay (s)	12.8	-	-	86.8	23.6	\$ 589	27.3	8	-	-
HCM Lane LOS	B	-	-	F	C	F	D	A	-	-
HCM 95th %tile Q(veh)	1.2	-	-	0.7	0.2	20.2	1	0.1	-	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

HCM 6th TWSC  
 9: San Pablo Ave & Project Driveway

10/09/2019

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	0	42	462	89	0	781
Future Vol, veh/h	0	42	462	89	0	781
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	200	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	46	502	97	0	849

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	927	251	0	0	599	0
Stage 1	502	-	-	-	-	-
Stage 2	425	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	267	749	-	-	974	-
Stage 1	573	-	-	-	-	-
Stage 2	627	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	267	749	-	-	974	-
Mov Cap-2 Maneuver	267	-	-	-	-	-
Stage 1	573	-	-	-	-	-
Stage 2	627	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	749	974
HCM Lane V/C Ratio	-	-	-	0.061	-
HCM Control Delay (s)	-	-	0	10.1	0
HCM Lane LOS	-	-	A	B	A
HCM 95th %tile Q(veh)	-	-	-	0.2	0



# HCM Unsignalized Intersection Capacity Analysis

## 10: John Muir Pkwy & Alfred Nobel Dr

09/28/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↗	↗↗	↗↗		↘↘		
Traffic Volume (veh/h)	15	140	131	478	61	5	
Future Volume (Veh/h)	15	140	131	478	61	5	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.75	0.75	0.88	0.88	0.92	0.92	
Hourly flow rate (vph)	20	187	149	543	66	5	
Pedestrians					4		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	696				558	350	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	696				558	350	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	98				85	99	
cM capacity (veh/h)	906				448	644	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	20	94	94	99	593	44	27
Volume Left	20	0	0	0	0	44	22
Volume Right	0	0	0	0	543	0	5
cSH	906	1700	1700	1700	1700	448	475
Volume to Capacity	0.02	0.06	0.06	0.06	0.35	0.10	0.06
Queue Length 95th (ft)	2	0	0	0	0	8	5
Control Delay (s)	9.1	0.0	0.0	0.0	0.0	13.9	13.0
Lane LOS	A					B	B
Approach Delay (s)	0.9			0.0		13.6	
Approach LOS						B	
Intersection Summary							
Average Delay			1.2				
Intersection Capacity Utilization			29.4%		ICU Level of Service		A
Analysis Period (min)			15				

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	775	1434	7	1	76
Future Vol, veh/h	0	775	1434	7	1	76
Conflicting Peds, #/hr	3	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	71	71
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	881	1630	8	1	107

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	2078 822
Stage 1	-	-	-	-	1637 -
Stage 2	-	-	-	-	441 -
Critical Hdwy	-	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	-	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	0	-	-	-	47 321
Stage 1	0	-	-	-	147 -
Stage 2	0	-	-	-	622 -
Platoon blocked, %	-	-	-	-	
Mov Cap-1 Maneuver	-	-	-	-	47 320
Mov Cap-2 Maneuver	-	-	-	-	47 -
Stage 1	-	-	-	-	147 -
Stage 2	-	-	-	-	621 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	21.8
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	320
HCM Lane V/C Ratio	-	-	-	0.335
HCM Control Delay (s)	-	-	-	21.8
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	1.4

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	54	131	184	17	153	18
Future Vol, veh/h	54	131	184	17	153	18
Peak Hour Factor	0.84	0.84	0.94	0.94	0.72	0.72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	64	156	196	18	213	25
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	9.6	9.9	10.7
HCM LOS	A	A	B

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	89%
Vol Thru, %	0%	100%	92%	0%
Vol Right, %	0%	0%	8%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	54	131	201	171
LT Vol	54	0	0	153
Through Vol	0	131	184	0
RT Vol	0	0	17	18
Lane Flow Rate	64	156	214	238
Geometry Grp	7	7	5	2
Degree of Util (X)	0.104	0.231	0.288	0.334
Departure Headway (Hd)	5.83	5.326	4.853	5.058
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	612	671	736	708
Service Time	3.592	3.088	2.914	3.115
HCM Lane V/C Ratio	0.105	0.232	0.291	0.336
HCM Control Delay	9.3	9.7	9.9	10.7
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.3	0.9	1.2	1.5

# **Existing Plus Project PM Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019




















Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	280	254	163	368	308	171
Future Volume (vph)	280	254	163	368	308	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.93		1.00	1.00	0.95	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3299		1805	3610	3402	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3299		1805	3610	3402	
Peak-hour factor, PHF	0.84	0.84	0.94	0.94	0.79	0.79
Adj. Flow (vph)	333	302	173	391	390	216
RTOR Reduction (vph)	79	0	0	0	38	0
Lane Group Flow (vph)	556	0	173	391	568	0
Confl. Peds. (#/hr)		1	1			1
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	21.5		13.9	40.8	22.9	
Effective Green, g (s)	21.5		13.9	40.8	22.9	
Actuated g/C Ratio	0.30		0.19	0.57	0.32	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	987		349	2051	1085	
v/s Ratio Prot	c0.17		c0.10	0.11	c0.17	
v/s Ratio Perm						
v/c Ratio	0.56		0.50	0.19	0.52	
Uniform Delay, d1	21.2		25.8	7.5	20.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.9		0.4	0.1	0.6	
Delay (s)	22.1		26.2	7.6	20.6	
Level of Service	C		C	A	C	
Approach Delay (s)	22.1			13.3	20.6	
Approach LOS	C			B	C	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			18.8		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.57			
Actuated Cycle Length (s)			71.8		Sum of lost time (s)	17.5
Intersection Capacity Utilization			50.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	48	61	12	0	512	140	24	332	210	
Future Volume (vph)	0	0	0	48	61	12	0	512	140	24	332	210	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5		4.0	5.5		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frbp, ped/bikes					1.00			0.99		1.00	1.00		
Flpb, ped/bikes					1.00			1.00		1.00	1.00		
Frt					0.99			0.97		1.00	0.94		
Flt Protected					0.98			1.00		0.95	1.00		
Satd. Flow (prot)					1836			3476		1805	3400		
Flt Permitted					0.98			1.00		0.95	1.00		
Satd. Flow (perm)					1836			3476		1805	3400		
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.94	0.94	0.94	0.86	0.86	0.86	
Adj. Flow (vph)	0	0	0	62	78	15	0	545	149	28	386	244	
RTOR Reduction (vph)	0	0	0	0	3	0	0	13	0	0	76	0	
Lane Group Flow (vph)	0	0	0	0	152	0	0	681	0	28	554	0	
Confl. Peds. (#/hr)									4	4			
Confl. Bikes (#/hr)						1							
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					10.8			25.0		2.6	31.6		
Effective Green, g (s)					10.8			25.0		2.6	31.6		
Actuated g/C Ratio					0.21			0.48		0.05	0.61		
Clearance Time (s)					4.0			5.5		4.0	5.5		
Vehicle Extension (s)					3.0			4.0		3.0	4.0		
Lane Grp Cap (vph)					382			1674		90	2070		
v/s Ratio Prot					c0.08			c0.20		0.02	c0.16		
v/s Ratio Perm													
v/c Ratio					0.40			0.41		0.31	0.27		
Uniform Delay, d1					17.7			8.7		23.8	4.7		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					0.7			0.2		2.0	0.1		
Delay (s)					18.4			8.9		25.8	4.8		
Level of Service					B			A		C	A		
Approach Delay (s)		0.0			18.4			8.9			5.7		
Approach LOS		A			B			A			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			8.5		HCM 2000 Level of Service						A		
HCM 2000 Volume to Capacity ratio			0.41										
Actuated Cycle Length (s)			51.9		Sum of lost time (s)					13.5			
Intersection Capacity Utilization			34.5%		ICU Level of Service					A			
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	93	79	736	0	0	375
Future Volume (vph)	93	79	736	0	0	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1585	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1585	3574			3610
Peak-hour factor, PHF	0.88	0.88	0.90	0.90	0.87	0.87
Adj. Flow (vph)	106	90	818	0	0	431
RTOR Reduction (vph)	0	69	0	0	0	0
Lane Group Flow (vph)	106	21	818	0	0	431
Confl. Peds. (#/hr)		13		7	7	
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	6.6	6.6	13.9			13.9
Effective Green, g (s)	6.6	6.6	13.9			13.9
Actuated g/C Ratio	0.22	0.22	0.46			0.46
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	393	345	1639			1656
v/s Ratio Prot	c0.06		c0.23			0.12
v/s Ratio Perm		0.01				
v/c Ratio	0.27	0.06	0.50			0.26
Uniform Delay, d1	9.8	9.4	5.8			5.0
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	0.0	0.2			0.1
Delay (s)	10.0	9.4	6.0			5.1
Level of Service	A	A	A			A
Approach Delay (s)	9.7		6.0			5.1
Approach LOS	A		A			A

### Intersection Summary




















HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	30.3	Sum of lost time (s)	9.8
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	95	62	17	175	76	332	79	313	39	151	214	54	
Future Volume (vph)	95	62	17	175	76	332	79	313	39	151	214	54	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12	
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95		
Frbp, ped/bikes		1.00			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		
Frt		0.99			1.00	0.85	1.00	0.98		1.00	0.97		
Flt Protected		0.97			0.97	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		3196			1836	1589	1805	3541		1805	3492		
Flt Permitted		0.72			0.68	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		2351			1287	1589	1805	3541		1805	3492		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.98	0.98	0.98	0.93	0.93	0.93	
Adj. Flow (vph)	99	65	18	182	79	346	81	319	40	162	230	58	
RTOR Reduction (vph)	0	9	0	0	0	243	0	12	0	0	24	0	
Lane Group Flow (vph)	0	173	0	0	261	103	81	347	0	162	264	0	
Confl. Peds. (#/hr)	6					6	1		4	4		1	
Confl. Bikes (#/hr)						2							
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA		
Protected Phases		4			8		5	2		1	6		
Permitted Phases	4			8		8							
Actuated Green, G (s)		13.4			13.0	13.0	3.3	9.6		6.2	12.5		
Effective Green, g (s)		13.4			13.0	13.0	3.3	9.6		6.2	12.5		
Actuated g/C Ratio		0.31			0.30	0.30	0.08	0.22		0.14	0.29		
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2		
Lane Grp Cap (vph)		720			382	472	136	777		256	998		
v/s Ratio Prot							0.04	c0.10		c0.09	c0.08		
v/s Ratio Perm		0.07			c0.20	0.06							
v/c Ratio		0.24			0.68	0.22	0.60	0.45		0.63	0.26		
Uniform Delay, d1		11.3			13.5	11.5	19.6	14.8		17.7	12.0		
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		0.1			4.0	0.1	4.6	0.1		3.7	0.1		
Delay (s)		11.4			17.5	11.6	24.2	14.9		21.4	12.1		
Level of Service		B			B	B	C	B		C	B		
Approach Delay (s)		11.4			14.2			16.6			15.4		
Approach LOS		B			B			B			B		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			14.8		HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio			0.58										
Actuated Cycle Length (s)			43.7		Sum of lost time (s)					14.9			
Intersection Capacity Utilization			53.6%		ICU Level of Service					A			
Analysis Period (min)			15										

c Critical Lane Group



# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	5	108	42	4	26	142	476	91	62	214	49
Future Volume (vph)	35	5	108	42	4	26	142	476	91	62	214	49
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	0.87		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1801	1599		1796	1632		1805	3510		1787	3574	1565
Flt Permitted	0.73	1.00		0.66	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1389	1599		1255	1632		1805	3510		1787	3574	1565
Peak-hour factor, PHF	0.77	0.77	0.77	0.78	0.78	0.78	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	45	6	140	54	5	33	167	560	107	67	230	53
RTOR Reduction (vph)	0	119	0	0	28	0	0	12	0	0	0	31
Lane Group Flow (vph)	45	27	0	54	10	0	167	655	0	67	230	22
Confl. Peds. (#/hr)	3		11	11		3	1		2	2		1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	7.2	7.2		7.2	7.2		8.0	23.4		4.0	19.4	19.4
Effective Green, g (s)	7.2	7.2		7.2	7.2		8.0	23.4		4.0	19.4	19.4
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.17	0.49		0.08	0.41	0.41
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	210	241		189	246		303	1725		150	1456	637
v/s Ratio Prot		0.02			0.01		c0.09	c0.19		0.04	0.06	
v/s Ratio Perm	0.03			c0.04								0.01
v/c Ratio	0.21	0.11		0.29	0.04		0.55	0.38		0.45	0.16	0.03
Uniform Delay, d1	17.7	17.4		17.9	17.3		18.2	7.6		20.7	8.9	8.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		1.1	0.1		1.7	0.3		0.8	0.1	0.0
Delay (s)	18.4	17.7		19.1	17.3		19.9	7.9		21.5	9.0	8.5
Level of Service	B	B		B	B		B	A		C	A	A
Approach Delay (s)		17.9			18.3			10.3			11.3	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			12.0				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			47.6				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			43.0%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	377	81	337	75	109	79	652	1074	308	278	31
Future Volume (vph)	51	377	81	337	75	109	79	652	1074	308	278	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.91		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3479		3467	1715		1805	3610	1615	1805	3552	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3479		3467	1715		1805	3610	1615	1805	3552	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	58	428	92	366	82	118	85	701	1155	362	327	36
RTOR Reduction (vph)	0	14	0	0	39	0	0	0	0	0	5	0
Lane Group Flow (vph)	58	506	0	366	161	0	85	701	1155	362	358	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	11.2	26.8		19.1	33.7		16.5	45.9	140.0	31.7	61.1	
Effective Green, g (s)	11.2	26.8		19.1	33.7		16.5	45.9	140.0	31.7	61.1	
Actuated g/C Ratio	0.08	0.19		0.14	0.24		0.12	0.33	1.00	0.23	0.44	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	142	665		472	412		212	1183	1615	408	1550	
v/s Ratio Prot	0.03	0.15		0.11	0.09		0.05	0.19		c0.20	0.10	
v/s Ratio Perm									c0.72			
v/c Ratio	0.41	0.76		0.78	0.39		0.40	0.59	0.72	0.89	0.23	
Uniform Delay, d1	61.2	53.6		58.4	44.5		57.2	39.2	0.0	52.4	24.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	5.1		7.1	1.3		0.5	2.2	2.7	19.6	0.3	
Delay (s)	61.9	58.7		65.5	45.8		57.6	41.4	2.7	72.0	25.1	
Level of Service	E	E		E	D		E	D	A	E	C	
Approach Delay (s)		59.0			58.6			19.1			48.5	
Approach LOS		E			E			B			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			36.6				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)				17.5	
Intersection Capacity Utilization			72.8%				ICU Level of Service				C	
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019





























Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↕↕↕↔		↶	↕↕
Traffic Volume (vph)	0	0	1750	1	6	726
Future Volume (vph)	0	0	1750	1	6	726
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	0	1862	1	6	764
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1863	0	6	764
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			68.9		1.3	78.2
Effective Green, g (s)			68.9		1.3	78.2
Actuated g/C Ratio			0.88		0.02	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4570		29	3574
v/s Ratio Prot			c0.36		0.00	c0.21
v/s Ratio Perm						
v/c Ratio			0.41		0.21	0.21
Uniform Delay, d1			0.9		37.9	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		3.5	0.1
Delay (s)			1.1		41.5	0.1
Level of Service			A		D	A
Approach Delay (s)	0.0		1.1			0.5
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			0.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.44			
Actuated Cycle Length (s)			78.2		Sum of lost time (s)	12.0
Intersection Capacity Utilization			37.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 	 		 		 	 	
Traffic Volume (vph)	33	71	6	223	138	705	51	967	345	371	326	28
Future Volume (vph)	33	71	6	223	138	705	51	967	345	371	326	28
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	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	1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3564		1681	1774	2842	1787	3574	1583	3502	3567	
Flt Permitted	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3564		1681	1774	2842	1787	3574	1583	3502	3567	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	35	76	6	240	148	758	57	1087	388	399	351	30
RTOR Reduction (vph)	0	5	0	0	0	430	0	0	175	0	3	0
Lane Group Flow (vph)	35	77	0	190	198	328	57	1087	213	399	378	0
Confl. Peds. (#/hr)			10	10								
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	1%	1%	2%	0%	0%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	11.6	11.6		24.7	24.7	51.0	9.4	55.4	55.4	26.3	72.3	
Effective Green, g (s)	11.6	11.6		24.7	24.7	51.0	9.4	55.4	55.4	26.3	72.3	
Actuated g/C Ratio	0.08	0.08		0.18	0.18	0.36	0.07	0.40	0.40	0.19	0.52	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	149	295		296	312	1035	119	1414	626	657	1842	
v/s Ratio Prot	0.02	c0.02		c0.11	0.11	0.06	0.03	c0.30		c0.11	0.11	
v/s Ratio Perm						0.06			0.13			
v/c Ratio	0.23	0.26		0.64	0.63	0.32	0.48	0.77	0.34	0.61	0.21	
Uniform Delay, d1	60.0	60.2		53.5	53.5	32.0	62.9	36.7	29.5	52.1	18.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.24	0.78	0.91	1.00	1.00	
Incremental Delay, d2	2.3	1.3		7.6	6.9	0.2	3.6	3.6	1.3	1.8	0.3	
Delay (s)	62.3	61.5		61.1	60.4	32.2	81.9	32.1	28.1	54.0	18.6	
Level of Service	E	E		E	E	C	F	C	C	D	B	
Approach Delay (s)		61.8			41.9			32.9			36.7	
Approach LOS		E			D			C			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			37.6				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			78.5%			ICU Level of Service				D		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	240	1261	135	85	394	107	70	8	69	64	2	107	
Future Volume (vph)	240	1261	135	85	394	107	70	8	69	64	2	107	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98		0.98		1.00	1.00	0.98	
Flpb, ped/bikes	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		0.93		1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (perm)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584	
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.90	0.90	0.90	0.96	0.96	0.96	
Adj. Flow (vph)	258	1356	145	89	410	111	78	9	77	67	2	111	
RTOR Reduction (vph)	0	0	23	0	0	47	0	72	0	0	0	103	
Lane Group Flow (vph)	258	1356	122	89	410	64	0	92	0	67	2	8	
Confl. Peds. (#/hr)	4		1	1		4	6		9	9		6	
Confl. Bikes (#/hr)			1						5				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm	
Protected Phases	5	2		1	6		8	8		4	4		
Permitted Phases			2			6						4	
Actuated Green, G (s)	24.5	93.8	93.8	11.3	80.6	80.6		8.3		9.6	9.6	9.6	
Effective Green, g (s)	24.5	93.8	93.8	11.3	80.6	80.6		8.3		9.6	9.6	9.6	
Actuated g/C Ratio	0.18	0.67	0.67	0.08	0.58	0.58		0.06		0.07	0.07	0.07	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	315	2418	1066	145	2078	913		190		123	130	108	
v/s Ratio Prot	c0.14	c0.38		0.05	0.11			c0.03		c0.04	0.00		
v/s Ratio Perm			0.08			0.04						0.00	
v/c Ratio	0.82	0.56	0.11	0.61	0.20	0.07		0.48		0.54	0.02	0.07	
Uniform Delay, d1	55.6	12.2	8.3	62.2	14.2	13.1		63.8		63.1	60.8	61.0	
Progression Factor	1.00	1.00	1.00	1.09	1.43	2.91		1.00		1.00	1.00	1.00	
Incremental Delay, d2	14.5	0.9	0.2	5.2	0.2	0.1		0.7		2.6	0.0	0.1	
Delay (s)	70.1	13.2	8.5	73.0	20.5	38.3		64.5		65.7	60.8	61.1	
Level of Service	E	B	A	E	C	D		E		E	E	E	
Approach Delay (s)		21.1			31.4			64.5			62.8		
Approach LOS		C			C			E			E		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			28.8									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.62										
Actuated Cycle Length (s)			140.0									Sum of lost time (s)	17.0
Intersection Capacity Utilization			65.3%									ICU Level of Service	C
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis  
 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↖	↗	↖↗	↖	↗	↖	↖↗↘		↖	↗↘		
Traffic Volume (vph)	73	40	158	488	60	241	57	786	57	83	633	22	
Future Volume (vph)	73	40	158	488	60	241	57	786	57	83	633	22	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	1.00	0.99	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.91	0.85	1.00	0.99		1.00	0.99		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1840	1582	3502	1627	1514	1805	5124		1805	3588		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1840	1582	3502	1627	1514	1805	5124		1805	3588		
Peak-hour factor, PHF	0.85	0.85	0.85	0.96	0.96	0.96	0.91	0.91	0.91	0.89	0.89	0.89	
Adj. Flow (vph)	86	47	186	508	62	251	63	864	63	93	711	25	
RTOR Reduction (vph)	0	0	166	0	56	121	0	6	0	0	2	0	
Lane Group Flow (vph)	0	133	20	508	105	32	63	921	0	93	734	0	
Confl. Peds. (#/hr)	1		3	3		1	5		4	1		9	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		12.3	12.3	23.9	23.9	23.9	8.6	50.4		11.4	53.2		
Effective Green, g (s)		12.3	12.3	23.9	23.9	23.9	8.6	50.4		11.4	53.2		
Actuated g/C Ratio		0.11	0.11	0.21	0.21	0.21	0.07	0.44		0.10	0.46		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		196	169	727	338	314	134	2245		178	1659		
v/s Ratio Prot		c0.07		c0.15	0.06		0.03	0.18		c0.05	c0.20		
v/s Ratio Perm			0.01			0.02							
v/c Ratio		0.68	0.12	0.70	0.31	0.10	0.47	0.41		0.52	0.44		
Uniform Delay, d1		49.4	46.4	42.2	38.6	36.9	51.0	22.1		49.2	20.9		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		9.0	0.3	2.9	0.5	0.1	0.9	0.6		1.3	0.9		
Delay (s)		58.4	46.8	45.2	39.1	37.0	52.0	22.7		50.5	21.7		
Level of Service		E	D	D	D	D	D	C		D	C		
Approach Delay (s)		51.6			42.5			24.5			25.0		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			32.6		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.55										
Actuated Cycle Length (s)			115.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			65.3%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

# **Existing Plus Project PM Unsignalized**

HCM 6th AWSC  
5: Viewpoint Blvd & Willow Ave

09/28/2019

Intersection	
Intersection Delay, s/veh	13.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷	↶	↶	↷		↶	↷	
Traffic Vol, veh/h	53	2	42	71	2	117	78	255	125	191	147	101
Future Vol, veh/h	53	2	42	71	2	117	78	255	125	191	147	101
Peak Hour Factor	0.78	0.78	0.78	0.84	0.84	0.84	0.93	0.93	0.93	0.95	0.95	0.95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	68	3	54	85	2	139	84	274	134	201	155	106
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	12	12.7	13.6	13.7
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	40%	0%	5%	0%	100%	0%	0%	100%	33%
Vol Right, %	0%	0%	60%	0%	95%	0%	0%	100%	0%	0%	67%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	78	170	210	53	44	71	2	117	191	98	150
LT Vol	78	0	0	53	0	71	0	0	191	0	0
Through Vol	0	170	85	0	2	0	2	0	0	98	49
RT Vol	0	0	125	0	42	0	0	117	0	0	101
Lane Flow Rate	84	183	226	68	56	85	2	139	201	103	158
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.177	0.359	0.418	0.16	0.114	0.195	0.005	0.274	0.426	0.204	0.291
Departure Headway (Hd)	7.585	7.079	6.658	8.454	7.286	8.302	7.798	7.093	7.623	7.117	6.64
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	473	508	540	425	491	433	459	506	472	504	542
Service Time	5.326	4.82	4.399	6.204	5.036	6.051	5.547	4.842	5.364	4.858	4.381
HCM Lane V/C Ratio	0.178	0.36	0.419	0.16	0.114	0.196	0.004	0.275	0.426	0.204	0.292
HCM Control Delay	12	13.8	14.1	12.8	11	13.1	10.6	12.5	15.9	11.7	12.1
HCM Lane LOS	B	B	B	B	B	B	B	B	C	B	B
HCM 95th-tile Q	0.6	1.6	2	0.6	0.4	0.7	0	1.1	2.1	0.8	1.2



Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	179	212	260	0	0	264
Future Vol, veh/h	179	212	260	0	0	264
Peak Hour Factor	0.90	0.90	0.87	0.87	0.92	0.92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	199	236	299	0	0	287
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	11.9	14.2	9.5
HCM LOS	B	B	A

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	260	179	212	132	132
LT Vol	0	179	0	0	0
Through Vol	260	0	0	132	132
RT Vol	0	0	212	0	0
Lane Flow Rate	299	199	236	143	143
Geometry Grp	4	7	7	7	7
Degree of Util (X)	0.484	0.363	0.35	0.245	0.176
Departure Headway (Hd)	5.835	6.568	5.355	6.15	4.423
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	619	549	671	584	809
Service Time	3.867	4.297	3.084	3.886	2.159
HCM Lane V/C Ratio	0.483	0.362	0.352	0.245	0.177
HCM Control Delay	14.2	13	11	10.9	8.1
HCM Lane LOS	B	B	B	B	A
HCM 95th-tile Q	2.6	1.6	1.6	1	0.6

HCM 6th TWSC  
8: Linus Pauling Dr & San Pablo Ave

10/09/2019

Intersection												
Int Delay, s/veh	15.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗	↗	↖	↗	↖
Traffic Vol, veh/h	122	11	253	116	6	20	12	505	74	29	328	24
Future Vol, veh/h	122	11	253	116	6	20	12	505	74	29	328	24
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	0	-	-	175	-	175	200	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	66	92	66	92	92	92	92	92	92	92	97	97
Heavy Vehicles, %	0	2	0	2	2	2	0	0	2	2	0	0
Mvmt Flow	185	12	383	126	7	22	13	549	80	32	338	25

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	707	1058	170	814	1003	275	364	0	0	629	0	0
Stage 1	403	403	-	575	575	-	-	-	-	-	-	-
Stage 2	304	655	-	239	428	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.54	6.9	7.54	6.54	6.94	4.1	-	-	4.14	-	-
Critical Hdwy Stg 1	6.5	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.02	3.3	3.52	4.02	3.32	2.2	-	-	2.22	-	-
Pot Cap-1 Maneuver	326	223	851	270	241	722	1206	-	-	949	-	-
Stage 1	601	598	-	470	501	-	-	-	-	-	-	-
Stage 2	686	461	-	743	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	299	213	850	137	230	722	1205	-	-	949	-	-
Mov Cap-2 Maneuver	299	213	-	137	230	-	-	-	-	-	-	-
Stage 1	594	577	-	465	495	-	-	-	-	-	-	-
Stage 2	649	456	-	386	563	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.8	99.7	0.2	0.7
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1205	-	-	299	779	137	483	949	-	-
HCM Lane V/C Ratio	0.011	-	-	0.618	0.507	0.92	0.059	0.033	-	-
HCM Control Delay (s)	8	-	-	34.7	14.3	119.2	12.9	8.9	-	-
HCM Lane LOS	A	-	-	D	B	F	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	3.8	2.9	6.2	0.2	0.1	-	-

HCM 6th TWSC  
 9: San Pablo Ave & Project Driveway

10/09/2019

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗		↑↑
Traffic Vol, veh/h	0	20	601	135	0	581
Future Vol, veh/h	0	20	601	135	0	581
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	653	147	0	632

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	969	327	0	0	-
Stage 1	653	-	-	-	-
Stage 2	316	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-
Pot Cap-1 Maneuver	251	669	-	-	0
Stage 1	480	-	-	-	0
Stage 2	712	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	251	669	-	-	-
Mov Cap-2 Maneuver	251	-	-	-	-
Stage 1	480	-	-	-	-
Stage 2	712	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBT
Capacity (veh/h)	-	-	-	669
HCM Lane V/C Ratio	-	-	-	0.032
HCM Control Delay (s)	-	-	0	10.6
HCM Lane LOS	-	-	A	B
HCM 95th %tile Q(veh)	-	-	-	0.1

# HCM Unsignalized Intersection Capacity Analysis

## 10: John Muir Pkwy & Alfred Nobel Dr

09/28/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↵	↑↑	↑↑		↵↵		
Traffic Volume (veh/h)	7	119	114	75	487	31	
Future Volume (Veh/h)	7	119	114	75	487	31	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.85	0.85	0.87	0.87	0.79	0.79	
Hourly flow rate (vph)	8	140	131	86	616	39	
Pedestrians					1		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	218				261	110	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	218				261	110	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	99				13	96	
cM capacity (veh/h)	1362				707	929	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	8	70	70	87	130	411	244
Volume Left	8	0	0	0	0	411	205
Volume Right	0	0	0	0	86	0	39
cSH	1362	1700	1700	1700	1700	707	735
Volume to Capacity	0.01	0.04	0.04	0.05	0.08	0.58	0.33
Queue Length 95th (ft)	0	0	0	0	0	94	37
Control Delay (s)	7.7	0.0	0.0	0.0	0.0	16.9	12.3
Lane LOS	A					C	B
Approach Delay (s)	0.4			0.0		15.2	
Approach LOS						C	
Intersection Summary							
Average Delay			9.8				
Intersection Capacity Utilization			27.4%		ICU Level of Service		A
Analysis Period (min)			15				

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	1390	560	10	0	34
Future Vol, veh/h	0	1390	560	10	0	34
Conflicting Peds, #/hr	0	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	96	96	77	77
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	0	1479	583	10	0	44

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	300
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	6.9
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	3.3
Pot Cap-1 Maneuver	0	-	-	-	702
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	700
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	700
HCM Lane V/C Ratio	-	-	-	0.063
HCM Control Delay (s)	-	-	-	10.5
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	55	133	181	6	199	54
Future Vol, veh/h	55	133	181	6	199	54
Peak Hour Factor	0.87	0.87	0.77	0.77	0.93	0.93
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	63	153	235	8	214	58
Number of Lanes	1	1	1	0	1	0























Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	9.8	10.6	11.3
HCM LOS	A	B	B

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	79%
Vol Thru, %	0%	100%	97%	0%
Vol Right, %	0%	0%	3%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	55	133	187	253
LT Vol	55	0	0	199
Through Vol	0	133	181	0
RT Vol	0	0	6	54
Lane Flow Rate	63	153	243	272
Geometry Grp	7	7	5	2
Degree of Util (X)	0.105	0.232	0.336	0.382
Departure Headway (Hd)	5.959	5.454	4.975	5.061
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	597	653	716	705
Service Time	3.737	3.232	3.05	3.131
HCM Lane V/C Ratio	0.106	0.234	0.339	0.386
HCM Control Delay	9.4	9.9	10.6	11.3
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	0.4	0.9	1.5	1.8

# **Existing Plus Project Mitigated AM**

HCM Signalized Intersection Capacity Analysis  
8: Linus Pauling Dr & San Pablo Ave

11/25/2019























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	3	9	0	11	84	174	248	0	28	772	189
Future Volume (vph)	10	3	9	0	11	84	174	248	0	28	772	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.99			1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.88			0.87		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1595			1616		1805	3610		1770	3610	1575
Flt Permitted	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1719	1595			1616		1805	3610		1770	3610	1575
Peak-hour factor, PHF	0.88	0.92	0.88	0.92	0.92	0.92	0.94	0.94	0.92	0.92	0.88	0.88
Adj. Flow (vph)	11	3	10	0	12	91	185	264	0	30	877	215
RTOR Reduction (vph)	0	8	0	0	84	0	0	0	0	0	0	118
Lane Group Flow (vph)	11	5	0	0	19	0	185	264	0	30	877	97
Confl. Peds. (#/hr)							3					3
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	5%	2%	5%	2%	2%	2%	0%	0%	2%	2%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	0.6	8.6			4.0		7.2	29.2		0.8	22.8	22.8
Effective Green, g (s)	0.6	8.6			4.0		7.2	29.2		0.8	22.8	22.8
Actuated g/C Ratio	0.01	0.17			0.08		0.14	0.58		0.02	0.45	0.45
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	20	271			127		256	2083		27	1626	709
v/s Ratio Prot	c0.01	0.00			c0.01		c0.10	0.07		0.02	c0.24	
v/s Ratio Perm												0.06
v/c Ratio	0.55	0.02			0.15		0.72	0.13		1.11	0.54	0.14
Uniform Delay, d1	24.9	17.5			21.7		20.7	4.9		24.9	10.1	8.1
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	28.9	0.0			0.6		9.7	0.0		209.3	0.3	0.1
Delay (s)	53.7	17.5			22.3		30.4	4.9		234.2	10.4	8.2
Level of Service	D	B			C		C	A		F	B	A
Approach Delay (s)		34.1			22.3			15.4			16.0	
Approach LOS		C			C			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			16.5				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			50.6				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			48.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												



# **Existing Plus Project Mitigated PM**

HCM Signalized Intersection Capacity Analysis  
 8: Linus Pauling Dr & San Pablo Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	122	11	253	116	6	20	12	505	74	29	328	24	
Future Volume (vph)	122	11	253	116	6	20	12	505	74	29	328	24	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85		1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1805	1602		1770	1651		1803	3610	1583	1770	3610	1580	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1805	1602		1770	1651		1803	3610	1583	1770	3610	1580	
Peak-hour factor, PHF	0.66	0.92	0.66	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.97	0.97	
Adj. Flow (vph)	185	12	383	126	7	22	13	549	80	32	338	25	
RTOR Reduction (vph)	0	302	0	0	20	0	0	0	56	0	0	17	
Lane Group Flow (vph)	185	93	0	126	9	0	13	549	24	32	338	8	
Confl. Peds. (#/hr)							1					1	
Confl. Bikes (#/hr)			1										
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	0%	2%	2%	0%	0%	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases									2			6	
Actuated Green, G (s)	13.2	11.0		7.6	5.4		0.5	15.9	15.9	1.7	17.1	17.1	
Effective Green, g (s)	13.2	11.0		7.6	5.4		0.5	15.9	15.9	1.7	17.1	17.1	
Actuated g/C Ratio	0.25	0.21		0.15	0.10		0.01	0.30	0.30	0.03	0.33	0.33	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	456	337		257	170		17	1099	482	57	1182	517	
v/s Ratio Prot	c0.10	c0.06		c0.07	0.01		0.01	c0.15		c0.02	0.09		
v/s Ratio Perm									0.02			0.01	
v/c Ratio	0.41	0.28		0.49	0.05		0.76	0.50	0.05	0.56	0.29	0.02	
Uniform Delay, d1	16.2	17.3		20.5	21.1		25.8	14.9	12.8	24.9	13.0	11.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	0.4		1.5	0.1		106.9	0.4	0.0	12.0	0.1	0.0	
Delay (s)	16.8	17.7		22.0	21.2		132.7	15.2	12.9	36.9	13.2	11.9	
Level of Service	B	B		C	C		F	B	B	D	B	B	
Approach Delay (s)		17.4			21.8			17.3			15.0		
Approach LOS		B			C			B			B		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			17.2									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.45										
Actuated Cycle Length (s)			52.2									Sum of lost time (s)	16.0
Intersection Capacity Utilization			53.3%									ICU Level of Service	A
Analysis Period (min)			15										
c Critical Lane Group													

**Background AM  
Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	241	179	440	351	327	404
Future Volume (vph)	241	179	440	351	327	404
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.92	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3319		1805	3610	3248	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3319		1805	3610	3248	
Peak-hour factor, PHF	0.84	0.84	0.86	0.86	0.81	0.81
Adj. Flow (vph)	287	213	512	408	404	499
RTOR Reduction (vph)	75	0	0	0	110	0
Lane Group Flow (vph)	425	0	512	408	793	0
Confl. Peds. (#/hr)		1	4			4
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	22.2		42.5	86.0	39.5	
Effective Green, g (s)	22.2		42.5	86.0	39.5	
Actuated g/C Ratio	0.19		0.36	0.73	0.34	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	626		651	2637	1090	
v/s Ratio Prot	c0.13		c0.28	0.11	c0.24	
v/s Ratio Perm						
v/c Ratio	0.68		0.79	0.15	0.73	
Uniform Delay, d1	44.4		33.6	4.8	34.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	3.2		5.8	0.0	2.6	
Delay (s)	47.6		39.3	4.9	37.0	
Level of Service	D		D	A	D	
Approach Delay (s)	47.6			24.0	37.0	
Approach LOS	D			C	D	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			34.2		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.77			
Actuated Cycle Length (s)			117.7		Sum of lost time (s)	17.5
Intersection Capacity Utilization			70.8%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↕			↕		↕	↕		
Traffic Volume (vph)	0	0	0	142	118	35	0	749	129	14	267	217	
Future Volume (vph)	0	0	0	142	118	35	0	749	129	14	267	217	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5		4.0	5.5		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frb, ped/bikes					1.00			1.00		1.00	1.00		
Flpb, ped/bikes					1.00			1.00		1.00	1.00		
Frt					0.98			0.98		1.00	0.93		
Flt Protected					0.98			1.00		0.95	1.00		
Satd. Flow (prot)					1825			3519		1787	3334		
Flt Permitted					0.98			1.00		0.95	1.00		
Satd. Flow (perm)					1825			3519		1787	3334		
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.84	0.84	0.84	
Adj. Flow (vph)	0	0	0	153	127	38	0	851	147	17	318	258	
RTOR Reduction (vph)	0	0	0	0	4	0	0	7	0	0	111	0	
Lane Group Flow (vph)	0	0	0	0	314	0	0	991	0	17	465	0	
Confl. Peds. (#/hr)									1	1			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					19.9			32.7		2.2	38.9		
Effective Green, g (s)					19.9			32.7		2.2	38.9		
Actuated g/C Ratio					0.29			0.48		0.03	0.57		
Clearance Time (s)					4.0			5.5		4.0	5.5		
Vehicle Extension (s)					3.0			4.0		3.0	4.0		
Lane Grp Cap (vph)					531			1684		57	1898		
v/s Ratio Prot					c0.17			c0.28		0.01	c0.14		
v/s Ratio Perm													
v/c Ratio					0.59			0.59		0.30	0.24		
Uniform Delay, d1					20.7			12.9		32.3	7.4		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					1.8			0.6		2.9	0.1		
Delay (s)					22.5			13.5		35.2	7.4		
Level of Service					C			B		D	A		
Approach Delay (s)		0.0			22.5			13.5			8.2		
Approach LOS		A			C			B			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			13.4		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.58										
Actuated Cycle Length (s)			68.3		Sum of lost time (s)					13.5			
Intersection Capacity Utilization			48.9%		ICU Level of Service					A			
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis




















## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	185	347	950	0	0	402
Future Volume (vph)	185	347	950	0	0	402
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1589	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1589	3574			3610
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.74	0.74
Adj. Flow (vph)	220	413	1056	0	0	543
RTOR Reduction (vph)	0	27	0	0	0	0
Lane Group Flow (vph)	220	386	1056	0	0	543
Confl. Peds. (#/hr)		6		8	8	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	16.3	16.3	21.4			21.4
Effective Green, g (s)	16.3	16.3	21.4			21.4
Actuated g/C Ratio	0.34	0.34	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	619	545	1610			1626
v/s Ratio Prot	0.12		c0.30			0.15
v/s Ratio Perm		c0.24				
v/c Ratio	0.36	0.71	0.66			0.33
Uniform Delay, d1	11.7	13.5	10.2			8.4
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	3.4	1.0			0.1
Delay (s)	11.8	17.0	11.2			8.6
Level of Service	B	B	B			A
Approach Delay (s)	15.2		11.2			8.6
Approach LOS	B		B			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			11.7		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.68			
Actuated Cycle Length (s)			47.5		Sum of lost time (s)	9.8
Intersection Capacity Utilization			56.6%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis  
4: I-80 EB Ramps & Willow Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	48	12	46	60	271	89	558	102	129	344	75
Future Volume (vph)	121	48	12	46	60	271	89	558	102	129	344	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes		1.00			1.00	1.00	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		0.99			1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3228			1841	1599	1805	3514		1805	3505	
Flt Permitted		0.75			0.76	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2505			1427	1599	1805	3514		1805	3505	
Peak-hour factor, PHF	0.88	0.88	0.88	0.91	0.91	0.91	0.89	0.89	0.89	0.75	0.75	0.75
Adj. Flow (vph)	138	55	14	51	66	298	100	627	115	172	459	100
RTOR Reduction (vph)	0	6	0	0	0	244	0	16	0	0	18	0
Lane Group Flow (vph)	0	201	0	0	117	54	100	726	0	172	541	0
Confl. Peds. (#/hr)							1		4	4		1
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)		8.0			7.6	7.6	4.9	12.9		6.4	14.4	
Effective Green, g (s)		8.0			7.6	7.6	4.9	12.9		6.4	14.4	
Actuated g/C Ratio		0.19			0.18	0.18	0.12	0.31		0.15	0.34	
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		479			259	290	211	1084		276	1207	
v/s Ratio Prot							0.06	c0.21		c0.10	0.15	
v/s Ratio Perm		0.08			c0.08	0.03						
v/c Ratio		0.42			0.45	0.19	0.47	0.67		0.62	0.45	
Uniform Delay, d1		14.9			15.2	14.5	17.2	12.6		16.6	10.6	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.5	0.1	0.6	1.2		3.1	0.1	
Delay (s)		15.1			15.7	14.6	17.9	13.8		19.7	10.7	
Level of Service		B			B	B	B	B		B	B	
Approach Delay (s)		15.1			14.9			14.3			12.8	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.0				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			41.8				Sum of lost time (s)				14.9	
Intersection Capacity Utilization			55.4%				ICU Level of Service				B	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	4	144	120	4	72	55	181	44	55	734	29
Future Volume (vph)	77	4	144	120	4	72	55	181	44	55	734	29
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.86		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1594		1797	1630		1805	3489		1805	3610	1575
Flt Permitted	0.70	1.00		0.63	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1325	1594		1200	1630		1805	3489		1805	3610	1575
Peak-hour factor, PHF	0.89	0.89	0.89	0.83	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	4	162	145	5	87	60	197	48	60	798	32
RTOR Reduction (vph)	0	119	0	0	64	0	0	18	0	0	0	18
Lane Group Flow (vph)	87	47	0	145	28	0	60	227	0	60	798	14
Confl. Peds. (#/hr)			8	8			3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	15.7	15.7		15.7	15.7		4.3	26.6		4.0	26.3	26.3
Effective Green, g (s)	15.7	15.7		15.7	15.7		4.3	26.6		4.0	26.3	26.3
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.07	0.45		0.07	0.44	0.44
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	350	422		317	431		130	1565		121	1601	698
v/s Ratio Prot		0.03			0.02		c0.03	0.07		0.03	c0.22	
v/s Ratio Perm	0.07			c0.12								0.01
v/c Ratio	0.25	0.11		0.46	0.07		0.46	0.15		0.50	0.50	0.02
Uniform Delay, d1	17.2	16.5		18.2	16.3		26.4	9.6		26.7	11.8	9.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		1.4	0.1		1.9	0.1		1.2	0.5	0.0
Delay (s)	17.7	16.7		19.7	16.4		28.3	9.7		27.8	12.3	9.3
Level of Service	B	B		B	B		C	A		C	B	A
Approach Delay (s)		17.0			18.4			13.4			13.2	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.6				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			59.3				Sum of lost time (s)				13.0	
Intersection Capacity Utilization			57.1%				ICU Level of Service				B	
Analysis Period (min)			15									



























c Critical Lane Group



# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		 		 				 			 		
Traffic Volume (vph)	61	348	74	694	318	117	361	382	1022	205	544	64	
Future Volume (vph)	61	348	74	694	318	117	361	382	1022	205	544	64	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0		
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95		
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00		
Frt	1.00	0.97		1.00	0.96		1.00	1.00	0.85	1.00	0.98		
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1787	3473		3467	1805		1805	3610	1615	1805	3547		
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1787	3473		3467	1805		1805	3610	1615	1805	3547		
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95	
Adj. Flow (vph)	66	378	80	746	342	126	384	406	1087	216	573	67	
RTOR Reduction (vph)	0	13	0	0	9	0	0	0	0	0	6	0	
Lane Group Flow (vph)	66	445	0	746	459	0	384	406	1087	216	634	0	
Confl. Peds. (#/hr)							3					3	
Confl. Bikes (#/hr)			1										
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA		
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases									Free				
Actuated Green, G (s)	10.8	25.9		31.5	45.6		31.8	38.9	133.6	20.8	27.9		
Effective Green, g (s)	10.8	25.9		31.5	45.6		31.8	38.9	133.6	20.8	27.9		
Actuated g/C Ratio	0.08	0.19		0.24	0.34		0.24	0.29	1.00	0.16	0.21		
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0		
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)	144	673		817	616		429	1051	1615	281	740		
v/s Ratio Prot	0.04	0.13		c0.22	0.25		c0.21	0.11		0.12	c0.18		
v/s Ratio Perm									c0.67				
v/c Ratio	0.46	0.66		0.91	0.75		0.90	0.39	0.67	0.77	0.86		
Uniform Delay, d1	58.6	49.8		49.7	38.9		49.3	37.8	0.0	54.1	50.9		
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.8	2.4		14.2	5.9		20.1	0.3	2.3	10.8	10.0		
Delay (s)	59.5	52.2		63.9	44.8		69.4	38.1	2.3	64.9	60.9		
Level of Service	E	D		E	D		E	D	A	E	E		
Approach Delay (s)		53.2			56.5			23.8			61.9		
Approach LOS		D			E			C			E		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			43.4									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.87										
Actuated Cycle Length (s)			133.6									Sum of lost time (s)	17.5
Intersection Capacity Utilization			88.6%									ICU Level of Service	E
Analysis Period (min)			15										
c	Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
 12: San Pablo Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↶↶↶		↷	↶↶
Traffic Volume (vph)	0	0	1619	0	58	1345
Future Volume (vph)	0	0	1619	0	58	1345
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frbp, ped/bikes			1.00		1.00	1.00
Flpb, ped/bikes			1.00		1.00	1.00
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.97	0.97
Adj. Flow (vph)	0	0	1760	0	60	1387
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1760	0	60	1387
Confl. Peds. (#/hr)				1	1	
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			62.1		5.5	75.6
Effective Green, g (s)			62.1		5.5	75.6
Actuated g/C Ratio			0.82		0.07	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4260		130	3574
v/s Ratio Prot			0.34		0.03	c0.39
v/s Ratio Perm						
v/c Ratio			0.41		0.46	0.39
Uniform Delay, d1			1.8		33.6	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		2.6	0.3
Delay (s)			2.1		36.2	0.3
Level of Service			A		D	A
Approach Delay (s)	0.0		2.1			1.8
Approach LOS	A		A			A

Intersection Summary































HCM 2000 Control Delay	2.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	75.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 	 		 		 	 	 
Traffic Volume (vph)	178	207	70	490	210	1087	39	461	328	348	888	84
Future Volume (vph)	178	207	70	490	210	1087	39	461	328	348	888	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3453		1715	1769	2815	1787	3574	1563	3467	3528	
Flt Permitted	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3453		1715	1769	2815	1787	3574	1563	3467	3528	
Peak-hour factor, PHF	0.79	0.79	0.79	0.89	0.89	0.89	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	225	262	89	551	236	1221	43	512	364	391	998	94
RTOR Reduction (vph)	0	24	0	0	0	231	0	0	274	0	4	0
Lane Group Flow (vph)	225	327	0	386	401	990	43	512	90	391	1088	0
Confl. Peds. (#/hr)	1		8	8		1			1	1		
Confl. Bikes (#/hr)			1			1			10			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	28.2	28.2		37.1	37.1	52.3	7.8	33.5	33.5	15.2	40.9	
Effective Green, g (s)	28.2	28.2		37.1	37.1	52.3	7.8	33.5	33.5	15.2	40.9	
Actuated g/C Ratio	0.21	0.21		0.27	0.27	0.38	0.06	0.25	0.25	0.11	0.30	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	374	715		467	482	1082	102	880	385	387	1060	
v/s Ratio Prot	c0.12	0.09		0.23	0.23	c0.10	0.02	0.14		c0.11	c0.31	
v/s Ratio Perm						0.25			0.06			
v/c Ratio	0.60	0.46		0.83	0.83	0.92	0.42	0.58	0.23	1.01	1.03	
Uniform Delay, d1	48.8	47.2		46.4	46.5	39.7	61.9	45.1	41.0	60.4	47.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.8	1.3		13.3	13.4	11.9	3.8	1.9	0.9	48.4	34.5	
Delay (s)	53.6	48.5		59.7	60.0	51.7	65.7	47.0	41.9	108.8	82.1	
Level of Service	D	D		E	E	D	E	D	D	F	F	
Approach Delay (s)		50.5			54.9			45.8			89.1	
Approach LOS		D			D			D			F	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			62.9				HCM 2000 Level of Service				E	
HCM 2000 Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			136.0				Sum of lost time (s)				22.0	
Intersection Capacity Utilization			82.3%				ICU Level of Service				E	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/25/2019


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↶	↷	↷		↶	↷
Traffic Volume (vph)	7	788	1442	13	23	112
Future Volume (vph)	7	788	1442	13	23	112
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1804	3610	3604		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1804	3610	3604		1805	1615
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.71	0.71
Adj. Flow (vph)	8	895	1639	15	32	158
RTOR Reduction (vph)	0	0	1	0	0	123
Lane Group Flow (vph)	8	895	1653	0	32	35
Confl. Peds. (#/hr)	3			3		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	0.7	32.9	28.2		6.8	6.8
Effective Green, g (s)	0.7	32.9	28.2		6.8	6.8
Actuated g/C Ratio	0.01	0.69	0.59		0.14	0.14
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	26	2489	2130		257	230
v/s Ratio Prot	0.00	c0.25	c0.46		0.02	
v/s Ratio Perm						c0.02
v/c Ratio	0.31	0.36	0.78		0.12	0.15
Uniform Delay, d1	23.3	3.1	7.4		17.9	17.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	6.6	0.1	1.8		0.2	0.3
Delay (s)	29.9	3.1	9.2		18.1	18.2
Level of Service	C	A	A		B	B
Approach Delay (s)		3.4	9.2		18.2	
Approach LOS		A	A		B	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			7.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.66			
Actuated Cycle Length (s)			47.7		Sum of lost time (s)	12.0
Intersection Capacity Utilization			53.9%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

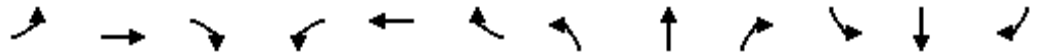
11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	83	343	28	51	1430	52	149	9	158	146	2	264
Future Volume (vph)	83	343	28	51	1430	52	149	9	158	146	2	264
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98		0.99		1.00	1.00	0.98
Flpb, ped/bikes	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		0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1589	1805	3610	1584		3155		1805	1900	1584
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1589	1805	3610	1584		3155		1805	1900	1584
Peak-hour factor, PHF	0.96	0.96	0.96	0.95	0.95	0.95	0.87	0.87	0.87	0.93	0.93	0.93
Adj. Flow (vph)	86	357	29	54	1505	55	171	10	182	157	2	284
RTOR Reduction (vph)	0	0	15	0	0	29	0	145	0	0	0	244
Lane Group Flow (vph)	86	357	14	54	1505	26	0	218	0	157	2	40
Confl. Peds. (#/hr)	7		3	3		7	3		7	2		9
Confl. Bikes (#/hr)			2			1			5			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6						4
Actuated Green, G (s)	7.2	42.1	42.1	6.0	40.9	40.9		10.5		12.5	12.5	12.5
Effective Green, g (s)	7.2	42.1	42.1	6.0	40.9	40.9		10.5		12.5	12.5	12.5
Actuated g/C Ratio	0.08	0.48	0.48	0.07	0.46	0.46		0.12		0.14	0.14	0.14
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	147	1725	759	122	1675	735		376		256	269	224
v/s Ratio Prot	c0.05	0.10		0.03	c0.42			c0.07		c0.09	0.00	
v/s Ratio Perm			0.01			0.02						0.03
v/c Ratio	0.59	0.21	0.02	0.44	0.90	0.03		0.58		0.61	0.01	0.18
Uniform Delay, d1	39.0	13.3	12.1	39.4	21.7	12.9		36.7		35.5	32.5	33.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	3.8	0.0	0.0	0.9	6.7	0.0		1.3		3.0	0.0	0.1
Delay (s)	42.8	13.3	12.1	40.4	28.4	12.9		38.1		38.6	32.5	33.4
Level of Service	D	B	B	D	C	B		D		D	C	C
Approach Delay (s)		18.6			28.2			38.1			35.2	
Approach LOS		B			C			D			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			29.0			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			88.1			Sum of lost time (s)			17.0			
Intersection Capacity Utilization			85.1%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕	↗	↖↗	↖	↗	↖	↖↗↘		↖	↖↗		
Traffic Volume (vph)	23	33	115	431	38	417	62	1345	92	139	648	25	
Future Volume (vph)	23	33	115	431	38	417	62	1345	92	139	648	25	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.87	0.85	1.00	0.99		1.00	0.99		
Flt Protected		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1862	1585	3502	1558	1510	1805	5127		1805	3587		
Flt Permitted		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1862	1585	3502	1558	1510	1805	5127		1805	3587		
Peak-hour factor, PHF	0.83	0.83	0.83	0.93	0.93	0.93	0.89	0.89	0.89	0.73	0.73	0.73	
Adj. Flow (vph)	28	40	139	463	41	448	70	1511	103	190	888	34	
RTOR Reduction (vph)	0	0	126	0	164	193	0	5	0	0	2	0	
Lane Group Flow (vph)	0	68	13	463	83	49	70	1609	0	190	920	0	
Confl. Peds. (#/hr)	3		2	2		3	5		4	4		5	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Effective Green, g (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Actuated g/C Ratio		0.09	0.09	0.20	0.20	0.20	0.10	0.42		0.15	0.47		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		167	142	706	314	304	171	2157		263	1691		
v/s Ratio Prot		c0.04		c0.13	0.05		0.04	c0.31		c0.11	0.26		
v/s Ratio Perm			0.01			0.03							
v/c Ratio		0.41	0.09	0.66	0.26	0.16	0.41	0.75		0.72	0.54		
Uniform Delay, d1		51.6	50.1	44.1	40.4	39.5	51.1	29.3		48.9	22.5		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.6	0.3	2.2	0.4	0.2	0.6	2.4		8.0	1.3		
Delay (s)		53.2	50.4	46.3	40.8	39.8	51.7	31.7		57.0	23.8		
Level of Service		D	D	D	D	D	D	C		E	C		
Approach Delay (s)		51.3			43.2			32.6			29.5		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			35.2		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.68										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			69.4%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

# **Background AM Unsignalized**

HCM 6th AWSC  
5: Viewpoint Blvd & Willow Ave

09/29/2019

Intersection	
Intersection Delay, s/veh	25
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↑	↗	↖	↕		↖	↗	
Traffic Vol, veh/h	123	46	59	138	4	257	23	348	50	117	314	33
Future Vol, veh/h	123	46	59	138	4	257	23	348	50	117	314	33
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.83	0.83	0.83	0.77	0.77	0.77
Heavy Vehicles, %	0	0	0	1	1	1	0	0	0	0	0	0
Mvmt Flow	127	47	61	150	4	279	28	419	60	152	408	43
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	17.9	26.3	28.1	24.3
HCM LOS	C	D	D	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	70%	0%	44%	0%	100%	0%	0%	100%	76%
Vol Right, %	0%	0%	30%	0%	56%	0%	0%	100%	0%	0%	24%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	23	232	166	123	105	138	4	257	117	209	138
LT Vol	23	0	0	123	0	138	0	0	117	0	0
Through Vol	0	232	116	0	46	0	4	0	0	209	105
RT Vol	0	0	50	0	59	0	0	257	0	0	33
Lane Flow Rate	28	280	200	127	108	150	4	279	152	272	179
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.077	0.733	0.512	0.368	0.287	0.424	0.012	0.694	0.41	0.695	0.448
Departure Headway (Hd)	9.952	9.438	9.221	10.449	9.556	10.165	9.655	8.941	9.715	9.201	9.029
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	359	383	390	344	375	354	370	402	369	391	397
Service Time	7.738	7.224	7.007	8.242	7.348	7.951	7.441	6.727	7.5	6.986	6.813
HCM Lane V/C Ratio	0.078	0.731	0.513	0.369	0.288	0.424	0.011	0.694	0.412	0.696	0.451
HCM Control Delay	13.6	34.3	21.4	19.3	16.2	20.3	12.6	29.8	19.1	30.6	19
HCM Lane LOS	B	D	C	C	C	C	B	D	C	D	C
HCM 95th-tile Q	0.2	5.7	2.8	1.6	1.2	2	0	5.1	1.9	5.1	2.2



Intersection	
Intersection Delay, s/veh	140.2
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	233	272	555	0	0	939
Future Vol, veh/h	233	272	555	0	0	939
Peak Hour Factor	0.88	0.88	0.67	0.67	0.83	0.83
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	265	309	828	0	0	1131
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	22.8	309.1	76.1
HCM LOS	C	F	F

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	555	233	272	470	470
LT Vol	0	233	0	0	0
Through Vol	555	0	0	470	470
RT Vol	0	0	272	0	0
Lane Flow Rate	828	265	309	566	566
Geometry Grp	4	7	7	7	7
Degree of Util (X)	1.625	0.605	0.603	1.142	0.875
Departure Headway (Hd)	7.198	8.945	7.692	8.002	6.233
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	514	408	473	458	588
Service Time	5.198	6.645	5.392	5.702	3.933
HCM Lane V/C Ratio	1.611	0.65	0.653	1.236	0.963
HCM Control Delay	309.1	24.4	21.4	114.3	37.8
HCM Lane LOS	F	C	C	F	E
HCM 95th-tile Q	45.7	3.8	3.9	18.4	10

Intersection						
Int Delay, s/veh	3.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙	↗	↙	↑↑	↑↑	↗
Traffic Vol, veh/h	36	9	174	273	801	208
Future Vol, veh/h	36	9	174	273	801	208
Conflicting Peds, #/hr	0	0	3	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	125	0	175	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	94	94	88	88
Heavy Vehicles, %	5	5	0	0	0	0
Mvmt Flow	41	10	185	290	910	236

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1428	458	1149	0	-	0
Stage 1	913	-	-	-	-	-
Stage 2	515	-	-	-	-	-
Critical Hdwy	6.9	7	4.1	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.55	3.35	2.2	-	-	-
Pot Cap-1 Maneuver	122	542	615	-	-	-
Stage 1	344	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	85	541	613	-	-	-
Mov Cap-2 Maneuver	85	-	-	-	-	-
Stage 1	240	-	-	-	-	-
Stage 2	555	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	67.6	5.2	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	613	-	85	541	-	-
HCM Lane V/C Ratio	0.302	-	0.481	0.019	-	-
HCM Control Delay (s)	13.4	-	81.6	11.8	-	-
HCM Lane LOS	B	-	F	B	-	-
HCM 95th %tile Q(veh)	1.3	-	2	0.1	-	-

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑		↘	↗
Traffic Vol, veh/h	15	112	120	478	61	5
Future Vol, veh/h	15	112	120	478	61	5
Conflicting Peds, #/hr	4	0	0	4	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	130	-	-	-	125	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	88	88	92	92
Heavy Vehicles, %	0	0	0	0	2	2
Mvmt Flow	20	149	136	543	66	5

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	683	0	-	0	527 344
Stage 1	-	-	-	-	412 -
Stage 2	-	-	-	-	115 -
Critical Hdwy	4.1	-	-	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	2.2	-	-	-	3.52 3.32
Pot Cap-1 Maneuver	919	-	-	-	481 652
Stage 1	-	-	-	-	637 -
Stage 2	-	-	-	-	897 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	916	-	-	-	468 650
Mov Cap-2 Maneuver	-	-	-	-	468 -
Stage 1	-	-	-	-	621 -
Stage 2	-	-	-	-	894 -

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	916	-	-	-	468	650
HCM Lane V/C Ratio	0.022	-	-	-	0.142	0.008
HCM Control Delay (s)	9	-	-	-	14	10.6
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5	0

Intersection	
Intersection Delay, s/veh	28.6
Intersection LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↘		↘	
Traffic Vol, veh/h	274	175	227	17	368	11
Future Vol, veh/h	274	175	227	17	368	11
Peak Hour Factor	0.84	0.84	0.94	0.94	0.72	0.72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	326	208	241	18	511	15
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	20	16	43.6
HCM LOS	C	C	E

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	97%
Vol Thru, %	0%	100%	93%	0%
Vol Right, %	0%	0%	7%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	274	175	244	379
LT Vol	274	0	0	368
Through Vol	0	175	227	0
RT Vol	0	0	17	11
Lane Flow Rate	326	208	260	526
Geometry Grp	7	7	5	2
Degree of Util (X)	0.67	0.398	0.486	0.909
Departure Headway (Hd)	7.389	6.877	6.738	6.218
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	493	525	537	579
Service Time	5.099	4.587	4.748	4.316
HCM Lane V/C Ratio	0.661	0.396	0.484	0.908
HCM Control Delay	23.8	14.1	16	43.6
HCM Lane LOS	C	B	C	E
HCM 95th-tile Q	4.9	1.9	2.6	11.1

**Background PM  
Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	TT		T	TT	TT	
Traffic Volume (vph)	351	228	154	368	308	229
Future Volume (vph)	351	228	154	368	308	229
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frbp, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.94	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3336		1805	3610	3361	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3336		1805	3610	3361	
Peak-hour factor, PHF	0.84	0.84	0.94	0.94	0.79	0.79
Adj. Flow (vph)	418	271	164	391	390	290
RTOR Reduction (vph)	54	0	0	0	67	0
Lane Group Flow (vph)	635	0	164	391	613	0
Confl. Peds. (#/hr)		1	1			1
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	25.4		14.1	43.6	25.5	
Effective Green, g (s)	25.4		14.1	43.6	25.5	
Actuated g/C Ratio	0.32		0.18	0.56	0.32	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	1079		324	2005	1091	
v/s Ratio Prot	c0.19		c0.09	0.11	c0.18	
v/s Ratio Perm						
v/c Ratio	0.59		0.51	0.20	0.56	
Uniform Delay, d1	22.2		29.1	8.7	21.9	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.0		0.5	0.1	0.8	
Delay (s)	23.2		29.5	8.8	22.7	
Level of Service	C		C	A	C	
Approach Delay (s)	23.2			14.9	22.7	
Approach LOS	C			B	C	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			20.6		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.60			
Actuated Cycle Length (s)			78.5		Sum of lost time (s)	17.5
Intersection Capacity Utilization			53.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↕			↕		↕	↕		
Traffic Volume (vph)	0	0	0	48	61	12	0	492	140	24	306	210	
Future Volume (vph)	0	0	0	48	61	12	0	492	140	24	306	210	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5		4.0	5.5		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frbp, ped/bikes					1.00			0.99		1.00	1.00		
Flpb, ped/bikes					1.00			1.00		1.00	1.00		
Frt					0.99			0.97		1.00	0.94		
Flt Protected					0.98			1.00		0.95	1.00		
Satd. Flow (prot)					1836			3471		1805	3390		
Flt Permitted					0.98			1.00		0.95	1.00		
Satd. Flow (perm)					1836			3471		1805	3390		
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.94	0.94	0.94	0.86	0.86	0.86	
Adj. Flow (vph)	0	0	0	62	78	15	0	523	149	28	356	244	
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	94	0	
Lane Group Flow (vph)	0	0	0	0	152	0	0	658	0	28	506	0	
Confl. Peds. (#/hr)									4	4			
Confl. Bikes (#/hr)						1							
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					10.7			24.4		2.6	31.0		
Effective Green, g (s)					10.7			24.4		2.6	31.0		
Actuated g/C Ratio					0.21			0.48		0.05	0.61		
Clearance Time (s)					4.0			5.5		4.0	5.5		
Vehicle Extension (s)					3.0			4.0		3.0	4.0		
Lane Grp Cap (vph)					383			1654		91	2052		
v/s Ratio Prot					c0.08			c0.19		0.02	c0.15		
v/s Ratio Perm													
v/c Ratio					0.40			0.40		0.31	0.25		
Uniform Delay, d1					17.5			8.7		23.4	4.7		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					0.7			0.2		1.9	0.1		
Delay (s)					18.1			8.9		25.4	4.8		
Level of Service					B			A		C	A		
Approach Delay (s)		0.0			18.1			8.9			5.7		
Approach LOS		A			B			A			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			8.5		HCM 2000 Level of Service						A		
HCM 2000 Volume to Capacity ratio			0.40										
Actuated Cycle Length (s)			51.2		Sum of lost time (s)						13.5		
Intersection Capacity Utilization			34.5%		ICU Level of Service						A		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis  
 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↶	↕	↷	↶	↷
Traffic Volume (vph)	93	79	716	0	0	362
Future Volume (vph)	93	79	716	0	0	362
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1585	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1585	3574			3610
Peak-hour factor, PHF	0.88	0.88	0.90	0.90	0.87	0.87
Adj. Flow (vph)	106	90	796	0	0	416
RTOR Reduction (vph)	0	70	0	0	0	0
Lane Group Flow (vph)	106	20	796	0	0	416
Confl. Peds. (#/hr)		13		7	7	
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	6.5	6.5	13.3			13.3
Effective Green, g (s)	6.5	6.5	13.3			13.3
Actuated g/C Ratio	0.22	0.22	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	396	348	1605			1622
v/s Ratio Prot	c0.06		c0.22			0.12
v/s Ratio Perm		0.01				
v/c Ratio	0.27	0.06	0.50			0.26
Uniform Delay, d1	9.6	9.1	5.8			5.1
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	0.0	0.2			0.1
Delay (s)	9.7	9.2	6.0			5.2
Level of Service	A	A	A			A
Approach Delay (s)	9.5		6.0			5.2
Approach LOS	A		A			A

Intersection Summary

HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	29.6	Sum of lost time (s)	9.8
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		




















c Critical Lane Group



# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	95	62	17	175	76	312	79	313	39	138	214	54	
Future Volume (vph)	95	62	17	175	76	312	79	313	39	138	214	54	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12	
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95		
Frbp, ped/bikes		1.00			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		
Frt		0.99			1.00	0.85	1.00	0.98		1.00	0.97		
Flt Protected		0.97			0.97	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		3196			1836	1589	1805	3541		1805	3492		
Flt Permitted		0.72			0.68	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		2351			1287	1589	1805	3541		1805	3492		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.98	0.98	0.98	0.93	0.93	0.93	
Adj. Flow (vph)	99	65	18	182	79	325	81	319	40	148	230	58	
RTOR Reduction (vph)	0	9	0	0	0	228	0	12	0	0	25	0	
Lane Group Flow (vph)	0	173	0	0	261	97	81	347	0	148	263	0	
Confl. Peds. (#/hr)	6					6	1		4	4		1	
Confl. Bikes (#/hr)						2							
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA		
Protected Phases		4			8		5	2		1	6		
Permitted Phases	4			8		8							
Actuated Green, G (s)		13.2			12.8	12.8	3.3	9.5		5.8	12.0		
Effective Green, g (s)		13.2			12.8	12.8	3.3	9.5		5.8	12.0		
Actuated g/C Ratio		0.31			0.30	0.30	0.08	0.22		0.13	0.28		
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2		
Lane Grp Cap (vph)		721			383	473	138	782		243	974		
v/s Ratio Prot							0.04	c0.10		c0.08	0.08		
v/s Ratio Perm		0.07			c0.20	0.06							
v/c Ratio		0.24			0.68	0.20	0.59	0.44		0.61	0.27		
Uniform Delay, d1		11.1			13.3	11.3	19.2	14.5		17.5	12.1		
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		0.1			4.0	0.1	4.1	0.1		3.0	0.1		
Delay (s)		11.2			17.3	11.4	23.3	14.6		20.5	12.1		
Level of Service		B			B	B	C	B		C	B		
Approach Delay (s)		11.2			14.0			16.2			15.0		
Approach LOS		B			B			B			B		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			14.5		HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio			0.58										
Actuated Cycle Length (s)			43.0		Sum of lost time (s)					14.9			
Intersection Capacity Utilization			52.9%		ICU Level of Service					A			
Analysis Period (min)			15										

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019




























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↕		↖	↗	↖
Traffic Volume (vph)	35	5	108	42	4	26	142	449	91	62	186	49
Future Volume (vph)	35	5	108	42	4	26	142	449	91	62	186	49
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	0.87		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1801	1599		1796	1632		1805	3505		1787	3574	1565
Flt Permitted	0.73	1.00		0.66	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1389	1599		1255	1632		1805	3505		1787	3574	1565
Peak-hour factor, PHF	0.77	0.77	0.77	0.78	0.78	0.78	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	45	6	140	54	5	33	167	528	107	67	200	53
RTOR Reduction (vph)	0	119	0	0	28	0	0	13	0	0	0	32
Lane Group Flow (vph)	45	27	0	54	10	0	167	622	0	67	200	21
Confl. Peds. (#/hr)	3		11	11		3	1		2	2		1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	7.2	7.2		7.2	7.2		7.9	22.9		3.9	18.9	18.9
Effective Green, g (s)	7.2	7.2		7.2	7.2		7.9	22.9		3.9	18.9	18.9
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.17	0.49		0.08	0.40	0.40
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	212	244		192	250		303	1707		148	1437	629
v/s Ratio Prot		0.02			0.01		c0.09	c0.18		0.04	0.06	
v/s Ratio Perm	0.03			c0.04								0.01
v/c Ratio	0.21	0.11		0.28	0.04		0.55	0.36		0.45	0.14	0.03
Uniform Delay, d1	17.4	17.1		17.6	17.0		17.9	7.5		20.5	8.9	8.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		1.1	0.1		1.7	0.3		0.8	0.1	0.0
Delay (s)	18.1	17.4		18.7	17.0		19.7	7.8		21.3	9.0	8.6
Level of Service	B	B		B	B		B	A		C	A	A
Approach Delay (s)		17.6			18.0			10.3			11.5	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			12.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			47.0				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			42.3%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 		 				 			 	
Traffic Volume (vph)	104	579	129	433	225	81	227	579	1193	265	276	41
Future Volume (vph)	104	579	129	433	225	81	227	579	1193	265	276	41
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.96		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3476		3467	1807		1805	3610	1615	1805	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3476		3467	1807		1805	3610	1615	1805	3534	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	118	658	147	471	245	88	244	623	1283	312	325	48
RTOR Reduction (vph)	0	14	0	0	9	0	0	0	0	0	8	0
Lane Group Flow (vph)	118	791	0	471	324	0	244	623	1283	312	365	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	14.9	34.3		22.7	41.1		16.5	39.1	140.0	27.4	50.0	
Effective Green, g (s)	14.9	34.3		22.7	41.1		16.5	39.1	140.0	27.4	50.0	
Actuated g/C Ratio	0.11	0.24		0.16	0.29		0.12	0.28	1.00	0.20	0.36	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	190	851		562	530		212	1008	1615	353	1262	
v/s Ratio Prot	0.07	c0.23		0.14	0.18		c0.14	0.17		0.17	0.10	
v/s Ratio Perm									c0.79			
v/c Ratio	0.62	0.93		0.84	0.61		1.15	0.62	0.79	0.88	0.29	
Uniform Delay, d1	59.8	51.7		56.9	42.6		61.8	43.9	0.0	54.8	32.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.5	16.2		10.1	3.0		108.5	2.8	4.1	21.5	0.6	
Delay (s)	64.3	67.9		67.0	45.6		170.2	46.8	4.1	76.3	32.8	
Level of Service	E	E		E	D		F	D	A	E	C	
Approach Delay (s)		67.4			58.1			35.3			52.6	
Approach LOS		E			E			D			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			48.4				HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)		17.5				
Intersection Capacity Utilization			81.7%			ICU Level of Service		D				
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019































Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑↑↑		↖	↗
Traffic Volume (vph)	0	0	1842	1	6	808
Future Volume (vph)	0	0	1842	1	6	808
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	0	1960	1	6	851
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1961	0	6	851
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			68.9		1.3	78.2
Effective Green, g (s)			68.9		1.3	78.2
Actuated g/C Ratio			0.88		0.02	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4570		29	3574
v/s Ratio Prot			c0.38		0.00	c0.24
v/s Ratio Perm						
v/c Ratio			0.43		0.21	0.24
Uniform Delay, d1			0.9		37.9	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		3.5	0.2
Delay (s)			1.2		41.5	0.2
Level of Service			A		D	A
Approach Delay (s)	0.0		1.2			0.4
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			1.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			78.2		Sum of lost time (s)	12.0
Intersection Capacity Utilization			38.9%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 	 		 		 	 	
Traffic Volume (vph)	177	196	73	275	306	703	63	1030	363	494	348	124
Future Volume (vph)	177	196	73	275	306	703	63	1030	363	494	348	124
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	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	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3441		1681	1794	2842	1787	3574	1583	3502	3468	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3441		1681	1794	2842	1787	3574	1583	3502	3468	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	190	211	78	296	329	756	71	1157	408	531	374	133
RTOR Reduction (vph)	0	28	0	0	0	151	0	0	210	0	24	0
Lane Group Flow (vph)	190	261	0	266	359	605	71	1157	198	531	483	0
Confl. Peds. (#/hr)			10	10								
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	1%	1%	2%	0%	0%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9	
Effective Green, g (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9	
Actuated g/C Ratio	0.17	0.17		0.24	0.24	0.41	0.07	0.26	0.26	0.17	0.36	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	310	592		405	433	1155	117	944	418	577	1260	
v/s Ratio Prot	c0.11	0.08		0.16	c0.20	0.09	0.04	c0.32		c0.15	0.14	
v/s Ratio Perm						0.13			0.12			
v/c Ratio	0.61	0.44		0.66	0.83	0.52	0.61	1.23	0.47	0.92	0.38	
Uniform Delay, d1	53.6	51.9		47.9	50.4	31.3	63.6	51.5	43.3	57.5	32.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.1	1.5		6.1	14.3	0.6	9.9	111.0	3.8	20.4	0.9	
Delay (s)	59.8	53.4		53.9	64.7	31.9	73.5	162.5	47.1	77.9	33.8	
Level of Service	E	D		D	E	C	E	F	D	E	C	
Approach Delay (s)		55.9			44.7			129.9			56.4	
Approach LOS		E			D			F			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			79.3				HCM 2000 Level of Service				E	
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			91.8%			ICU Level of Service				F		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/25/2019


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑		↘	↗
Traffic Volume (vph)	10	1454	644	21	21	66
Future Volume (vph)	10	1454	644	21	21	66
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	3574	3520		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	3574	3520		1805	1615
Peak-hour factor, PHF	0.94	0.94	0.96	0.96	0.77	0.77
Adj. Flow (vph)	11	1547	671	22	27	86
RTOR Reduction (vph)	0	0	3	0	0	73
Lane Group Flow (vph)	11	1547	690	0	27	13
Confl. Peds. (#/hr)				3		
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	0.7	27.2	22.5		6.3	6.3
Effective Green, g (s)	0.7	27.2	22.5		6.3	6.3
Actuated g/C Ratio	0.02	0.66	0.54		0.15	0.15
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	30	2342	1908		274	245
v/s Ratio Prot	0.01	c0.43	0.20		c0.01	
v/s Ratio Perm						0.01
v/c Ratio	0.37	0.66	0.36		0.10	0.05
Uniform Delay, d1	20.2	4.3	5.4		15.2	15.0
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	7.4	0.7	0.1		0.2	0.1
Delay (s)	27.6	5.1	5.5		15.3	15.1
Level of Service	C	A	A		B	B
Approach Delay (s)		5.2	5.5		15.2	
Approach LOS		A	A		B	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			5.8		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.63			
Actuated Cycle Length (s)			41.5		Sum of lost time (s)	12.0
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave
























11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	1260	135	85	408	107	70	8	69	115	13	107
Future Volume (vph)	285	1260	135	85	408	107	70	8	69	115	13	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98		0.98		1.00	1.00	0.98
Flpb, ped/bikes	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		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.90	0.90	0.90	0.96	0.96	0.96
Adj. Flow (vph)	306	1355	145	89	425	111	78	9	77	120	14	111
RTOR Reduction (vph)	0	0	25	0	0	54	0	72	0	0	0	100
Lane Group Flow (vph)	306	1355	120	89	425	57	0	92	0	120	14	11
Confl. Peds. (#/hr)	4		1	1		4	6		9	9		6
Confl. Bikes (#/hr)			1						5			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6						4
Actuated Green, G (s)	29.6	89.7	89.7	11.3	71.4	71.4		8.3		13.7	13.7	13.7
Effective Green, g (s)	29.6	89.7	89.7	11.3	71.4	71.4		8.3		13.7	13.7	13.7
Actuated g/C Ratio	0.21	0.64	0.64	0.08	0.51	0.51		0.06		0.10	0.10	0.10
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	381	2312	1020	145	1841	808		190		176	185	155
v/s Ratio Prot	c0.17	c0.38		0.05	0.12			c0.03		c0.07	0.01	
v/s Ratio Perm			0.08			0.04						0.01
v/c Ratio	0.80	0.59	0.12	0.61	0.23	0.07		0.48		0.68	0.08	0.07
Uniform Delay, d1	52.4	14.5	9.8	62.2	19.0	17.4		63.8		61.0	57.4	57.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	11.0	1.1	0.2	5.3	0.3	0.2		0.7		8.4	0.1	0.1
Delay (s)	63.4	15.6	10.0	67.6	19.3	17.6		64.5		69.4	57.5	57.4
Level of Service	E	B	B	E	B	B		E		E	E	E
Approach Delay (s)		23.2			25.9			64.5			63.3	
Approach LOS		C			C			E			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			29.7				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)		17.0			
Intersection Capacity Utilization			66.0%				ICU Level of Service			C		
Analysis Period (min)			15									
c	Critical Lane Group											

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	73	40	203	507	82	246	57	893	66	178	788	22	
Future Volume (vph)	73	40	203	507	82	246	57	893	66	178	788	22	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	1.00	0.99	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.92	0.85	1.00	0.99		1.00	1.00		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1840	1582	3502	1653	1514	1805	5122		1805	3592		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1840	1582	3502	1653	1514	1805	5122		1805	3592		
Peak-hour factor, PHF	0.85	0.85	0.85	0.96	0.96	0.96	0.91	0.91	0.91	0.89	0.89	0.89	
Adj. Flow (vph)	86	47	239	528	85	256	63	981	73	200	885	25	
RTOR Reduction (vph)	0	0	185	0	38	128	0	7	0	0	1	0	
Lane Group Flow (vph)	0	133	54	528	139	36	63	1047	0	200	909	0	
Confl. Peds. (#/hr)	1		3	3		1	5		4	1		9	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		12.3	12.3	25.3	25.3	25.3	8.6	40.4		20.0	51.8		
Effective Green, g (s)		12.3	12.3	25.3	25.3	25.3	8.6	40.4		20.0	51.8		
Actuated g/C Ratio		0.11	0.11	0.22	0.22	0.22	0.07	0.35		0.17	0.45		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		196	169	770	363	333	134	1799		313	1617		
v/s Ratio Prot		c0.07		c0.15	0.08		0.03	0.20		c0.11	c0.25		
v/s Ratio Perm			0.03			0.02							
v/c Ratio		0.68	0.32	0.69	0.38	0.11	0.47	0.58		0.64	0.56		
Uniform Delay, d1		49.4	47.5	41.2	38.2	35.8	51.0	30.4		44.1	23.3		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		9.0	1.1	2.5	0.7	0.1	0.9	1.4		3.1	1.4		
Delay (s)		58.4	48.6	43.7	38.9	36.0	52.0	31.8		47.3	24.7		
Level of Service		E	D	D	D	D	D	C		D	C		
Approach Delay (s)		52.1			41.3			32.9			28.7		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			35.7		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.64										
Actuated Cycle Length (s)			115.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			67.4%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													



# **Background PM Unsignalized**

Intersection	
Intersection Delay, s/veh	14.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↑	↵	↵	↕		↵	↕	
Traffic Vol, veh/h	53	53	42	71	2	117	78	279	125	191	170	101
Future Vol, veh/h	53	53	42	71	2	117	78	279	125	191	170	101
Peak Hour Factor	0.78	0.78	0.78	0.84	0.84	0.84	0.93	0.93	0.93	0.95	0.95	0.95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	68	68	54	85	2	139	84	300	134	201	179	106
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	13.5	13.6	15.3	14.9
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	43%	0%	56%	0%	100%	0%	0%	100%	36%
Vol Right, %	0%	0%	57%	0%	44%	0%	0%	100%	0%	0%	64%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	78	186	218	53	95	71	2	117	191	113	158
LT Vol	78	0	0	53	0	71	0	0	191	0	0
Through Vol	0	186	93	0	53	0	2	0	0	113	57
RT Vol	0	0	125	0	42	0	0	117	0	0	101
Lane Flow Rate	84	200	234	68	122	85	2	139	201	119	166
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.187	0.418	0.463	0.165	0.268	0.207	0.005	0.294	0.451	0.251	0.328
Departure Headway (Hd)	8.025	7.517	7.11	8.739	7.93	8.818	8.312	7.604	8.071	7.564	7.109
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	446	478	506	410	452	406	429	471	446	474	505
Service Time	5.79	5.282	4.875	6.513	5.703	6.595	6.089	5.381	5.837	5.329	4.874
HCM Lane V/C Ratio	0.188	0.418	0.462	0.166	0.27	0.209	0.005	0.295	0.451	0.251	0.329
HCM Control Delay	12.6	15.6	15.9	13.2	13.6	13.9	11.1	13.5	17.3	12.9	13.3
HCM Lane LOS	B	C	C	B	B	B	B	B	C	B	B
HCM 95th-tile Q	0.7	2	2.4	0.6	1.1	0.8	0	1.2	2.3	1	1.4

Intersection	
Intersection Delay, s/veh	72
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	308	282	564	0	0	717
Future Vol, veh/h	308	282	564	0	0	717
Peak Hour Factor	0.90	0.90	0.87	0.87	0.92	0.92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	342	313	648	0	0	779
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	28	170.7	27
HCM LOS	D	F	D

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	564	308	282	359	359
LT Vol	0	308	0	0	0
Through Vol	564	0	0	359	359
RT Vol	0	0	282	0	0
Lane Flow Rate	648	342	313	390	390
Geometry Grp	4	7	7	7	7
Degree of Util (X)	1.298	0.77	0.601	0.804	0.62
Departure Headway (Hd)	7.208	8.597	7.354	7.881	6.119
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	506	424	495	464	592
Service Time	5.242	6.297	5.054	5.581	3.819
HCM Lane V/C Ratio	1.281	0.807	0.632	0.841	0.659
HCM Control Delay	170.7	34.8	20.5	35.7	18.3
HCM Lane LOS	F	D	C	E	C
HCM 95th-tile Q	27.4	6.5	3.9	7.4	4.2

Intersection						
Int Delay, s/veh	7.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	157	253	12	555	359	61
Future Vol, veh/h	157	253	12	555	359	61
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	125	0	175	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	66	66	92	92	97	97
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	238	383	13	603	370	63

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	699	186	434	0	0
Stage 1	371	-	-	-	-
Stage 2	328	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-
Pot Cap-1 Maneuver	378	831	1136	-	-
Stage 1	674	-	-	-	-
Stage 2	708	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	373	830	1135	-	-
Mov Cap-2 Maneuver	373	-	-	-	-
Stage 1	666	-	-	-	-
Stage 2	707	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.6	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1135	-	373	830	-	-
HCM Lane V/C Ratio	0.011	-	0.638	0.462	-	-
HCM Control Delay (s)	8.2	-	30.2	13	-	-
HCM Lane LOS	A	-	D	B	-	-
HCM 95th %tile Q(veh)	0	-	4.2	2.5	-	-

Intersection						
Int Delay, s/veh	21					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑		↘	↗
Traffic Vol, veh/h	7	112	112	75	487	31
Future Vol, veh/h	7	112	112	75	487	31
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	130	-	-	-	125	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	87	87	79	79
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	8	132	129	86	616	39

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	216	0	-	0	255 109
Stage 1	-	-	-	-	173 -
Stage 2	-	-	-	-	82 -
Critical Hdwy	4.1	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	2.2	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1366	-	-	-	717 930
Stage 1	-	-	-	-	846 -
Stage 2	-	-	-	-	938 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1365	-	-	-	711 929
Mov Cap-2 Maneuver	-	-	-	-	711 -
Stage 1	-	-	-	-	840 -
Stage 2	-	-	-	-	937 -

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	32.2
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1365	-	-	-	711	929
HCM Lane V/C Ratio	0.006	-	-	-	0.867	0.042
HCM Control Delay (s)	7.7	-	-	-	33.7	9
HCM Lane LOS	A	-	-	-	D	A
HCM 95th %tile Q(veh)	0	-	-	-	10.4	0.1

Intersection	
Intersection Delay, s/veh	24.2
Intersection LOS	C

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↗		↘	
Traffic Vol, veh/h	275	195	253	6	418	16
Future Vol, veh/h	275	195	253	6	418	16
Peak Hour Factor	0.87	0.87	0.77	0.77	0.93	0.93
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	316	224	329	8	449	17
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	19.2	19.5	33.5
HCM LOS	C	C	D

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	96%
Vol Thru, %	0%	100%	98%	0%
Vol Right, %	0%	0%	2%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	275	195	259	434
LT Vol	275	0	0	418
Through Vol	0	195	253	0
RT Vol	0	0	6	16
Lane Flow Rate	316	224	336	467
Geometry Grp	7	7	5	2
Degree of Util (X)	0.645	0.426	0.615	0.829
Departure Headway (Hd)	7.347	6.836	6.583	6.503
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	493	529	552	560
Service Time	5.059	4.547	4.583	4.503
HCM Lane V/C Ratio	0.641	0.423	0.609	0.834
HCM Control Delay	22.5	14.5	19.5	33.5
HCM Lane LOS	C	B	C	D
HCM 95th-tile Q	4.5	2.1	4.1	8.5

# **Background Plus Project AM Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	262	242	446	351	327	426
Future Volume (vph)	262	242	446	351	327	426
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.93		1.00	1.00	0.92	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3295		1805	3610	3240	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3295		1805	3610	3240	
Peak-hour factor, PHF	0.84	0.84	0.86	0.86	0.81	0.81
Adj. Flow (vph)	312	288	519	408	404	526
RTOR Reduction (vph)	91	0	0	0	116	0
Lane Group Flow (vph)	509	0	519	408	814	0
Confl. Peds. (#/hr)		1	4			4
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	26.5		42.5	88.6	42.1	
Effective Green, g (s)	26.5		42.5	88.6	42.1	
Actuated g/C Ratio	0.21		0.34	0.71	0.34	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	700		615	2566	1094	
v/s Ratio Prot	c0.15		c0.29	0.11	c0.25	
v/s Ratio Perm						
v/c Ratio	0.73		0.84	0.16	0.74	
Uniform Delay, d1	45.7		38.0	5.9	36.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.0		9.9	0.0	3.0	
Delay (s)	49.7		47.9	5.9	39.5	
Level of Service	D		D	A	D	
Approach Delay (s)	49.7			29.4	39.5	
Approach LOS	D			C	D	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			38.2		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.81			
Actuated Cycle Length (s)			124.6		Sum of lost time (s)	17.5
Intersection Capacity Utilization			74.4%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						



# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕			↕		↕	↕	
Traffic Volume (vph)	0	0	0	142	118	35	0	755	129	14	330	217
Future Volume (vph)	0	0	0	142	118	35	0	755	129	14	330	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0			5.5		4.0	5.5	
Lane Util. Factor					1.00			0.95		1.00	0.95	
Frbp, ped/bikes					1.00			1.00		1.00	1.00	
Flpb, ped/bikes					1.00			1.00		1.00	1.00	
Frt					0.98			0.98		1.00	0.94	
Flt Protected					0.98			1.00		0.95	1.00	
Satd. Flow (prot)					1825			3520		1787	3362	
Flt Permitted					0.98			1.00		0.95	1.00	
Satd. Flow (perm)					1825			3520		1787	3362	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.84	0.84	0.84
Adj. Flow (vph)	0	0	0	153	127	38	0	858	147	17	393	258
RTOR Reduction (vph)	0	0	0	0	4	0	0	7	0	0	91	0
Lane Group Flow (vph)	0	0	0	0	314	0	0	998	0	17	560	0
Confl. Peds. (#/hr)									1	1		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type				Split	NA			NA		Prot	NA	
Protected Phases				8	8			2		1	6	
Permitted Phases												
Actuated Green, G (s)					19.9			32.9		2.2	39.1	
Effective Green, g (s)					19.9			32.9		2.2	39.1	
Actuated g/C Ratio					0.29			0.48		0.03	0.57	
Clearance Time (s)					4.0			5.5		4.0	5.5	
Vehicle Extension (s)					3.0			4.0		3.0	4.0	
Lane Grp Cap (vph)					530			1690		57	1919	
v/s Ratio Prot					c0.17			c0.28		0.01	c0.17	
v/s Ratio Perm												
v/c Ratio					0.59			0.59		0.30	0.29	
Uniform Delay, d1					20.8			12.9		32.4	7.6	
Progression Factor					1.00			1.00		1.00	1.00	
Incremental Delay, d2					1.8			0.7		2.9	0.1	
Delay (s)					22.6			13.6		35.3	7.7	
Level of Service					C			B		D	A	
Approach Delay (s)		0.0			22.6			13.6			8.4	
Approach LOS		A			C			B			A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			13.3		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			68.5		Sum of lost time (s)					13.5		
Intersection Capacity Utilization			49.1%		ICU Level of Service					A		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	185	347	956	0	0	444
Future Volume (vph)	185	347	956	0	0	444
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1589	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1589	3574			3610
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.74	0.74
Adj. Flow (vph)	220	413	1062	0	0	600
RTOR Reduction (vph)	0	26	0	0	0	0
Lane Group Flow (vph)	220	387	1062	0	0	600
Confl. Peds. (#/hr)		6		8	8	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	16.3	16.3	21.7			21.7
Effective Green, g (s)	16.3	16.3	21.7			21.7
Actuated g/C Ratio	0.34	0.34	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	615	541	1622			1638
v/s Ratio Prot	0.12		c0.30			0.17
v/s Ratio Perm		c0.24				
v/c Ratio	0.36	0.71	0.65			0.37
Uniform Delay, d1	11.8	13.7	10.1			8.5
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	3.7	1.0			0.1
Delay (s)	12.0	17.4	11.1			8.7
Level of Service	B	B	B			A
Approach Delay (s)	15.5		11.1			8.7
Approach LOS	B		B			A




















### Intersection Summary

HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	9.8
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 4: I-80 EB Ramps & Willow Ave






















11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	48	12	46	60	277	89	558	102	171	344	75
Future Volume (vph)	121	48	12	46	60	277	89	558	102	171	344	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes		1.00			1.00	1.00	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		0.99			1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3228			1841	1599	1805	3513		1805	3505	
Flt Permitted		0.75			0.76	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2504			1427	1599	1805	3513		1805	3505	
Peak-hour factor, PHF	0.88	0.88	0.88	0.91	0.91	0.91	0.89	0.89	0.89	0.75	0.75	0.75
Adj. Flow (vph)	138	55	14	51	66	304	100	627	115	228	459	100
RTOR Reduction (vph)	0	7	0	0	0	254	0	16	0	0	17	0
Lane Group Flow (vph)	0	200	0	0	117	50	100	726	0	228	542	0
Confl. Peds. (#/hr)							1		4	4		1
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)		8.1			7.7	7.7	5.2	14.8		9.7	19.3	
Effective Green, g (s)		8.1			7.7	7.7	5.2	14.8		9.7	19.3	
Actuated g/C Ratio		0.17			0.16	0.16	0.11	0.31		0.21	0.41	
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		430			233	261	199	1103		371	1436	
v/s Ratio Prot							0.06	c0.21		c0.13	c0.15	
v/s Ratio Perm		0.08			c0.08	0.03						
v/c Ratio		0.47			0.50	0.19	0.50	0.66		0.61	0.38	
Uniform Delay, d1		17.6			18.0	17.0	19.7	14.0		17.0	9.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.6	0.1	0.7	1.1		2.1	0.1	
Delay (s)		17.8			18.6	17.1	20.5	15.1		19.1	9.8	
Level of Service		B			B	B	C	B		B	A	
Approach Delay (s)		17.8			17.5			15.7			12.5	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			15.1				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			47.1				Sum of lost time (s)				14.9	
Intersection Capacity Utilization			55.8%				ICU Level of Service				B	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave























11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	4	144	120	4	72	55	265	44	55	762	29
Future Volume (vph)	77	4	144	120	4	72	55	265	44	55	762	29
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.86		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1594		1797	1630		1805	3522		1805	3610	1575
Flt Permitted	0.70	1.00		0.63	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1325	1594		1191	1630		1805	3522		1805	3610	1575
Peak-hour factor, PHF	0.89	0.89	0.89	0.83	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	4	162	145	5	87	60	288	48	60	828	32
RTOR Reduction (vph)	0	120	0	0	64	0	0	11	0	0	0	18
Lane Group Flow (vph)	87	46	0	145	28	0	60	325	0	60	828	14
Confl. Peds. (#/hr)			8	8			3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	15.8	15.8		15.8	15.8		4.3	27.6		4.1	27.4	27.4
Effective Green, g (s)	15.8	15.8		15.8	15.8		4.3	27.6		4.1	27.4	27.4
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.07	0.46		0.07	0.45	0.45
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	346	416		311	425		128	1606		122	1634	713
v/s Ratio Prot		0.03			0.02		c0.03	0.09		0.03	c0.23	
v/s Ratio Perm	0.07			c0.12								0.01
v/c Ratio	0.25	0.11		0.47	0.07		0.47	0.20		0.49	0.51	0.02
Uniform Delay, d1	17.7	17.0		18.8	16.8		27.0	9.9		27.2	11.8	9.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		1.5	0.1		2.0	0.1		1.1	0.5	0.0
Delay (s)	18.2	17.2		20.3	16.9		29.0	10.0		28.3	12.3	9.2
Level of Service	B	B		C	B		C	A		C	B	A
Approach Delay (s)		17.5			19.0			12.9			13.2	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.5				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			60.5				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			57.9%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 11: John Muir Pkwy & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	348	74	694	318	152	361	463	1022	279	660	96
Future Volume (vph)	86	348	74	694	318	152	361	463	1022	279	660	96
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.95		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3473		3467	1790		1805	3610	1615	1805	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3473		3467	1790		1805	3610	1615	1805	3534	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	93	378	80	746	342	163	384	493	1087	294	695	101
RTOR Reduction (vph)	0	13	0	0	12	0	0	0	0	0	7	0
Lane Group Flow (vph)	93	445	0	746	493	0	384	493	1087	294	789	0
Confl. Peds. (#/hr)							3					3
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	14.3	27.1		31.3	43.1		32.3	35.7	136.6	26.0	29.4	
Effective Green, g (s)	14.3	27.1		31.3	43.1		32.3	35.7	136.6	26.0	29.4	
Actuated g/C Ratio	0.10	0.20		0.23	0.32		0.24	0.26	1.00	0.19	0.22	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	187	689		794	564		426	943	1615	343	760	
v/s Ratio Prot	0.05	0.13		c0.22	c0.28		c0.21	0.14		0.16	c0.22	
v/s Ratio Perm									0.67			
v/c Ratio	0.50	0.65		0.94	0.87		0.90	0.52	0.67	0.86	1.04	
Uniform Delay, d1	57.8	50.3		51.7	44.2		50.6	43.2	0.0	53.5	53.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.8	2.1		18.4	15.2		21.4	0.7	2.3	18.0	42.9	
Delay (s)	58.5	52.4		70.1	59.4		72.0	43.8	2.3	71.5	96.5	
Level of Service	E	D		E	E		E	D	A	E	F	
Approach Delay (s)		53.5			65.8			26.3			89.8	
Approach LOS		D			E			C			F	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			53.8				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			136.6				Sum of lost time (s)			17.5		
Intersection Capacity Utilization			94.5%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019































Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑↑		↘	↑↑
Traffic Volume (vph)	0	0	1700	0	58	1461
Future Volume (vph)	0	0	1700	0	58	1461
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frbp, ped/bikes			1.00		1.00	1.00
Flpb, ped/bikes			1.00		1.00	1.00
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.97	0.97
Adj. Flow (vph)	0	0	1848	0	60	1506
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1848	0	60	1506
Confl. Peds. (#/hr)				1	1	
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			62.1		5.5	75.6
Effective Green, g (s)			62.1		5.5	75.6
Actuated g/C Ratio			0.82		0.07	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4260		130	3574
v/s Ratio Prot			0.36		0.03	c0.42
v/s Ratio Perm						
v/c Ratio			0.43		0.46	0.42
Uniform Delay, d1			1.9		33.6	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		2.6	0.4
Delay (s)			2.2		36.2	0.4
Level of Service			A		D	A
Approach Delay (s)	0.0		2.2			1.7
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			2.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.50			
Actuated Cycle Length (s)			75.6		Sum of lost time (s)	12.0
Intersection Capacity Utilization			43.7%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 				 		 		 	 	
Traffic Volume (vph)	178	207	70	490	210	1119	39	510	328	401	951	84
Future Volume (vph)	178	207	70	490	210	1119	39	510	328	401	951	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3453		1715	1769	2815	1787	3574	1564	3467	3531	
Flt Permitted	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3453		1715	1769	2815	1787	3574	1564	3467	3531	
Peak-hour factor, PHF	0.79	0.79	0.79	0.89	0.89	0.89	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	225	262	89	551	236	1257	43	567	364	451	1069	94
RTOR Reduction (vph)	0	24	0	0	0	222	0	0	273	0	4	0
Lane Group Flow (vph)	225	327	0	386	401	1035	43	567	91	451	1159	0
Confl. Peds. (#/hr)	1		8	8		1			1	1		
Confl. Bikes (#/hr)			1			1			10			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	28.3	28.3		37.2	37.2	52.4	7.8	34.3	34.3	15.2	41.7	
Effective Green, g (s)	28.3	28.3		37.2	37.2	52.4	7.8	34.3	34.3	15.2	41.7	
Actuated g/C Ratio	0.21	0.21		0.27	0.27	0.38	0.06	0.25	0.25	0.11	0.30	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	372	713		465	480	1076	101	894	391	384	1074	
v/s Ratio Prot	c0.12	0.09		0.23	0.23	c0.11	0.02	0.16		c0.13	c0.33	
v/s Ratio Perm						0.26			0.06			
v/c Ratio	0.60	0.46		0.83	0.84	0.96	0.43	0.63	0.23	1.17	1.08	
Uniform Delay, d1	49.3	47.6		46.9	47.0	41.3	62.4	45.8	40.9	60.9	47.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.9	1.3		13.7	13.7	18.9	3.9	2.5	0.9	102.7	51.4	
Delay (s)	54.2	49.0		60.7	60.8	60.2	66.3	48.2	41.7	163.6	99.0	
Level of Service	D	D		E	E	E	E	D	D	F	F	
Approach Delay (s)		51.0			60.4			46.6			117.1	
Approach LOS		D			E			D			F	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			74.3				HCM 2000 Level of Service				E	
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			137.0				Sum of lost time (s)				22.0	
Intersection Capacity Utilization			84.1%				ICU Level of Service				E	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/25/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑↑	↑↑		↖	↗
Traffic Volume (vph)	7	837	1505	13	23	112
Future Volume (vph)	7	837	1505	13	23	112
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1804	3610	3605		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1804	3610	3605		1805	1615
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.71	0.71
Adj. Flow (vph)	8	951	1710	15	32	158
RTOR Reduction (vph)	0	0	1	0	0	109
Lane Group Flow (vph)	8	951	1724	0	32	49
Confl. Peds. (#/hr)	3			3		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	0.6	36.2	31.6		7.2	7.2
Effective Green, g (s)	0.6	36.2	31.6		7.2	7.2
Actuated g/C Ratio	0.01	0.70	0.61		0.14	0.14
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	21	2542	2216		252	226
v/s Ratio Prot	0.00	c0.26	c0.48		0.02	
v/s Ratio Perm						c0.03
v/c Ratio	0.38	0.37	0.78		0.13	0.22
Uniform Delay, d1	25.2	3.1	7.3		19.3	19.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	11.2	0.1	1.8		0.2	0.5
Delay (s)	36.4	3.1	9.1		19.6	20.1
Level of Service	D	A	A		B	C
Approach Delay (s)		3.4	9.1		20.0	
Approach LOS		A	A		B	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			7.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.68			
Actuated Cycle Length (s)			51.4		Sum of lost time (s)	12.0
Intersection Capacity Utilization			55.6%		ICU Level of Service	B
Analysis Period (min)			15			

























c Critical Lane Group



# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	83	392	28	51	1493	52	149	9	158	146	2	264	
Future Volume (vph)	83	392	28	51	1493	52	149	9	158	146	2	264	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98		0.99		1.00	1.00	0.98	
Flpb, ped/bikes	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		0.92		1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1805	3610	1589	1805	3610	1584		3155		1805	1900	1584	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00	
Satd. Flow (perm)	1805	3610	1589	1805	3610	1584		3155		1805	1900	1584	
Peak-hour factor, PHF	0.96	0.96	0.96	0.95	0.95	0.95	0.87	0.87	0.87	0.93	0.93	0.93	
Adj. Flow (vph)	86	408	29	54	1572	55	171	10	182	157	2	284	
RTOR Reduction (vph)	0	0	15	0	0	29	0	145	0	0	0	244	
Lane Group Flow (vph)	86	408	14	54	1572	26	0	218	0	157	2	40	
Confl. Peds. (#/hr)	7		3	3		7	3		7	2		9	
Confl. Bikes (#/hr)			2			1			5				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm	
Protected Phases	5	2		1	6		8	8		4	4		
Permitted Phases			2			6						4	
Actuated Green, G (s)	7.2	42.1	42.1	6.0	40.9	40.9		10.5		12.5	12.5	12.5	
Effective Green, g (s)	7.2	42.1	42.1	6.0	40.9	40.9		10.5		12.5	12.5	12.5	
Actuated g/C Ratio	0.08	0.48	0.48	0.07	0.46	0.46		0.12		0.14	0.14	0.14	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	147	1725	759	122	1675	735		376		256	269	224	
v/s Ratio Prot	c0.05	0.11		0.03	c0.44			c0.07		c0.09	0.00		
v/s Ratio Perm			0.01			0.02						0.03	
v/c Ratio	0.59	0.24	0.02	0.44	0.94	0.03		0.58		0.61	0.01	0.18	
Uniform Delay, d1	39.0	13.5	12.1	39.4	22.4	12.9		36.7		35.5	32.5	33.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	3.8	0.0	0.0	0.9	10.4	0.0		1.3		3.0	0.0	0.1	
Delay (s)	42.8	13.6	12.1	40.4	32.8	12.9		38.1		38.6	32.5	33.4	
Level of Service	D	B	B	D	C	B		D		D	C	C	
Approach Delay (s)		18.3			32.4			38.1			35.2		
Approach LOS		B			C			D			D		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			31.1				HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.79										
Actuated Cycle Length (s)			88.1				Sum of lost time (s)			17.0			
Intersection Capacity Utilization			86.8%				ICU Level of Service			E			
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕	↗	↖↗	↖	↗	↖	↖↗↘		↖	↖↗		
Traffic Volume (vph)	23	33	115	431	38	433	62	1361	92	139	701	25	
Future Volume (vph)	23	33	115	431	38	433	62	1361	92	139	701	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.87	0.85	1.00	0.99		1.00	0.99		
Flt Protected		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1862	1585	3502	1557	1510	1805	5128		1805	3589		
Flt Permitted		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1862	1585	3502	1557	1510	1805	5128		1805	3589		
Peak-hour factor, PHF	0.83	0.83	0.83	0.93	0.93	0.93	0.89	0.89	0.89	0.73	0.73	0.73	
Adj. Flow (vph)	28	40	139	463	41	466	70	1529	103	190	960	34	
RTOR Reduction (vph)	0	0	126	0	171	201	0	5	0	0	2	0	
Lane Group Flow (vph)	0	68	13	463	84	51	70	1627	0	190	992	0	
Confl. Peds. (#/hr)	3		2	2		3	5		4	4		5	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Effective Green, g (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Actuated g/C Ratio		0.09	0.09	0.20	0.20	0.20	0.10	0.42		0.15	0.47		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		167	142	706	313	304	171	2158		263	1692		
v/s Ratio Prot		c0.04		c0.13	0.05		0.04	c0.32		c0.11	0.28		
v/s Ratio Perm			0.01			0.03							
v/c Ratio		0.41	0.09	0.66	0.27	0.17	0.41	0.75		0.72	0.59		
Uniform Delay, d1		51.6	50.1	44.1	40.4	39.6	51.1	29.5		48.9	23.2		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.6	0.3	2.2	0.5	0.3	0.6	2.5		8.0	1.5		
Delay (s)		53.2	50.4	46.3	40.9	39.8	51.7	32.0		57.0	24.7		
Level of Service		D	D	D	D	D	D	C		E	C		
Approach Delay (s)		51.3			43.2			32.8			29.8		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			35.4		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.69										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			69.8%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

# **Background Plus Project AM Unsignalized**

Intersection	
Intersection Delay, s/veh	25
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↑	↗	↖	↕		↖	↗	
Traffic Vol, veh/h	123	46	59	138	4	257	23	348	50	117	314	33
Future Vol, veh/h	123	46	59	138	4	257	23	348	50	117	314	33
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.83	0.83	0.83	0.77	0.77	0.77
Heavy Vehicles, %	0	0	0	1	1	1	0	0	0	0	0	0
Mvmt Flow	127	47	61	150	4	279	28	419	60	152	408	43
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	17.9	26.3	28.1	24.3
HCM LOS	C	D	D	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	70%	0%	44%	0%	100%	0%	0%	100%	76%
Vol Right, %	0%	0%	30%	0%	56%	0%	0%	100%	0%	0%	24%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	23	232	166	123	105	138	4	257	117	209	138
LT Vol	23	0	0	123	0	138	0	0	117	0	0
Through Vol	0	232	116	0	46	0	4	0	0	209	105
RT Vol	0	0	50	0	59	0	0	257	0	0	33
Lane Flow Rate	28	280	200	127	108	150	4	279	152	272	179
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.077	0.733	0.512	0.368	0.287	0.424	0.012	0.694	0.41	0.695	0.448
Departure Headway (Hd)	9.952	9.438	9.221	10.449	9.556	10.165	9.655	8.941	9.715	9.201	9.029
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	359	383	390	344	375	354	370	402	369	391	397
Service Time	7.738	7.224	7.007	8.242	7.348	7.951	7.441	6.727	7.5	6.986	6.813
HCM Lane V/C Ratio	0.078	0.731	0.513	0.369	0.288	0.424	0.011	0.694	0.412	0.696	0.451
HCM Control Delay	13.6	34.3	21.4	19.3	16.2	20.3	12.6	29.8	19.1	30.6	19
HCM Lane LOS	B	D	C	C	C	C	B	D	C	D	C
HCM 95th-tile Q	0.2	5.7	2.8	1.6	1.2	2	0	5.1	1.9	5.1	2.2

Intersection	
Intersection Delay, s/veh	140.2
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	233	272	555	0	0	939
Future Vol, veh/h	233	272	555	0	0	939
Peak Hour Factor	0.88	0.88	0.67	0.67	0.83	0.83
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	265	309	828	0	0	1131
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	22.8	309.1	76.1
HCM LOS	C	F	F

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	555	233	272	470	470
LT Vol	0	233	0	0	0
Through Vol	555	0	0	470	470
RT Vol	0	0	272	0	0
Lane Flow Rate	828	265	309	566	566
Geometry Grp	4	7	7	7	7
Degree of Util (X)	1.625	0.605	0.603	1.142	0.875
Departure Headway (Hd)	7.198	8.945	7.692	8.002	6.233
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	514	408	473	458	588
Service Time	5.198	6.645	5.392	5.702	3.933
HCM Lane V/C Ratio	1.611	0.65	0.653	1.236	0.963
HCM Control Delay	309.1	24.4	21.4	114.3	37.8
HCM Lane LOS	F	C	C	F	E
HCM 95th-tile Q	45.7	3.8	3.9	18.4	10

Intersection												
Int Delay, s/veh	86.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↑↑	↖	↖	↑↑	↖
Traffic Vol, veh/h	36	3	9	221	11	42	174	273	51	28	801	208
Future Vol, veh/h	36	3	9	221	11	42	174	273	51	28	801	208
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	0	0	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	0	-	-	175	-	175	200	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	92	88	92	92	92	94	94	92	92	88	88
Heavy Vehicles, %	5	2	5	2	2	2	0	0	2	2	0	0
Mvmt Flow	41	3	10	240	12	46	185	290	55	30	910	236

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1494	1688	458	1177	1869	145	1149	0	0	345	0	0
Stage 1	973	973	-	660	660	-	-	-	-	-	-	-
Stage 2	521	715	-	517	1209	-	-	-	-	-	-	-
Critical Hdwy	7.6	6.54	7	7.54	6.54	6.94	4.1	-	-	4.14	-	-
Critical Hdwy Stg 1	6.6	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.6	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.55	4.02	3.35	3.52	4.02	3.32	2.2	-	-	2.22	-	-
Pot Cap-1 Maneuver	83	93	542	~ 146	72	876	615	-	-	1211	-	-
Stage 1	265	329	-	418	458	-	-	-	-	-	-	-
Stage 2	499	433	-	509	254	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	49	63	541	~ 104	49	876	613	-	-	1211	-	-
Mov Cap-2 Maneuver	49	63	-	~ 104	49	-	-	-	-	-	-	-
Stage 1	184	320	-	292	320	-	-	-	-	-	-	-
Stage 2	318	302	-	482	247	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	165.4	\$ 558.3	4.7	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	613	-	-	49	191	104	195	1211	-	-
HCM Lane V/C Ratio	0.302	-	-	0.835	0.071	2.31	0.295	0.025	-	-
HCM Control Delay (s)	13.4	-	-	211.6	25.3	684.8	31	8	-	-
HCM Lane LOS	B	-	-	F	D	F	D	A	-	-
HCM 95th %tile Q(veh)	1.3	-	-	3.4	0.2	21.3	1.2	0.1	-	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↕↕	↗		↕↕
Traffic Vol, veh/h	0	42	701	89	0	810
Future Vol, veh/h	0	42	701	89	0	810
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	46	762	97	0	880

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1202	381	0	0	-
Stage 1	762	-	-	-	-
Stage 2	440	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-
Pot Cap-1 Maneuver	177	617	-	-	0
Stage 1	421	-	-	-	0
Stage 2	616	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	177	617	-	-	-
Mov Cap-2 Maneuver	177	-	-	-	-
Stage 1	421	-	-	-	-
Stage 2	616	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBT
Capacity (veh/h)	-	-	617
HCM Lane V/C Ratio	-	-	0.074
HCM Control Delay (s)	-	-	0 11.3
HCM Lane LOS	-	-	A B
HCM 95th %tile Q(veh)	-	-	0.2

# HCM Unsignalized Intersection Capacity Analysis

## 10: John Muir Pkwy & Alfred Nobel Dr

09/29/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↗	↗↗	↗↗		↘↘		
Traffic Volume (veh/h)	15	145	144	478	61	5	
Future Volume (Veh/h)	15	145	144	478	61	5	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.75	0.75	0.88	0.88	0.92	0.92	
Hourly flow rate (vph)	20	193	164	543	66	5	
Pedestrians					4		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	711				576	358	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	711				576	358	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	98				85	99	
cM capacity (veh/h)	895				436	637	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	20	96	96	109	598	44	27
Volume Left	20	0	0	0	0	44	22
Volume Right	0	0	0	0	543	0	5
cSH	895	1700	1700	1700	1700	436	463
Volume to Capacity	0.02	0.06	0.06	0.06	0.35	0.10	0.06
Queue Length 95th (ft)	2	0	0	0	0	8	5
Control Delay (s)	9.1	0.0	0.0	0.0	0.0	14.2	13.3
Lane LOS	A					B	B
Approach Delay (s)	0.9			0.0		13.8	
Approach LOS						B	
Intersection Summary							
Average Delay			1.2				
Intersection Capacity Utilization			29.8%		ICU Level of Service		A
Analysis Period (min)			15				



Intersection	
Intersection Delay, s/veh	33.2
Intersection LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	274	175	227	17	368	27
Future Vol, veh/h	274	175	227	17	368	27
Peak Hour Factor	0.84	0.84	0.94	0.94	0.72	0.72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	326	208	241	18	511	38
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	20.6	16.4	53.5
HCM LOS	C	C	F

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	93%
Vol Thru, %	0%	100%	93%	0%
Vol Right, %	0%	0%	7%	7%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	274	175	244	395
LT Vol	274	0	0	368
Through Vol	0	175	227	0
RT Vol	0	0	17	27
Lane Flow Rate	326	208	260	549
Geometry Grp	7	7	5	2
Degree of Util (X)	0.678	0.403	0.492	0.961
Departure Headway (Hd)	7.481	6.968	6.83	6.303
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	483	517	527	582
Service Time	5.228	4.716	4.878	4.303
HCM Lane V/C Ratio	0.675	0.402	0.493	0.943
HCM Control Delay	24.6	14.4	16.4	53.5
HCM Lane LOS	C	B	C	F
HCM 95th-tile Q	5	1.9	2.7	13

# **Background Plus Project PM Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	359	261	175	368	308	237
Future Volume (vph)	359	261	175	368	308	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.93	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3324		1805	3610	3356	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3324		1805	3610	3356	
Peak-hour factor, PHF	0.84	0.84	0.94	0.94	0.79	0.79
Adj. Flow (vph)	427	311	186	391	390	300
RTOR Reduction (vph)	60	0	0	0	70	0
Lane Group Flow (vph)	678	0	186	391	620	0
Confl. Peds. (#/hr)		1	1			1
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	29.0		15.7	46.6	26.9	
Effective Green, g (s)	29.0		15.7	46.6	26.9	
Actuated g/C Ratio	0.34		0.18	0.55	0.32	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	1132		333	1976	1060	
v/s Ratio Prot	c0.20		c0.10	0.11	c0.18	
v/s Ratio Perm						
v/c Ratio	0.60		0.56	0.20	0.59	
Uniform Delay, d1	23.2		31.5	9.8	24.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.0		1.2	0.1	1.0	
Delay (s)	24.2		32.7	9.8	25.4	
Level of Service	C		C	A	C	
Approach Delay (s)	24.2			17.2	25.4	
Approach LOS	C			B	C	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			22.6		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.62			
Actuated Cycle Length (s)			85.1		Sum of lost time (s)	17.5
Intersection Capacity Utilization			55.9%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↕			↕		↕	↕		
Traffic Volume (vph)	0	0	0	48	61	12	0	513	140	24	339	210	
Future Volume (vph)	0	0	0	48	61	12	0	513	140	24	339	210	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5		4.0	5.5		
Lane Util. Factor					1.00			0.95		1.00	0.95		
Frbp, ped/bikes					1.00			0.99		1.00	1.00		
Flpb, ped/bikes					1.00			1.00		1.00	1.00		
Frt					0.99			0.97		1.00	0.94		
Flt Protected					0.98			1.00		0.95	1.00		
Satd. Flow (prot)					1836			3476		1805	3403		
Flt Permitted					0.98			1.00		0.95	1.00		
Satd. Flow (perm)					1836			3476		1805	3403		
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.94	0.94	0.94	0.86	0.86	0.86	
Adj. Flow (vph)	0	0	0	62	78	15	0	546	149	28	394	244	
RTOR Reduction (vph)	0	0	0	0	3	0	0	13	0	0	72	0	
Lane Group Flow (vph)	0	0	0	0	152	0	0	682	0	28	566	0	
Confl. Peds. (#/hr)									4	4			
Confl. Bikes (#/hr)						1							
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					10.8			25.0		2.6	31.6		
Effective Green, g (s)					10.8			25.0		2.6	31.6		
Actuated g/C Ratio					0.21			0.48		0.05	0.61		
Clearance Time (s)					4.0			5.5		4.0	5.5		
Vehicle Extension (s)					3.0			4.0		3.0	4.0		
Lane Grp Cap (vph)					382			1674		90	2071		
v/s Ratio Prot					c0.08			c0.20		0.02	c0.17		
v/s Ratio Perm													
v/c Ratio					0.40			0.41		0.31	0.27		
Uniform Delay, d1					17.7			8.7		23.8	4.8		
Progression Factor					1.00			1.00		1.00	1.00		
Incremental Delay, d2					0.7			0.2		2.0	0.1		
Delay (s)					18.4			8.9		25.8	4.9		
Level of Service					B			A		C	A		
Approach Delay (s)		0.0			18.4			8.9			5.7		
Approach LOS		A			B			A			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			8.5		HCM 2000 Level of Service						A		
HCM 2000 Volume to Capacity ratio			0.41										
Actuated Cycle Length (s)			51.9		Sum of lost time (s)						13.5		
Intersection Capacity Utilization			34.5%		ICU Level of Service						A		
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	93	79	737	0	0	382
Future Volume (vph)	93	79	737	0	0	382
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1585	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1585	3574			3610
Peak-hour factor, PHF	0.88	0.88	0.90	0.90	0.87	0.87
Adj. Flow (vph)	106	90	819	0	0	439
RTOR Reduction (vph)	0	68	0	0	0	0
Lane Group Flow (vph)	106	22	819	0	0	439
Confl. Peds. (#/hr)		13		7	7	
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	6.6	6.6	13.9			13.9
Effective Green, g (s)	6.6	6.6	13.9			13.9
Actuated g/C Ratio	0.22	0.22	0.46			0.46
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	393	345	1639			1656
v/s Ratio Prot	c0.06		c0.23			0.12
v/s Ratio Perm		0.01				
v/c Ratio	0.27	0.06	0.50			0.27
Uniform Delay, d1	9.8	9.4	5.8			5.1
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	0.0	0.2			0.1
Delay (s)	10.0	9.4	6.0			5.1
Level of Service	A	A	A			A
Approach Delay (s)	9.7		6.0			5.1
Approach LOS	A		A			A




















### Intersection Summary

HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	30.3	Sum of lost time (s)	9.8
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	62	17	175	76	333	79	313	39	158	214	54
Future Volume (vph)	95	62	17	175	76	333	79	313	39	158	214	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes		1.00			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	
Frt		0.99			1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3196			1836	1589	1805	3541		1805	3492	
Flt Permitted		0.72			0.68	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2351			1287	1589	1805	3541		1805	3492	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.98	0.98	0.98	0.93	0.93	0.93
Adj. Flow (vph)	99	65	18	182	79	347	81	319	40	170	230	58
RTOR Reduction (vph)	0	9	0	0	0	244	0	12	0	0	24	0
Lane Group Flow (vph)	0	173	0	0	261	103	81	347	0	170	264	0
Confl. Peds. (#/hr)	6					6	1		4	4		1
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)		13.5			13.1	13.1	3.3	9.6		6.4	12.7	
Effective Green, g (s)		13.5			13.1	13.1	3.3	9.6		6.4	12.7	
Actuated g/C Ratio		0.31			0.30	0.30	0.07	0.22		0.15	0.29	
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		721			383	473	135	772		262	1007	
v/s Ratio Prot							0.04	c0.10		c0.09	c0.08	
v/s Ratio Perm		0.07			c0.20	0.07						
v/c Ratio		0.24			0.68	0.22	0.60	0.45		0.65	0.26	
Uniform Delay, d1		11.4			13.6	11.6	19.7	14.9		17.7	12.0	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			4.0	0.1	4.7	0.2		4.1	0.1	
Delay (s)		11.5			17.6	11.7	24.4	15.1		21.8	12.1	
Level of Service		B			B	B	C	B		C	B	
Approach Delay (s)		11.5			14.2			16.8			15.7	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			15.0				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			44.0				Sum of lost time (s)				14.9	
Intersection Capacity Utilization			54.0%				ICU Level of Service				A	
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	5	108	42	4	26	142	489	91	62	215	49
Future Volume (vph)	35	5	108	42	4	26	142	489	91	62	215	49
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	0.87		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1801	1599		1796	1632		1805	3513		1787	3574	1565
Flt Permitted	0.73	1.00		0.66	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1389	1599		1255	1632		1805	3513		1787	3574	1565
Peak-hour factor, PHF	0.77	0.77	0.77	0.78	0.78	0.78	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	45	6	140	54	5	33	167	575	107	67	231	53
RTOR Reduction (vph)	0	119	0	0	28	0	0	12	0	0	0	31
Lane Group Flow (vph)	45	27	0	54	10	0	167	671	0	67	231	22
Confl. Peds. (#/hr)	3		11	11		3	1		2	2		1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	7.3	7.3		7.3	7.3		8.1	24.3		4.0	20.2	20.2
Effective Green, g (s)	7.3	7.3		7.3	7.3		8.1	24.3		4.0	20.2	20.2
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.17	0.50		0.08	0.42	0.42
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	208	240		188	245		300	1756		147	1485	650
v/s Ratio Prot		0.02			0.01		c0.09	c0.19		0.04	0.06	
v/s Ratio Perm	0.03			c0.04								0.01
v/c Ratio	0.22	0.11		0.29	0.04		0.56	0.38		0.46	0.16	0.03
Uniform Delay, d1	18.1	17.9		18.3	17.7		18.6	7.5		21.3	8.9	8.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		1.2	0.1		1.8	0.3		0.8	0.1	0.0
Delay (s)	18.9	18.1		19.5	17.7		20.4	7.8		22.1	9.0	8.5
Level of Service	B	B		B	B		C	A		C	A	A
Approach Delay (s)		18.3			18.8			10.3			11.4	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			12.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			48.6				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			43.3%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 11: John Muir Pkwy & San Pablo Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	123	579	129	433	225	131	227	721	1193	308	334	55
Future Volume (vph)	123	579	129	433	225	131	227	721	1193	308	334	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.94		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3476		3467	1778		1805	3610	1615	1805	3526	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3476		3467	1778		1805	3610	1615	1805	3526	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	140	658	147	471	245	142	244	775	1283	362	393	65
RTOR Reduction (vph)	0	14	0	0	15	0	0	0	0	0	10	0
Lane Group Flow (vph)	140	791	0	471	372	0	244	775	1283	362	448	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	15.3	34.3		22.7	40.7		16.5	36.5	140.0	30.0	50.0	
Effective Green, g (s)	15.3	34.3		22.7	40.7		16.5	36.5	140.0	30.0	50.0	
Actuated g/C Ratio	0.11	0.24		0.16	0.29		0.12	0.26	1.00	0.21	0.36	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	195	851		562	516		212	941	1615	386	1259	
v/s Ratio Prot	0.08	c0.23		0.14	0.21		c0.14	0.21		c0.20	0.13	
v/s Ratio Perm									c0.79			
v/c Ratio	0.72	0.93		0.84	0.72		1.15	0.82	0.79	0.94	0.36	
Uniform Delay, d1	60.3	51.7		56.9	44.6		61.8	48.7	0.0	54.1	33.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.0	16.2		10.1	6.0		108.5	8.1	4.1	29.8	0.8	
Delay (s)	70.3	67.9		67.0	50.6		170.2	56.8	4.1	83.9	33.9	
Level of Service	E	E		E	D		F	E	A	F	C	
Approach Delay (s)		68.2			59.6			39.5			56.0	
Approach LOS		E			E			D			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			51.2				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)				17.5	
Intersection Capacity Utilization			83.9%				ICU Level of Service				E	
Analysis Period (min)			15									

c Critical Lane Group



# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019
































Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↵	↑↑↑		↵	↑↑
Traffic Volume (vph)	0	0	1984	1	6	866
Future Volume (vph)	0	0	1984	1	6	866
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	0	2111	1	6	912
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2112	0	6	912
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			68.9		1.3	78.2
Effective Green, g (s)			68.9		1.3	78.2
Actuated g/C Ratio			0.88		0.02	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4570		29	3574
v/s Ratio Prot			c0.41		0.00	c0.26
v/s Ratio Perm						
v/c Ratio			0.46		0.21	0.26
Uniform Delay, d1			0.9		37.9	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		3.5	0.2
Delay (s)			1.3		41.5	0.2
Level of Service			A		D	A
Approach Delay (s)	0.0		1.3			0.4
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			1.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.50			
Actuated Cycle Length (s)			78.2		Sum of lost time (s)	12.0
Intersection Capacity Utilization			41.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 				 		 		 	 	 
Traffic Volume (vph)	177	196	73	275	306	809	63	1066	363	525	375	124
Future Volume (vph)	177	196	73	275	306	809	63	1066	363	525	375	124
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.95	1.00	0.97	0.95	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	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	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3441		1681	1794	2842	1787	3574	1583	3502	3476	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3441		1681	1794	2842	1787	3574	1583	3502	3476	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	190	211	78	296	329	870	71	1198	408	565	403	133
RTOR Reduction (vph)	0	28	0	0	0	151	0	0	203	0	21	0
Lane Group Flow (vph)	190	261	0	266	359	719	71	1198	205	565	515	0
Confl. Peds. (#/hr)			10	10								
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	1%	1%	2%	0%	0%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9	
Effective Green, g (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9	
Actuated g/C Ratio	0.17	0.17		0.24	0.24	0.41	0.07	0.26	0.26	0.17	0.36	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	310	592		405	433	1155	117	944	418	577	1263	
v/s Ratio Prot	c0.11	0.08		0.16	c0.20	0.10	0.04	c0.34		c0.16	0.15	
v/s Ratio Perm						0.15			0.13			
v/c Ratio	0.61	0.44		0.66	0.83	0.62	0.61	1.27	0.49	0.98	0.41	
Uniform Delay, d1	53.6	51.9		47.9	50.4	33.0	63.6	51.5	43.5	58.2	33.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.1	1.5		6.1	14.3	1.2	9.9	129.5	4.1	31.9	1.0	
Delay (s)	59.8	53.4		53.9	64.7	34.2	73.5	181.0	47.6	90.1	34.3	
Level of Service	E	D		D	E	C	E	F	D	F	C	
Approach Delay (s)		55.9			45.0			144.0			62.9	
Approach LOS		E			D			F			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			85.2				HCM 2000 Level of Service				F	
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			93.7%			ICU Level of Service				F		
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/25/2019


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑	↑↑		↰	↰
Traffic Volume (vph)	10	1490	671	21	21	66
Future Volume (vph)	10	1490	671	21	21	66
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	3574	3521		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	3574	3521		1805	1615
Peak-hour factor, PHF	0.94	0.94	0.96	0.96	0.77	0.77
Adj. Flow (vph)	11	1585	699	22	27	86
RTOR Reduction (vph)	0	0	4	0	0	71
Lane Group Flow (vph)	11	1585	717	0	27	15
Confl. Peds. (#/hr)				3		
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	0.6	20.8	16.2		6.2	6.2
Effective Green, g (s)	0.6	20.8	16.2		6.2	6.2
Actuated g/C Ratio	0.02	0.59	0.46		0.18	0.18
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	30	2123	1629		319	286
v/s Ratio Prot	0.01	c0.44	0.20		c0.01	
v/s Ratio Perm						0.01
v/c Ratio	0.37	0.75	0.44		0.08	0.05
Uniform Delay, d1	17.0	5.2	6.3		12.0	12.0
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	7.4	1.5	0.2		0.1	0.1
Delay (s)	24.5	6.6	6.5		12.1	12.0
Level of Service	C	A	A		B	B
Approach Delay (s)		6.8	6.5		12.1	
Approach LOS		A	A		B	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			6.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.70			
Actuated Cycle Length (s)			35.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			51.2%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	1296	135	85	435	107	70	8	69	115	13	107
Future Volume (vph)	285	1296	135	85	435	107	70	8	69	115	13	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98		0.98		1.00	1.00	0.98
Flpb, ped/bikes	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		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.98		0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1592	1805	3610	1586		3214		1805	1900	1584
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.90	0.90	0.90	0.96	0.96	0.96
Adj. Flow (vph)	306	1394	145	89	453	111	78	9	77	120	14	111
RTOR Reduction (vph)	0	0	25	0	0	54	0	72	0	0	0	100
Lane Group Flow (vph)	306	1394	120	89	453	57	0	92	0	120	14	11
Confl. Peds. (#/hr)	4		1	1		4	6		9	9		6
Confl. Bikes (#/hr)			1						5			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6						4
Actuated Green, G (s)	29.6	89.7	89.7	11.3	71.4	71.4		8.3		13.7	13.7	13.7
Effective Green, g (s)	29.6	89.7	89.7	11.3	71.4	71.4		8.3		13.7	13.7	13.7
Actuated g/C Ratio	0.21	0.64	0.64	0.08	0.51	0.51		0.06		0.10	0.10	0.10
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	381	2312	1020	145	1841	808		190		176	185	155
v/s Ratio Prot	c0.17	c0.39		0.05	0.13			c0.03		c0.07	0.01	
v/s Ratio Perm			0.08			0.04						0.01
v/c Ratio	0.80	0.60	0.12	0.61	0.25	0.07		0.48		0.68	0.08	0.07
Uniform Delay, d1	52.4	14.7	9.8	62.2	19.2	17.4		63.8		61.0	57.4	57.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	11.0	1.2	0.2	5.3	0.3	0.2		0.7		8.4	0.1	0.1
Delay (s)	63.4	15.9	10.0	67.6	19.5	17.6		64.5		69.4	57.5	57.4
Level of Service	E	B	B	E	B	B		E		E	E	E
Approach Delay (s)		23.3			25.8			64.5			63.3	
Approach LOS		C			C			E			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			29.6									C
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			140.0							17.0		
Intersection Capacity Utilization			67.0%									C
Analysis Period (min)			15									
c	Critical Lane Group											

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕	↗	↖↗	↖	↗	↖	↖↗↘		↖	↖↗		
Traffic Volume (vph)	73	40	203	507	82	299	57	946	66	178	819	22	
Future Volume (vph)	73	40	203	507	82	299	57	946	66	178	819	22	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	1.00	0.99	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.91	0.85	1.00	0.99		1.00	1.00		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1840	1582	3502	1635	1514	1805	5126		1805	3593		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1840	1582	3502	1635	1514	1805	5126		1805	3593		
Peak-hour factor, PHF	0.85	0.85	0.85	0.96	0.96	0.96	0.91	0.91	0.91	0.89	0.89	0.89	
Adj. Flow (vph)	86	47	239	528	85	311	63	1040	73	200	920	25	
RTOR Reduction (vph)	0	0	184	0	49	150	0	6	0	0	1	0	
Lane Group Flow (vph)	0	133	55	528	154	43	63	1107	0	200	944	0	
Confl. Peds. (#/hr)	1		3	3		1	5		4	1		9	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		12.3	12.3	25.5	25.5	25.5	8.6	40.4		19.8	51.6		
Effective Green, g (s)		12.3	12.3	25.5	25.5	25.5	8.6	40.4		19.8	51.6		
Actuated g/C Ratio		0.11	0.11	0.22	0.22	0.22	0.07	0.35		0.17	0.45		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		196	169	776	362	335	134	1800		310	1612		
v/s Ratio Prot		c0.07		c0.15	0.09		0.03	0.22		c0.11	c0.26		
v/s Ratio Perm			0.03			0.03							
v/c Ratio		0.68	0.33	0.68	0.43	0.13	0.47	0.61		0.65	0.59		
Uniform Delay, d1		49.4	47.5	41.0	38.5	35.8	51.0	30.9		44.3	23.7		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		9.0	1.1	2.5	0.8	0.2	0.9	1.6		3.4	1.6		
Delay (s)		58.4	48.6	43.5	39.3	36.0	52.0	32.4		47.8	25.3		
Level of Service		E	D	D	D	D	D	C		D	C		
Approach Delay (s)		52.1			41.0			33.5			29.2		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			36.0		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.65										
Actuated Cycle Length (s)			115.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			67.4%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

# **Background Plus Project PM Unsignalized**

Intersection	
Intersection Delay, s/veh	14.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↑	↵	↵	↕		↵	↕	
Traffic Vol, veh/h	53	53	42	71	2	117	78	279	125	191	170	101
Future Vol, veh/h	53	53	42	71	2	117	78	279	125	191	170	101
Peak Hour Factor	0.78	0.78	0.78	0.84	0.84	0.84	0.93	0.93	0.93	0.95	0.95	0.95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	68	68	54	85	2	139	84	300	134	201	179	106
Number of Lanes	1	1	0	1	1	1	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	2
HCM Control Delay	13.5	13.6	15.3	14.9
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	100%	43%	0%	56%	0%	100%	0%	0%	100%	36%
Vol Right, %	0%	0%	57%	0%	44%	0%	0%	100%	0%	0%	64%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	78	186	218	53	95	71	2	117	191	113	158
LT Vol	78	0	0	53	0	71	0	0	191	0	0
Through Vol	0	186	93	0	53	0	2	0	0	113	57
RT Vol	0	0	125	0	42	0	0	117	0	0	101
Lane Flow Rate	84	200	234	68	122	85	2	139	201	119	166
Geometry Grp	8	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.187	0.418	0.463	0.165	0.268	0.207	0.005	0.294	0.451	0.251	0.328
Departure Headway (Hd)	8.025	7.517	7.11	8.739	7.93	8.818	8.312	7.604	8.071	7.564	7.109
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	446	478	506	410	452	406	429	471	446	474	505
Service Time	5.79	5.282	4.875	6.513	5.703	6.595	6.089	5.381	5.837	5.329	4.874
HCM Lane V/C Ratio	0.188	0.418	0.462	0.166	0.27	0.209	0.005	0.295	0.451	0.251	0.329
HCM Control Delay	12.6	15.6	15.9	13.2	13.6	13.9	11.1	13.5	17.3	12.9	13.3
HCM Lane LOS	B	C	C	B	B	B	B	B	C	B	B
HCM 95th-tile Q	0.7	2	2.4	0.6	1.1	0.8	0	1.2	2.3	1	1.4

Intersection	
Intersection Delay, s/veh	72
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑			↑↑
Traffic Vol, veh/h	308	282	564	0	0	717
Future Vol, veh/h	308	282	564	0	0	717
Peak Hour Factor	0.90	0.90	0.87	0.87	0.92	0.92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	342	313	648	0	0	779
Number of Lanes	1	1	1	0	0	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	2	2	0
HCM Control Delay	28	170.7	27
HCM LOS	D	F	D

Lane	NBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	0%	100%	0%	0%	0%
Vol Thru, %	100%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	564	308	282	359	359
LT Vol	0	308	0	0	0
Through Vol	564	0	0	359	359
RT Vol	0	0	282	0	0
Lane Flow Rate	648	342	313	390	390
Geometry Grp	4	7	7	7	7
Degree of Util (X)	1.298	0.77	0.601	0.804	0.62
Departure Headway (Hd)	7.208	8.597	7.354	7.881	6.119
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	506	424	495	464	592
Service Time	5.242	6.297	5.054	5.581	3.819
HCM Lane V/C Ratio	1.281	0.807	0.632	0.841	0.659
HCM Control Delay	170.7	34.8	20.5	35.7	18.3
HCM Lane LOS	F	D	C	E	C
HCM 95th-tile Q	27.4	6.5	3.9	7.4	4.2



HCM 6th TWSC  
8: Linus Pauling Dr & San Pablo Ave

10/09/2019

Intersection												
Int Delay, s/veh	22.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↑↑	↖	↖	↑↑	↖
Traffic Vol, veh/h	157	11	253	116	6	20	12	555	74	29	359	61
Future Vol, veh/h	157	11	253	116	6	20	12	555	74	29	359	61
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	0	-	-	175	-	175	200	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	66	92	66	92	92	92	92	92	92	92	97	97
Heavy Vehicles, %	0	2	0	2	2	2	0	0	2	2	0	0
Mvmt Flow	238	12	383	126	7	22	13	603	80	32	370	63

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	766	1144	186	884	1127	302	434	0	0	683	0	0
Stage 1	435	435	-	629	629	-	-	-	-	-	-	-
Stage 2	331	709	-	255	498	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.54	6.9	7.54	6.54	6.94	4.1	-	-	4.14	-	-
Critical Hdwy Stg 1	6.5	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.02	3.3	3.52	4.02	3.32	2.2	-	-	2.22	-	-
Pot Cap-1 Maneuver	296	198	831	240	203	694	1136	-	-	906	-	-
Stage 1	575	579	-	437	474	-	-	-	-	-	-	-
Stage 2	662	435	-	727	543	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	269	189	830	~ 119	193	694	1135	-	-	906	-	-
Mov Cap-2 Maneuver	269	189	-	~ 119	193	-	-	-	-	-	-	-
Stage 1	568	558	-	432	469	-	-	-	-	-	-	-
Stage 2	625	430	-	369	523	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	35.5	141	0.2	0.6
HCM LOS	E	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1135	-	-	269	753	119	434	906	-	-
HCM Lane V/C Ratio	0.011	-	-	0.884	0.525	1.06	0.065	0.035	-	-
HCM Control Delay (s)	8.2	-	-	69.8	14.9	169.5	13.9	9.1	-	-
HCM Lane LOS	A	-	-	F	B	F	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	7.7	3.1	7.3	0.2	0.1	-	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	0	20	975	135	0	612
Future Vol, veh/h	0	20	975	135	0	612
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	200	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	1060	147	0	665

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1393	530	0	0	1207
Stage 1	1060	-	-	-	-
Stage 2	333	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	133	493	-	-	574
Stage 1	294	-	-	-	-
Stage 2	698	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	133	493	-	-	574
Mov Cap-2 Maneuver	133	-	-	-	-
Stage 1	294	-	-	-	-
Stage 2	698	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	493	574
HCM Lane V/C Ratio	-	-	-	0.044	-
HCM Control Delay (s)	-	-	0	12.6	0
HCM Lane LOS	-	-	A	B	A
HCM 95th %tile Q(veh)	-	-	-	0.1	0

HCM Unsignalized Intersection Capacity Analysis  
 10: John Muir Pkwy & Alfred Nobel Dr

09/29/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↖	↗↗	↖↖		↘↘		
Traffic Volume (veh/h)	7	126	131	75	487	31	
Future Volume (Veh/h)	7	126	131	75	487	31	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.85	0.85	0.87	0.87	0.79	0.79	
Hourly flow rate (vph)	8	148	151	86	616	39	
Pedestrians					1		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	238				285	120	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	238				285	120	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	99				10	96	
cM capacity (veh/h)	1340				683	915	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	8	74	74	101	136	411	244
Volume Left	8	0	0	0	0	411	205
Volume Right	0	0	0	0	86	0	39
cSH	1340	1700	1700	1700	1700	683	712
Volume to Capacity	0.01	0.04	0.04	0.06	0.08	0.60	0.34
Queue Length 95th (ft)	0	0	0	0	0	101	38
Control Delay (s)	7.7	0.0	0.0	0.0	0.0	17.9	12.7
Lane LOS	A					C	B
Approach Delay (s)	0.4			0.0		16.0	
Approach LOS						C	
Intersection Summary							
Average Delay			10.0				
Intersection Capacity Utilization			27.8%		ICU Level of Service		A
Analysis Period (min)			15				

Intersection	
Intersection Delay, s/veh	31.9
Intersection LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	275	195	253	6	418	69
Future Vol, veh/h	275	195	253	6	418	69
Peak Hour Factor	0.87	0.87	0.77	0.77	0.93	0.93
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	316	224	329	8	449	74
Number of Lanes	1	1	1	0	1	0























Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	20.7	21.1	50.4
HCM LOS	C	C	F

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	86%
Vol Thru, %	0%	100%	98%	0%
Vol Right, %	0%	0%	2%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	275	195	259	487
LT Vol	275	0	0	418
Through Vol	0	195	253	0
RT Vol	0	0	6	69
Lane Flow Rate	316	224	336	524
Geometry Grp	7	7	5	2
Degree of Util (X)	0.668	0.442	0.637	0.942
Departure Headway (Hd)	7.607	7.094	6.82	6.477
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	474	507	528	566
Service Time	5.362	4.849	4.871	4.477
HCM Lane V/C Ratio	0.667	0.442	0.636	0.926
HCM Control Delay	24.4	15.4	21.1	50.4
HCM Lane LOS	C	C	C	F
HCM 95th-tile Q	4.8	2.2	4.4	12.1

# **Background Plus Project Mitigated AM**

HCM Signalized Intersection Capacity Analysis  
 8: Linus Pauling Dr & San Pablo Ave























11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	3	9	0	11	84	174	273	0	28	801	208
Future Volume (vph)	36	3	9	0	11	84	174	273	0	28	801	208
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.99			1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.88			0.87		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1595			1616		1805	3610		1770	3610	1575
Flt Permitted	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1719	1595			1616		1805	3610		1770	3610	1575
Peak-hour factor, PHF	0.88	0.92	0.88	0.92	0.92	0.92	0.94	0.94	0.92	0.92	0.88	0.88
Adj. Flow (vph)	41	3	10	0	12	91	185	290	0	30	910	236
RTOR Reduction (vph)	0	8	0	0	84	0	0	0	0	0	0	130
Lane Group Flow (vph)	41	5	0	0	19	0	185	290	0	30	910	106
Confl. Peds. (#/hr)							3					3
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	5%	2%	5%	2%	2%	2%	0%	0%	2%	2%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	1.4	9.4			4.0		7.2	29.6		0.8	23.2	23.2
Effective Green, g (s)	1.4	9.4			4.0		7.2	29.6		0.8	23.2	23.2
Actuated g/C Ratio	0.03	0.18			0.08		0.14	0.57		0.02	0.45	0.45
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	46	289			124		250	2062		27	1616	705
v/s Ratio Prot	c0.02	0.00			c0.01		c0.10	0.08		0.02	c0.25	
v/s Ratio Perm												0.07
v/c Ratio	0.89	0.02			0.15		0.74	0.14		1.11	0.56	0.15
Uniform Delay, d1	25.1	17.4			22.3		21.4	5.2		25.5	10.6	8.5
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	91.9	0.0			0.6		10.9	0.0		209.3	0.5	0.1
Delay (s)	117.0	17.4			22.9		32.3	5.2		234.8	11.0	8.6
Level of Service	F	B			C		C	A		F	B	A
Approach Delay (s)		93.0			22.9			15.8			16.2	
Approach LOS		F			C			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			18.8				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			51.8				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			50.4%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

# **Background Plus Project Mitigated PM**

HCM Signalized Intersection Capacity Analysis  
8: Linus Pauling Dr & San Pablo Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	157	11	253	0	6	40	12	555	0	29	359	61	
Future Volume (vph)	157	11	253	0	6	40	12	555	0	29	359	61	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00	
Frbp, ped/bikes	1.00	0.99			1.00		1.00	1.00		1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00	
Frt	1.00	0.85			0.87		1.00	1.00		1.00	1.00	0.85	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1805	1603			1622		1804	3610		1770	3610	1581	
Flt Permitted	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00	
Satd. Flow (perm)	1805	1603			1622		1804	3610		1770	3610	1581	
Peak-hour factor, PHF	0.66	0.92	0.66	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.97	0.97	
Adj. Flow (vph)	238	12	383	0	7	43	13	603	0	32	370	63	
RTOR Reduction (vph)	0	241	0	0	41	0	0	0	0	0	0	43	
Lane Group Flow (vph)	238	154	0	0	9	0	13	603	0	32	370	20	
Confl. Peds. (#/hr)							1					1	
Confl. Bikes (#/hr)			1										
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	0%	2%	2%	0%	0%	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases									2			6	
Actuated Green, G (s)	9.1	15.1			2.0		0.5	12.4		1.1	13.0	13.0	
Effective Green, g (s)	9.1	15.1			2.0		0.5	12.4		1.1	13.0	13.0	
Actuated g/C Ratio	0.22	0.37			0.05		0.01	0.31		0.03	0.32	0.32	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	404	596			79		22	1102		47	1155	506	
v/s Ratio Prot	c0.13	c0.10			0.01		0.01	c0.17		c0.02	0.10		
v/s Ratio Perm												0.01	
v/c Ratio	0.59	0.26			0.12		0.59	0.55		0.68	0.32	0.04	
Uniform Delay, d1	14.1	8.9			18.5		19.9	11.8		19.6	10.5	9.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.2	0.2			0.7		36.0	0.6		33.6	0.2	0.0	
Delay (s)	16.3	9.1			19.1		55.9	12.3		53.2	10.6	9.5	
Level of Service	B	A			B		E	B		D	B	A	
Approach Delay (s)		11.8			19.1			13.2			13.4		
Approach LOS		B			B			B			B		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			12.9									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.57										
Actuated Cycle Length (s)			40.6									Sum of lost time (s)	16.0
Intersection Capacity Utilization			44.9%									ICU Level of Service	A
Analysis Period (min)			15										
c Critical Lane Group													



# Cumulative AM Signalized

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	287	199	402	461	677	530
Future Volume (vph)	287	199	402	461	677	530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.93	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3327		1805	3610	3314	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3327		1805	3610	3314	
Peak-hour factor, PHF	0.84	0.84	0.86	0.86	0.81	0.81
Adj. Flow (vph)	342	237	467	536	836	654
RTOR Reduction (vph)	69	0	0	0	64	0
Lane Group Flow (vph)	510	0	467	536	1426	0
Confl. Peds. (#/hr)		1	4			4
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	26.8		42.1	98.2	52.1	
Effective Green, g (s)	26.8		42.1	98.2	52.1	
Actuated g/C Ratio	0.20		0.31	0.73	0.39	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	662		564	2635	1283	
v/s Ratio Prot	c0.15		c0.26	0.15	c0.43	
v/s Ratio Perm						
v/c Ratio	0.77		0.83	0.20	1.11	
Uniform Delay, d1	50.9		42.8	5.8	41.2	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.9		9.3	0.1	61.6	
Delay (s)	56.8		52.1	5.8	102.8	
Level of Service	E		D	A	F	
Approach Delay (s)	56.8			27.4	102.8	
Approach LOS	E			C	F	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			69.5		HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			0.97			
Actuated Cycle Length (s)			134.5		Sum of lost time (s)	17.5
Intersection Capacity Utilization			83.9%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↔			↕		↖	↕		
Traffic Volume (vph)	0	0	0	214	0	0	0	960	167	0	633	292	
Future Volume (vph)	0	0	0	214	0	0	0	960	167	0	633	292	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5			5.5		
Lane Util. Factor					1.00			0.95			0.95		
Frb, ped/bikes					1.00			1.00			1.00		
Flpb, ped/bikes					1.00			1.00			1.00		
Frt					1.00			0.98			0.95		
Flt Protected					0.95			1.00			1.00		
Satd. Flow (prot)					1805			3518			3405		
Flt Permitted					0.95			1.00			1.00		
Satd. Flow (perm)					1805			3518			3405		
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.84	0.84	0.84	
Adj. Flow (vph)	0	0	0	230	0	0	0	1091	190	0	754	348	
RTOR Reduction (vph)	0	0	0	0	0	0	0	5	0	0	34	0	
Lane Group Flow (vph)	0	0	0	0	230	0	0	1276	0	0	1068	0	
Confl. Peds. (#/hr)									1	1			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					15.4			52.0			52.0		
Effective Green, g (s)					15.4			52.0			52.0		
Actuated g/C Ratio					0.20			0.68			0.68		
Clearance Time (s)					4.0			5.5			5.5		
Vehicle Extension (s)					3.0			4.0			4.0		
Lane Grp Cap (vph)					361			2378			2302		
v/s Ratio Prot					c0.13			c0.36			0.31		
v/s Ratio Perm													
v/c Ratio					0.64			0.54			0.46		
Uniform Delay, d1					28.2			6.3			5.9		
Progression Factor					1.00			1.00			1.00		
Incremental Delay, d2					3.7			0.3			0.2		
Delay (s)					31.9			6.6			6.1		
Level of Service					C			A			A		
Approach Delay (s)		0.0			31.9			6.6			6.1		
Approach LOS		A			C			A			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			8.6		HCM 2000 Level of Service						A		
HCM 2000 Volume to Capacity ratio			0.59										
Actuated Cycle Length (s)			76.9		Sum of lost time (s)						13.5		
Intersection Capacity Utilization			51.7%		ICU Level of Service						A		
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	185	347	950	0	0	402
Future Volume (vph)	185	347	950	0	0	402
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1589	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1589	3574			3610
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.74	0.74
Adj. Flow (vph)	220	413	1056	0	0	543
RTOR Reduction (vph)	0	27	0	0	0	0
Lane Group Flow (vph)	220	386	1056	0	0	543
Confl. Peds. (#/hr)		6		8	8	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	16.3	16.3	21.4			21.4
Effective Green, g (s)	16.3	16.3	21.4			21.4
Actuated g/C Ratio	0.34	0.34	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	619	545	1610			1626
v/s Ratio Prot	0.12		c0.30			0.15
v/s Ratio Perm		c0.24				
v/c Ratio	0.36	0.71	0.66			0.33
Uniform Delay, d1	11.7	13.5	10.2			8.4
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	3.4	1.0			0.1
Delay (s)	11.8	17.0	11.2			8.6
Level of Service	B	B	B			A
Approach Delay (s)	15.2		11.2			8.6
Approach LOS	B		B			A

### Intersection Summary

HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	9.8
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔↔			↕	↗	↘	↕↕		↘	↕↕		
Traffic Volume (vph)	121	48	12	46	60	271	89	558	102	129	344	75	
Future Volume (vph)	121	48	12	46	60	271	89	558	102	129	344	75	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12	
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95		
Frbp, ped/bikes		1.00			1.00	1.00	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		0.99			1.00	0.85	1.00	0.98		1.00	0.97		
Flt Protected		0.97			0.98	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		3228			1841	1599	1805	3514		1805	3505		
Flt Permitted		0.75			0.76	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		2505			1427	1599	1805	3514		1805	3505		
Peak-hour factor, PHF	0.88	0.88	0.88	0.91	0.91	0.91	0.89	0.89	0.89	0.75	0.75	0.75	
Adj. Flow (vph)	138	55	14	51	66	298	100	627	115	172	459	100	
RTOR Reduction (vph)	0	6	0	0	0	244	0	16	0	0	18	0	
Lane Group Flow (vph)	0	201	0	0	117	54	100	726	0	172	541	0	
Confl. Peds. (#/hr)							1		4	4		1	
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%	
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA		
Protected Phases		4			8		5	2		1	6		
Permitted Phases	4			8		8							
Actuated Green, G (s)		8.0			7.6	7.6	4.9	12.9		6.4	14.4		
Effective Green, g (s)		8.0			7.6	7.6	4.9	12.9		6.4	14.4		
Actuated g/C Ratio		0.19			0.18	0.18	0.12	0.31		0.15	0.34		
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2		
Lane Grp Cap (vph)		479			259	290	211	1084		276	1207		
v/s Ratio Prot							0.06	c0.21		c0.10	0.15		
v/s Ratio Perm		0.08			c0.08	0.03							
v/c Ratio		0.42			0.45	0.19	0.47	0.67		0.62	0.45		
Uniform Delay, d1		14.9			15.2	14.5	17.2	12.6		16.6	10.6		
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		0.2			0.5	0.1	0.6	1.2		3.1	0.1		
Delay (s)		15.1			15.7	14.6	17.9	13.8		19.7	10.7		
Level of Service		B			B	B	B	B		B	B		
Approach Delay (s)		15.1			14.9			14.3			12.8		
Approach LOS		B			B			B			B		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			14.0									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.60										
Actuated Cycle Length (s)			41.8									Sum of lost time (s)	14.9
Intersection Capacity Utilization			55.4%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 5: Viewpoint Blvd & Willow Ave

11/25/2019














Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↕		↖	↗	↖
Traffic Volume (vph)	119	4	65	124	2	204	30	550	64	98	360	28
Future Volume (vph)	119	4	65	124	2	204	30	550	64	98	360	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1631		1787	1881	1599	1805	3548		1805	3610	1578
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1631		1787	1881	1599	1805	3548		1805	3610	1578
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.83	0.83	0.83	0.77	0.77	0.77
Adj. Flow (vph)	123	4	67	135	2	222	36	663	77	127	468	36
RTOR Reduction (vph)	0	59	0	0	0	188	0	13	0	0	0	21
Lane Group Flow (vph)	123	12	0	135	2	34	36	727	0	127	468	15
Confl. Peds. (#/hr)				5			2		3	3		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	4.5	6.0		6.3	7.8	7.8	1.8	18.6		4.5	21.3	21.3
Effective Green, g (s)	4.5	6.0		6.3	7.8	7.8	1.8	18.6		4.5	21.3	21.3
Actuated g/C Ratio	0.09	0.12		0.12	0.15	0.15	0.04	0.36		0.09	0.41	0.41
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	158	190		219	285	242	63	1283		158	1495	653
v/s Ratio Prot	0.07	0.01		c0.08	0.00		0.02	c0.20		c0.07	c0.13	
v/s Ratio Perm						c0.02						0.01
v/c Ratio	0.78	0.06		0.62	0.01	0.14	0.57	0.57		0.80	0.31	0.02
Uniform Delay, d1	23.0	20.2		21.4	18.5	18.9	24.4	13.2		23.0	10.1	8.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	21.1	0.1		5.1	0.0	0.3	11.9	0.6		24.8	0.1	0.0
Delay (s)	44.0	20.3		26.5	18.5	19.2	36.3	13.7		47.8	10.2	8.9
Level of Service	D	C		C	B	B	D	B		D	B	A
Approach Delay (s)		35.4			21.9			14.8			17.7	
Approach LOS		D			C			B			B	

Intersection Summary		
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.51	B
Actuated Cycle Length (s)	51.4	Sum of lost time (s)
Intersection Capacity Utilization	46.5%	16.0
Analysis Period (min)	15	ICU Level of Service
		A
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis  
6: SR-4 WB Off-Ramp & Willow Ave
























11/25/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	233	272	555	0	0	939
Future Volume (vph)	233	272	555	0	0	939
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	1.00	1.00	1.00			0.95
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1787	1599	1900			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1787	1599	1900			3610
Peak-hour factor, PHF	0.88	0.88	0.67	0.67	0.83	0.83
Adj. Flow (vph)	265	309	828	0	0	1131
RTOR Reduction (vph)	0	75	0	0	0	0
Lane Group Flow (vph)	265	234	828	0	0	1131
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	11.2	11.2	21.2			21.2
Effective Green, g (s)	11.2	11.2	21.2			21.2
Actuated g/C Ratio	0.28	0.28	0.52			0.52
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	495	443	997			1894
v/s Ratio Prot	c0.15		c0.44			0.31
v/s Ratio Perm		0.15				
v/c Ratio	0.54	0.53	0.83			0.60
Uniform Delay, d1	12.4	12.4	8.1			6.6
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	1.1	1.1	6.0			0.5
Delay (s)	13.5	13.5	14.1			7.2
Level of Service	B	B	B			A
Approach Delay (s)	13.5		14.1			7.2
Approach LOS	B		B			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			10.9		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			40.4		Sum of lost time (s)	8.0
Intersection Capacity Utilization			52.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								 			 	
Traffic Volume (vph)	74	0	109	104	2	80	62	284	52	49	871	24
Future Volume (vph)	74	0	109	104	2	80	62	284	52	49	871	24
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1586		1796	1621		1805	3514		1805	3610	1575
Flt Permitted	0.69	1.00		0.68	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1318	1586		1283	1621		1805	3514		1805	3610	1575
Peak-hour factor, PHF	0.89	0.89	0.89	0.83	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	0	122	125	2	96	67	309	57	53	947	26
RTOR Reduction (vph)	0	96	0	0	76	0	0	11	0	0	0	13
Lane Group Flow (vph)	83	26	0	125	22	0	67	355	0	53	947	13
Confl. Peds. (#/hr)			8	8			3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	13.5	13.5		13.5	13.5		6.1	33.7		4.0	31.6	31.6
Effective Green, g (s)	13.5	13.5		13.5	13.5		6.1	33.7		4.0	31.6	31.6
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.10	0.52		0.06	0.49	0.49
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	277	333		269	340		171	1844		112	1776	775
v/s Ratio Prot		0.02			0.01		c0.04	0.10		0.03	c0.26	
v/s Ratio Perm	0.06			c0.10								0.01
v/c Ratio	0.30	0.08		0.46	0.07		0.39	0.19		0.47	0.53	0.02
Uniform Delay, d1	21.4	20.3		22.2	20.3		27.3	8.1		29.1	11.2	8.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	0.1		1.7	0.1		1.1	0.1		1.1	0.6	0.0
Delay (s)	22.2	20.5		23.9	20.4		28.4	8.2		30.2	11.8	8.4
Level of Service	C	C		C	C		C	A		C	B	A
Approach Delay (s)		21.2			22.4			11.3			12.7	
Approach LOS		C			C			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.4				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			64.2				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			51.7%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group



# HCM Signalized Intersection Capacity Analysis

## 8: Linus Pauling Dr & San Pablo Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	13	258	425	980	146
Future Volume (vph)	10	13	258	425	980	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1719	1506	1805	3610	3610	1576
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1719	1506	1805	3610	3610	1576
Peak-hour factor, PHF	0.88	0.88	0.94	0.94	0.88	0.88
Adj. Flow (vph)	11	15	274	452	1114	166
RTOR Reduction (vph)	0	15	0	0	0	85
Lane Group Flow (vph)	11	0	274	452	1114	81
Confl. Peds. (#/hr)			3			3
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	5%	5%	0%	0%	0%	0%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	1.2	1.2	10.9	38.0	23.1	23.1
Effective Green, g (s)	1.2	1.2	10.9	38.0	23.1	23.1
Actuated g/C Ratio	0.03	0.03	0.23	0.81	0.49	0.49
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	43	38	416	2906	1766	771
v/s Ratio Prot	c0.01		c0.15	0.13	c0.31	
v/s Ratio Perm		0.00				0.05
v/c Ratio	0.26	0.01	0.66	0.16	0.63	0.11
Uniform Delay, d1	22.6	22.4	16.5	1.0	8.9	6.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.1	0.1	3.7	0.0	0.7	0.1
Delay (s)	25.7	22.5	20.2	1.1	9.6	6.5
Level of Service	C	C	C	A	A	A
Approach Delay (s)	23.9			8.3	9.2	
Approach LOS	C			A	A	




























### Intersection Summary

HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	47.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 		 				 	 		 	
Traffic Volume (vph)	61	348	74	694	318	117	361	382	1022	205	544	64
Future Volume (vph)	61	348	74	694	318	117	361	382	1022	205	544	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	0.88	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.96		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3473		3467	1805		1805	3610	2842	1805	3547	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3473		3467	1805		1805	3610	2842	1805	3547	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95
Adj. Flow (vph)	66	378	80	746	342	126	384	406	1087	216	573	67
RTOR Reduction (vph)	0	13	0	0	9	0	0	0	0	0	6	0
Lane Group Flow (vph)	66	445	0	746	459	0	384	406	1087	216	634	0
Confl. Peds. (#/hr)							3					3
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	10.8	25.9		31.5	45.6		31.8	38.9	133.6	20.8	27.9	
Effective Green, g (s)	10.8	25.9		31.5	45.6		31.8	38.9	133.6	20.8	27.9	
Actuated g/C Ratio	0.08	0.19		0.24	0.34		0.24	0.29	1.00	0.16	0.21	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	144	673		817	616		429	1051	2842	281	740	
v/s Ratio Prot	0.04	0.13		c0.22	c0.25		c0.21	0.11		0.12	c0.18	
v/s Ratio Perm									0.38			
v/c Ratio	0.46	0.66		0.91	0.75		0.90	0.39	0.38	0.77	0.86	
Uniform Delay, d1	58.6	49.8		49.7	38.9		49.3	37.8	0.0	54.1	50.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.8	2.4		14.2	5.9		20.1	0.3	0.4	10.8	10.0	
Delay (s)	59.5	52.2		63.9	44.8		69.4	38.1	0.4	64.9	60.9	
Level of Service	E	D		E	D		E	D	A	E	E	
Approach Delay (s)		53.2			56.5			22.7			61.9	
Approach LOS		D			E			C			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			43.0				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			133.6				Sum of lost time (s)			17.5		
Intersection Capacity Utilization			88.6%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019


























Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑↑↑		↖	↗
Traffic Volume (vph)	0	0	1619	0	58	1345
Future Volume (vph)	0	0	1619	0	58	1345
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frbp, ped/bikes			1.00		1.00	1.00
Flpb, ped/bikes			1.00		1.00	1.00
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.97	0.97
Adj. Flow (vph)	0	0	1760	0	60	1387
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1760	0	60	1387
Confl. Peds. (#/hr)				1	1	
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			62.1		5.5	75.6
Effective Green, g (s)			62.1		5.5	75.6
Actuated g/C Ratio			0.82		0.07	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4260		130	3574
v/s Ratio Prot			0.34		0.03	c0.39
v/s Ratio Perm						
v/c Ratio			0.41		0.46	0.39
Uniform Delay, d1			1.8		33.6	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		2.6	0.3
Delay (s)			2.1		36.2	0.3
Level of Service			A		D	A
Approach Delay (s)	0.0		2.1			1.8
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			2.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.46			
Actuated Cycle Length (s)			75.6		Sum of lost time (s)	12.0
Intersection Capacity Utilization			41.3%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	178	207	70	490	210	1087	39	461	328	348	888	84
Future Volume (vph)	178	207	70	490	210	1087	39	461	328	348	888	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.91	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3453		1715	1769	2815	1787	5136	1563	3467	3528	
Flt Permitted	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3453		1715	1769	2815	1787	5136	1563	3467	3528	
Peak-hour factor, PHF	0.79	0.79	0.79	0.89	0.89	0.89	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	225	262	89	551	236	1221	43	512	364	391	998	94
RTOR Reduction (vph)	0	24	0	0	0	229	0	0	277	0	4	0
Lane Group Flow (vph)	225	327	0	386	401	992	43	512	87	391	1088	0
Confl. Peds. (#/hr)	1		8	8		1			1	1		
Confl. Bikes (#/hr)			1			1			10			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	28.0	28.0		37.0	37.0	52.3	7.7	32.1	32.1	15.3	39.7	
Effective Green, g (s)	28.0	28.0		37.0	37.0	52.3	7.7	32.1	32.1	15.3	39.7	
Actuated g/C Ratio	0.21	0.21		0.28	0.28	0.39	0.06	0.24	0.24	0.11	0.30	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	376	719		472	487	1095	102	1226	373	394	1042	
v/s Ratio Prot	c0.12	0.09		0.23	0.23	c0.10	0.02	0.10		c0.11	c0.31	
v/s Ratio Perm						0.25			0.06			
v/c Ratio	0.60	0.46		0.82	0.82	0.91	0.42	0.42	0.23	0.99	1.04	
Uniform Delay, d1	48.1	46.5		45.5	45.6	38.7	61.2	43.2	41.2	59.5	47.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.7	1.3		12.4	12.6	10.8	3.8	0.7	0.9	43.2	40.0	
Delay (s)	52.8	47.8		57.9	58.2	49.6	65.0	43.9	42.1	102.7	87.4	
Level of Service	D	D		E	E	D	E	D	D	F	F	
Approach Delay (s)		49.8			52.9			44.2			91.4	
Approach LOS		D			D			D			F	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			62.4				HCM 2000 Level of Service				E	
HCM 2000 Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			134.4				Sum of lost time (s)				22.0	
Intersection Capacity Utilization			82.3%				ICU Level of Service				E	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/25/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	213	1714	1813	13	118	113
Future Volume (vph)	213	1714	1813	13	118	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	3610	3605		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	3610	3605		1805	1615
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.71	0.71
Adj. Flow (vph)	242	1948	2060	15	166	159
RTOR Reduction (vph)	0	0	0	0	0	135
Lane Group Flow (vph)	242	1948	2075	0	166	24
Confl. Peds. (#/hr)	3			3		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	12.0	65.1	49.1		12.8	12.8
Effective Green, g (s)	12.0	65.1	49.1		12.8	12.8
Actuated g/C Ratio	0.14	0.76	0.57		0.15	0.15
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	252	2735	2060		268	240
v/s Ratio Prot	c0.13	0.54	c0.58		c0.09	
v/s Ratio Perm						0.01
v/c Ratio	0.96	0.71	1.01		0.62	0.10
Uniform Delay, d1	36.7	5.5	18.4		34.3	31.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	45.6	0.9	21.6		4.2	0.2
Delay (s)	82.3	6.4	40.0		38.5	31.7
Level of Service	F	A	D		D	C
Approach Delay (s)		14.8	40.0		35.2	
Approach LOS		B	D		D	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			27.6		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.93			
Actuated Cycle Length (s)			85.9		Sum of lost time (s)	12.0
Intersection Capacity Utilization			78.9%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	432	59	26	1498	40	492	7	166	85	2	430
Future Volume (vph)	159	432	59	26	1498	40	492	7	166	85	2	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98		0.99		1.00	1.00	0.98
Flpb, ped/bikes	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		0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96		0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1586	1805	3610	1578		3265		1805	1900	1578
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96		0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1586	1805	3610	1578		3265		1805	1900	1578
Peak-hour factor, PHF	0.96	0.96	0.96	0.95	0.95	0.95	0.87	0.87	0.87	0.93	0.93	0.93
Adj. Flow (vph)	166	450	61	27	1577	42	566	8	191	91	2	462
RTOR Reduction (vph)	0	0	39	0	0	29	0	22	0	0	0	135
Lane Group Flow (vph)	166	450	22	27	1577	13	0	743	0	91	2	327
Confl. Peds. (#/hr)	7		3	3		7	3		7	2		9
Confl. Bikes (#/hr)			2			1			5			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6						4
Actuated Green, G (s)	12.2	50.2	50.2	4.4	42.4	42.4		34.4		31.7	31.7	31.7
Effective Green, g (s)	12.2	50.2	50.2	4.4	42.4	42.4		34.4		31.7	31.7	31.7
Actuated g/C Ratio	0.09	0.36	0.36	0.03	0.31	0.31		0.25		0.23	0.23	0.23
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	159	1316	578	57	1111	485		815		415	437	363
v/s Ratio Prot	c0.09	0.12		0.01	c0.44			c0.23		0.05	0.00	
v/s Ratio Perm			0.01			0.01						c0.21
v/c Ratio	1.04	0.34	0.04	0.47	1.42	0.03		1.21dl		0.22	0.00	0.90
Uniform Delay, d1	62.7	31.8	28.2	65.5	47.6	33.3		50.2		43.0	40.8	51.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	83.5	0.1	0.0	2.3	194.1	0.0		14.1		0.1	0.0	23.4
Delay (s)	146.3	31.8	28.2	67.8	241.7	33.3		64.3		43.1	40.8	74.9
Level of Service	F	C	C	E	F	C		E		D	D	E
Approach Delay (s)		59.6			233.6			64.3			69.6	
Approach LOS		E			F			E			E	

### Intersection Summary

HCM 2000 Control Delay	140.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	137.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	107.1%	ICU Level of Service	G
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕	↗	↖↗	↖	↗	↖	↖↗↘		↖	↖↗		
Traffic Volume (vph)	23	33	115	431	38	417	62	1345	92	139	648	25	
Future Volume (vph)	23	33	115	431	38	417	62	1345	92	139	648	25	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.87	0.85	1.00	0.99		1.00	0.99		
Flt Protected		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1862	1585	3502	1558	1510	1805	5127		1805	3587		
Flt Permitted		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1862	1585	3502	1558	1510	1805	5127		1805	3587		
Peak-hour factor, PHF	0.83	0.83	0.83	0.93	0.93	0.93	0.89	0.89	0.89	0.73	0.73	0.73	
Adj. Flow (vph)	28	40	139	463	41	448	70	1511	103	190	888	34	
RTOR Reduction (vph)	0	0	126	0	164	193	0	5	0	0	2	0	
Lane Group Flow (vph)	0	68	13	463	83	49	70	1609	0	190	920	0	
Confl. Peds. (#/hr)	3		2	2		3	5		4	4		5	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Effective Green, g (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Actuated g/C Ratio		0.09	0.09	0.20	0.20	0.20	0.10	0.42		0.15	0.47		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		167	142	706	314	304	171	2157		263	1691		
v/s Ratio Prot		c0.04		c0.13	0.05		0.04	c0.31		c0.11	0.26		
v/s Ratio Perm			0.01			0.03							
v/c Ratio		0.41	0.09	0.66	0.26	0.16	0.41	0.75		0.72	0.54		
Uniform Delay, d1		51.6	50.1	44.1	40.4	39.5	51.1	29.3		48.9	22.5		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.6	0.3	2.2	0.4	0.2	0.6	2.4		8.0	1.3		
Delay (s)		53.2	50.4	46.3	40.8	39.8	51.7	31.7		57.0	23.8		
Level of Service		D	D	D	D	D	D	C		E	C		
Approach Delay (s)		51.3			43.2			32.6			29.5		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			35.2		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.68										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			69.4%		ICU Level of Service					C			
Analysis Period (min)			15										
c	Critical Lane Group												

# Cumulative AM Unsignalized



HCM Unsignalized Intersection Capacity Analysis  
 10: John Muir Pkwy & Alfred Nobel Dr

09/29/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↖	↑↑	↑↑		↘↘		
Traffic Volume (veh/h)	54	379	147	439	54	7	
Future Volume (Veh/h)	54	379	147	439	54	7	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.75	0.75	0.88	0.88	0.92	0.92	
Hourly flow rate (vph)	72	505	167	499	59	8	
Pedestrians					4		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	670				817	337	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	670				817	337	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	92				80	99	
cM capacity (veh/h)	927				289	657	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	72	252	252	111	555	39	28
Volume Left	72	0	0	0	0	39	20
Volume Right	0	0	0	0	499	0	8
cSH	927	1700	1700	1700	1700	289	345
Volume to Capacity	0.08	0.15	0.15	0.07	0.33	0.14	0.08
Queue Length 95th (ft)	6	0	0	0	0	12	6
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	19.4	16.3
Lane LOS	A					C	C
Approach Delay (s)	1.1			0.0		18.1	
Approach LOS						C	
Intersection Summary							
Average Delay			1.4				
Intersection Capacity Utilization			35.2%		ICU Level of Service		A
Analysis Period (min)			15				

HCM 6th AWSC  
17: Willow Ave & SR-4 EB On-Ramp

09/29/2019

Intersection	
Intersection Delay, s/veh	28.6
Intersection LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	274	175	227	17	368	11
Future Vol, veh/h	274	175	227	17	368	11
Peak Hour Factor	0.84	0.84	0.94	0.94	0.72	0.72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	326	208	241	18	511	15
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	20	16	43.6
HCM LOS	C	C	E

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	97%
Vol Thru, %	0%	100%	93%	0%
Vol Right, %	0%	0%	7%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	274	175	244	379
LT Vol	274	0	0	368
Through Vol	0	175	227	0
RT Vol	0	0	17	11
Lane Flow Rate	326	208	260	526
Geometry Grp	7	7	5	2
Degree of Util (X)	0.67	0.398	0.486	0.909
Departure Headway (Hd)	7.389	6.877	6.738	6.218
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	493	525	537	579
Service Time	5.099	4.587	4.748	4.316
HCM Lane V/C Ratio	0.661	0.396	0.484	0.908
HCM Control Delay	23.8	14.1	16	43.6
HCM Lane LOS	C	B	C	E
HCM 95th-tile Q	4.9	1.9	2.6	11.1

# Cumulative PM Signalized

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/26/2019




















Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	351	228	154	368	308	229
Future Volume (vph)	351	228	154	368	308	229
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.94	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3336		1805	3610	3361	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3336		1805	3610	3361	
Peak-hour factor, PHF	0.84	0.84	0.94	0.94	0.79	0.79
Adj. Flow (vph)	418	271	164	391	390	290
RTOR Reduction (vph)	54	0	0	0	67	0
Lane Group Flow (vph)	635	0	164	391	613	0
Confl. Peds. (#/hr)		1	1			1
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	25.4		14.1	43.6	25.5	
Effective Green, g (s)	25.4		14.1	43.6	25.5	
Actuated g/C Ratio	0.32		0.18	0.56	0.32	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	1079		324	2005	1091	
v/s Ratio Prot	c0.19		c0.09	0.11	c0.18	
v/s Ratio Perm						
v/c Ratio	0.59		0.51	0.20	0.56	
Uniform Delay, d1	22.2		29.1	8.7	21.9	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.0		0.5	0.1	0.8	
Delay (s)	23.2		29.5	8.8	22.7	
Level of Service	C		C	A	C	
Approach Delay (s)	23.2			14.9	22.7	
Approach LOS	C			B	C	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			20.6		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.60			
Actuated Cycle Length (s)			78.5		Sum of lost time (s)	17.5
Intersection Capacity Utilization			53.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/26/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	71	0	0	0	576	196	0	407	237
Future Volume (vph)	0	0	0	71	0	0	0	576	196	0	407	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0			5.5			5.5	
Lane Util. Factor					1.00			0.95			0.95	
Frbp, ped/bikes					1.00			0.99			1.00	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					1.00			0.96			0.94	
Flt Protected					0.95			1.00			1.00	
Satd. Flow (prot)					1805			3451			3410	
Flt Permitted					0.95			1.00			1.00	
Satd. Flow (perm)					1805			3451			3410	
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.94	0.94	0.94	0.86	0.86	0.86
Adj. Flow (vph)	0	0	0	91	0	0	0	613	209	0	473	276
RTOR Reduction (vph)	0	0	0	0	0	0	0	12	0	0	57	0
Lane Group Flow (vph)	0	0	0	0	91	0	0	810	0	0	692	0
Confl. Peds. (#/hr)									4	4		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type				Split	NA			NA		Prot	NA	
Protected Phases				8	8			2		1	6	
Permitted Phases												
Actuated Green, G (s)					7.3			31.7			31.7	
Effective Green, g (s)					7.3			31.7			31.7	
Actuated g/C Ratio					0.15			0.65			0.65	
Clearance Time (s)					4.0			5.5			5.5	
Vehicle Extension (s)					3.0			4.0			4.0	
Lane Grp Cap (vph)					271			2255			2228	
v/s Ratio Prot					c0.05			c0.23			0.20	
v/s Ratio Perm												
v/c Ratio					0.34			0.36			0.31	
Uniform Delay, d1					18.4			3.8			3.7	
Progression Factor					1.00			1.00			1.00	
Incremental Delay, d2					0.7			0.1			0.1	
Delay (s)					19.2			3.9			3.8	
Level of Service					B			A			A	
Approach Delay (s)		0.0			19.2			3.9			3.8	
Approach LOS		A			B			A			A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			4.7		HCM 2000 Level of Service						A	
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			48.5		Sum of lost time (s)						13.5	
Intersection Capacity Utilization			34.1%		ICU Level of Service						A	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/26/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	182	67	867	0	0	373
Future Volume (vph)	182	67	867	0	0	373
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1584	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1584	3574			3610
Peak-hour factor, PHF	0.88	0.88	0.90	0.90	0.87	0.87
Adj. Flow (vph)	207	76	963	0	0	429
RTOR Reduction (vph)	0	41	0	0	0	0
Lane Group Flow (vph)	207	35	963	0	0	429
Confl. Peds. (#/hr)		13		7	7	
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	9.2	9.2	17.0			17.0
Effective Green, g (s)	9.2	9.2	17.0			17.0
Actuated g/C Ratio	0.26	0.26	0.47			0.47
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	461	404	1687			1704
v/s Ratio Prot	c0.11		c0.27			0.12
v/s Ratio Perm		0.02				
v/c Ratio	0.45	0.09	0.57			0.25
Uniform Delay, d1	11.3	10.2	6.9			5.7
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.3	0.0	0.5			0.1
Delay (s)	11.5	10.2	7.3			5.8
Level of Service	B	B	A			A
Approach Delay (s)	11.2		7.3			5.8
Approach LOS	B		A			A

### Intersection Summary




















HCM 2000 Control Delay	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	36.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/26/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	91	61	22	275	71	348	89	446	58	136	326	49	
Future Volume (vph)	91	61	22	275	71	348	89	446	58	136	326	49	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12	
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95		
Frbp, ped/bikes		1.00			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		
Frt		0.98			1.00	0.85	1.00	0.98		1.00	0.98		
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		3186			1827	1588	1805	3538		1805	3533		
Flt Permitted		0.71			0.65	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		2305			1231	1588	1805	3538		1805	3533		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.98	0.98	0.98	0.93	0.93	0.93	
Adj. Flow (vph)	95	64	23	286	74	362	91	455	59	146	351	53	
RTOR Reduction (vph)	0	10	0	0	0	209	0	12	0	0	14	0	
Lane Group Flow (vph)	0	172	0	0	360	154	91	502	0	146	390	0	
Confl. Peds. (#/hr)	6					6	1		4	4		1	
Confl. Bikes (#/hr)						2							
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA		
Protected Phases		4			8		5	2		1	6		
Permitted Phases	4			8		8							
Actuated Green, G (s)		25.2			24.8	24.8	5.0	12.1		6.6	13.7		
Effective Green, g (s)		25.2			24.8	24.8	5.0	12.1		6.6	13.7		
Actuated g/C Ratio		0.43			0.42	0.42	0.09	0.21		0.11	0.23		
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2		
Lane Grp Cap (vph)		994			522	674	154	733		203	828		
v/s Ratio Prot							0.05	c0.14		c0.08	0.11		
v/s Ratio Perm		0.07			c0.29	0.10							
v/c Ratio		0.17			0.69	0.23	0.59	0.69		0.72	0.47		
Uniform Delay, d1		10.2			13.7	10.7	25.7	21.4		25.0	19.2		
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		0.0			3.0	0.1	4.0	2.1		9.7	0.2		
Delay (s)		10.2			16.7	10.8	29.7	23.5		34.7	19.4		
Level of Service		B			B	B	C	C		C	B		
Approach Delay (s)		10.2			13.7			24.4			23.5		
Approach LOS		B			B			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			19.2		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.69										
Actuated Cycle Length (s)			58.4		Sum of lost time (s)					14.9			
Intersection Capacity Utilization			61.2%		ICU Level of Service					B			
Analysis Period (min)			15										

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 5: Viewpoint Blvd & Willow Ave

11/26/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↖	↗	↖	↖↗		↖	↖↗	
Traffic Volume (vph)	66	1	31	46	1	128	45	438	57	198	339	135
Future Volume (vph)	66	1	31	46	1	128	45	438	57	198	339	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	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	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1598		1805	1900	1615	1805	3542		1805	3430	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1598		1805	1900	1615	1805	3542		1805	3430	
Peak-hour factor, PHF	0.78	0.78	0.78	0.84	0.84	0.84	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	85	1	40	55	1	152	48	471	61	208	357	142
RTOR Reduction (vph)	0	34	0	0	0	132	0	15	0	0	55	0
Lane Group Flow (vph)	85	7	0	55	1	20	48	517	0	208	444	0
Confl. Peds. (#/hr)			3	3			4		3	3		4
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	3.1	8.4		1.4	6.7	6.7	1.8	18.0		8.1	24.3	
Effective Green, g (s)	3.1	8.4		1.4	6.7	6.7	1.8	18.0		8.1	24.3	
Actuated g/C Ratio	0.06	0.16		0.03	0.13	0.13	0.03	0.35		0.16	0.47	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	107	258		48	245	208	62	1228		281	1605	
v/s Ratio Prot	c0.05	0.00		0.03	0.00		0.03	c0.15		c0.12	0.13	
v/s Ratio Perm						c0.01						
v/c Ratio	0.79	0.03		1.15	0.00	0.09	0.77	0.42		0.74	0.28	
Uniform Delay, d1	24.1	18.3		25.2	19.7	19.9	24.8	13.0		20.9	8.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	32.1	0.0		175.7	0.0	0.2	44.2	0.2		10.0	0.1	
Delay (s)	56.2	18.4		200.9	19.7	20.1	69.1	13.2		30.9	8.5	
Level of Service	E	B		F	B	C	E	B		C	A	
Approach Delay (s)		43.9			67.9			17.8			15.1	
Approach LOS		D			E			B			B	












### Intersection Summary

HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	51.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



HCM Signalized Intersection Capacity Analysis  
6: SR-4 WB Off-Ramp & Willow Ave

11/26/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	308	282	564	0	0	717
Future Volume (vph)	308	282	564	0	0	717
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	1.00	1.00	1.00			0.95
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1787	1599	1900			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1787	1599	1900			3610
Peak-hour factor, PHF	0.90	0.90	0.87	0.87	0.92	0.92
Adj. Flow (vph)	342	313	648	0	0	779
RTOR Reduction (vph)	0	86	0	0	0	0
Lane Group Flow (vph)	342	227	648	0	0	779
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	11.7	11.7	15.8			15.8
Effective Green, g (s)	11.7	11.7	15.8			15.8
Actuated g/C Ratio	0.33	0.33	0.45			0.45
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	588	526	845			1606
v/s Ratio Prot	c0.19		c0.34			0.22
v/s Ratio Perm		0.14				
v/c Ratio	0.58	0.43	0.77			0.49
Uniform Delay, d1	9.9	9.3	8.3			7.0
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	1.5	0.6	4.2			0.2
Delay (s)	11.3	9.9	12.5			7.2
Level of Service	B	A	B			A
Approach Delay (s)	10.6		12.5			7.2
Approach LOS	B		B			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			9.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.69			
Actuated Cycle Length (s)			35.5		Sum of lost time (s)	8.0
Intersection Capacity Utilization			53.8%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/26/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↕		↖	↗	↖
Traffic Volume (vph)	35	0	110	43	3	26	119	471	82	65	227	47
Future Volume (vph)	35	0	110	43	3	26	119	471	82	65	227	47
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.87		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1801	1586		1796	1625		1805	3518		1787	3574	1565
Flt Permitted	0.73	1.00		0.67	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1390	1586		1259	1625		1805	3518		1787	3574	1565
Peak-hour factor, PHF	0.77	0.77	0.77	0.78	0.78	0.78	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	45	0	143	55	4	33	140	554	96	70	244	51
RTOR Reduction (vph)	0	121	0	0	28	0	0	11	0	0	0	29
Lane Group Flow (vph)	45	22	0	55	9	0	140	639	0	70	244	22
Confl. Peds. (#/hr)	3		11	11		3	1		2	2		1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	7.3	7.3		7.3	7.3		7.4	23.6		4.0	20.2	20.2
Effective Green, g (s)	7.3	7.3		7.3	7.3		7.4	23.6		4.0	20.2	20.2
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.15	0.49		0.08	0.42	0.42
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	211	241		191	247		278	1733		149	1507	659
v/s Ratio Prot		0.01			0.01		c0.08	c0.18		0.04	0.07	
v/s Ratio Perm	0.03			c0.04								0.01
v/c Ratio	0.21	0.09		0.29	0.04		0.50	0.37		0.47	0.16	0.03
Uniform Delay, d1	17.8	17.4		18.0	17.3		18.6	7.5		20.9	8.6	8.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.2		1.1	0.1		1.0	0.3		0.9	0.1	0.0
Delay (s)	18.5	17.7		19.1	17.4		19.6	7.8		21.8	8.7	8.2
Level of Service	B	B		B	B		B	A		C	A	A
Approach Delay (s)		17.9			18.4			9.9			11.1	
Approach LOS		B			B			A			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			11.8				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			47.9				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			42.7%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 8: Linus Pauling Dr & San Pablo Ave

11/26/2019

























Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	76	353	24	619	396	21
Future Volume (vph)	76	353	24	619	396	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1805	1594	1804	3610	3610	1581
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1805	1594	1804	3610	3610	1581
Peak-hour factor, PHF	0.66	0.66	0.92	0.92	0.97	0.97
Adj. Flow (vph)	115	535	26	673	408	22
RTOR Reduction (vph)	0	271	0	0	0	14
Lane Group Flow (vph)	115	264	26	673	408	8
Confl. Peds. (#/hr)			1			1
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	10.0	10.0	0.5	16.4	11.9	11.9
Effective Green, g (s)	10.0	10.0	0.5	16.4	11.9	11.9
Actuated g/C Ratio	0.29	0.29	0.01	0.48	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	524	463	26	1721	1248	546
v/s Ratio Prot	0.06		0.01	c0.19	0.11	
v/s Ratio Perm		c0.17				0.00
v/c Ratio	0.22	0.57	1.00	0.39	0.33	0.01
Uniform Delay, d1	9.2	10.4	16.9	5.8	8.3	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	1.7	176.5	0.1	0.2	0.0
Delay (s)	9.5	12.1	193.5	5.9	8.5	7.4
Level of Service	A	B	F	A	A	A
Approach Delay (s)	11.6			12.9	8.4	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	34.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/26/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	104	579	129	433	225	81	227	579	1193	265	276	41
Future Volume (vph)	104	579	129	433	225	81	227	579	1193	265	276	41
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	0.88	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.96		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3476		3467	1807		1805	3610	2842	1805	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3476		3467	1807		1805	3610	2842	1805	3534	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	118	658	147	471	245	88	244	623	1283	312	325	48
RTOR Reduction (vph)	0	14	0	0	9	0	0	0	0	0	8	0
Lane Group Flow (vph)	118	791	0	471	324	0	244	623	1283	312	365	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	14.9	34.3		22.7	41.1		16.5	39.1	140.0	27.4	50.0	
Effective Green, g (s)	14.9	34.3		22.7	41.1		16.5	39.1	140.0	27.4	50.0	
Actuated g/C Ratio	0.11	0.24		0.16	0.29		0.12	0.28	1.00	0.20	0.36	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	190	851		562	530		212	1008	2842	353	1262	
v/s Ratio Prot	0.07	c0.23		c0.14	0.18		c0.14	c0.17		c0.17	0.10	
v/s Ratio Perm									0.45			
v/c Ratio	0.62	0.93		0.84	0.61		1.15	0.62	0.45	0.88	0.29	
Uniform Delay, d1	59.8	51.7		56.9	42.6		61.8	43.9	0.0	54.8	32.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.5	16.2		10.1	3.0		108.5	2.8	0.5	21.5	0.6	
Delay (s)	64.3	67.9		67.0	45.6		170.2	46.8	0.5	76.3	32.8	
Level of Service	E	E		E	D		F	D	A	E	C	
Approach Delay (s)		67.4			58.1			33.2			52.6	
Approach LOS		E			E			C			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			47.4				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			17.5			
Intersection Capacity Utilization			81.7%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/26/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	10	10	1921	46	26	657
Future Volume (vph)	10	10	1921	46	26	657
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.91		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	5169		1787	3574
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	1615	5169		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.94	0.94	0.95	0.95
Adj. Flow (vph)	11	11	2044	49	27	692
RTOR Reduction (vph)	0	11	2	0	0	0
Lane Group Flow (vph)	11	0	2091	0	27	692
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)	2.7	2.7	62.8		3.1	69.9
Effective Green, g (s)	2.7	2.7	62.8		3.1	69.9
Actuated g/C Ratio	0.03	0.03	0.78		0.04	0.87
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	60	54	4027		68	3099
v/s Ratio Prot	c0.01		c0.40		c0.02	0.19
v/s Ratio Perm		0.00				
v/c Ratio	0.18	0.01	0.52		0.40	0.22
Uniform Delay, d1	37.9	37.7	3.3		37.8	0.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.5	0.1	0.5		3.8	0.2
Delay (s)	39.4	37.7	3.8		41.6	1.0
Level of Service	D	D	A		D	A
Approach Delay (s)	38.5		3.8			2.6
Approach LOS	D		A			A

### Intersection Summary

HCM 2000 Control Delay	3.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 13: Sycamore Ave & San Pablo Ave

11/26/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	177	196	73	275	306	703	63	1030	363	494	348	124
Future Volume (vph)	177	196	73	275	306	703	63	1030	363	494	348	124
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.91	1.00	0.97	0.95	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	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	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3441		1681	1794	2842	1787	5136	1583	3502	3468	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3441		1681	1794	2842	1787	5136	1583	3502	3468	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	190	211	78	296	329	756	71	1157	408	531	374	133
RTOR Reduction (vph)	0	28	0	0	0	151	0	0	300	0	24	0
Lane Group Flow (vph)	190	261	0	266	359	605	71	1157	108	531	483	0
Confl. Peds. (#/hr)			10	10								
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	1%	1%	2%	0%	0%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9	
Effective Green, g (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9	
Actuated g/C Ratio	0.17	0.17		0.24	0.24	0.41	0.07	0.26	0.26	0.17	0.36	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	310	592		405	433	1155	117	1357	418	577	1260	
v/s Ratio Prot	c0.11	0.08		0.16	c0.20	0.09	0.04	c0.23		c0.15	0.14	
v/s Ratio Perm						0.13			0.07			
v/c Ratio	0.61	0.44		0.66	0.83	0.52	0.61	0.85	0.26	0.92	0.38	
Uniform Delay, d1	53.6	51.9		47.9	50.4	31.3	63.6	48.9	40.7	57.5	32.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.1	1.5		6.1	14.3	0.6	9.9	6.9	1.5	20.4	0.9	
Delay (s)	59.8	53.4		53.9	64.7	31.9	73.5	55.9	42.2	77.9	33.8	
Level of Service	E	D		D	E	C	E	E	D	E	C	
Approach Delay (s)		55.9			44.7			53.2			56.4	
Approach LOS		E			D			D			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			51.6				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)				22.0	
Intersection Capacity Utilization			83.3%				ICU Level of Service				E	
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/26/2019


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	358	1653	1666	10	121	127
Future Volume (vph)	358	1653	1666	10	121	127
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	3574	3536		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	3574	3536		1805	1615
Peak-hour factor, PHF	0.94	0.94	0.96	0.96	0.77	0.77
Adj. Flow (vph)	381	1759	1735	10	157	165
RTOR Reduction (vph)	0	0	1	0	0	141
Lane Group Flow (vph)	381	1759	1744	0	157	24
Confl. Peds. (#/hr)				3		
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	19.0	66.1	43.1		12.4	12.4
Effective Green, g (s)	19.0	66.1	43.1		12.4	12.4
Actuated g/C Ratio	0.22	0.76	0.50		0.14	0.14
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	392	2731	1761		258	231
v/s Ratio Prot	c0.21	0.49	c0.49		c0.09	
v/s Ratio Perm						0.01
v/c Ratio	0.97	0.64	0.99		0.61	0.10
Uniform Delay, d1	33.5	4.7	21.5		34.8	32.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	37.9	0.5	19.2		4.0	0.2
Delay (s)	71.4	5.3	40.7		38.8	32.4
Level of Service	E	A	D		D	C
Approach Delay (s)		17.0	40.7		35.5	
Approach LOS		B	D		D	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			28.3		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.92			
Actuated Cycle Length (s)			86.5		Sum of lost time (s)	12.0
Intersection Capacity Utilization			82.9%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave
























11/26/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	474	1362	169	71	398	140	72	9	46	79	3	202	
Future Volume (vph)	474	1362	169	71	398	140	72	9	46	79	3	202	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98		0.98		1.00	1.00	0.98	
Flpb, ped/bikes	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		0.95		1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1805	3610	1592	1805	3610	1586		3270		1805	1900	1584	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1805	3610	1592	1805	3610	1586		3270		1805	1900	1584	
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.90	0.90	0.90	0.96	0.96	0.96	
Adj. Flow (vph)	510	1465	182	74	415	146	80	10	51	82	3	210	
RTOR Reduction (vph)	0	0	23	0	0	99	0	48	0	0	0	194	
Lane Group Flow (vph)	510	1465	159	74	415	47	0	93	0	82	3	16	
Confl. Peds. (#/hr)	4		1	1		4	6		9	9		6	
Confl. Bikes (#/hr)			1						5				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm	
Protected Phases	5	2		1	6		8	8		4	4		
Permitted Phases			2			6						4	
Actuated Green, G (s)	58.6	94.9	94.9	9.0	45.3	45.3		8.3		10.8	10.8	10.8	
Effective Green, g (s)	58.6	94.9	94.9	9.0	45.3	45.3		8.3		10.8	10.8	10.8	
Actuated g/C Ratio	0.42	0.68	0.68	0.06	0.32	0.32		0.06		0.08	0.08	0.08	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	755	2447	1079	116	1168	513		193		139	146	122	
v/s Ratio Prot	c0.28	c0.41		0.04	0.11			c0.03		c0.05	0.00		
v/s Ratio Perm			0.10			0.03						0.01	
v/c Ratio	0.68	0.60	0.15	0.64	0.36	0.09		0.48		0.59	0.02	0.13	
Uniform Delay, d1	33.0	12.2	8.1	63.9	36.2	33.0		63.8		62.5	59.7	60.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.9	1.1	0.3	8.2	0.8	0.4		0.7		4.1	0.0	0.2	
Delay (s)	34.9	13.3	8.4	72.1	37.0	33.4		64.5		66.5	59.7	60.4	
Level of Service	C	B	A	E	D	C		E		E	E	E	
Approach Delay (s)		18.0			40.3			64.5			62.1		
Approach LOS		B			D			E			E		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			28.4									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.64										
Actuated Cycle Length (s)			140.0									Sum of lost time (s)	17.0
Intersection Capacity Utilization			75.4%									ICU Level of Service	D
Analysis Period (min)			15										
c Critical Lane Group													



HCM Signalized Intersection Capacity Analysis  
 16: Willow Ave & Sycamore Ave

11/26/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	73	40	203	507	82	246	57	893	66	178	788	22	
Future Volume (vph)	73	40	203	507	82	246	57	893	66	178	788	22	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	1.00	0.99	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.92	0.85	1.00	0.99		1.00	1.00		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1840	1582	3502	1653	1514	1805	5122		1805	3592		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1840	1582	3502	1653	1514	1805	5122		1805	3592		
Peak-hour factor, PHF	0.85	0.85	0.85	0.96	0.96	0.96	0.91	0.91	0.91	0.89	0.89	0.89	
Adj. Flow (vph)	86	47	239	528	85	256	63	981	73	200	885	25	
RTOR Reduction (vph)	0	0	185	0	38	128	0	7	0	0	1	0	
Lane Group Flow (vph)	0	133	54	528	139	36	63	1047	0	200	909	0	
Confl. Peds. (#/hr)	1		3	3		1	5		4	1		9	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		12.3	12.3	25.3	25.3	25.3	8.6	40.4		20.0	51.8		
Effective Green, g (s)		12.3	12.3	25.3	25.3	25.3	8.6	40.4		20.0	51.8		
Actuated g/C Ratio		0.11	0.11	0.22	0.22	0.22	0.07	0.35		0.17	0.45		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		196	169	770	363	333	134	1799		313	1617		
v/s Ratio Prot		c0.07		c0.15	0.08		0.03	0.20		c0.11	c0.25		
v/s Ratio Perm			0.03			0.02							
v/c Ratio		0.68	0.32	0.69	0.38	0.11	0.47	0.58		0.64	0.56		
Uniform Delay, d1		49.4	47.5	41.2	38.2	35.8	51.0	30.4		44.1	23.3		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		9.0	1.1	2.5	0.7	0.1	0.9	1.4		3.1	1.4		
Delay (s)		58.4	48.6	43.7	38.9	36.0	52.0	31.8		47.3	24.7		
Level of Service		E	D	D	D	D	D	C		D	C		
Approach Delay (s)		52.1			41.3			32.9			28.7		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			35.7		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.64										
Actuated Cycle Length (s)			115.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			67.4%		ICU Level of Service					C			
Analysis Period (min)			15										
c	Critical Lane Group												

# Cumulative PM Unsignalized

# HCM Unsignalized Intersection Capacity Analysis

## 10: John Muir Pkwy & Alfred Nobel Dr

10/04/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↖	↗↗	↖↖		↘↘		
Traffic Volume (veh/h)	9	276	255	70	459	43	
Future Volume (Veh/h)	9	276	255	70	459	43	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.85	0.85	0.87	0.87	0.79	0.79	
Hourly flow rate (vph)	11	325	293	80	581	54	
Pedestrians					1		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	374				518	188	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	374				518	188	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	99				0	93	
cM capacity (veh/h)	1195				487	828	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	11	162	162	195	178	387	248
Volume Left	11	0	0	0	0	387	194
Volume Right	0	0	0	0	80	0	54
cSH	1195	1700	1700	1700	1700	487	535
Volume to Capacity	0.01	0.10	0.10	0.11	0.10	0.80	0.46
Queue Length 95th (ft)	1	0	0	0	0	184	61
Control Delay (s)	8.0	0.0	0.0	0.0	0.0	35.4	17.4
Lane LOS	A					E	C
Approach Delay (s)	0.3			0.0		28.4	
Approach LOS						D	
Intersection Summary							
Average Delay			13.5				
Intersection Capacity Utilization			30.5%		ICU Level of Service		A
Analysis Period (min)			15				

HCM 6th AWSC  
17: Willow Ave & SR-4 EB On-Ramp

09/29/2019

Intersection	
Intersection Delay, s/veh	37.5
Intersection LOS	E

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↗	↑	↘		↖	
Traffic Vol, veh/h	109	273	371	0	216	271
Future Vol, veh/h	109	273	371	0	216	271
Peak Hour Factor	0.87	0.87	0.77	0.77	0.93	0.93
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	125	314	482	0	232	291
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	19.9	43.5	46.8
HCM LOS	C	E	E

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	44%
Vol Thru, %	0%	100%	100%	0%
Vol Right, %	0%	0%	0%	56%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	109	273	371	487
LT Vol	109	0	0	216
Through Vol	0	273	371	0
RT Vol	0	0	0	271
Lane Flow Rate	125	314	482	524
Geometry Grp	7	7	5	2
Degree of Util (X)	0.274	0.641	0.896	0.925
Departure Headway (Hd)	7.866	7.351	6.694	6.356
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	456	490	540	571
Service Time	5.636	5.121	4.752	4.401
HCM Lane V/C Ratio	0.274	0.641	0.893	0.918
HCM Control Delay	13.6	22.4	43.5	46.8
HCM Lane LOS	B	C	E	E
HCM 95th-tile Q	1.1	4.4	10.4	11.6

# **Cumulative Plus Project AM Signalized**

# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	TT		T	TT	TT	
Traffic Volume (vph)	308	262	408	461	677	552
Future Volume (vph)	308	262	408	461	677	552
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.93		1.00	1.00	0.93	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3305		1805	3610	3307	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3305		1805	3610	3307	
Peak-hour factor, PHF	0.84	0.84	0.86	0.86	0.81	0.81
Adj. Flow (vph)	367	312	474	536	836	681
RTOR Reduction (vph)	82	0	0	0	68	0
Lane Group Flow (vph)	597	0	474	536	1449	0
Confl. Peds. (#/hr)		1	4			4
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	31.5		42.1	98.2	52.1	
Effective Green, g (s)	31.5		42.1	98.2	52.1	
Actuated g/C Ratio	0.23		0.30	0.71	0.37	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	747		545	2546	1237	
v/s Ratio Prot	c0.18		c0.26	0.15	c0.44	
v/s Ratio Perm						
v/c Ratio	0.80		0.87	0.21	1.17	
Uniform Delay, d1	50.9		46.0	7.1	43.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	6.3		13.4	0.1	86.2	
Delay (s)	57.2		59.4	7.1	129.7	
Level of Service	E		E	A	F	
Approach Delay (s)	57.2			31.7	129.7	
Approach LOS	E			C	F	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			83.5		HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio			1.01			
Actuated Cycle Length (s)			139.2		Sum of lost time (s)	17.5
Intersection Capacity Utilization			87.6%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↕			↕		↕	↕		
Traffic Volume (vph)	0	0	0	214	90	0	0	966	167	0	696	292	
Future Volume (vph)	0	0	0	214	90	0	0	966	167	0	696	292	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5			5.5		
Lane Util. Factor					1.00			0.95			0.95		
Frbp, ped/bikes					1.00			1.00			1.00		
Flpb, ped/bikes					1.00			1.00			1.00		
Frt					1.00			0.98			0.96		
Flt Protected					0.97			1.00			1.00		
Satd. Flow (prot)					1835			3519			3416		
Flt Permitted					0.97			1.00			1.00		
Satd. Flow (perm)					1835			3519			3416		
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.84	0.84	0.84	
Adj. Flow (vph)	0	0	0	230	97	0	0	1098	190	0	829	348	
RTOR Reduction (vph)	0	0	0	0	0	0	0	5	0	0	32	0	
Lane Group Flow (vph)	0	0	0	0	327	0	0	1283	0	0	1145	0	
Confl. Peds. (#/hr)									1	1			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					19.5			52.3			52.3		
Effective Green, g (s)					19.5			52.3			52.3		
Actuated g/C Ratio					0.24			0.64			0.64		
Clearance Time (s)					4.0			5.5			5.5		
Vehicle Extension (s)					3.0			4.0			4.0		
Lane Grp Cap (vph)					440			2263			2197		
v/s Ratio Prot					c0.18			c0.36			0.34		
v/s Ratio Perm													
v/c Ratio					0.74			0.57			0.52		
Uniform Delay, d1					28.6			8.1			7.8		
Progression Factor					1.00			1.00			1.00		
Incremental Delay, d2					6.7			0.4			0.3		
Delay (s)					35.3			8.5			8.1		
Level of Service					D			A			A		
Approach Delay (s)		0.0			35.3			8.5			8.1		
Approach LOS		A			D			A			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			11.5		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.65										
Actuated Cycle Length (s)			81.3		Sum of lost time (s)						13.5		
Intersection Capacity Utilization			56.5%		ICU Level of Service						B		
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019




















						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	185	347	956	0	0	444
Future Volume (vph)	185	347	956	0	0	444
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1589	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1589	3574			3610
Peak-hour factor, PHF	0.84	0.84	0.90	0.90	0.74	0.74
Adj. Flow (vph)	220	413	1062	0	0	600
RTOR Reduction (vph)	0	26	0	0	0	0
Lane Group Flow (vph)	220	387	1062	0	0	600
Confl. Peds. (#/hr)		6		8	8	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	16.3	16.3	21.7			21.7
Effective Green, g (s)	16.3	16.3	21.7			21.7
Actuated g/C Ratio	0.34	0.34	0.45			0.45
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	615	541	1622			1638
v/s Ratio Prot	0.12		c0.30			0.17
v/s Ratio Perm		c0.24				
v/c Ratio	0.36	0.71	0.65			0.37
Uniform Delay, d1	11.8	13.7	10.1			8.5
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.1	3.7	1.0			0.1
Delay (s)	12.0	17.4	11.1			8.7
Level of Service	B	B	B			A
Approach Delay (s)	15.5		11.1			8.7
Approach LOS	B		B			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			11.7		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.68			
Actuated Cycle Length (s)			47.8		Sum of lost time (s)	9.8
Intersection Capacity Utilization			56.7%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						



# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	48	12	46	60	277	89	558	102	171	344	75
Future Volume (vph)	121	48	12	46	60	277	89	558	102	171	344	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes		1.00			1.00	1.00	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		0.99			1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3228			1841	1599	1805	3513		1805	3505	
Flt Permitted		0.75			0.76	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2504			1427	1599	1805	3513		1805	3505	
Peak-hour factor, PHF	0.88	0.88	0.88	0.91	0.91	0.91	0.89	0.89	0.89	0.75	0.75	0.75
Adj. Flow (vph)	138	55	14	51	66	304	100	627	115	228	459	100
RTOR Reduction (vph)	0	7	0	0	0	254	0	16	0	0	17	0
Lane Group Flow (vph)	0	200	0	0	117	50	100	726	0	228	542	0
Confl. Peds. (#/hr)							1		4	4		1
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)		8.1			7.7	7.7	5.2	14.8		9.7	19.3	
Effective Green, g (s)		8.1			7.7	7.7	5.2	14.8		9.7	19.3	
Actuated g/C Ratio		0.17			0.16	0.16	0.11	0.31		0.21	0.41	
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1	
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)		430			233	261	199	1103		371	1436	
v/s Ratio Prot							0.06	c0.21		c0.13	c0.15	
v/s Ratio Perm		0.08			c0.08	0.03						
v/c Ratio		0.47			0.50	0.19	0.50	0.66		0.61	0.38	
Uniform Delay, d1		17.6			18.0	17.0	19.7	14.0		17.0	9.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.6	0.1	0.7	1.1		2.1	0.1	
Delay (s)		17.8			18.6	17.1	20.5	15.1		19.1	9.8	
Level of Service		B			B	B	C	B		B	A	
Approach Delay (s)		17.8			17.5			15.7			12.5	
Approach LOS		B			B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			15.1				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			47.1				Sum of lost time (s)				14.9	
Intersection Capacity Utilization			55.8%				ICU Level of Service				B	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 5: Viewpoint Blvd & Willow Ave

11/25/2019














Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	4	65	124	2	204	30	550	64	98	360	28
Future Volume (vph)	119	4	65	124	2	204	30	550	64	98	360	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1631		1787	1881	1599	1805	3548		1803	3610	1578
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.37	1.00	1.00
Satd. Flow (perm)	1805	1631		1787	1881	1599	1805	3548		703	3610	1578
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.83	0.83	0.83	0.77	0.77	0.77
Adj. Flow (vph)	123	4	67	135	2	222	36	663	77	127	468	36
RTOR Reduction (vph)	0	56	0	0	0	131	0	14	0	0	0	24
Lane Group Flow (vph)	123	15	0	135	2	91	36	726	0	127	468	12
Confl. Peds. (#/hr)				5			2			3	3	2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases						8				6		6
Actuated Green, G (s)	5.2	7.8		7.2	9.8	9.8	1.3	21.8		16.5	16.5	16.5
Effective Green, g (s)	5.2	7.8		7.2	9.8	9.8	1.3	21.8		16.5	16.5	16.5
Actuated g/C Ratio	0.11	0.16		0.15	0.20	0.20	0.03	0.45		0.34	0.34	0.34
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	192	260		263	377	321	48	1584		237	1220	533
v/s Ratio Prot	0.07	0.01		c0.08	0.00		0.02	c0.20				0.13
v/s Ratio Perm						c0.06				c0.18		0.01
v/c Ratio	0.64	0.06		0.51	0.01	0.28	0.75	0.46		0.54	0.38	0.02
Uniform Delay, d1	20.9	17.4		19.2	15.6	16.5	23.6	9.4		13.1	12.3	10.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.1	0.1		1.7	0.0	0.5	48.1	0.2		2.3	0.2	0.0
Delay (s)	28.0	17.5		20.9	15.6	17.0	71.7	9.6		15.4	12.5	10.8
Level of Service	C	B		C	B	B	E	A		B	B	B
Approach Delay (s)		24.2			18.5			12.5			13.0	
Approach LOS		C			B			B			B	

### Intersection Summary

HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
6: SR-4 WB Off-Ramp & Willow Ave
























11/25/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	233	272	555	0	0	939
Future Volume (vph)	233	272	555	0	0	939
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	1.00	1.00	1.00			0.95
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1787	1599	1900			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1787	1599	1900			3610
Peak-hour factor, PHF	0.88	0.88	0.67	0.67	0.83	0.83
Adj. Flow (vph)	265	309	828	0	0	1131
RTOR Reduction (vph)	0	75	0	0	0	0
Lane Group Flow (vph)	265	234	828	0	0	1131
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	11.2	11.2	21.2			21.2
Effective Green, g (s)	11.2	11.2	21.2			21.2
Actuated g/C Ratio	0.28	0.28	0.52			0.52
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	495	443	997			1894
v/s Ratio Prot	c0.15		c0.44			0.31
v/s Ratio Perm		0.15				
v/c Ratio	0.54	0.53	0.83			0.60
Uniform Delay, d1	12.4	12.4	8.1			6.6
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	1.1	1.1	6.0			0.5
Delay (s)	13.5	13.5	14.1			7.2
Level of Service	B	B	B			A
Approach Delay (s)	13.5		14.1			7.2
Approach LOS	B		B			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			10.9		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			40.4		Sum of lost time (s)	8.0
Intersection Capacity Utilization			52.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								 			 	
Traffic Volume (vph)	74	2	109	104	2	80	62	368	52	49	899	24
Future Volume (vph)	74	2	109	104	2	80	62	368	52	49	899	24
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1591		1796	1621		1805	3533		1805	3610	1575
Flt Permitted	0.69	1.00		0.68	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1318	1591		1281	1621		1805	3533		1805	3610	1575
Peak-hour factor, PHF	0.89	0.89	0.89	0.83	0.83	0.83	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	2	122	125	2	96	67	400	57	53	977	26
RTOR Reduction (vph)	0	97	0	0	76	0	0	8	0	0	0	13
Lane Group Flow (vph)	83	27	0	125	22	0	67	449	0	53	977	13
Confl. Peds. (#/hr)			8	8			3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	13.6	13.6		13.6	13.6		6.1	34.5		4.1	32.5	32.5
Effective Green, g (s)	13.6	13.6		13.6	13.6		6.1	34.5		4.1	32.5	32.5
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.09	0.53		0.06	0.50	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	274	331		267	338		168	1869		113	1799	785
v/s Ratio Prot		0.02			0.01		c0.04	0.13		0.03	c0.27	
v/s Ratio Perm	0.06			c0.10								0.01
v/c Ratio	0.30	0.08		0.47	0.07		0.40	0.24		0.47	0.54	0.02
Uniform Delay, d1	21.8	20.8		22.6	20.7		27.8	8.3		29.5	11.2	8.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1		1.8	0.1		1.1	0.1		1.1	0.6	0.0
Delay (s)	22.6	20.9		24.4	20.8		29.0	8.4		30.6	11.8	8.3
Level of Service	C	C		C	C		C	A		C	B	A
Approach Delay (s)		21.6			22.8			11.0			12.7	
Approach LOS		C			C			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			14.3				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			65.2				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			52.4%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 8: Linus Pauling Dr & San Pablo Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	3	9	221	11	42	174	273	51	28	801	208
Future Volume (vph)	36	3	9	221	11	42	174	273	51	28	801	208
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.88		1.00	0.88		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	1585		1770	1641		1805	3610	1583	1770	3610	1574
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	1585		1770	1641		1805	3610	1583	1770	3610	1574
Peak-hour factor, PHF	0.88	0.92	0.88	0.92	0.92	0.92	0.94	0.94	0.92	0.92	0.88	0.88
Adj. Flow (vph)	41	3	10	240	12	46	185	290	55	30	910	236
RTOR Reduction (vph)	0	10	0	0	40	0	0	0	26	0	0	135
Lane Group Flow (vph)	41	3	0	240	18	0	185	290	29	30	910	101
Confl. Peds. (#/hr)							3					3
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	5%	2%	5%	2%	2%	2%	0%	0%	2%	2%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	2.0	1.4		8.7	8.1		8.6	32.5	32.5	2.0	25.9	25.9
Effective Green, g (s)	2.0	1.4		8.7	8.1		8.6	32.5	32.5	2.0	25.9	25.9
Actuated g/C Ratio	0.03	0.02		0.14	0.13		0.14	0.54	0.54	0.03	0.43	0.43
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	56	36		254	219		256	1936	848	58	1542	672
v/s Ratio Prot	0.02	0.00		c0.14	c0.01		c0.10	0.08		0.02	c0.25	
v/s Ratio Perm									0.02			0.06
v/c Ratio	0.73	0.09		0.94	0.08		0.72	0.15	0.03	0.52	0.59	0.15
Uniform Delay, d1	29.0	29.0		25.7	23.0		24.9	7.1	6.6	28.8	13.3	10.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	38.7	1.1		41.2	0.2		9.7	0.0	0.0	7.6	0.6	0.1
Delay (s)	67.7	30.1		67.0	23.2		34.5	7.1	6.7	36.4	13.9	10.7
Level of Service	E	C		E	C		C	A	A	D	B	B
Approach Delay (s)		58.7			58.4			16.6			13.8	
Approach LOS		E			E			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			22.2				HCM 2000 Level of Service		C			
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			60.6				Sum of lost time (s)		16.0			
Intersection Capacity Utilization			60.7%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 11: John Muir Pkwy & San Pablo Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	86	348	74	694	318	152	361	463	1022	279	660	96	
Future Volume (vph)	86	348	74	694	318	152	361	463	1022	279	660	96	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0		
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	0.88	1.00	0.95		
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00		
Frt	1.00	0.97		1.00	0.95		1.00	1.00	0.85	1.00	0.98		
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1787	3473		3467	1790		1805	3610	2842	1805	3534		
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1787	3473		3467	1790		1805	3610	2842	1805	3534		
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95	
Adj. Flow (vph)	93	378	80	746	342	163	384	493	1087	294	695	101	
RTOR Reduction (vph)	0	13	0	0	12	0	0	0	0	0	7	0	
Lane Group Flow (vph)	93	445	0	746	493	0	384	493	1087	294	789	0	
Confl. Peds. (#/hr)							3					3	
Confl. Bikes (#/hr)			1										
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA		
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases									Free				
Actuated Green, G (s)	14.3	27.1		31.3	43.1		32.3	35.7	136.6	26.0	29.4		
Effective Green, g (s)	14.3	27.1		31.3	43.1		32.3	35.7	136.6	26.0	29.4		
Actuated g/C Ratio	0.10	0.20		0.23	0.32		0.24	0.26	1.00	0.19	0.22		
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0		
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)	187	689		794	564		426	943	2842	343	760		
v/s Ratio Prot	0.05	0.13		c0.22	c0.28		c0.21	0.14		0.16	c0.22		
v/s Ratio Perm									0.38				
v/c Ratio	0.50	0.65		0.94	0.87		0.90	0.52	0.38	0.86	1.04		
Uniform Delay, d1	57.8	50.3		51.7	44.2		50.6	43.2	0.0	53.5	53.6		
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.8	2.1		18.4	15.2		21.4	0.7	0.4	18.0	42.9		
Delay (s)	58.5	52.4		70.1	59.4		72.0	43.8	0.4	71.5	96.5		
Level of Service	E	D		E	E		E	D	A	E	F		
Approach Delay (s)		53.5			65.8			25.3			89.8		
Approach LOS		D			E			C			F		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			53.4									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.95										
Actuated Cycle Length (s)			136.6									Sum of lost time (s)	17.5
Intersection Capacity Utilization			94.5%									ICU Level of Service	F
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↑↑↑		↶	↑↑
Traffic Volume (vph)	0	0	1700	0	58	1461
Future Volume (vph)	0	0	1700	0	58	1461
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0
Lane Util. Factor			0.91		1.00	0.95
Frbp, ped/bikes			1.00		1.00	1.00
Flpb, ped/bikes			1.00		1.00	1.00
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			5187		1787	3574
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			5187		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.97	0.97
Adj. Flow (vph)	0	0	1848	0	60	1506
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1848	0	60	1506
Confl. Peds. (#/hr)				1	1	
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)			62.1		5.5	75.6
Effective Green, g (s)			62.1		5.5	75.6
Actuated g/C Ratio			0.82		0.07	1.00
Clearance Time (s)			4.0		4.0	4.0
Vehicle Extension (s)			3.0		3.0	3.0
Lane Grp Cap (vph)			4260		130	3574
v/s Ratio Prot			0.36		0.03	c0.42
v/s Ratio Perm						
v/c Ratio			0.43		0.46	0.42
Uniform Delay, d1			1.9		33.6	0.0
Progression Factor			1.00		1.00	1.00
Incremental Delay, d2			0.3		2.6	0.4
Delay (s)			2.2		36.2	0.4
Level of Service			A		D	A
Approach Delay (s)	0.0		2.2			1.7
Approach LOS	A		A			A
<b>Intersection Summary</b>						
HCM 2000 Control Delay			2.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.50			
Actuated Cycle Length (s)			75.6		Sum of lost time (s)	12.0
Intersection Capacity Utilization			43.7%		ICU Level of Service	A
Analysis Period (min)			15			





























c Critical Lane Group



# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 				 		  		 	 	
Traffic Volume (vph)	178	207	70	490	210	1119	39	510	328	401	951	84
Future Volume (vph)	178	207	70	490	210	1119	39	510	328	401	951	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.91	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3453		1715	1769	2815	1787	5136	1563	3467	3531	
Flt Permitted	0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	3453		1715	1769	2815	1787	5136	1563	3467	3531	
Peak-hour factor, PHF	0.79	0.79	0.79	0.89	0.89	0.89	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	225	262	89	551	236	1257	43	567	364	451	1069	94
RTOR Reduction (vph)	0	24	0	0	0	221	0	0	276	0	4	0
Lane Group Flow (vph)	225	327	0	386	401	1036	43	567	88	451	1159	0
Confl. Peds. (#/hr)	1		8	8		1			1	1		
Confl. Bikes (#/hr)			1			1			10			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8			2			
Actuated Green, G (s)	28.1	28.1		37.0	37.0	52.3	7.8	32.7	32.7	15.3	40.2	
Effective Green, g (s)	28.1	28.1		37.0	37.0	52.3	7.8	32.7	32.7	15.3	40.2	
Actuated g/C Ratio	0.21	0.21		0.27	0.27	0.39	0.06	0.24	0.24	0.11	0.30	
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	375	718		469	484	1089	103	1243	378	392	1050	
v/s Ratio Prot	c0.12	0.09		0.23	0.23	c0.11	0.02	0.11		c0.13	c0.33	
v/s Ratio Perm						0.26			0.06			
v/c Ratio	0.60	0.46		0.82	0.83	0.95	0.42	0.46	0.23	1.15	1.10	
Uniform Delay, d1	48.4	46.8		46.0	46.1	40.2	61.5	43.6	41.1	59.9	47.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.7	1.3		13.0	13.0	17.0	3.7	0.8	0.9	93.2	60.7	
Delay (s)	53.1	48.1		58.9	59.1	57.2	65.2	44.4	42.0	153.1	108.1	
Level of Service	D	D		E	E	E	E	D	D	F	F	
Approach Delay (s)		50.1			57.9			44.4			120.7	
Approach LOS		D			E			D			F	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			74.0				HCM 2000 Level of Service				E	
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			135.1				Sum of lost time (s)				22.0	
Intersection Capacity Utilization			84.1%				ICU Level of Service				E	
Analysis Period (min)			15									
c Critical Lane Group												



# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/25/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	213	1763	1876	13	118	113
Future Volume (vph)	213	1763	1876	13	118	113
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	3610	3606		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	3610	3606		1805	1615
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.71	0.71
Adj. Flow (vph)	242	2003	2132	15	166	159
RTOR Reduction (vph)	0	0	0	0	0	136
Lane Group Flow (vph)	242	2003	2147	0	166	23
Confl. Peds. (#/hr)	3			3		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	12.0	66.1	50.1		12.7	12.7
Effective Green, g (s)	12.0	66.1	50.1		12.7	12.7
Actuated g/C Ratio	0.14	0.76	0.58		0.15	0.15
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	249	2749	2081		264	236
v/s Ratio Prot	c0.13	0.55	c0.60		c0.09	
v/s Ratio Perm						0.01
v/c Ratio	0.97	0.73	1.03		0.63	0.10
Uniform Delay, d1	37.2	5.5	18.3		34.8	32.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	48.9	1.0	28.3		4.6	0.2
Delay (s)	86.1	6.5	46.7		39.5	32.3
Level of Service	F	A	D		D	C
Approach Delay (s)		15.1	46.7		35.9	
Approach LOS		B	D		D	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			30.9		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.95			
Actuated Cycle Length (s)			86.8		Sum of lost time (s)	12.0
Intersection Capacity Utilization			80.6%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	481	59	26	1561	40	492	7	166	85	2	430
Future Volume (vph)	159	481	59	26	1561	40	492	7	166	85	2	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98		0.99		1.00	1.00	0.98
Flpb, ped/bikes	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		0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96		0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1586	1805	3610	1578		3265		1805	1900	1578
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96		0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1586	1805	3610	1578		3265		1805	1900	1578
Peak-hour factor, PHF	0.96	0.96	0.96	0.95	0.95	0.95	0.87	0.87	0.87	0.93	0.93	0.93
Adj. Flow (vph)	166	501	61	27	1643	42	566	8	191	91	2	462
RTOR Reduction (vph)	0	0	39	0	0	29	0	22	0	0	0	135
Lane Group Flow (vph)	166	501	22	27	1643	13	0	743	0	91	2	327
Confl. Peds. (#/hr)	7		3	3		7	3		7	2		9
Confl. Bikes (#/hr)			2			1			5			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6						4
Actuated Green, G (s)	12.2	50.2	50.2	4.4	42.4	42.4		34.4		31.7	31.7	31.7
Effective Green, g (s)	12.2	50.2	50.2	4.4	42.4	42.4		34.4		31.7	31.7	31.7
Actuated g/C Ratio	0.09	0.36	0.36	0.03	0.31	0.31		0.25		0.23	0.23	0.23
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	159	1316	578	57	1111	485		815		415	437	363
v/s Ratio Prot	c0.09	0.14		0.01	c0.46			c0.23		0.05	0.00	
v/s Ratio Perm			0.01			0.01						c0.21
v/c Ratio	1.04	0.38	0.04	0.47	1.48	0.03		1.21dl		0.22	0.00	0.90
Uniform Delay, d1	62.7	32.3	28.2	65.5	47.6	33.3		50.2		43.0	40.8	51.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	83.5	0.1	0.0	2.3	220.4	0.0		14.1		0.1	0.0	23.4
Delay (s)	146.3	32.3	28.2	67.8	268.0	33.3		64.3		43.1	40.8	74.9
Level of Service	F	C	C	E	F	C		E		D	D	E
Approach Delay (s)		58.0			259.1			64.3			69.6	
Approach LOS		E			F			E			E	

### Intersection Summary

HCM 2000 Control Delay	152.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	137.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	108.9%	ICU Level of Service	G
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕	↗	↖↗	↖	↗	↖	↕↖↗		↖	↕↖		
Traffic Volume (vph)	23	33	115	431	38	433	62	1361	92	139	701	25	
Future Volume (vph)	23	33	115	431	38	433	62	1361	92	139	701	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.87	0.85	1.00	0.99		1.00	0.99		
Flt Protected		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1862	1585	3502	1557	1510	1805	5128		1805	3589		
Flt Permitted		0.98	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1862	1585	3502	1557	1510	1805	5128		1805	3589		
Peak-hour factor, PHF	0.83	0.83	0.83	0.93	0.93	0.93	0.89	0.89	0.89	0.73	0.73	0.73	
Adj. Flow (vph)	28	40	139	463	41	466	70	1529	103	190	960	34	
RTOR Reduction (vph)	0	0	126	0	171	201	0	5	0	0	2	0	
Lane Group Flow (vph)	0	68	13	463	84	51	70	1627	0	190	992	0	
Confl. Peds. (#/hr)	3		2	2		3	5		4	4		5	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Effective Green, g (s)		10.8	10.8	24.2	24.2	24.2	11.4	50.5		17.5	56.6		
Actuated g/C Ratio		0.09	0.09	0.20	0.20	0.20	0.10	0.42		0.15	0.47		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		167	142	706	313	304	171	2158		263	1692		
v/s Ratio Prot		c0.04		c0.13	0.05		0.04	c0.32		c0.11	0.28		
v/s Ratio Perm			0.01			0.03							
v/c Ratio		0.41	0.09	0.66	0.27	0.17	0.41	0.75		0.72	0.59		
Uniform Delay, d1		51.6	50.1	44.1	40.4	39.6	51.1	29.5		48.9	23.2		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.6	0.3	2.2	0.5	0.3	0.6	2.5		8.0	1.5		
Delay (s)		53.2	50.4	46.3	40.9	39.8	51.7	32.0		57.0	24.7		
Level of Service		D	D	D	D	D	D	C		E	C		
Approach Delay (s)		51.3			43.2			32.8			29.8		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			35.4		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.69										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			69.8%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

# **Cumulative Plus Project AM Unsignalized**

HCM 6th TWSC  
 9: San Pablo Ave & Project Driveway

10/09/2019

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↕↕	↗		↕↕
Traffic Vol, veh/h	0	42	726	89	0	993
Future Vol, veh/h	0	42	726	89	0	993
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	46	789	97	0	1079

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1329	395	0	0	-
Stage 1	789	-	-	-	-
Stage 2	540	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-
Pot Cap-1 Maneuver	146	604	-	-	0
Stage 1	408	-	-	-	0
Stage 2	548	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	146	604	-	-	-
Mov Cap-2 Maneuver	146	-	-	-	-
Stage 1	408	-	-	-	-
Stage 2	548	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBT
Capacity (veh/h)	-	-	-	604
HCM Lane V/C Ratio	-	-	-	0.076
HCM Control Delay (s)	-	-	0	11.4
HCM Lane LOS	-	-	A	B
HCM 95th %tile Q(veh)	-	-	-	0.2

HCM Unsignalized Intersection Capacity Analysis  
 10: John Muir Pkwy & Alfred Nobel Dr

09/29/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↶	↷↷	↷↷		↶↶		
Traffic Volume (veh/h)	54	412	171	439	54	7	
Future Volume (Veh/h)	54	412	171	439	54	7	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.75	0.75	0.88	0.88	0.92	0.92	
Hourly flow rate (vph)	72	549	194	499	59	8	
Pedestrians					4		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	697				866	350	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	697				866	350	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	92				78	99	
cM capacity (veh/h)	906				268	644	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	72	274	274	129	564	39	28
Volume Left	72	0	0	0	0	39	20
Volume Right	0	0	0	0	499	0	8
cSH	906	1700	1700	1700	1700	268	323
Volume to Capacity	0.08	0.16	0.16	0.08	0.33	0.15	0.09
Queue Length 95th (ft)	6	0	0	0	0	13	7
Control Delay (s)	9.3	0.0	0.0	0.0	0.0	20.7	17.2
Lane LOS	A					C	C
Approach Delay (s)	1.1			0.0		19.3	
Approach LOS						C	
Intersection Summary							
Average Delay			1.4				
Intersection Capacity Utilization			35.9%		ICU Level of Service		A
Analysis Period (min)			15				

Intersection	
Intersection Delay, s/veh	33.2
Intersection LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↘		↘	
Traffic Vol, veh/h	274	175	227	17	368	27
Future Vol, veh/h	274	175	227	17	368	27
Peak Hour Factor	0.84	0.84	0.94	0.94	0.72	0.72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	326	208	241	18	511	38
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	20.6	16.4	53.5
HCM LOS	C	C	F

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	93%
Vol Thru, %	0%	100%	93%	0%
Vol Right, %	0%	0%	7%	7%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	274	175	244	395
LT Vol	274	0	0	368
Through Vol	0	175	227	0
RT Vol	0	0	17	27
Lane Flow Rate	326	208	260	549
Geometry Grp	7	7	5	2
Degree of Util (X)	0.678	0.403	0.492	0.961
Departure Headway (Hd)	7.481	6.968	6.83	6.303
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	483	517	527	582
Service Time	5.228	4.716	4.878	4.303
HCM Lane V/C Ratio	0.675	0.402	0.493	0.943
HCM Control Delay	24.6	14.4	16.4	53.5
HCM Lane LOS	C	B	C	F
HCM 95th-tile Q	5	1.9	2.7	13

# **Cumulative Plus Project PM Signalized**



# HCM Signalized Intersection Capacity Analysis

## 1: San Pablo Ave & Willow Ave

11/25/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	TT		T	TT	TT	
Traffic Volume (vph)	359	261	175	368	308	237
Future Volume (vph)	359	261	175	368	308	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	5.5	5.5	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.93	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	3324		1805	3610	3356	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	3324		1805	3610	3356	
Peak-hour factor, PHF	0.84	0.84	0.94	0.94	0.79	0.79
Adj. Flow (vph)	427	311	186	391	390	300
RTOR Reduction (vph)	60	0	0	0	70	0
Lane Group Flow (vph)	678	0	186	391	620	0
Confl. Peds. (#/hr)		1	1			1
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases						
Actuated Green, G (s)	29.0		15.7	46.6	26.9	
Effective Green, g (s)	29.0		15.7	46.6	26.9	
Actuated g/C Ratio	0.34		0.18	0.55	0.32	
Clearance Time (s)	4.0		4.0	5.5	5.5	
Vehicle Extension (s)	4.0		2.0	4.0	4.0	
Lane Grp Cap (vph)	1132		333	1976	1060	
v/s Ratio Prot	c0.20		c0.10	0.11	c0.18	
v/s Ratio Perm						
v/c Ratio	0.60		0.56	0.20	0.59	
Uniform Delay, d1	23.2		31.5	9.8	24.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.0		1.2	0.1	1.0	
Delay (s)	24.2		32.7	9.8	25.4	
Level of Service	C		C	A	C	
Approach Delay (s)	24.2			17.2	25.4	
Approach LOS	C			B	C	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			22.6		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.62			
Actuated Cycle Length (s)			85.1		Sum of lost time (s)	17.5
Intersection Capacity Utilization			55.9%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 2: Hawthorne Dr & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↕			↕		↕	↕		
Traffic Volume (vph)	0	0	0	71	69	0	0	597	196	0	440	237	
Future Volume (vph)	0	0	0	71	69	0	0	597	196	0	440	237	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0			5.5			5.5		
Lane Util. Factor					1.00			0.95			0.95		
Frbp, ped/bikes					1.00			0.99			1.00		
Flpb, ped/bikes					1.00			1.00			1.00		
Frt					1.00			0.96			0.95		
Flt Protected					0.98			1.00			1.00		
Satd. Flow (prot)					1853			3456			3420		
Flt Permitted					0.98			1.00			1.00		
Satd. Flow (perm)					1853			3456			3420		
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.94	0.94	0.94	0.86	0.86	0.86	
Adj. Flow (vph)	0	0	0	91	88	0	0	635	209	0	512	276	
RTOR Reduction (vph)	0	0	0	0	0	0	0	15	0	0	62	0	
Lane Group Flow (vph)	0	0	0	0	179	0	0	829	0	0	726	0	
Confl. Peds. (#/hr)									4	4			
Confl. Bikes (#/hr)						1							
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type				Split	NA			NA		Prot	NA		
Protected Phases				8	8			2		1	6		
Permitted Phases													
Actuated Green, G (s)					12.0			27.0			27.0		
Effective Green, g (s)					12.0			27.0			27.0		
Actuated g/C Ratio					0.25			0.56			0.56		
Clearance Time (s)					4.0			5.5			5.5		
Vehicle Extension (s)					3.0			4.0			4.0		
Lane Grp Cap (vph)					458			1923			1903		
v/s Ratio Prot					c0.10			c0.24			0.21		
v/s Ratio Perm													
v/c Ratio					0.39			0.43			0.38		
Uniform Delay, d1					15.2			6.3			6.1		
Progression Factor					1.00			1.00			1.00		
Incremental Delay, d2					0.6			0.2			0.2		
Delay (s)					15.8			6.5			6.2		
Level of Service					B			A			A		
Approach Delay (s)		0.0			15.8			6.5			6.2		
Approach LOS		A			B			A			A		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			7.3		HCM 2000 Level of Service						A		
HCM 2000 Volume to Capacity ratio			0.47										
Actuated Cycle Length (s)			48.5		Sum of lost time (s)					13.5			
Intersection Capacity Utilization			38.3%		ICU Level of Service						A		
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 3: I-80 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	182	67	888	0	0	393
Future Volume (vph)	182	67	888	0	0	393
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7	5.1			5.1
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1805	1584	3574			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1805	1584	3574			3610
Peak-hour factor, PHF	0.88	0.88	0.90	0.90	0.87	0.87
Adj. Flow (vph)	207	76	987	0	0	452
RTOR Reduction (vph)	0	38	0	0	0	0
Lane Group Flow (vph)	207	38	987	0	0	452
Confl. Peds. (#/hr)		13		7	7	
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	9.3	9.3	18.0			18.0
Effective Green, g (s)	9.3	9.3	18.0			18.0
Actuated g/C Ratio	0.25	0.25	0.49			0.49
Clearance Time (s)	4.7	4.7	5.1			5.1
Vehicle Extension (s)	2.0	2.0	3.0			3.0
Lane Grp Cap (vph)	452	397	1734			1751
v/s Ratio Prot	c0.11		c0.28			0.13
v/s Ratio Perm		0.02				
v/c Ratio	0.46	0.10	0.57			0.26
Uniform Delay, d1	11.8	10.7	6.8			5.6
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.3	0.0	0.4			0.1
Delay (s)	12.0	10.7	7.2			5.7
Level of Service	B	B	A			A
Approach Delay (s)	11.7		7.2			5.7
Approach LOS	B		A			A

### Intersection Summary




















HCM 2000 Control Delay	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	37.1	Sum of lost time (s)	9.8
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 4: I-80 EB Ramps & Willow Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	91	61	22	275	71	369	89	446	58	156	326	49	
Future Volume (vph)	91	61	22	275	71	369	89	446	58	156	326	49	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12	
Total Lost time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Lane Util. Factor		0.95			1.00	1.00	1.00	0.95		1.00	0.95		
Frbp, ped/bikes		1.00			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		
Frt		0.98			1.00	0.85	1.00	0.98		1.00	0.98		
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		3186			1827	1588	1805	3538		1805	3533		
Flt Permitted		0.68			0.65	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		2239			1231	1588	1805	3538		1805	3533		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.98	0.98	0.98	0.93	0.93	0.93	
Adj. Flow (vph)	95	64	23	286	74	384	91	455	59	168	351	53	
RTOR Reduction (vph)	0	10	0	0	0	232	0	12	0	0	13	0	
Lane Group Flow (vph)	0	172	0	0	360	152	91	502	0	168	391	0	
Confl. Peds. (#/hr)	6					6	1		4	4		1	
Confl. Bikes (#/hr)						2							
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA		
Protected Phases		4			8		5	2		1	6		
Permitted Phases	4			8		8							
Actuated Green, G (s)		25.0			24.6	24.6	5.3	13.5		9.0	17.2		
Effective Green, g (s)		25.0			24.6	24.6	5.3	13.5		9.0	17.2		
Actuated g/C Ratio		0.40			0.40	0.40	0.09	0.22		0.15	0.28		
Clearance Time (s)		4.7			5.1	5.1	4.7	5.1		4.7	5.1		
Vehicle Extension (s)		0.2			0.2	0.2	0.2	0.2		0.2	0.2		
Lane Grp Cap (vph)		902			488	630	154	770		262	980		
v/s Ratio Prot							0.05	c0.14		c0.09	c0.11		
v/s Ratio Perm		0.08			c0.29	0.10							
v/c Ratio		0.19			0.74	0.24	0.59	0.65		0.64	0.40		
Uniform Delay, d1		12.0			15.9	12.5	27.3	22.1		25.0	18.2		
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		0.0			5.0	0.1	4.0	1.5		4.0	0.1		
Delay (s)		12.0			20.9	12.6	31.3	23.6		29.0	18.3		
Level of Service		B			C	B	C	C		C	B		
Approach Delay (s)		12.0			16.6			24.8			21.4		
Approach LOS		B			B			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			19.9		HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio			0.68										
Actuated Cycle Length (s)			62.0		Sum of lost time (s)					14.9			
Intersection Capacity Utilization			62.3%		ICU Level of Service					B			
Analysis Period (min)			15										

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 5: Viewpoint Blvd & Willow Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↕		↖	↗	↖
Traffic Volume (vph)	66	1	31	46	1	128	45	438	57	198	339	135
Future Volume (vph)	66	1	31	46	1	128	45	438	57	198	339	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1598		1805	1900	1615	1805	3542		1805	3610	1572
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1598		1805	1900	1615	1805	3542		1805	3610	1572
Peak-hour factor, PHF	0.78	0.78	0.78	0.84	0.84	0.84	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	85	1	40	55	1	152	48	471	61	208	357	142
RTOR Reduction (vph)	0	34	0	0	0	132	0	15	0	0	0	76
Lane Group Flow (vph)	85	7	0	55	1	20	48	517	0	208	357	66
Confl. Peds. (#/hr)			3	3			4		3	3		4
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	3.1	8.4		1.4	6.7	6.7	1.8	18.0		8.1	24.3	24.3
Effective Green, g (s)	3.1	8.4		1.4	6.7	6.7	1.8	18.0		8.1	24.3	24.3
Actuated g/C Ratio	0.06	0.16		0.03	0.13	0.13	0.03	0.35		0.16	0.47	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	107	258		48	245	208	62	1228		281	1690	736
v/s Ratio Prot	c0.05	0.00		0.03	0.00		0.03	c0.15		c0.12	0.10	
v/s Ratio Perm						c0.01						0.04
v/c Ratio	0.79	0.03		1.15	0.00	0.09	0.77	0.42		0.74	0.21	0.09
Uniform Delay, d1	24.1	18.3		25.2	19.7	19.9	24.8	13.0		20.9	8.1	7.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	32.1	0.0		175.7	0.0	0.2	44.2	0.2		10.0	0.1	0.1
Delay (s)	56.2	18.4		200.9	19.7	20.1	69.1	13.2		30.9	8.2	7.7
Level of Service	E	B		F	B	C	E	B		C	A	A
Approach Delay (s)		43.9			67.9			17.8			14.8	
Approach LOS		D			E			B			B	

Intersection Summary		
HCM 2000 Control Delay	25.0	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.46	C
Actuated Cycle Length (s)	51.9	Sum of lost time (s)
Intersection Capacity Utilization	45.5%	16.0
Analysis Period (min)	15	ICU Level of Service
		A
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis  
6: SR-4 WB Off-Ramp & Willow Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	308	282	564	0	0	717
Future Volume (vph)	308	282	564	0	0	717
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	1.00	1.00	1.00			0.95
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1787	1599	1900			3610
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	1787	1599	1900			3610
Peak-hour factor, PHF	0.90	0.90	0.87	0.87	0.92	0.92
Adj. Flow (vph)	342	313	648	0	0	779
RTOR Reduction (vph)	0	86	0	0	0	0
Lane Group Flow (vph)	342	227	648	0	0	779
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	11.7	11.7	15.8			15.8
Effective Green, g (s)	11.7	11.7	15.8			15.8
Actuated g/C Ratio	0.33	0.33	0.45			0.45
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	588	526	845			1606
v/s Ratio Prot	c0.19		c0.34			0.22
v/s Ratio Perm		0.14				
v/c Ratio	0.58	0.43	0.77			0.49
Uniform Delay, d1	9.9	9.3	8.3			7.0
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	1.5	0.6	4.2			0.2
Delay (s)	11.3	9.9	12.5			7.2
Level of Service	B	A	B			A
Approach Delay (s)	10.6		12.5			7.2
Approach LOS	B		B			A























Intersection Summary

HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	35.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 7: Victoria Cres W & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	4	110	43	3	26	119	511	82	65	256	47
Future Volume (vph)	35	4	110	43	3	26	119	511	82	65	256	47
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	0.87		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1801	1596		1796	1625		1805	3524		1787	3574	1565
Flt Permitted	0.73	1.00		0.66	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1390	1596		1253	1625		1805	3524		1787	3574	1565
Peak-hour factor, PHF	0.77	0.77	0.77	0.78	0.78	0.78	0.85	0.85	0.85	0.93	0.93	0.93
Adj. Flow (vph)	45	5	143	55	4	33	140	601	96	70	275	51
RTOR Reduction (vph)	0	121	0	0	28	0	0	9	0	0	0	29
Lane Group Flow (vph)	45	27	0	55	9	0	140	688	0	70	275	22
Confl. Peds. (#/hr)	3		11	11		3	1		2	2		1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								6
Actuated Green, G (s)	7.5	7.5		7.5	7.5		7.6	25.1		4.1	21.6	21.6
Effective Green, g (s)	7.5	7.5		7.5	7.5		7.6	25.1		4.1	21.6	21.6
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.15	0.51		0.08	0.43	0.43
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0		2.5	5.0		2.0	5.0	5.0
Lane Grp Cap (vph)	209	240		189	245		276	1779		147	1553	680
v/s Ratio Prot		0.02			0.01		c0.08	c0.20		0.04	0.08	
v/s Ratio Perm	0.03			c0.04								0.01
v/c Ratio	0.22	0.11		0.29	0.04		0.51	0.39		0.48	0.18	0.03
Uniform Delay, d1	18.5	18.2		18.7	18.0		19.3	7.6		21.8	8.6	8.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		1.2	0.1		1.1	0.3		0.9	0.1	0.0
Delay (s)	19.2	18.5		19.9	18.1		20.4	7.9		22.7	8.7	8.1
Level of Service	B	B		B	B		C	A		C	A	A
Approach Delay (s)		18.7			19.2			10.0			11.1	
Approach LOS		B			B			A			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			11.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			49.7				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			43.8%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
8: Linus Pauling Dr & San Pablo Ave




























11/25/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	157	11	253	116	6	20	12	555	74	29	359	61	
Future Volume (vph)	157	11	253	116	6	20	12	555	74	29	359	61	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85		1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1805	1602		1770	1651		1803	3610	1583	1770	3610	1580	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1805	1602		1770	1651		1803	3610	1583	1770	3610	1580	
Peak-hour factor, PHF	0.66	0.92	0.66	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.97	0.97	
Adj. Flow (vph)	238	12	383	126	7	22	13	603	80	32	370	63	
RTOR Reduction (vph)	0	250	0	0	20	0	0	0	58	0	0	45	
Lane Group Flow (vph)	238	145	0	126	9	0	13	603	22	32	370	18	
Confl. Peds. (#/hr)							1					1	
Confl. Bikes (#/hr)			1										
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	0%	2%	2%	0%	0%	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases									2			6	
Actuated Green, G (s)	13.3	12.0		5.3	4.0		0.6	13.4	13.4	1.2	14.0	14.0	
Effective Green, g (s)	13.3	12.0		5.3	4.0		0.6	13.4	13.4	1.2	14.0	14.0	
Actuated g/C Ratio	0.28	0.25		0.11	0.08		0.01	0.28	0.28	0.03	0.29	0.29	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	501	401		195	137		22	1009	442	44	1055	461	
v/s Ratio Prot	c0.13	c0.09		c0.07	0.01		0.01	c0.17		c0.02	0.10		
v/s Ratio Perm									0.01			0.01	
v/c Ratio	0.48	0.36		0.65	0.06		0.59	0.60	0.05	0.73	0.35	0.04	
Uniform Delay, d1	14.4	14.8		20.4	20.2		23.5	14.9	12.6	23.2	13.4	12.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	0.6		7.2	0.2		36.0	1.0	0.0	45.3	0.2	0.0	
Delay (s)	15.1	15.3		27.6	20.4		59.5	15.9	12.7	68.5	13.6	12.2	
Level of Service	B	B		C	C		E	B	B	E	B	B	
Approach Delay (s)		15.3			26.2			16.3			17.2		
Approach LOS		B			C			B			B		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			17.0									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.56										
Actuated Cycle Length (s)			47.9									Sum of lost time (s)	16.0
Intersection Capacity Utilization			54.7%									ICU Level of Service	A
Analysis Period (min)			15										
c Critical Lane Group													



HCM Signalized Intersection Capacity Analysis  
 11: John Muir Pkwy & San Pablo Ave

11/25/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 		 				 	 		 	
Traffic Volume (vph)	123	579	129	433	225	131	227	721	1193	308	334	55
Future Volume (vph)	123	579	129	433	225	131	227	721	1193	308	334	55
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.0		4.0	5.5		3.5	5.0	4.0	3.5	5.0	
Lane Util. Factor	1.00	0.95		0.97	1.00		1.00	0.95	0.88	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	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	1.00	
Frt	1.00	0.97		1.00	0.94		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	3476		3467	1778		1805	3610	2842	1805	3526	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1787	3476		3467	1778		1805	3610	2842	1805	3526	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	140	658	147	471	245	142	244	775	1283	362	393	65
RTOR Reduction (vph)	0	14	0	0	15	0	0	0	0	0	10	0
Lane Group Flow (vph)	140	791	0	471	372	0	244	775	1283	362	448	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	15.3	34.3		22.7	40.7		16.5	36.5	140.0	30.0	50.0	
Effective Green, g (s)	15.3	34.3		22.7	40.7		16.5	36.5	140.0	30.0	50.0	
Actuated g/C Ratio	0.11	0.24		0.16	0.29		0.12	0.26	1.00	0.21	0.36	
Clearance Time (s)	3.5	4.0		4.0	5.5		3.5	5.0		3.5	5.0	
Vehicle Extension (s)	2.0	3.0		2.0	5.0		2.0	4.0		2.0	4.0	
Lane Grp Cap (vph)	195	851		562	516		212	941	2842	386	1259	
v/s Ratio Prot	0.08	c0.23		c0.14	0.21		c0.14	c0.21		c0.20	0.13	
v/s Ratio Perm									0.45			
v/c Ratio	0.72	0.93		0.84	0.72		1.15	0.82	0.45	0.94	0.36	
Uniform Delay, d1	60.3	51.7		56.9	44.6		61.8	48.7	0.0	54.1	33.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.0	16.2		10.1	6.0		108.5	8.1	0.5	29.8	0.8	
Delay (s)	70.3	67.9		67.0	50.6		170.2	56.8	0.5	83.9	33.9	
Level of Service	E	E		E	D		F	E	A	F	C	
Approach Delay (s)		68.2			59.6			37.5			56.0	
Approach LOS		E			E			D			E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			50.3				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)				17.5	
Intersection Capacity Utilization			83.9%				ICU Level of Service				E	
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 12: San Pablo Ave

11/25/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↕↕↕		↶	↷↷
Traffic Volume (vph)	10	10	2063	46	26	715
Future Volume (vph)	10	10	2063	46	26	715
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.91		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	5170		1787	3574
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	1615	5170		1787	3574
Peak-hour factor, PHF	0.92	0.92	0.94	0.94	0.95	0.95
Adj. Flow (vph)	11	11	2195	49	27	753
RTOR Reduction (vph)	0	11	2	0	0	0
Lane Group Flow (vph)	11	0	2242	0	27	753
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4				
Actuated Green, G (s)	2.7	2.7	62.8		3.1	69.9
Effective Green, g (s)	2.7	2.7	62.8		3.1	69.9
Actuated g/C Ratio	0.03	0.03	0.78		0.04	0.87
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	60	54	4028		68	3099
v/s Ratio Prot	c0.01		c0.43		c0.02	0.21
v/s Ratio Perm		0.00				
v/c Ratio	0.18	0.01	0.56		0.40	0.24
Uniform Delay, d1	37.9	37.7	3.5		37.8	0.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.5	0.1	0.6		3.8	0.2
Delay (s)	39.4	37.7	4.0		41.6	1.1
Level of Service	D	D	A		D	A
Approach Delay (s)	38.5		4.0			2.5
Approach LOS	D		A			A
































### Intersection Summary

HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 13: Sycamore Ave & San Pablo Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		 			 	 		  		 	 	 	
Traffic Volume (vph)	177	196	73	275	306	809	63	1066	363	525	375	124	
Future Volume (vph)	177	196	73	275	306	809	63	1066	363	525	375	124	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0		
Lane Util. Factor	1.00	0.95		0.95	0.95	0.88	1.00	0.91	1.00	0.97	0.95		
Frbp, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	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	1.00	1.00		
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1805	3441		1681	1794	2842	1787	5136	1583	3502	3476		
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1805	3441		1681	1794	2842	1787	5136	1583	3502	3476		
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.93	0.93	0.93	
Adj. Flow (vph)	190	211	78	296	329	870	71	1198	408	565	403	133	
RTOR Reduction (vph)	0	28	0	0	0	151	0	0	291	0	21	0	
Lane Group Flow (vph)	190	261	0	266	359	719	71	1198	117	565	515	0	
Confl. Peds. (#/hr)			10	10									
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	1%	1%	2%	0%	0%	0%	
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA	Perm	Prot	NA		
Protected Phases	4	4		8	8	1	5	2		1	6		
Permitted Phases						8			2				
Actuated Green, G (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9		
Effective Green, g (s)	24.1	24.1		33.8	33.8	56.9	9.2	37.0	37.0	23.1	50.9		
Actuated g/C Ratio	0.17	0.17		0.24	0.24	0.41	0.07	0.26	0.26	0.17	0.36		
Clearance Time (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0		
Vehicle Extension (s)	6.0	6.0		6.0	6.0	4.0	4.0	6.0	6.0	4.0	6.0		
Lane Grp Cap (vph)	310	592		405	433	1155	117	1357	418	577	1263		
v/s Ratio Prot	c0.11	0.08		0.16	c0.20	0.10	0.04	c0.23		c0.16	0.15		
v/s Ratio Perm						0.15			0.07				
v/c Ratio	0.61	0.44		0.66	0.83	0.62	0.61	0.88	0.28	0.98	0.41		
Uniform Delay, d1	53.6	51.9		47.9	50.4	33.0	63.6	49.4	40.9	58.2	33.3		
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	6.1	1.5		6.1	14.3	1.2	9.9	8.6	1.7	31.9	1.0		
Delay (s)	59.8	53.4		53.9	64.7	34.2	73.5	58.0	42.6	90.1	34.3		
Level of Service	E	D		D	E	C	E	E	D	F	C		
Approach Delay (s)		55.9			45.0			54.9			62.9		
Approach LOS		E			D			D			E		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			53.8		HCM 2000 Level of Service					D			
HCM 2000 Volume to Capacity ratio			0.83										
Actuated Cycle Length (s)			140.0		Sum of lost time (s)					22.0			
Intersection Capacity Utilization			84.8%		ICU Level of Service					E			
Analysis Period (min)			15										

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 14: San Pablo Ave & Tsushima St

11/25/2019



























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	358	1689	1693	10	121	127
Future Volume (vph)	358	1689	1693	10	121	127
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	3574	3536		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	3574	3536		1805	1615
Peak-hour factor, PHF	0.94	0.94	0.96	0.96	0.77	0.77
Adj. Flow (vph)	381	1797	1764	10	157	165
RTOR Reduction (vph)	0	0	1	0	0	141
Lane Group Flow (vph)	381	1797	1773	0	157	24
Confl. Peds. (#/hr)				3		
Heavy Vehicles (%)	1%	1%	2%	2%	0%	0%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	19.0	66.1	43.1		12.4	12.4
Effective Green, g (s)	19.0	66.1	43.1		12.4	12.4
Actuated g/C Ratio	0.22	0.76	0.50		0.14	0.14
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	392	2731	1761		258	231
v/s Ratio Prot	c0.21	0.50	c0.50		c0.09	
v/s Ratio Perm						0.01
v/c Ratio	0.97	0.66	1.01		0.61	0.10
Uniform Delay, d1	33.5	4.8	21.7		34.8	32.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	37.9	0.6	23.2		4.0	0.2
Delay (s)	71.4	5.4	44.9		38.8	32.4
Level of Service	E	A	D		D	C
Approach Delay (s)		17.0	44.9		35.5	
Approach LOS		B	D		D	
<b>Intersection Summary</b>						
HCM 2000 Control Delay			29.9		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.93			
Actuated Cycle Length (s)			86.5		Sum of lost time (s)	12.0
Intersection Capacity Utilization			83.7%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 15: San Pablo Ave & Hercules Ave

11/25/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	474	1398	169	71	425	140	72	9	46	79	3	202	
Future Volume (vph)	474	1398	169	71	425	140	72	9	46	79	3	202	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		0.95		1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98		0.98		1.00	1.00	0.98	
Flpb, ped/bikes	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		0.95		1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1805	3610	1592	1805	3610	1586		3270		1805	1900	1584	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1805	3610	1592	1805	3610	1586		3270		1805	1900	1584	
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.90	0.90	0.90	0.96	0.96	0.96	
Adj. Flow (vph)	510	1503	182	74	443	146	80	10	51	82	3	210	
RTOR Reduction (vph)	0	0	23	0	0	99	0	48	0	0	0	194	
Lane Group Flow (vph)	510	1503	159	74	443	47	0	93	0	82	3	16	
Confl. Peds. (#/hr)	4		1	1		4	6		9	9		6	
Confl. Bikes (#/hr)			1						5				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm	
Protected Phases	5	2		1	6		8	8		4	4		
Permitted Phases			2			6						4	
Actuated Green, G (s)	58.6	94.9	94.9	9.0	45.3	45.3		8.3		10.8	10.8	10.8	
Effective Green, g (s)	58.6	94.9	94.9	9.0	45.3	45.3		8.3		10.8	10.8	10.8	
Actuated g/C Ratio	0.42	0.68	0.68	0.06	0.32	0.32		0.06		0.08	0.08	0.08	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	755	2447	1079	116	1168	513		193		139	146	122	
v/s Ratio Prot	c0.28	c0.42		0.04	0.12			c0.03		c0.05	0.00		
v/s Ratio Perm			0.10			0.03						0.01	
v/c Ratio	0.68	0.61	0.15	0.64	0.38	0.09		0.48		0.59	0.02	0.13	
Uniform Delay, d1	33.0	12.4	8.1	63.9	36.5	33.0		63.8		62.5	59.7	60.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.9	1.2	0.3	8.2	0.9	0.4		0.7		4.1	0.0	0.2	
Delay (s)	34.9	13.6	8.4	72.1	37.4	33.4		64.5		66.5	59.7	60.4	
Level of Service	C	B	A	E	D	C		E		E	E	E	
Approach Delay (s)		18.1			40.4			64.5			62.1		
Approach LOS		B			D			E			E		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			28.5			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio			0.64										
Actuated Cycle Length (s)			140.0	Sum of lost time (s)			17.0						
Intersection Capacity Utilization			75.4%	ICU Level of Service			D						
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis  
 16: Willow Ave & Sycamore Ave

11/25/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↖	↗	↖↗	↖	↗	↖	↖↗↘		↖	↗↘		
Traffic Volume (vph)	73	40	203	507	82	299	57	946	66	178	819	22	
Future Volume (vph)	73	40	203	507	82	299	57	946	66	178	819	22	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Lane Util. Factor		1.00	1.00	0.97	0.95	0.95	1.00	0.91		1.00	0.95		
Frbp, ped/bikes		1.00	0.98	1.00	0.99	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		1.00	1.00		
Frt		1.00	0.85	1.00	0.91	0.85	1.00	0.99		1.00	1.00		
Flt Protected		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1840	1582	3502	1635	1514	1805	5126		1805	3593		
Flt Permitted		0.97	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1840	1582	3502	1635	1514	1805	5126		1805	3593		
Peak-hour factor, PHF	0.85	0.85	0.85	0.96	0.96	0.96	0.91	0.91	0.91	0.89	0.89	0.89	
Adj. Flow (vph)	86	47	239	528	85	311	63	1040	73	200	920	25	
RTOR Reduction (vph)	0	0	184	0	49	150	0	6	0	0	1	0	
Lane Group Flow (vph)	0	133	55	528	154	43	63	1107	0	200	944	0	
Confl. Peds. (#/hr)	1		3	3		1	5		4	1		9	
Confl. Bikes (#/hr)									2				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA		
Protected Phases	4	4		8	8		5	2		1	6		
Permitted Phases			4			8							
Actuated Green, G (s)		12.3	12.3	25.5	25.5	25.5	8.6	40.4		19.8	51.6		
Effective Green, g (s)		12.3	12.3	25.5	25.5	25.5	8.6	40.4		19.8	51.6		
Actuated g/C Ratio		0.11	0.11	0.22	0.22	0.22	0.07	0.35		0.17	0.45		
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	2.0	4.0		2.0	4.0		
Lane Grp Cap (vph)		196	169	776	362	335	134	1800		310	1612		
v/s Ratio Prot		c0.07		c0.15	0.09		0.03	0.22		c0.11	c0.26		
v/s Ratio Perm			0.03			0.03							
v/c Ratio		0.68	0.33	0.68	0.43	0.13	0.47	0.61		0.65	0.59		
Uniform Delay, d1		49.4	47.5	41.0	38.5	35.8	51.0	30.9		44.3	23.7		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		9.0	1.1	2.5	0.8	0.2	0.9	1.6		3.4	1.6		
Delay (s)		58.4	48.6	43.5	39.3	36.0	52.0	32.4		47.8	25.3		
Level of Service		E	D	D	D	D	D	C		D	C		
Approach Delay (s)		52.1			41.0			33.5			29.2		
Approach LOS		D			D			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			36.0		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.65										
Actuated Cycle Length (s)			115.0		Sum of lost time (s)					17.0			
Intersection Capacity Utilization			67.4%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

# **Cumulative Plus Project PM Unsignalized**

HCM 6th TWSC  
 9: San Pablo Ave & Project Driveway

10/09/2019

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗		↑↑
Traffic Vol, veh/h	0	20	975	135	0	612
Future Vol, veh/h	0	20	975	135	0	612
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	1060	147	0	665

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1393	530	0	0	-
Stage 1	1060	-	-	-	-
Stage 2	333	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-
Pot Cap-1 Maneuver	133	493	-	-	0
Stage 1	294	-	-	-	0
Stage 2	698	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	133	493	-	-	-
Mov Cap-2 Maneuver	133	-	-	-	-
Stage 1	294	-	-	-	-
Stage 2	698	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBT
Capacity (veh/h)	-	-	-	493
HCM Lane V/C Ratio	-	-	-	0.044
HCM Control Delay (s)	-	-	0	12.6
HCM Lane LOS	-	-	A	B
HCM 95th %tile Q(veh)	-	-	-	0.1



HCM Unsignalized Intersection Capacity Analysis  
 10: John Muir Pkwy & Alfred Nobel Dr

09/29/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↶	↷	↷		↶	↷	
Traffic Volume (veh/h)	9	290	274	70	459	43	
Future Volume (Veh/h)	9	290	274	70	459	43	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.85	0.85	0.87	0.87	0.79	0.79	
Hourly flow rate (vph)	11	341	315	80	581	54	
Pedestrians					1		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)			831				
pX, platoon unblocked							
vC, conflicting volume	396				548	198	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	396				548	198	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	99				0	93	
cM capacity (veh/h)	1173				466	815	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	11	170	170	210	185	387	248
Volume Left	11	0	0	0	0	387	194
Volume Right	0	0	0	0	80	0	54
cSH	1173	1700	1700	1700	1700	466	514
Volume to Capacity	0.01	0.10	0.10	0.12	0.11	0.83	0.48
Queue Length 95th (ft)	1	0	0	0	0	202	65
Control Delay (s)	8.1	0.0	0.0	0.0	0.0	40.5	18.3
Lane LOS	A					E	C
Approach Delay (s)	0.3			0.0		31.9	
Approach LOS						D	
Intersection Summary							
Average Delay			14.7				
Intersection Capacity Utilization			31.1%		ICU Level of Service		A
Analysis Period (min)			15				

Intersection	
Intersection Delay, s/veh	48.7
Intersection LOS	E

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↘		↘	
Traffic Vol, veh/h	109	273	371	0	216	324
Future Vol, veh/h	109	273	371	0	216	324
Peak Hour Factor	0.87	0.87	0.77	0.77	0.93	0.93
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	125	314	482	0	232	348
Number of Lanes	1	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	2
HCM Control Delay	20.9	46.9	71.3
HCM LOS	C	E	F

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	40%
Vol Thru, %	0%	100%	100%	0%
Vol Right, %	0%	0%	0%	60%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	109	273	371	540
LT Vol	109	0	0	216
Through Vol	0	273	371	0
RT Vol	0	0	0	324
Lane Flow Rate	125	314	482	581
Geometry Grp	7	7	5	2
Degree of Util (X)	0.277	0.65	0.909	1.031
Departure Headway (Hd)	8.234	7.717	7.008	6.395
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	439	471	520	569
Service Time	5.934	5.417	5.008	4.395
HCM Lane V/C Ratio	0.285	0.667	0.927	1.021
HCM Control Delay	14.1	23.6	46.9	71.3
HCM Lane LOS	B	C	E	F
HCM 95th-tile Q	1.1	4.6	10.6	15.9

**Appendix D**  
**Recommended Project Improvement**  
**Conceptual Diagrams**



**Cumulative Condition:**  
- Widen and stripe right turn pocket to a length of 100 feet

**1: San Pablo & Willow**





## 8: San Pablo & Linus Pauling





# 11: San Pablo & John Muir

## Background &

### Cumulative Conditions:

- Widen and stripe right turn pocket to a length of 150 feet

## Background &

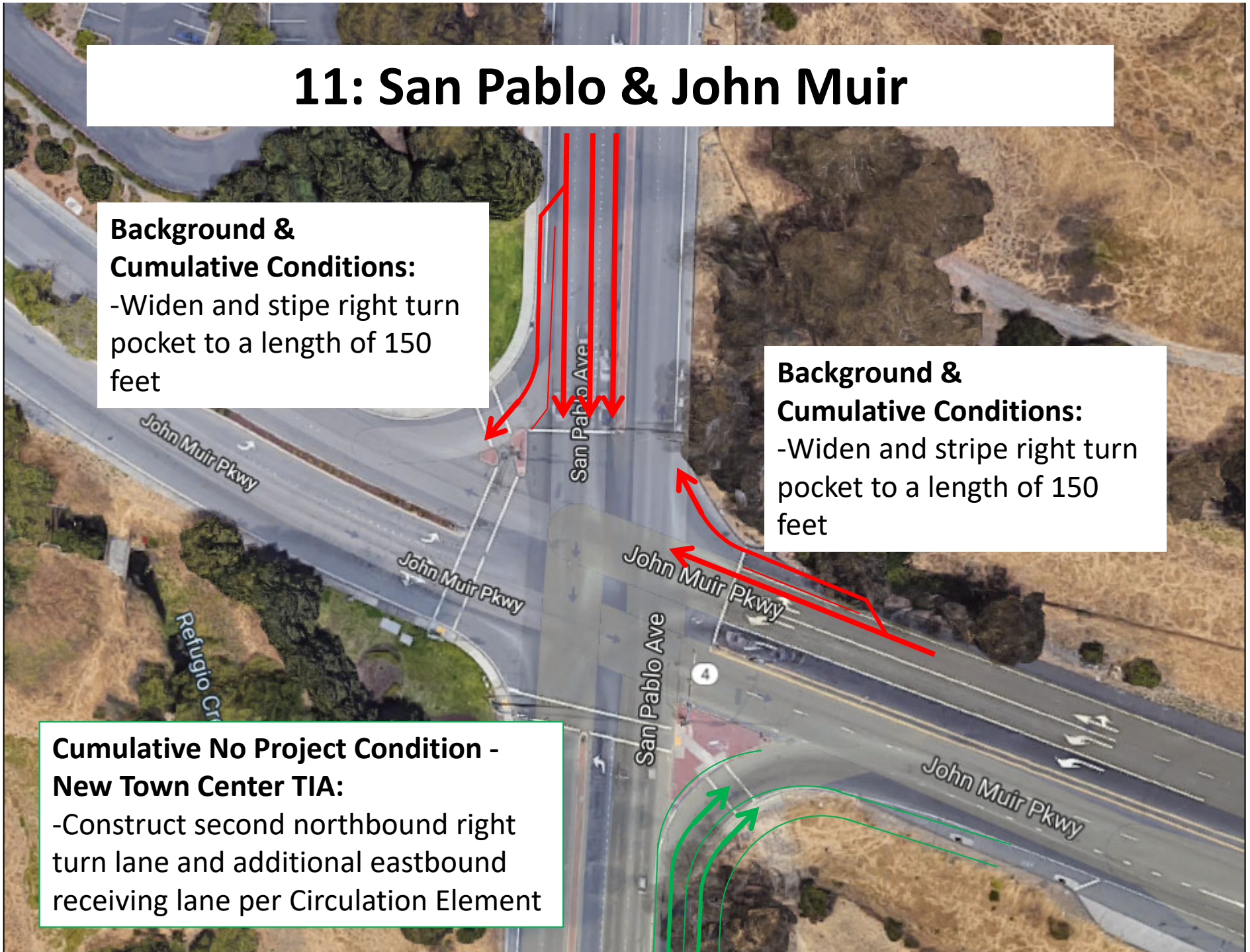
### Cumulative Conditions:

- Widen and stripe right turn pocket to a length of 150 feet

## Cumulative No Project Condition -

### New Town Center TIA:

- Construct second northbound right turn lane and additional eastbound receiving lane per Circulation Element





# 13: San Pablo & Sycamore

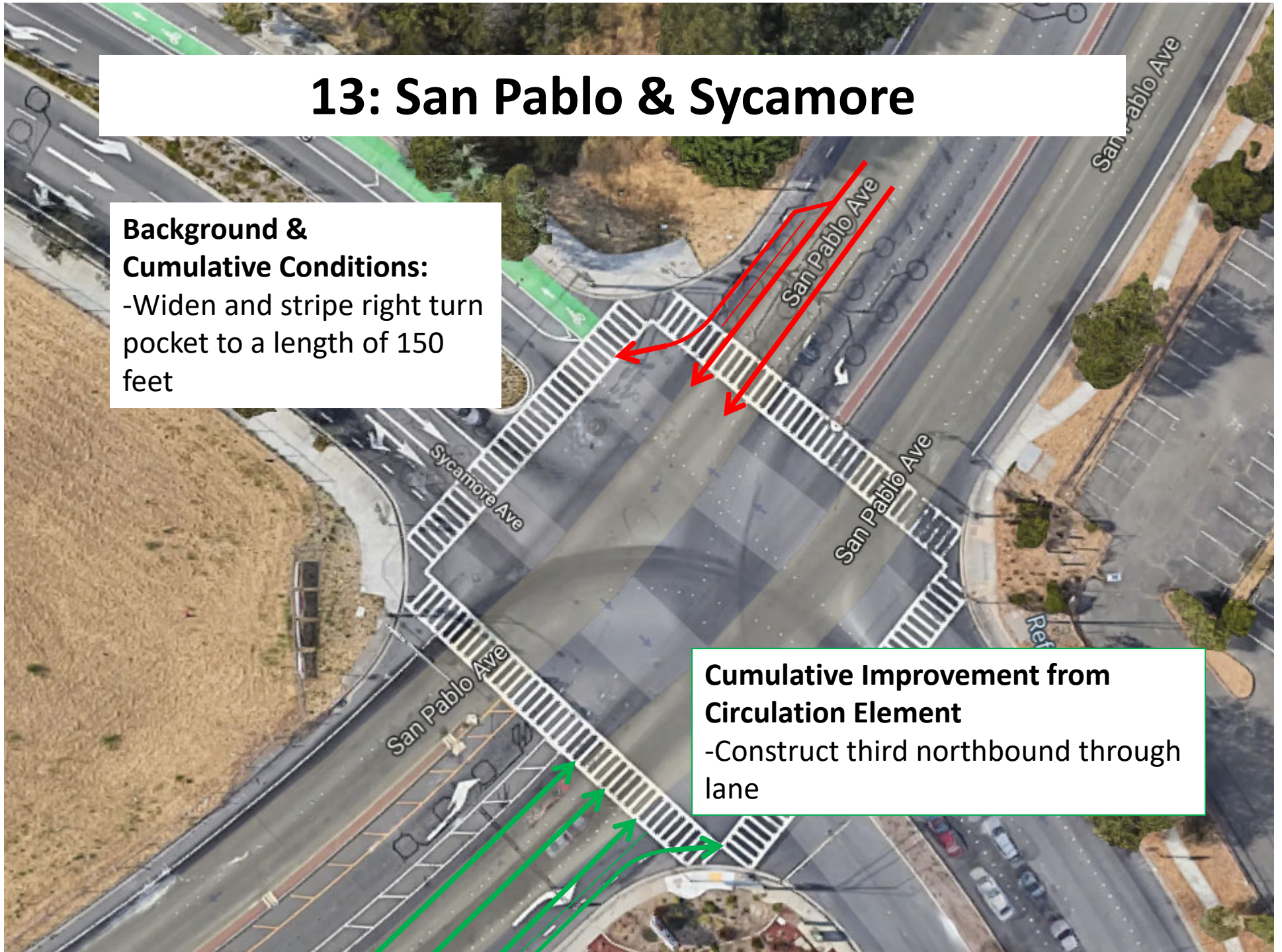
## Background &

### Cumulative Conditions:

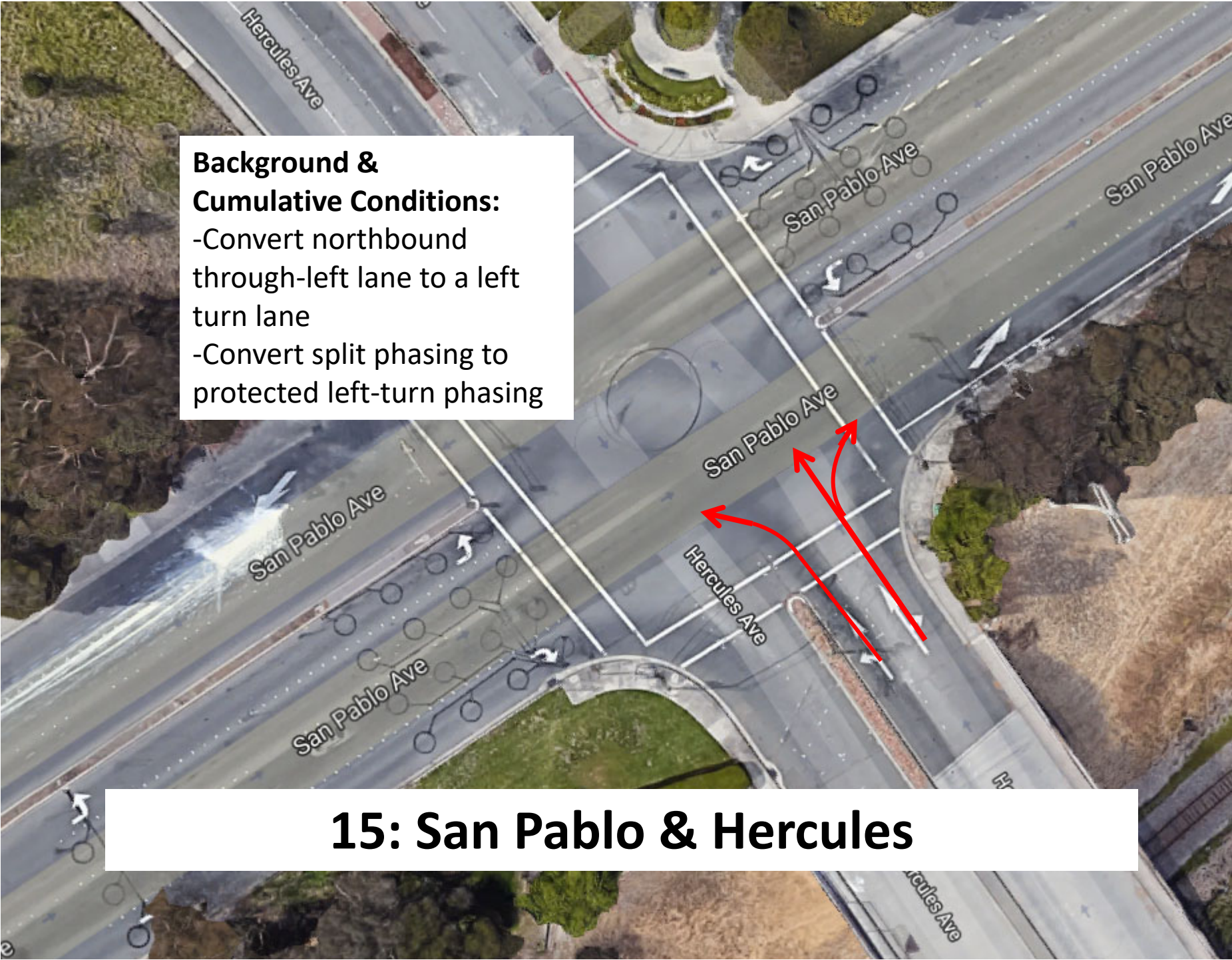
-Widen and stripe right turn pocket to a length of 150 feet

## Cumulative Improvement from Circulation Element

-Construct third northbound through lane







**Background & Cumulative Conditions:**

- Convert northbound through-left lane to a left turn lane
- Convert split phasing to protected left-turn phasing

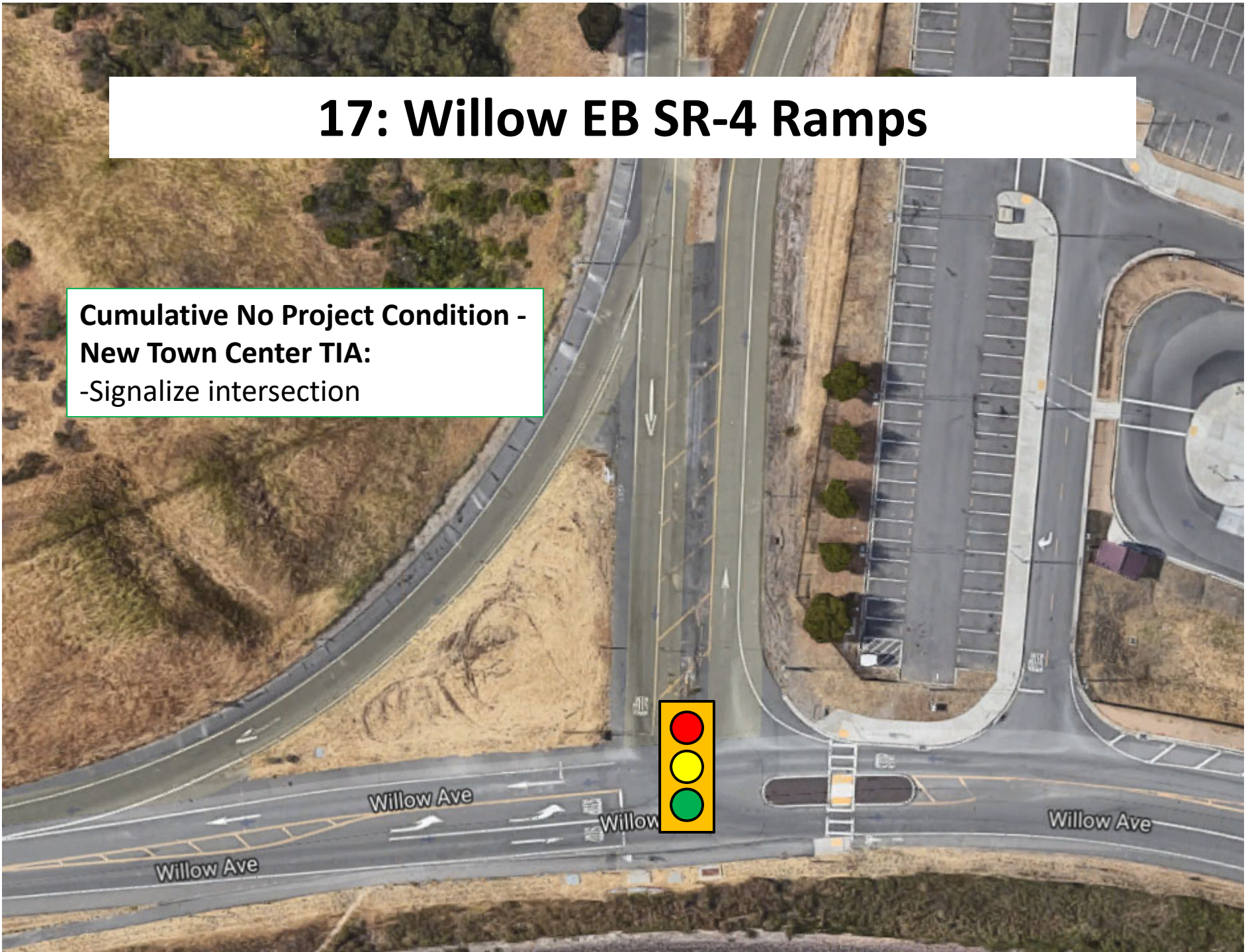
The image is an aerial photograph of a multi-lane intersection between San Pablo Avenue and Hercules Avenue. San Pablo Avenue runs diagonally from the top-left to the bottom-right, while Hercules Avenue runs horizontally across the middle. The intersection is marked with white lane lines and arrows. Three red arrows point to specific lane changes: one from the northbound through-left lane to a left-turn lane, and two from split phasing to protected left-turn phasing. The surrounding area includes green trees, a grassy area, and a paved road surface.

## 15: San Pablo & Hercules



# 17: Willow EB SR-4 Ramps

**Cumulative No Project Condition -  
New Town Center TIA:**  
-Signalize intersection



**Appendix E**  
**Background Trip Distribution Figures**







PM Peak						
SBR	EBL	EBT	EBR	WBL	WBT	WBR
66	73					
140				120		70
37	35					
22	24	198	41	20	118	
28	57	85			136	101
28						
	45	34			28	
	220					

Willow Avenue Commercial Center

Land Use	Units/ksf
Mini Warehouse	125
U-Haul Rental	8
Apartment	1
Tire Store	9.5
Auto Care Center	2.7
Car Wash Self Service	4
Car Wash Automated	2

Intersection		AM Peak																
Main Street (NS)	Cross Street (EW)	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
San Pablo Ave	Willow Ave																	
Willow Ave	Hawthorne Dr																	
Willow Ave	I-80 WB Off-Ramp																	
Willow Ave	I-80 EB Off-Ramp																	
Willow Ave	Viewpoint Blvd		16			19			41						24			23
Willow Ave	SR-4 WB Off-Ramp		16			19					8				24			23
San Pablo Ave	Victoria Cres W																	
San Pablo Ave	Linus Pauling Dr																	
San Pablo Ave	Future Hilltown Driveway																	
John Muir Pkwy	Alfred Nobel Dr																	
San Pablo Ave	John Muir Pkwy																	
San Pablo Ave	Market Hall																	
San Pablo Ave	Sycamore Ave																	
San Pablo Ave	Tsuhima Ave																	
San Pablo Ave	Hercules Ave																	
Sycamore Ave	Willow Ave			8	18						13		16			9	23	
Willow Ave	1-80 EB Off/SR-4 EB On				15				26			29					19	

PM Peak						
SBR	EBL	EBT	EBR	WBL	WBT	WBR
		51				
				9		
				19		24
		32			43	





PM Peak						
SBR	EBL	EBT	EBR	WBL	WBT	WBR
		2	5	46	3	
36	28	25		22	32	
4	10	25			23	11
						34

# Sycamore Crossing

Land Use	ksf
Supermarket	57.1
Bank	4
Coffee Shop	2
Fuel Station	20
Kiosk	2.5

Intersection		AM Peak											PM Peak						
Main Street (NS)	Cross Street (EW)	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
San Pablo Ave	Willow Ave																		
Willow Ave	Hawthorne Dr																		
Willow Ave	I-80 WB Off-Ramp																		
Willow Ave	I-80 EB Off-Ramp																		
Willow Ave	Viewpoint Blvd																		
Willow Ave	SR-4 WB Off-Ramp																		
San Pablo Ave	Victoria Cres W																		
San Pablo Ave	Linus Pauling Dr																		
San Pablo Ave	Future Hilltown Driiveway																		
John Muir Pkwy	Alfred Nobel Dr																		
San Pablo Ave	John Muir Pkwy	15	15	22		18		27					18	29	29	42		30	
San Pablo Ave	Market Hall																		
San Pablo Ave	Sycamore Ave		46		42	8	8	31	8	38	18				75		89	15	15
San Pablo Ave	Tsuhima Ave								39			46							
San Pablo Ave	Hercules Ave																		
Sycamore Ave	Willow Ave		27		21	21				27					45		44	45	
Willow Ave	I-80 EB Off/SR-4 EB On						9		18		7	14							15

Peak					
EBL	EBT	EBR	WBL	WBT	WBR
46			30		
59	15	67	30		
	74			75	
		45			
	30		15	29	