Transportation Impact Analysis

Peninsula Heights Development TIA

San Mateo, California

FINAL

November 2020

Transportation Impact Analysis

Peninsula Heights Development TIA

San Mateo, California

Prepared For:
Rendell Bustos
City of San Mateo
330 West 20th Avenue
San Mateo, CA 94403
(650) 522-7211

Prepared By:
Kittelson & Associates, Inc.
155 Grand Avenue, Suite 505
Oakland, California 94612
(510) 839-1742

Project Analysts: Anusha Musunuru, Lindsey Willman
Project Manager: Amanda Leahy, AICP
Project Principal: Damian Stefanakis

Project No. 24837.001

November 2020

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

EXECUTIVE SUMMARY

PROJECT TRIP GENERATION

The proposed project is estimated to generate 58 fewer vehicle trips (-130 inbound, 72 outbound) during the weekday AM peak hour and 22 fewer vehicle trips (73 inbound, -95 outbound) during the weekday PM peak hour compared to the existing office use. Accounting for the difference between the proposed project trips and the existing occupancy of the office buildings, the proposed project would not meet the minimum threshold of 100 new peak hour vehicle trips for a congestion management program (CMP) analysis per C/CAG CMP guidelines.

CEQA ANALYSIS

The proposed project is located within transportation analysis zone (TAZ) 2965, which has a vehicle miles traveled (VMT) per Capita of 23.9 and exceeds the countywide regional average of 15.5 VMT per Capita. Given that the project would replace an existing commercial area, the total VMT, generated by the existing and proposed land uses, was calculated to determine whether the proposed project would result in a net increase in VMT. Based on the total VMT calculations, the proposed project would result in a net reduction of 4,085 VMT at the project site and would result in a less-than-significant impact with respect to VMT.

LOCAL TRANSPORTATION ANALYSIS

Kittelson conducted the intersection level of service analysis at four study intersections for Existing, Baseline, Baseline with Project, Cumulative, and Cumulative with Project Conditions for weekday AM and PM peak hour traffic conditions. Kittelson reviewed the site access and on-site circulation based on the proposed site plan and the changes in the 95th percentile queue lengths caused by the proposed project at the study intersections. The results for all scenarios are presented in the report below. The proposed project would not cause any study intersections to exceed the level of service standard as specified in the City's Circulation Element of the 2030 General Plan, i.e. the acceptable level of service standards that were in place in February 2020, at the time of the Senate Bill 330 Application[1].

[1] The developer submitted a Senate Bill 330 Application in February 2020 that freezes codes and policies in effect of its submitted date.

INTRODUCTION

This report documents the California Environmental Quality Act (CEQA) analysis findings and the local transportation analysis conducted for the proposed Peninsula Heights development in San Mateo, California (Figure 1).

PROJECT DESCRIPTION

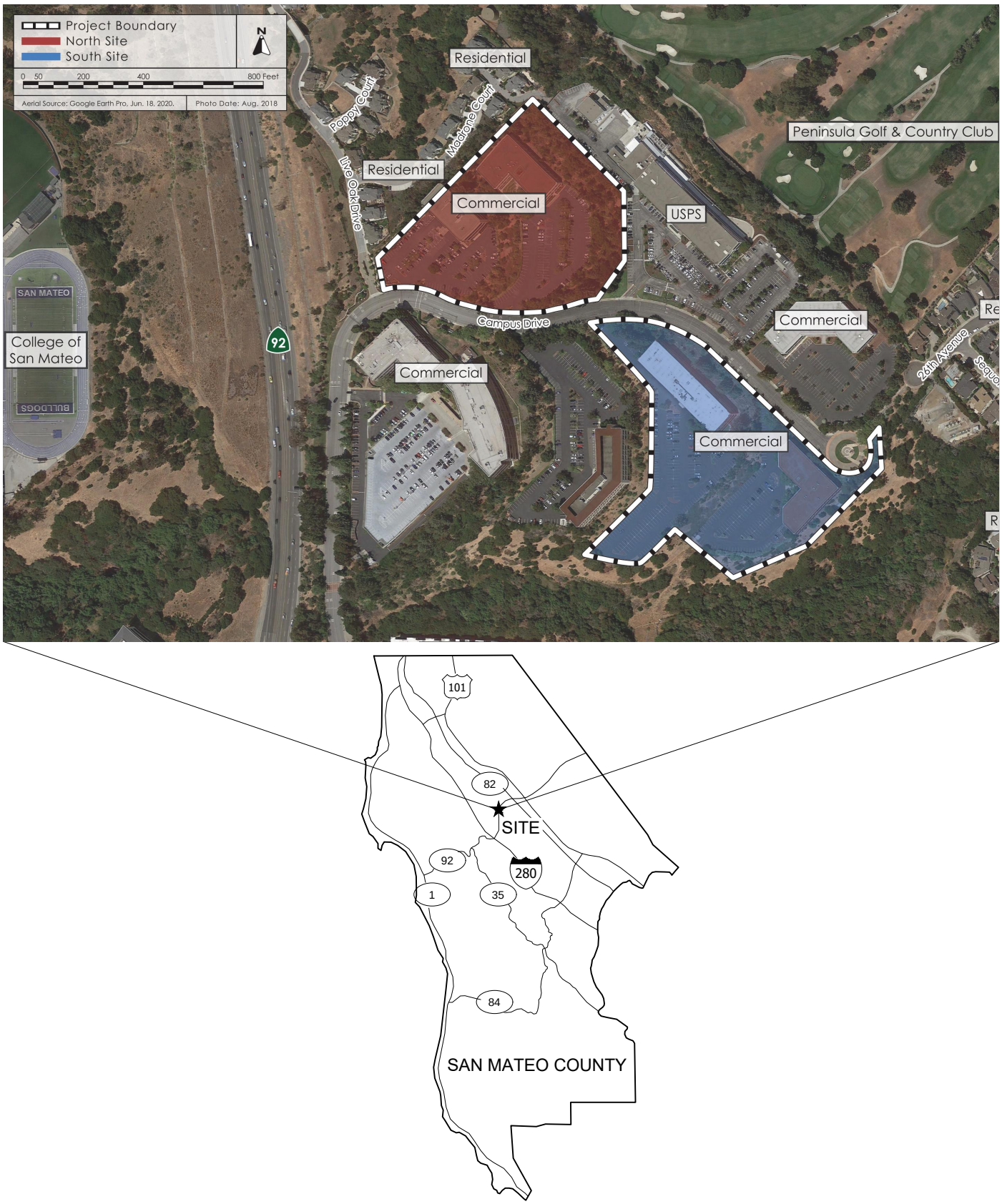
Project Location

The proposed project is located to the east of California State Route 92 (SR 92), on a hillside, across two parcels of 15.45 acres in San Mateo, California (Figure 1). Access to the existing site is provided via two two-way driveways on the north side and two two-way driveways on the south side of Campus Drive. Nearby land uses include residential, office, commercial, recreational, and institutional. There is also an undeveloped canyon to the south and southeast of the site.

Existing and Proposed Uses

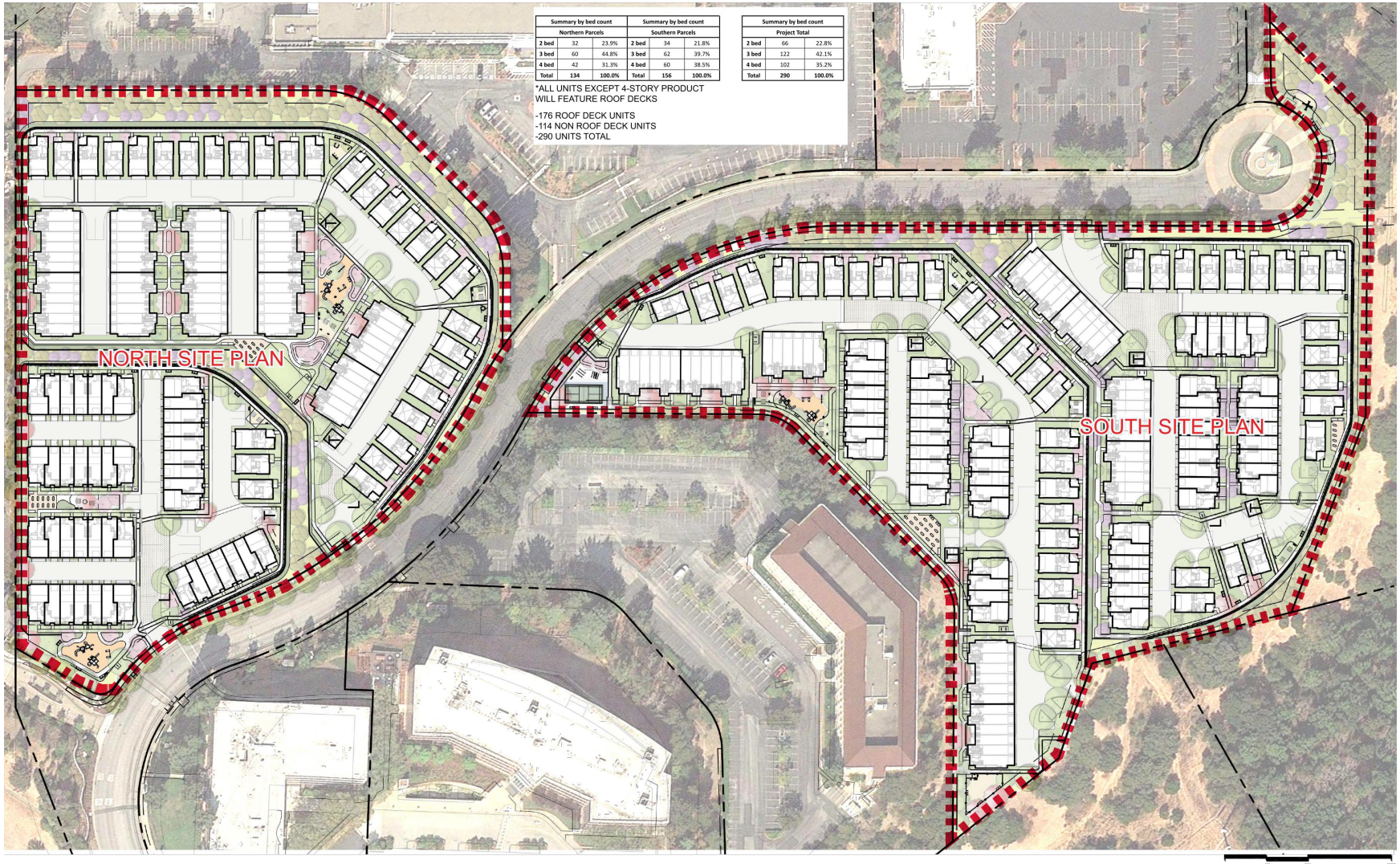
The existing site includes two parcels divided by Campus Drive – a northern parcel (7.04 acres) and a southern parcel (8.41 acres). The site includes four office buildings totaling 224,844 square feet of office space. The General Plan designation of the project site is *Executive Office* and zoned as E1-1 (Executive Park) which supports administrative, executive, and office-related commercial uses. Residential use is permitted in this zone with a Special Use Permit and is subject to the minimum development standards for R3 zoning and affordable housing requirements as adopted by City Council resolution.

Harvest Properties is proposing to replace the existing office buildings and construct 290 residential units composed of three-story, four-story townhomes, stacked flats, and detached single-family residences. The northern parcel would accommodate 60 four-story townhomes, 44 three-story townhomes, and 30 single-family dwelling units. The southern parcel would consist of 54 four-story townhomes, 58 three-story townhomes, and 44 single-family dwelling units (Figure 2). Each residential building would be a maximum of 46 feet tall, and each unit would range between 1,400 to 2,200 square feet. The project would reserve 10 percent of units as below market rate (BMR) units, for a total of 29 affordable units, and would qualify for benefits under the State Density Bonus law (California Government Code 65915). Additional on-site amenities would include four to six mini-parks, picnic areas, open spaces, terraces, and 1.2 miles of landscaped paths that would provide the residences public access to the surrounding roadways and neighborhoods. Regional access to the project site would be primarily provided by State Route 92 via W Hillsdale Boulevard and Campus Drive. Local access to the project site would be provided by Campus Drive.



Project Location

Figure 1



Summary by bed count		
Northern Parcels		
2 bed	32	23.9%
3 bed	60	44.8%
4 bed	42	31.3%
Total	134	100.0%

Summary by bed count		
Southern Parcels		
2 bed	34	21.8%
3 bed	62	39.7%
4 bed	60	38.5%
Total	156	100.0%

Summary by bed count		
Project Total		
2 bed	66	22.8%
3 bed	122	42.1%
4 bed	102	35.2%
Total	290	100.0%

*ALL UNITS EXCEPT 4-STORY PRODUCT WILL FEATURE ROOF DECKS

-176 ROOF DECK UNITS
-114 NON ROOF DECK UNITS
-290 UNITS TOTAL

PENINSULA HEIGHTS - SAN MATEO, CA

CAMPUS POP INVESTOR, LLC

PROPOSED OVERALL SITE PLAN

DAHLIN

JOB NO. 1483.001
DATE 05-20-20
5865 Owens Drive
Pleasanton, CA 94588
925-251-7200

N

1.3

Received from City of San Mateo (July 13, 2020)

Site Plan

Figure 2

C:\Users\lwillman\appdata\local\temp\AcPublish_21652\24837-Figures.dwg Sep 17, 2020 - 8:43am - lwillman Layout Tab: Site Plan

KITTELSON & ASSOCIATES

Transportation Demand Management Plan

The proposed project would implement a Transportation Demand Management (TDM) Plan to encourage sustainable, automobile-alternative, modes of transportation and reduce vehicle trips to and from the site. The available TDM services, proposed and recommended TDM measures are summarized in this section from the TDM Plan[2], as follows.

Available TDM Services

Commute.org is San Mateo County's Transportation Demand Management Agency. The residents and employees of the proposed project site will be able to take advantage of TDM resources curated for those commuting within the county and in surrounding areas, including:

- CAM Shuttle (Campus Drive, Commute.org Shuttle)
- Try Transit Incentives
- Ridematching
- Carpool Incentives
- Vanpool Incentives
- Bike Education
- Bike Incentives
- E-Bike Rebate
- Guaranteed Ride Home (GRH)

Proposed TDM Measures

The developer proposed TDM measures include the following:

- Upgrading current Class III Bicycle Route to Class II bike lane on Campus Drive from the shopping center to the east end gate,
- Sidewalk improvements to the proposed project site (study area), aligning with the City's Pedestrian Design Guidelines,
- Providing short term bike racks and long-term bicycle parking, and
- prewiring for electric vehicle charging in garages.

Additional Recommended TDM Measures

In addition to the developer proposed TDM measures by Harvest Properties, Steer Group recommended programmatic TDM measures to reduce VMT and increase sustainable trips. The Peninsula Heights TDM Plan outlines each of the TDM measures in detail, including the guidelines for implementation, cost estimates for each of the TDM measures, expected timelines, and anticipated responsible party for each

[2] Peninsula Heights TDM Plan, Prepared for the City of San Mateo by Steer Group, September 2020.

recommended measure. This section outlines the TDM measures developed by Steer Group, as part of this project, as follows:

- TDM Administration and Information Sharing
- Bike and Walk Strategies
- Recommended Shared Vehicle Strategies

SCOPE OF STUDY

The purpose of this transportation analysis is to determine whether the proposed project would have transportation impacts, as defined by the City of San Mateo's acceptable level of service standards in the Circulation Element of the 2030 General Plan, and VMT guidelines provided by the Governor's Office of Planning and Research (OPR), as of February 2020. The City was in the process of developing updated Traffic Impact Analysis Guidelines consistent with the City's General Plan and OPR requirements. The analysis covers the following topics:

California Environmental Quality Act (CEQA) Analysis

The California Environmental Quality Act (CEQA) transportation analysis assesses how the study area's transportation system would operate with the implementation of the proposed project at Peninsula Heights. The technical advisory provided by the OPR specifically addresses the requirements of California Senate Bill (SB) 743 which mandated specific types of CEQA analysis of land use development and transportation projects effective July 1, 2020. The quantitative methodology, significance thresholds, and mitigation measures for conducting transportation analysis are based on vehicle miles traveled (VMT) metrics.

Local Transportation Analysis

The City of San Mateo requires the analysis of unsignalized and signalized intersections, though it does not require the analysis of roadway segments, in compliance with the 2030 General Plan. Since a roadway segment's capacity is generally controlled by the downstream intersection, an intersection analysis is sufficient for assessing a project's impacts. Based on the discussions with City Staff and the approved scope of work, Kittelson evaluated the following under the local transportation analysis section:

- Site Access and On-Site Circulation
    - Vehicular Access
    - Pedestrian Access
    - Bicyclist Access
    - Transit Access
    - Emergency Vehicle Access
- Intersection Operations
    - Level of Service
    - Vehicle Queueing

CEQA ANALYSIS

SCREENING CRITERIA

According to the technical advisory by OPR[3], a project requires detailed VMT analysis unless it meets at least one of the City's five screening criteria:

1. Small Projects
2. Affordable Housing
3. Local-Serving Retail and Public Services
4. High-Quality Transit Area
5. Project Located in Low VMT Areas

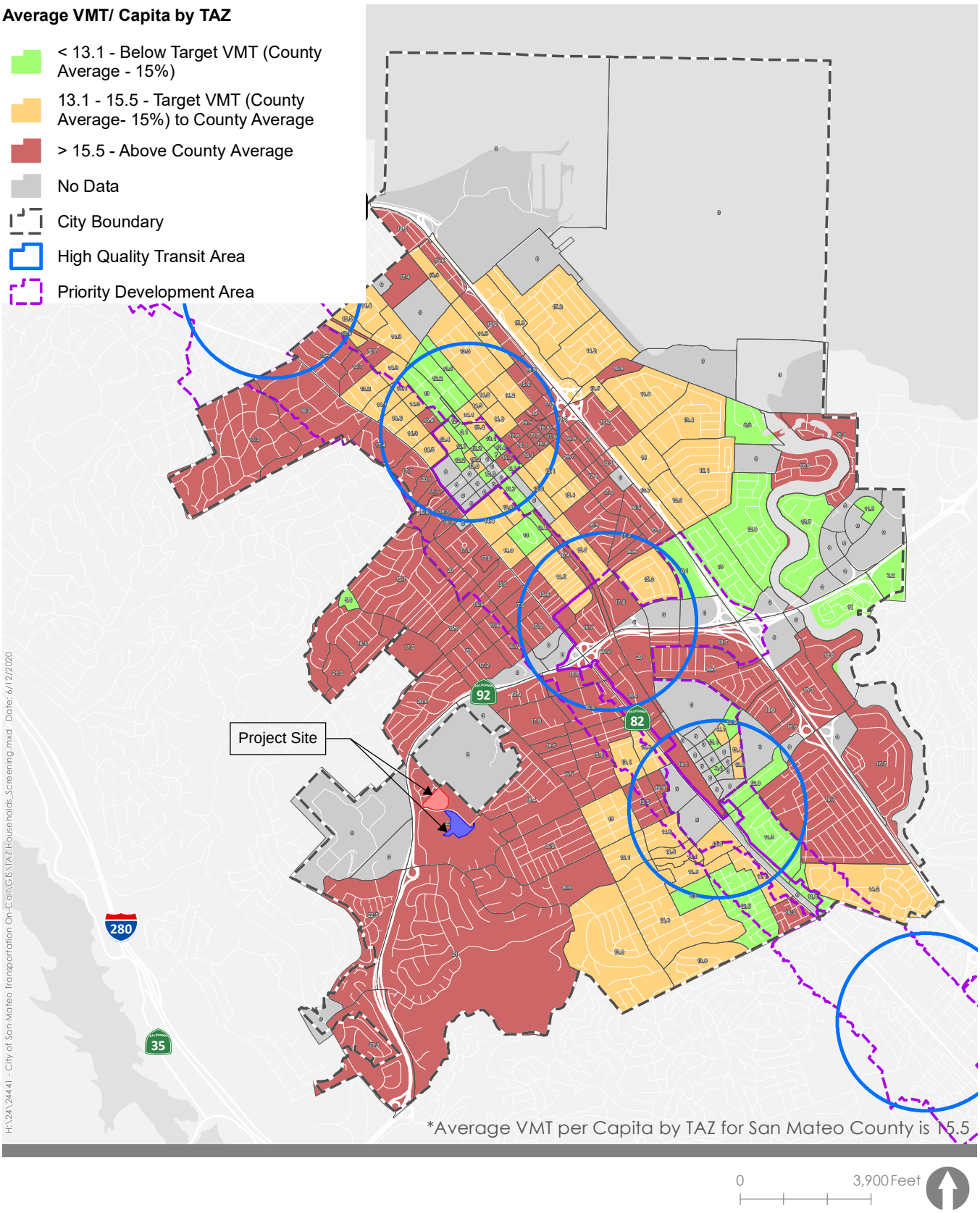
The proposed project would not meet any of the OPR's screening criteria and would not be screened out for the reasons described below. As such, a detailed VMT analysis is required.

1. *Small Projects* – The proposed project has 290 residential units and generates more than 110 vehicle daily trips.
2. *Affordable Housing* – The affordable housing for the proposed project is 10 percent which is less than 100 percent criterion specified in the guidelines.
3. *Local-Serving Retail and Public Services* – The proposed project is 100 percent residential, so this criterion does not apply.
4. *High-Quality Transit Area* – The proposed project is not located in a high-quality transit area as specified in Attachment A of the guidelines.
5. *Project Located in Low VMT Areas* – The proposed project is in TAZ 2965 with VMT per Capita of 23.9. San Mateo County has a regional average of 15.5 VMT per Capita with an impact threshold of 13.1 VMT per Capita for residential uses. The project is not located within a low VMT area (See Figure 3 and Figure 4).

SIGNIFICANT IMPACT THRESHOLDS

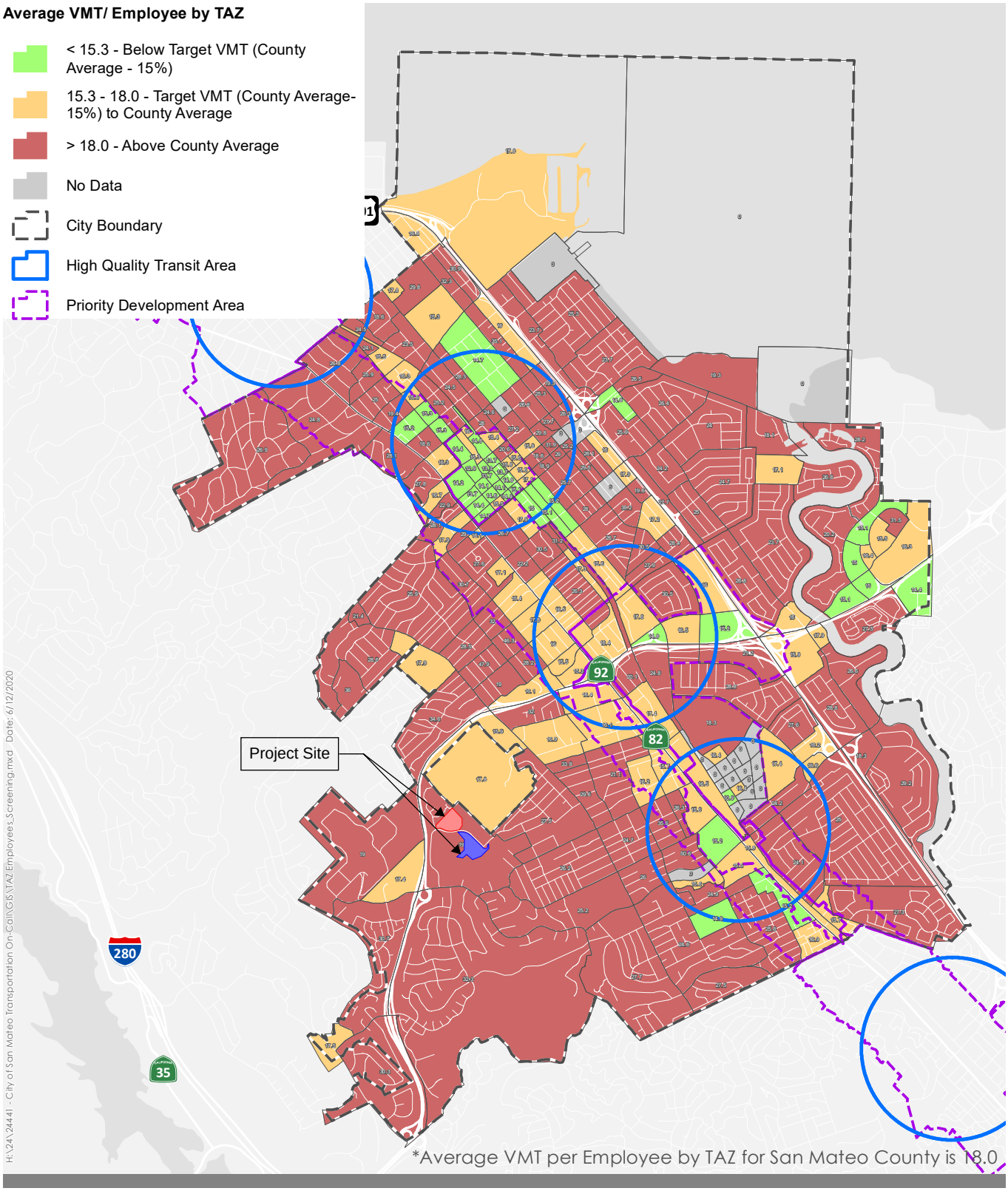
For projects which do not meet the screening criteria; the following threshold is used to assess a significant impact related to VMT, consistent with the OPR guidance. For residential projects, the project's impact would be considered significant if it would - Generate VMT per Capita greater than 15 percent below the existing San Mateo County average of 13.1 VMT per Capita

[3] Technical Advisory on Evaluating Transportation Impacts in CEQA, Governor's Office of Planning and Research, December 2018.



VMT Per Capita

Figure 3



VMT Per Employee

Figure 4

KITTELSON & ASSOCIATES

IMPACT DISCUSSION

Vehicle Miles Traveled

The proposed project is in TAZ 2965 with VMT per Capita of 23.9. San Mateo County has a regional average of 15.5 VMT per Capita with an impact threshold of 13.1 VMT per Capita for residential uses. However, according to Section E Redevelopment Projects (Page 17) of the technical advisory of OPR, "When a project replaces existing VMT-generating land uses and the project leads to a net overall decrease in VMT, the project would lead to a less-than-significant transportation impact."

Since the proposed project is a redevelopment project, replacing the existing office uses totaling approximately 224,844 square feet with 290 new residential units, the total VMT for existing and proposed uses was calculated to see if there is a net decrease or increase in the overall VMT. The total VMT calculations are presented in in Table 1.

Table 1: Total VMT Calculations for Existing and Proposed Uses

Site Conditions	Size (Characteristics)	Number of Employees/Residents	Existing VMT per Employee or VMT Per Capita for TAZ 2965	Total VMT Generated by the Site
Existing Office Use	224,844 (73.3% occupancy rate)[1]	1,320 employees[2]	19.5	25,740
Proposed Residential Use	290 Units (906 Bedrooms)	906 residents[3]	23.9	21,655
Net VMT Change (Proposed Residential Use – Existing Office Use)				-4,085

Source: Kittelson & Associates, 2020.
Notes:
[1] Assumes an average occupancy rate of 73.3% over the most recent three-year period. Occupancy data provided by City staff via email, dated July 24, 2020.
[2] Assumes an average of 125 square feet per employee based on data obtained from Gensler *Workplace Standards Benchmarking* (March 6, 2012) for the technology, finance, and biotech and science fields. https://www.gsa.gov/cdnstatic/Workplace_Standards_Benchmark.pdf.
[3] Assumes one person per bedroom.

As shown in Table 1, with the proposed project, there would be a net decrease in VMT at the project site. The proposed residential use would generate 4,085 fewer vehicle miles traveled on a daily basis than the existing office buildings.

According to Section E Redevelopment Projects (Page 17) of the technical advisory of OPR, the proposed project would result in a less-than-significant impact with respect to VMT and no further analysis or mitigations are required.

LOCAL TRANSPORTATION ANALYSIS

SCOPE OF STUDY

Time Periods

Traffic conditions at the study intersections were analyzed for the weekday AM and PM peak hours of adjacent street traffic. The AM peak hour occurs between 7 AM and 9 AM, and the PM peak hour occurs between 4 PM and 6 PM on a regular weekday. It is during these peak commute periods that the traffic demand on the roadway system is the greatest.

Transportation conditions were evaluated for the following scenarios:

- *Existing Conditions*. Traffic volumes for the Existing Conditions were estimated using historical counts, as collecting turning movement volumes at the study intersections was not recommended due to COVID-19[4] conditions. The study intersections were evaluated with a level of service analysis using Synchro software in accordance with the 2010 Highway Capacity Manual methodology.
- *Baseline Conditions*. Baseline traffic volumes were estimated by adding the projected volumes from approved, but not yet completed developments to existing peak hour volumes for the project completion year.
- *Baseline with Project Conditions*. Baseline traffic volumes with the project were estimated by adding the additional traffic generated by the project to the baseline traffic volumes. Baseline with Project Conditions were evaluated relative to Baseline Conditions to determine the effects the proposed project would have on the baseline roadway network.
- *Cumulative Conditions*. Cumulative Conditions are represented by future traffic volumes on the roadway network. This scenario was estimated by adding a regional growth to existing traffic volumes between the existing year (2020) and future year (2040).
- *Cumulative with Project Conditions*. Cumulative traffic volumes with the project are estimated by adding cumulative traffic volumes to the additional traffic generated by the project. Cumulative with Project Conditions were evaluated relative to Cumulative Conditions to determine the effects the proposed project would have on the future roadway network.

[4] The COVID-19 pandemic has resulted in shelter-in-place orders across the Bay Area and travel demand is significantly reduced across all modes. Travel patterns have also changed substantially. These changes are the result of multiple factors such as school closures, restrictions on business operations, and an increased amount of telecommuting.

Study Intersections

The following four study intersections were selected for analysis and are shown in Figure 5.

1. Campus Drive at Hillsdale Boulevard
2. SR-92 Westbound Ramps at Hillsdale Boulevard
3. SR-92 Eastbound Ramps at Hillsdale Boulevard
4. Alameda de Las Pulgas at Hillsdale Boulevard

Intersection Level of Service (LOS) Criteria

Level of service (LOS) describes the operating conditions experienced by motorists. LOS is a qualitative measure of the effect of a number of factors, including speed and travel time, traffic interruptions and delay, freedom to maneuver, driving comfort, and convenience. LOS A through LOS F covers the entire range of traffic operations that might occur. Motorists using a facility that operates at a LOS A experience very little delay, while those using a facility that operates at a LOS F will experience long delays. Intersection analyses for the four study intersections were conducted using the operational methodologies outlined in the 2010 Highway Capacity Manual (HCM) (Transportation Research Board, Washington, D.C., 2010), calculated with Synchro software.

Signalized Intersections

The HCM procedure calculates a weighted average control delay in seconds per vehicle at a signalized intersection and assigns a level of service designation based upon the delay. The City of San Mateo level of service standard is mid-LOS D (delay of 45 seconds) or better for all signalized study intersections.

Unsignalized Intersections

The HCM methodology calculates a weighted average control delay in seconds per vehicle for each controlled intersection leg and for the intersection. A level of service designation for all-way stop-controlled intersections is based upon the weighted average control delay for all intersection legs, similar to the level of service designation for signalized intersections. For two-way stop-controlled intersections, the LOS for the worst approach is used as the LOS performance measure. The City of San Mateo does not have a LOS standard for unsignalized intersections as specified in the 2030 General Plan. While the City adopted Transportation Impact Analysis (TIA) Guidelines in August 2020 to include LOS standards for unsignalized intersections, those standards do not apply to this analysis because the developer submitted a Senate Bill 330 Application in February 2020 that freezes codes and policies in effect of its submitted date. Therefore, intersection levels of service for unsignalized intersections are reported for informational purposes only.

Table 2 presents the relationship of average delay to level of service for both signalized and unsignalized intersections.

Study Intersections:

1. Campus Drive at Hillsdale Boulevard
2. SR-92 Westbound Ramps at Hillsdale Boulevard
3. SR-92 Eastbound Ramps at Hillsdale Boulevard
4. Alameda De Las Pulgas at Hillsdale Boulevard

Study Intersections

Figure 5

Table 2: Level of Service Definition for Intersections

Signalized Intersection			Unsignalized Intersection
Average Delay Per Vehicle (Seconds)	LOS	Description of Traffic Conditions	Average Delay Per Vehicle (Seconds)
≤10.0	A	Free flowing. Most vehicles do not have to stop.	≤10.0
>10.0 and ≤20.0	B	Minimal delays. Some vehicles have to stop, although waits are not bothersome.	>10.0 and ≤15.0
>20.0 and ≤35.0	C	Acceptable delays. Significant numbers of vehicles have to stop because of steady, high traffic volumes. Still, many pass without stopping.	>15.0 and ≤25.0
>35.0 and ≤55.0	D	Tolerable delays. Many vehicles have to stop. Drivers are aware of heavier traffic. Cars may have to wait through more than one red light. Queues begin to form, often on more than one approach.	>25.0 and ≤35.0
>55.0 and ≤80.0	E	Significant delays. Cars may have to wait through more than one red light. Long queues form, sometimes on several approaches.	>35.0 and ≤50.0
>80.0	F	Excessive delays. Intersection is jammed. Many cars have to wait through more than one red light, or more than 60 seconds. Traffic may back up into "up-stream" intersections.	>50.0

Source: Transportation Research Board, 2010 Highway Capacity Manual (Washington D.C., 2010)

General Plan LOS Policy Standard

Per the City's General Plan Policy C 2.7, all projects are required, at a minimum, to pay a transportation mitigation fee. The transportation mitigation fee is used to fund planned transportation improvements that are identified in the City of San Mateo Traffic Mitigation Program. The cost of the off-site improvements may be reimbursed by the City if a reimbursement program is established through the timeframe of the City of San Mateo's current Traffic Mitigation Program or at the time when the improvement was initially scheduled. In addition to paying the transportation impact fee, a development project may be required to fund off-site circulation improvements which are needed as a result of project generated traffic if:

Signalized Intersections

a) The level of service at the intersection drops below mid-level LOS D (average delay of more than 45 seconds) when the project traffic is added, **and**
b) An intersection that operates below its level of service standard under the base year conditions experiences an increase in delay of four or more seconds, **and**

c) The needed improvement of the intersection(s) is not funded in the applicable five-year City Capital Improvement Program from the date of application approval.

Unsignalized Intersections

As of February 2020, when the developer submitted its Senate Bill 330 application, the City of San Mateo did not have a LOS standard for unsignalized intersections as specified in the 2030 General Plan. Transportation studies typically evaluate whether unsignalized intersections are functioning adequately and whether signalization is warranted using the peak-hour volume signal warrant described in the California MUTCD.

EXISTING CONDITIONS

Roadway Network

Regional access to the project site would be primarily provided by State Route 92 via W Hillsdale Boulevard and Campus Drive.

State Route 92 is a four-to six lane state highway in California, serving as a major east-west corridor in the San Francisco Bay Area. It extends from State Route 1 in Half Moon Bay at the west end and San Mateo-Hayward Bridge to downtown Hayward in the East Bay at its junction with State Route 238. Access to and from the project study area is provided via interchanges at Hillsdale Boulevard.

Hillsdale Boulevard is an arterial roadway that extends in an east-west direction from the San Mateo Community College and transitioning into Beach Park Boulevard. In the vicinity of the project site, Hillsdale Boulevard has four lanes, and provides access to the project site via Campus Drive and State Route 92.

Campus Drive is a north-south local collector that extends from Hillsdale Boulevard to 26th Avenue. Collector streets are designed to channel traffic from local streets to arterials, and to handle short trips within the neighborhood areas. In the vicinity of the project site, Campus Drive has four lanes, and provides direct access to the project site via driveways.

Alameda de Las Pulgas is a north-south, four-lane arterial roadway extending from the St. Bartholomew School at Crystal Springs Road on the north and transitioning into San Carlos Avenue. In the vicinity of the project site, Alameda de Las Pulgas has four lanes, and provides access to the project site via Hillsdale Boulevard and Campus Drive.

Pedestrian Facilities and Amenities

Pedestrian facilities consist of sidewalks, crosswalks, and pedestrian signals at signalized intersections. In the project vicinity, sidewalks exist along both sides of Campus Drive, Hillsdale Boulevard, and Alameda

de Las Pulgas, providing pedestrian access to and from the project site. Marked crosswalks with pedestrian signal heads and push buttons are provided at Campus Drive/Hillsdale Boulevard intersection and marked crosswalks on all stop-controlled approaches are provided at Hillsdale Boulevard/Alameda de Las Pulgas intersection. The overall network of sidewalks and crosswalks in the study area has good connectivity and provides pedestrian with safe routes to maneuver.

As mentioned in the TDM memo developed by Steer Group, per the Citywide Pedestrian Master Plan, the project site's change of use from commercial to single and multi-family will obligate the developer to implement Pedestrian Design Guideline A.5 *Residential Type C New Development,* requiring a minimum overall sidewalk width of 9.5 feet with a recommended width of 12 feet.

Bicycle Facilities and Amenities

Bicycle facilities are defined by the following four classes[5]:

- **Class I** (Multi-use Path) – Provides a completely separated facility designed for the exclusive use of bicyclists and pedestrians with crossing points minimized.
- **Class II** (Bike Lane) – Provides a restricted right-of-way designated lane for the exclusive or semi-exclusive use of bicycles with through travel by motor vehicles or pedestrians prohibited, but with vehicle parking and crossflows by pedestrians and motorists permitted.
- **Class III** (Bike Route) – Provides a right-of-way designated by signs or permanent markings and shared with pedestrians and motorists.
- **Class IV** (Separated Bike Lane) – Provides a restricted right-of-way designated lane for the exclusive use of bicyclists that is separated by a vertical element to provide further separation from motor vehicle traffic.

The existing and proposed[6] bicycle routes within the study area are described below. The existing bicycle network is shown in Figure 6.

Alameda de Las Pulgas – This corridor has been identified by the public and local jurisdictions as a key bicycling corridor connecting Santa Clara County to San Mateo. It provides an inland alternative to the Bay Trail. Bike lanes (Class II) are striped on approximately half the length of the corridor (South of Belmont) while the remainder is a signed bicycle route (Class III). There is an existing Class III bike route on Alameda de Las Pulgas in the vicinity of the project. The 2020 Bicycle Master Plan proposes a Class II bike lane between 26th Avenue and Crystal Springs Road.

[5] As detailed in Chapter 1000 of the Highway Design Manual (Caltrans, 2015).

[6] As proposed in City of San Mateo Bicycle Master Plan, 2020. https://www.cityofsanmateo.org/3944/Bicycle-Master-Plan-2020.

Hillsdale Boulevard – There is an existing Class II bike lane on Hillsdale Boulevard extending from Alameda de Las Pulgas to Laurel Creek Drive, in the vicinity of the project site. The Bicycle Master Plan proposes extending the existing Class II bike lane from Laurel Creek Drive to 31st Avenue and installing a Class IV separated bike lane from 31st Avenue to San Mateo Community College.

Campus Drive/26th Avenue – There is an existing Class III bike route on Campus Drive extending from Hillsdale Boulevard to 26th Avenue, providing access to the project site. The Bicycle Master Plan proposes upgrading the existing Class III bike route to a Class II bike lane on Campus Drive to 26th Avenue and designating a Class III facility on 26th Avenue between Campus Drive and Hacienda Street.

Transit Service

The existing transit service to the study area is provided by the San Mateo County Transit District (SamTrans), Norfolk Caltrain Shuttle, and Caltrain. The project site has five bus routes (Route 250, 251, 256, 294 and 295) nearby, operated by SamTrans with the nearest bus stops located at the intersection of Alameda de Las Pulgas and Hillsdale Boulevard and in the study area vicinity. Two bus routes (school-day only) Route 57 and 58 operate in the vicinity of the project site. Caltrain commuter shuttles are available at the Hillsdale Caltrain Station and they have stops in the vicinity of project site at Glendora Drive/Hillsdale Boulevard, 31st Avenue/Hillsdale Boulevard, Del Monte Street/ Hillsdale Boulevard, and Alameda de Las Pulgas/Hillsdale Boulevard, Laurelwood Shopping Center stop on Campus Drive, Peninsula Office Park, and Campus Drive/26th Avenue intersections. The shuttle service operates during commute hours between transit stations and major employment areas, i.e. various area office buildings. The bus routes that provide the peak-hour services near the project site are described in Table 3 and are shown in Figure 7.

Caltrain Service

Commuter rail service between San Francisco and Gilroy is provided by Caltrain. The project site is located about 2.7 miles west of the Hillsdale Caltrain Station[7], which is about a 11-minute car ride, and 12-minute bike ride. Caltrain provides service at this station with approximately 15-minute frequency during the weekday AM and PM commute hours, midday, and at nights. Service is provided with approximately 90-minute headways on weekends.

[7] The Hillsdale Caltrain Station is temporarily closed for construction as part of the 25th Avenue Grade Separation project. Upon completion of construction, the Hillsdale Caltrain Station will be relocated about one block north of its current location, between 28th Avenue and 31st Avenue. More information about the relocation and construction timeline can be found on the Caltrain website, here: https://www.caltrain.com/projectsplans/Projects/Caltrain_Capital_Program/25th_Avenue_Grade_Separation/HillsdaleClosure.html. Website accessed October 8, 2020.

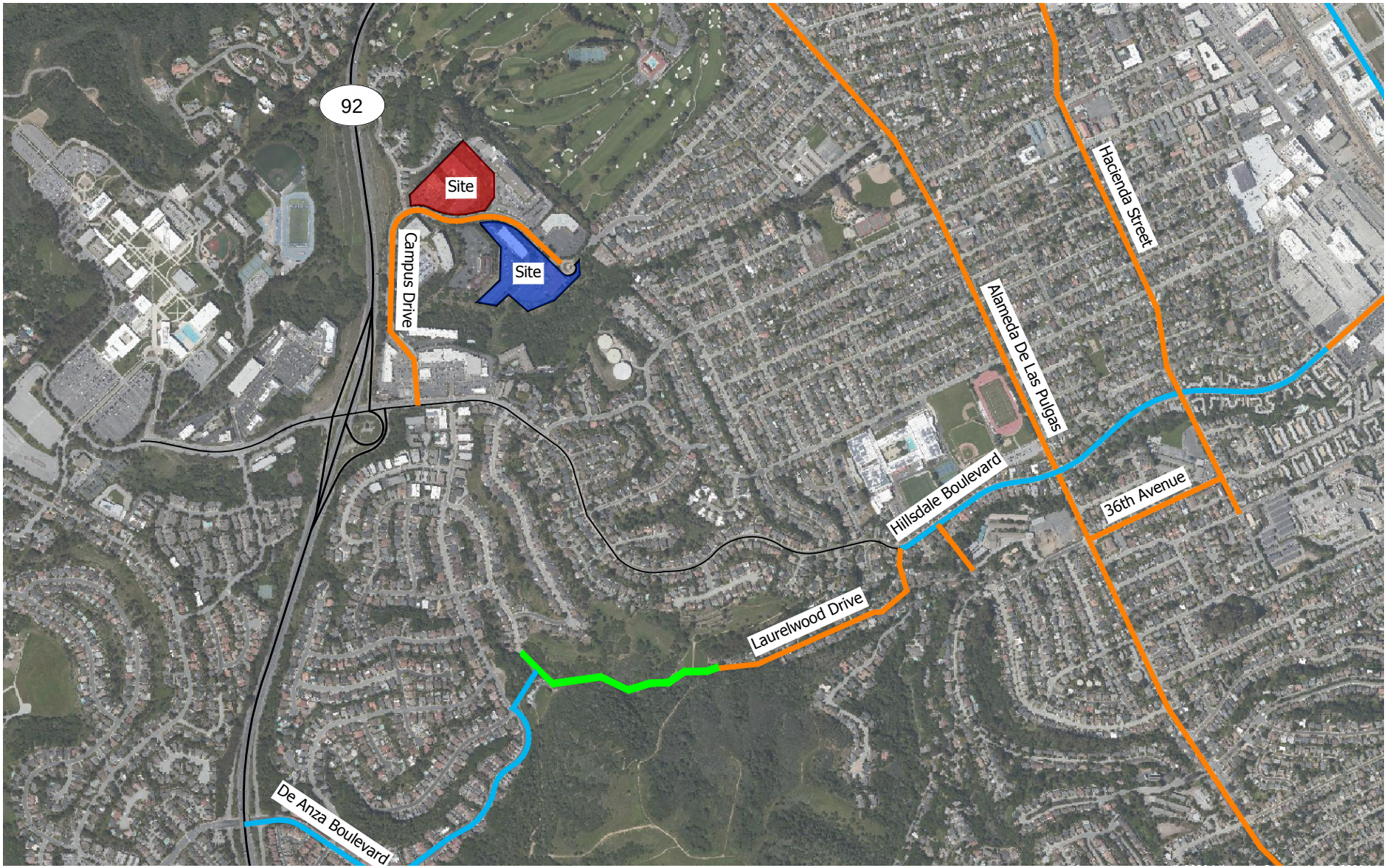
Emergency Vehicle Access

The developer proposes to maintain the existing emergency vehicle access (EVA) road connecting Campus Drive to 26th Avenue as an EVA. The nearest fire station is located approximately 2 miles from the project site at 320 Paul Scannell Drive.

Table 3: Existing Bus Service

Bus Route	Description	Operating Hours	Peak-Hour Headway	Closest Bus Stop
57	Hillsdale High School – Edgewater/Beach Park (School-day only)	6:30 AM – 8:30 AM (and) 3:30 PM – 4:30 PM	NA	31st Avenue and Fernwood Street
58	Borel School – Polhemus/Paul Scannell (School-day only)	7:00 AM – 8:00 AM (and) 1:00 PM – 3:30 PM	NA	Clearview Way/W Hillsdale Boulevard
250	5th/El Camino Real – College of San Mateo	6 AM – 11 PM	1 hour	Clearview Way/W Hillsdale Boulevard
251	Foster City – Hillsdale Mall	8:30 AM – 7 PM	2 hours	Alameda de Las Pulgas/W Hillsdale Boulevard (or) 31st Avenue and Fernwood Street
256	Hillsdale Mall – Foster City	6:30 AM – 8 PM	1 – 4 hours	Alameda de Las Pulgas/W Hillsdale Boulevard (or) 31st Avenue and Fernwood Street
294	San Mateo Medical Center – Hillsdale – CSM – Half Moon Bay	6 AM – 10 PM	1 hour	Clearview Way/W Hillsdale Boulevard
295	San Mateo Caltrain – Redwood City Transit Center	6 AM – 7 PM	2 hours	Alameda de Las Pulgas/26th Avenue
Norfolk Shuttle	Between Hillsdale Caltrain Station and Various Office Area Buildings	7 AM – 9:30 AM and 3 PM – 7 PM	30 – 45 min	Various stops on Hillsdale Boulevard and Campus Drive

Source: SamTrans, 2020.



Legend:

- Shared Use Path
- Bike Lane
- Bike Route

Existing Bicycle Network

Figure 6

KITTELSON & ASSOCIATES

Legend:

- Route 250
- Route 251
- Route 256
- Route 294
- Route 295
- Route 57 (School Days)
- Route 58 (School Days)

Existing Transit Services

Figure 7

KITTELSON & ASSOCIATES

Traffic Volumes

Multimodal turning movement counts were estimated at the four study intersections shown in Figure 5 for the weekday AM and weekday PM peak periods. The hour with the highest vehicle volumes from the peak periods was determined for use in the transportation analysis.

The estimated multimodal turning movement counts are presented in Appendix A. The existing intersection geometries and estimated existing volumes (due to COVID-19 conditions) are shown in Figure 8 and Figure 9.

Intersection Level of Service

The estimated traffic volumes due to COVID-19 conditions, lane configurations, and traffic controls for each study intersection were used to assess the Existing Conditions LOS and delay. Table 4 shows the findings of this analysis for the AM and PM peak hours. Detailed calculation worksheets for the Existing Conditions are provided in Appendix B. These delay and LOS values can be compared to the City of San Mateo thresholds outlined in the Circulation Element of the 2030 General Plan, discussed in the previous section.

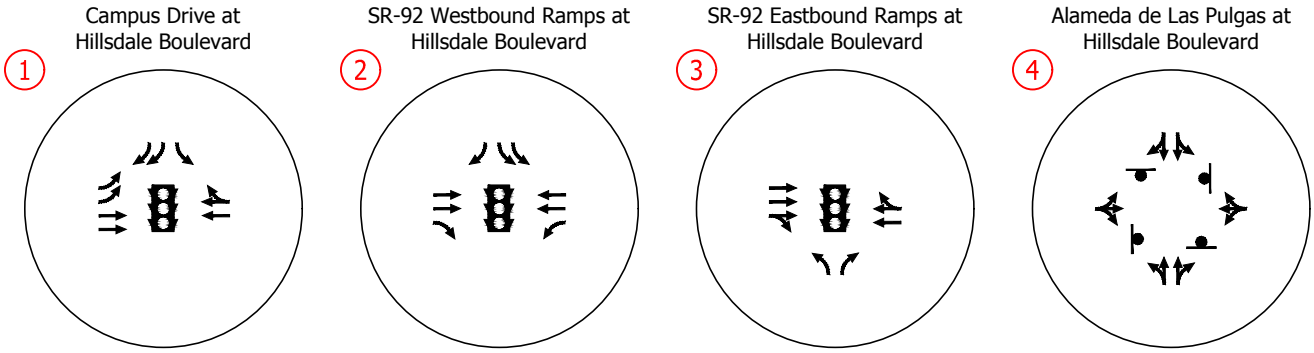
Table 4: Existing Conditions Intersection Operations Results

No	Location	Control	Existing AM		Existing PM	
			Delay	LOS	Delay	LOS
1	Campus Drive & Hillsdale Boulevard	Signal	11.4	B	9.3	A
2	SR-92 Westbound Ramps & Hillsdale Boulevard	Signal	10.9	B	15.5	B
3	SR-92 Eastbound Ramps & Hillsdale Boulevard	Signal	27.6	C	15.8	B
4	Alameda de Las Pulgas & Hillsdale Boulevard	AWSC	95.3	F	86.4	F

Notes: AWSC = All-Way Stop Control; AM = weekday a.m. peak hour; PM = weekday p.m. peak hour; LOS = Level of Service; Delay reported in seconds per vehicle; No = intersection number.
Source: Highway Capacity Manual 2010; Kittelson & Associates, 2020

As mentioned in the previous section, intersection analyses for the four study intersections were conducted using the operational methodologies outlined in the 2010 Highway Capacity Manual (HCM), calculated with Synchro software. However, Synchro's adaptation of HCM 2010 does not account for vehicles turning right on red (i.e., right-turn-on-red) at the SR-92 Eastbound Ramps/Hillsdale Boulevard intersection. Kittelson updated the Synchro network to more accurately reflect existing intersection operations and account for right-turn-on-red operations by modifying the growth rate input parameter for the respective turning movements in Synchro.

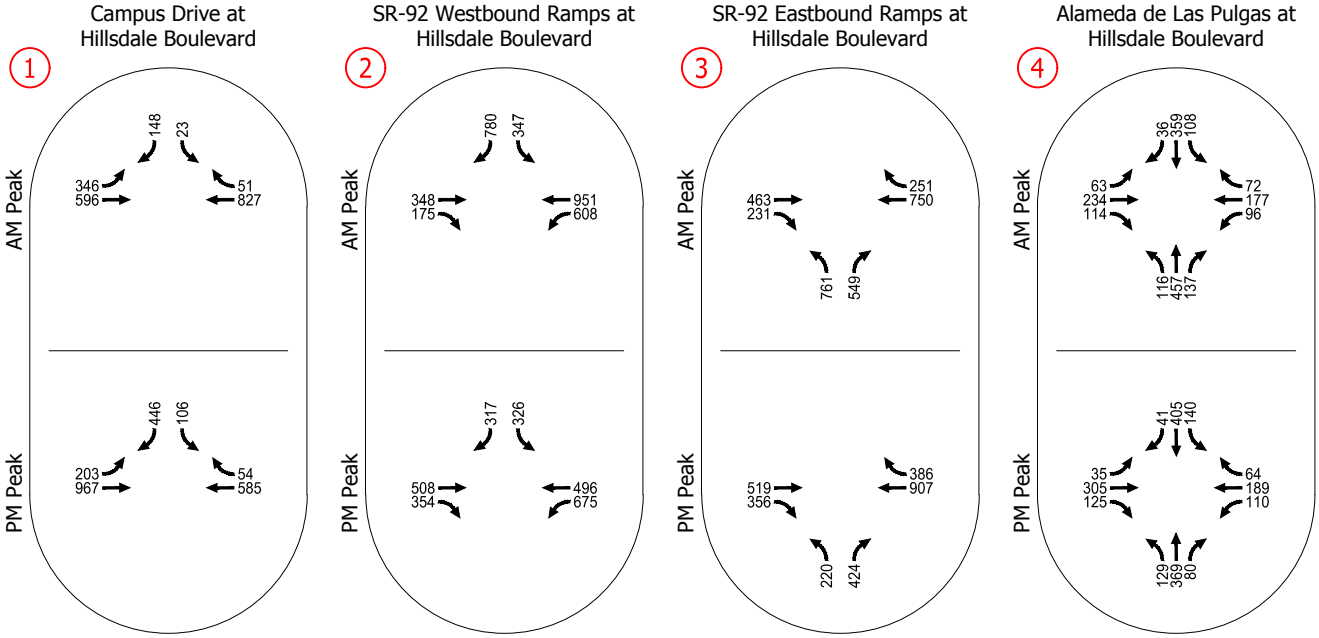
As shown in Table 4, the three signalized intersections currently operate at LOS C or better during both peak hours and the all-way stop-controlled intersection at Alameda de Las Pulgas and Hillsdale Boulevard, currently operates at LOS F during both peak hours.



- Stop Sign
- Traffic Signal

Existing Conditions
Traffic Control and
Lane Configurations

Figure
8



Existing Conditions Peak Hour Turning Movement Volumes

Figure 9

BASELINE CONDITIONS

This section presents baseline traffic conditions, which are defined as conditions just prior to the completion of the proposed project. Traffic volumes for the Baseline Conditions comprise volumes from existing traffic counts and traffic generated by other approved developments in the vicinity of the project site.

Transportation Network

The Baseline Conditions analysis assumes the reconfiguration of Campus Drive from a four-lane roadway to a three-lane roadway with Class II bike lanes on both sides. The assumed traffic control devices and lane configurations under Baseline Conditions are shown in Figure 10.

Intersection Level of Service

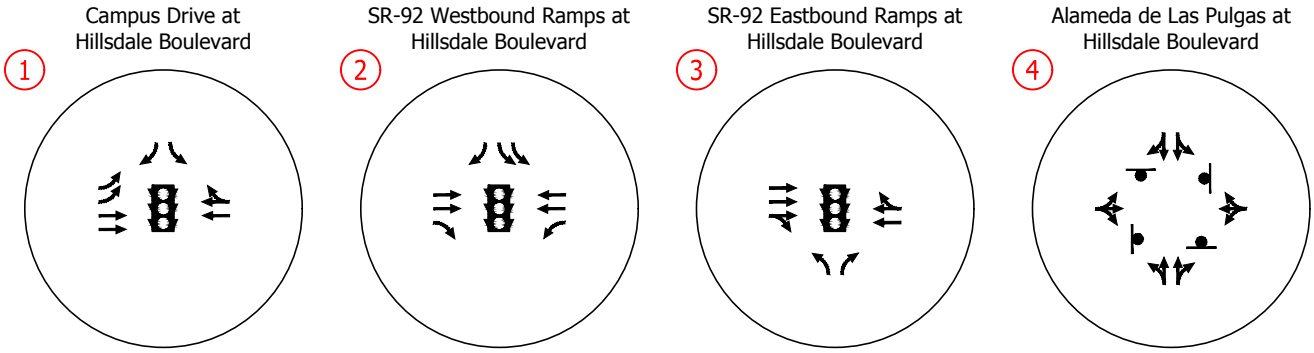
Traffic volumes for the Baseline Conditions are the same as the existing estimated traffic volumes, shown in Figure 9. This is because there are no projects that are underway in the vicinity of the study area that would add to the existing estimated volumes. Table 5 shows the Baseline intersection operations for the AM and PM peak hours, respectively. Detailed calculation worksheets for the Baseline Conditions are provided in Appendix C.

Table 5: Baseline Conditions Intersection Operations Results

No	Location	Control	Baseline AM		Baseline PM	
			Delay	LOS	Delay	LOS
1	Campus Drive & Hillsdale Boulevard	Signal	11.5	B	11.8	B
2	SR-92 Westbound Ramps & Hillsdale Boulevard	Signal	10.9	B	15.5	B
3	SR-92 Eastbound Ramps & Hillsdale Boulevard	Signal	27.6	C	15.7	B
4	Alameda de Las Pulgas & Hillsdale Boulevard	AWSC	95.3	F	86.4	F

Note:
AWSC = All-Way Stop Control; ; AM = weekday a.m. peak hour; PM = weekday p.m. peak hour; LOS = Level of Service; Delay reported in seconds per vehicle
Source: Highway Capacity Manual 2010; Kittelson & Associates, 2020

As shown in Table 5 under Baseline Conditions, the three signalized intersections would continue to operate at LOS C or better during both peak hours, and the all-way stop-controlled intersection at Alameda de Las Pulgas and Hillsdale Boulevard would continue to operate at LOS F during both peak hours.



- Stop Sign
- Traffic Signal

Baseline Conditions
Traffic Control and
Lane Configurations

Figure
10

PROJECT TRAVEL DEMAND

Trip Generation

Trip generation of the project is based on information compiled in the 10th Edition of the Institute of Transportation Engineers (ITE) *Trip Generation* manual[8]. The trips generated by the existing general office buildings (ITE code 710) were compared to the proposed residential units (ITE code 210 for single-family detached housing and ITE code 221 for mid-rise multifamily housing).

The owner of the four office buildings recorded the following occupancy data for the past two and a half years: 2018 – 82.2%, 2019 – 72.9%, and 2020 – 64.8%.[9] The average occupancy rate of 73.3% was applied to the trip estimates for the general office building land use, as to provide a quantitative approximation of how many trips the existing site is creating. No adjustments to the standard trip generation rates were made to account for internalization, pass-by trips, or diverted trips, as the proposed residential development does not provide the mix of uses that would typically result in these types of trips.

As summarized in Table 6, the proposed project is estimated to generate 58 fewer vehicle trips (-130 inbound, 72 outbound) during the weekday AM peak hour and 22 fewer vehicle trips (73 inbound, -95 outbound) during the weekday PM peak hour compared to the existing office campus. Accounting for the difference between the proposed project trips and the existing occupancy of the office buildings, the proposed project would not meet the minimum threshold of 100 new peak hour vehicle trips for a congestion management program (CMP) analysis per C/CAG CMP guidelines.

[8] Institute of Transportation Engineers. *Trip Generation, 9th Edition*, Washington, D.C. 2012

[9] Occupancy data provided by City staff via email, dated July 24, 2020.

Table 6: Project Trip Generation

Land Use	ITE Code	Size	Unit[1]	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
					In	Out	Total	In	Out	Total
Existing										
General Office Building	710	225	KSF	2,192	224	37	261	42	217	259
73.3% Occupancy Adjustment Adjusted Total[2]				**1,606**	**164**	**27**	**191**	**31**	**159**	**190**
Proposed										
Single Family Detached Housing	210	74	DU	699	14	41	55	46	27	73
Multifamily House (Low-Rise)	221	216	DU	1,175	20	58	78	58	37	95
Total				**1,874**	**34**	**99**	**133**	**104**	**64**	**168**
Net New Project Vehicle Trips				**268**	**-130**	**72**	**-58**	**73**	**-95**	**-22**

Notes:
[1] KSF = Thousand Square Feet. DU = Dwelling Unit.
[2] An average occupancy rate of 73.3% was applied to the estimated ITE vehicle trips to reflect the existing occupancy of the office buildings.

Trip Distribution and Assignment

The distribution of project trips was derived from existing travel volume data and from knowledge of local travel times. The recorded north/south distribution of traffic along State Route 92 was used to inform the direction that project traffic would be going to or coming from in order to access the project site. Access to State Route 92 from the project was assumed to be via the Campus Drive, Hillsdale Boulevard and the State Route 92 ramp terminal intersections.

BASELINE WITH PROJECT CONDITIONS

Site Access and On-Site Circulation

This section describes the site access and circulation of the proposed project based on a review of the proposed site plan.

Vehicle Access and Circulation

On-Site Circulation and Driveway Access

The proposed residential use would replace the existing four office buildings on-site. The project proposes to construct an inverted “L”-shaped roadway on-site that runs in a north-south direction from Campus Drive for both northern and southern parcels. This roadway would provide access to the parking garage entrances. Access to the buildings and the parking garages would be provided by two two-way driveways on the north side and two two-way driveways on the south side, on Campus Drive. All driveways are proposed to be 24 to 26 feet wide.

The project driveways need to be designed to preserve the sight triangles[10] free of visual obstructions. The proposed site plan shows driveway sight triangles start at the sidewalk and measure 10 feet on the side, established as per the City of San Mateo Municipal Code (Section 27.84.010 (B)(2)), and intersection sight triangles start at the sidewalk and measure 45 feet in length, established as per the City of San Mateo Municipal Code (Section 27.84.010 (B)(1)).

Sight distance is the continuous length of the roadway ahead, visible to the roadway user. According to the *Caltrans Highway Design Manual*, the minimum standards for stopping sight distance are related to the design speed for motorists (Table 201.1 Sight Distance Standards)[11]. Stopping sight distance[12] for motorists is measured from the drivers' eyes, which are assumed to be 3½ feet above the pavement surface, to an object ½ foot high on the road. The driveways from the project site lead to Campus Drive, which has a posted speed limit of 25 mph (i.e. design speed of 30 mph), the Caltrans stopping sight distance requirement is 200 feet.

There is no on-street parking or severe roadway curves along Campus Drive, hence the project driveways would all have adequate sight distance. The landscaping near the project driveways currently do not impair sight distance for the driver and should be taken care of in such a way that it does not interfere with drivers' view in future conditions as well. The project proposes a tree removal and mitigation plan at the project site to minimize the potential for landscaping to obscure the roadway visibility.

Vehicle Parking

The proposed project would include 624 on-site vehicle parking spaces, including 580 residential parking spaces in attached two-car garages and 44 surface parking spaces for visitors distributed across the northern and southern parcels. The proposed project would include 23 accessible units distributed across the northern and southern parcels. There is a total of nine accessible parking stalls (of which five are Electric Vehicle accessible parking stalls) and five Electric Vehicle parking stalls in the proposed project site. All parking aisle and parking stall dimensions are shown to comply with the minimum requirements of the City "Standard Drawings and Specifications". All parking spaces appear to have sufficient space near the end of dead-end aisles for vehicles to turn around.

---

[10] Sight triangles identify areas at the corners of intersections of roads and driveways where views of approaching traffic should not be obstructed.

[11] Chapter 200 – Geometric Design and Structure Standards, Caltrans Highway Design Manual, July 2020.

[12] The minimum stopping sight distance as defined by the Highway Design Manual is "the distance required by the user, traveling at a given speed, to bring the vehicle or bicycle to a stop after an object ½ foot high on the road becomes visible".

Passenger Loading

The project proposes passenger loading zones near the project site, which would serve as a waiting area for the residents. Four residential loading zones are shown in the proposed project site plan, which are established as per the City of San Mateo Municipal Code (Section 27.64.320).

Pedestrians

Pedestrian pathways would link the proposed development to the surrounding neighborhood. Approximately 2.2 acres of the site is dedicated to open space with 1.2 miles of paths and trails. Two pedestrian pathways (i.e. loops) are proposed within the northern parcel and one pedestrian pathway is proposed within the southern parcel to provide circulation and access to the proposed activity and fitness centers on site. Wayfinding signage would be provided to direct people to the on-site amenities. Overall, the proposed project would promote accessibility for people walking to and through the site by connecting new pathways to the existing sidewalk networks. The project would not generate activities that would interfere with access or circulation for people walking.

Bicyclists

The project would provide short term bike racks (class II) and secure long-term bicycle parking (class I). The North Site would provide 16 short-term and 208 long-term parking spaces, and the South Site would provide 17 short-term and 224 long-term parking spaces. Bicyclists would access the site from the Class II bike lanes on Campus Drive. Overall, the proposed project would promote accessibility for people biking to and through the site by providing bicycle parking and connecting to the existing bicycle networks. The project would not generate activities that would interfere with access or circulation for people biking.

Transit

Five bus routes (Route 250, 251, 256, 294 and 295) operated by SamTrans provide service to/from the project site from the bus stops located at the intersection of Alameda de Las Pulgas and Hillsdale Boulevard and in the study area vicinity. Two bus routes (school-day only)-Route 57 and 58 operate in the vicinity of the project site. Caltrain commuter shuttles are available at the Hillsdale Caltrain Station with stops in the vicinity of project site at Laurelwood Shopping Center stop on Campus Drive, Peninsula Office Park, and Campus Drive/26th Avenue intersections.

Emergency Vehicle and Fire Truck Access

The project proposes to maintain and improve the existing Emergency Vehicle Access road east of the roundabout on the south end of the project site, connecting Campus Drive to 26th Avenue. The proposed site plan designates 20 to 26 feet unobstructed fire lane width and no less than 13.5 feet unobstructed height for aerial apparatus access. All curbs within the project site will be painted red and marked with white curb lettering “No Parking Fire Lane” at no less than 25 feet intervals. The proposed internal streets would provide sufficient clear width to accommodate emergency vehicles and meet fire department

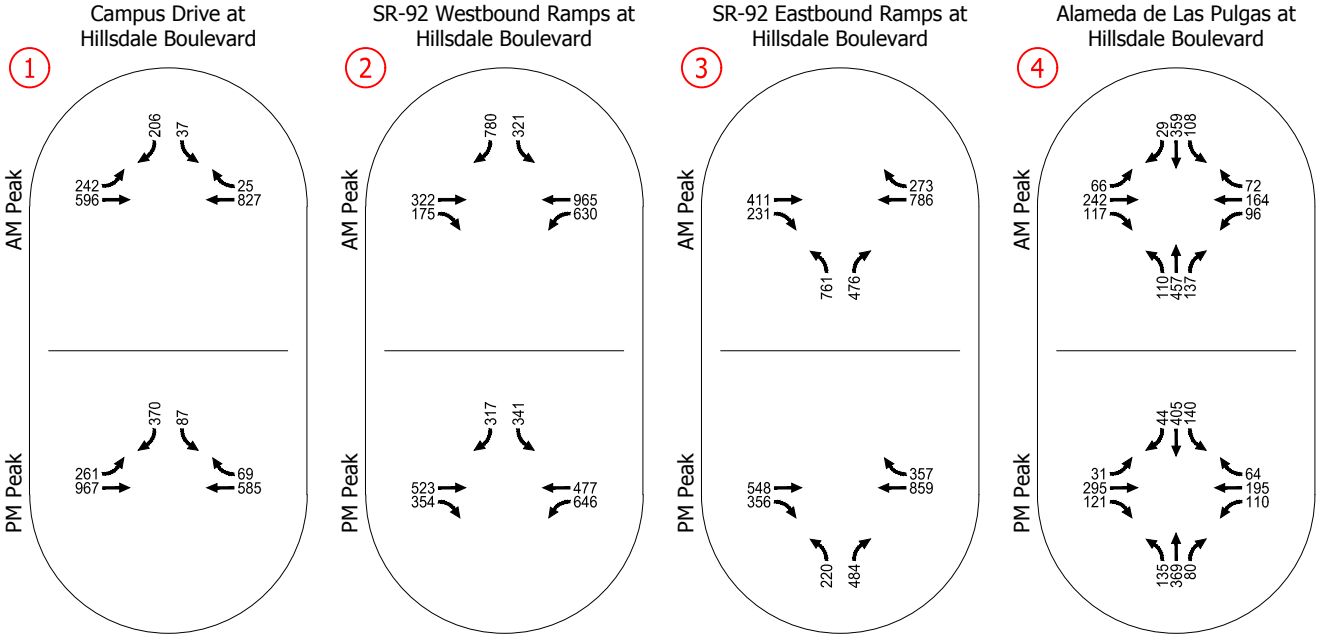
requirements. The proposed site plan also indicates that all fire hydrants in the vicinity of the project site shall be upgraded to Clow Model 960 or approved equivalent. Onsite hydrant spacing shall be 250 feet measured along access road. Although there would be a general increase in vehicle traffic from the proposed project, the proposed project would not inhibit emergency vehicle or fire truck access to or from the project site. Overall, fire truck access and circulation would meet San Mateo fire department requirements and development of the project site and associated increase in vehicles, pedestrians, and bicycle travel would not have a substantial adverse effect on emergency vehicle access to other buildings or land uses in the area or to hospitals.

Garbage Trucks

The project site plan shows three trash compactor rooms located at the southeast, south and western edges of the north project site, and two trash compactors located at the mid-south and southern edges of the south project site. Garbage trucks would enter and exit the project site via Campus Drive to access the proposed trash compactor rooms. Overall, garbage truck access and circulation would be adequate.

Intersection Level of Service

Traffic volumes for the Baseline with Project Conditions were developed by combining the existing estimated traffic volumes with the project only volumes. The resulting Baseline with Project turning movement volumes are shown in Figure 11. Table 7 shows the Baseline with Project intersection operations for the AM and PM peak hours, respectively. Detailed calculation worksheets for the Baseline with Project Conditions are provided in Appendix D.



Baseline with Project Conditions
Peak Hour Turning Movement Volumes

Figure
11

Table 7: Baseline with Project Conditions Intersection Operations Results

No	Location	Scenario	Weekday AM Peak Hour		Weekday PM Peak Hour	
			Delay	LOS	Delay	LOS
1	Campus Drive & Hillsdale Boulevard	No Project	11.5	B	11.8	B
		Plus Project	12.6	B	11.1	B
2	SR-92 Westbound Ramps & Hillsdale Boulevard	No Project	10.9	B	15.5	B
		Plus Project	10.7	B	15.0	B
3	SR-92 Eastbound Ramps & Hillsdale Boulevard	No Project	27.6	C	15.7	B
		Plus Project	28.1	C	20.9	C
4	Alameda de Las Pulgas & Hillsdale Boulevard[1]	No Project	95.3	F	86.4	F
		Plus Project	95.9	F	80.9	F

Note: No = intersection number;
LOS = Level of Service; Delay reported in seconds per vehicle
1 This intersection is an All-Way Stop Controlled intersection
Source: Highway Capacity Manual 2010; Kittelson & Associates, 2020

As shown in Table 7, under Baseline with Project Conditions, the three signalized intersections would continue to operate at LOS C or better during the AM and PM peak hours, and the all-way stop-controlled intersection at Alameda de Las Pulgas and Hillsdale Boulevard would continue to operate at LOS F during the both peak hours. The proposed project would not cause any intersection to exceed level of service standard and no intersection modifications would be required.

CUMULATIVE CONDITIONS

This section presents the anticipated Cumulative Conditions for the study intersections for the year 2040 and the effect the addition of the project trips would have on them.

Land Use Development and Transportation Network Changes

The C/CAG San Mateo County Travel Demand Model was used to develop the future volume forecast for Cumulative Conditions. The model includes future development throughout the region. The 2040 cumulative forecasts are consistent with regional growth totals projected by the Association of Bay Area Governments (ABAG) Plan Bay Area[13]. Therefore, the traffic forecasts reflect traffic reflecting both growth in Peninsula Heights and increases in traffic volumes on State Route 92 due to regional growth. Base year (Year 2020) and future year (Year 2040) forecasts were extracted from the model and linearly interpolated to develop growth between the estimated existing traffic counts (2020) and the current model horizon year (2040).

[13] https://mtc.ca.gov/our-work/plans-projects/plan-bay-area-2040

The intersection lane configurations under Cumulative Conditions were assumed to be the same as described under the Baseline Conditions. Additionally, Cumulative Conditions analysis assumed the intersection of Alameda de Las Pulgas and Hillside Boulevard will be converted from a stop-controlled intersection to a signalized intersection. The assumed traffic control devices and lane configurations under Cumulative Conditions for all study intersections are shown in Figure 12.

Intersection Level of Service

The projected turning movement volumes for each peak hour under Cumulative Conditions are provided in Figure 13. Based on these volumes and lane configurations, the cumulative operations at the study intersections are shown in Table 8. Detailed calculation worksheets for the Cumulative Conditions are provided in Appendix E.

Table 8: Cumulative Conditions Intersection Operations Results

No	Location	Control	Cumulative AM		Cumulative PM	
			Delay	LOS	Delay	LOS
1	Campus Drive & Hillsdale Boulevard	Signal	13.3	B	14.3	B
2	SR-92 Westbound Ramps & Hillsdale Boulevard	Signal	13.2	B	**60.9**	**E**
3	SR-92 Eastbound Ramps & Hillsdale Boulevard	Signal	36.8	D	32.7	C
4	Alameda de Las Pulgas & Hillsdale Boulevard	Signal	17.6	B	18.2	B

Note: **Red bold lettering** indicates an intersection that does not meet the City's minimum acceptable design level of service (LOS D for Signalized intersections); No = intersection number; LOS = Level of Service; Delay reported in seconds per vehicle.
Source: Highway Capacity Manual 2010; Kittelson & Associates, 2020

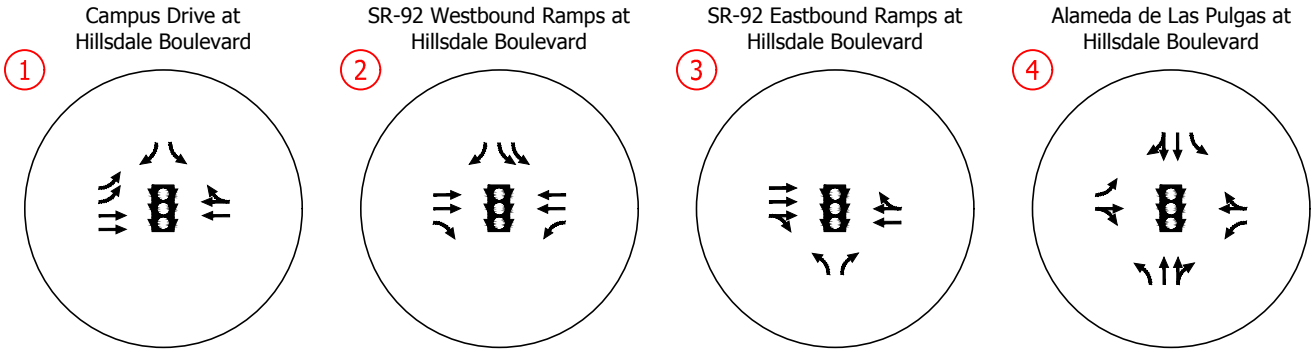
As shown in Table 8, under Cumulative Conditions, all study intersections would be signalized. Conversion of Alameda de Las Pulgas and Hillsdale Boulevard to a signalized intersection would reduce delay and improve operations at this location from LOS F under Existing and Baseline Conditions to LOS B under Cumulative Conditions. Three of the study intersections would operate at LOS D or better, and one study intersection, SR-92 Westbound Ramps and Hillsdale Boulevard, would operate at LOS E during the PM peak hour.

CUMULATIVE WITH PROJECT CONDITIONS

This section discusses the effect of proposed project on traffic operations under Cumulative Conditions. Traffic volumes for the Cumulative with Project Conditions were developed using the same additive approach used for the Baseline with Project volumes. The turning movement volumes resulting from adding the project trips to the Cumulative Conditions volumes are shown in Figure 14.

Intersection Level of Service

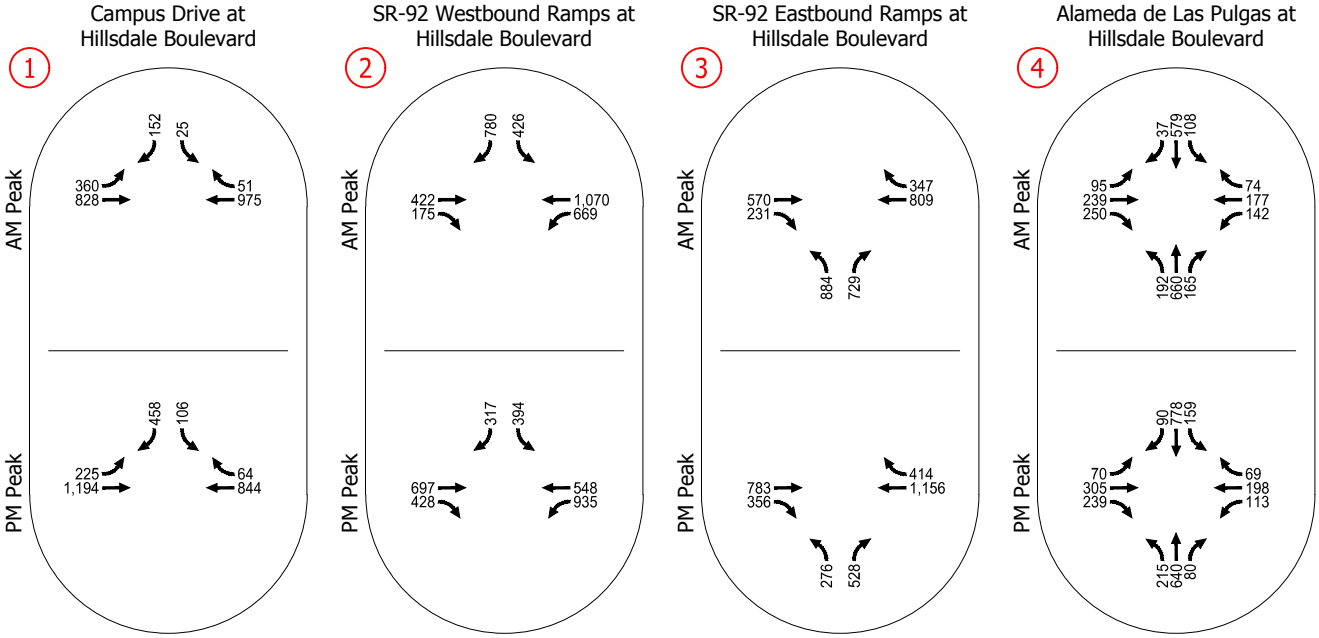
Based on these volumes and lane configurations, the Cumulative with Project operations at the study intersections are shown in Table 9. Detailed calculation worksheets for the Cumulative with Project Conditions are provided in Appendix F. Based on the significance criteria previously described, the proposed project would not cause significant impact at any of the study intersections.



- Traffic Signal

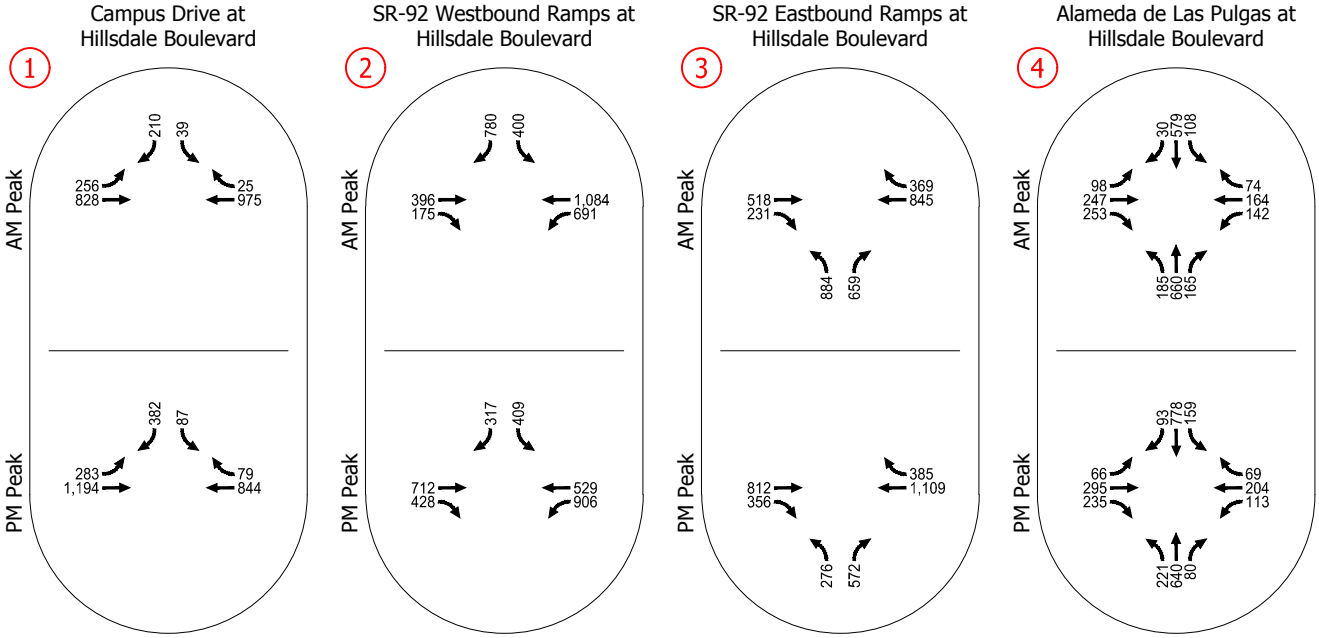
Cumulative Conditions
Traffic Control and
Lane Configurations

Figure
12



Cumulative Conditions Peak Hour Turning Movement Volumes

Figure 13



Cumulative with Project Conditions
Peak Hour Turning Movement Volumes

Figure
14

Table 9: Cumulative with Project Conditions Intersection Operations Results

No	Location	Scenario	Weekday AM Peak Hour		Weekday PM Peak Hour	
			Delay	LOS	Delay	LOS
1	Campus Drive & Hillsdale Boulevard	No Project	13.3	B	14.3	B
		Plus Project	12.9	B	13.7	B
2	SR-92 Westbound Ramps & Hillsdale Boulevard	No Project	13.2	B	**60.9**	**E**
		Plus Project	13.3	B	**57.9**	**E**
3	SR-92 Eastbound Ramps & Hillsdale Boulevard	No Project	36.8	D	32.7	C
		Plus Project	37.5	D	38.8	D
4	Alameda de Las Pulgas & Hillsdale Boulevard	No Project	17.6	B	18.2	B
		Plus Project	17.8	B	18.1	B

Note: **Red bold lettering** indicates an intersection that does not meet the City's minimum acceptable design level of service (LOS D for Signalized intersections); All intersections are signalized; No = intersection number; Delay presented ins seconds per vehicle; LOS = level of service.
Source: Highway Capacity Manual 2010; Kittelson & Associates, 2020

As shown in Table 9, three study intersections that would operate at LOS D or better under Cumulative Conditions would continue to operate at LOS D or better under Cumulative with Project Conditions. The SR-92 Westbound Ramps and Hillsdale Boulevard intersection would operate at LOS E under Cumulative Conditions during the PM peak hour and would continue to operate at LOS E during the PM peak hour under Cumulative with Project Conditions. The proposed project would not cause any of the study intersections to exceed the level of service standard, and no intersection modifications would be required.

95TH PERCENTILE QUEUE ANALYSIS

In addition to the operations analysis, Kittelson also reviewed the changes in 95th percentile queue lengths for the study intersections. Queue lengths are typically evaluated as part of the network-level or design-related considerations (i.e., to gauge interaction between nearby intersections). The 95th percentile queue lengths are reported to provide an appropriate storage for all but the worst 5% of traffic scenarios. This report is providing queue lengths at the request of the City. Since there are no impact criteria available to evaluate queue length, this information is presented for informational purposes only.

The queue lengths presented are derived from outputs from Synchro traffic analysis software and are representative of the 95th percentile traffic volumes[14].

Table 10 displays the existing storage lengths for each approach at the study intersections. Table 11 through Table 13 show the 95th percentile queue lengths for the Existing, Baseline, Baseline with Project,

[14] Microsimulation of queues using SimTraffic, another analysis software package, was not performed because this model is typically used in the design phase of a project. For a planning level study, industry practice is to use the Synchro outputs.

Cumulative and Cumulative with Project conditions. A summary of how the proposed project may affect 95th percentile queue lengths is as follows:

- Existing Conditions – The westbound left-turn queue length exceeds the existing storage capacity during the weekday peak hours at the SR-92 Westbound Ramps at Hillsdale Boulevard. Similarly, the queue lengths for westbound through movement at the SR-92 Eastbound Ramps at Hillsdale Boulevard, and northbound movement at Alameda de Las Pulgas at Hillsdale Boulevard exceeds the existing link/storage lengths during the weekday peak hours.
- Baseline with Project Conditions – At the SR-92 Westbound Ramps at Hillsdale Boulevard, the project would not increase the westbound left-turn lane queue length, though the number of vehicles present during the weekday peak hours is estimated to exceed the storage capacity. The project would increase queue lengths by five vehicles for the westbound through movement at the SR-92 Eastbound Ramps at Hillsdale Boulevard. For other study intersections, the proposed project would change queue lengths by one or two vehicles on some turning movements.
- Cumulative with Project Conditions – At the SR-92 Westbound Ramps at Hillsdale Boulevard, the project is estimated to increase the westbound left-turn lane queue length by more than two vehicles and would cause additional traffic queue spillback at the intersection of SR-92 Eastbound Ramps at Hillsdale Boulevard. Similarly, the project would increase queue lengths by two vehicles for the northbound right-turn movement and cause queue spillback at the northbound left-turn movement at the SR-92 Eastbound Ramps at Hillsdale Boulevard. For other study intersections, the proposed project would change queue lengths by one or two vehicles on some turning movements.

Table 10: Existing Storage Lengths

#	Location	Storage Length (number of vehicles)											
		Eastbound Movements			Westbound Movements			Northbound Movements			Southbound Movements		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
1	Campus Drive & Hillsdale Boulevard (Signal)	6	10	-	-	10	-	-	-	-	7	>20	10
2	SR-92 Westbound Ramps & Hillsdale Boulevard (Signal)	-	>20	-	8	>20	-	-	-	-	15	-	15
3	SR-92 Eastbound Ramps & Hillsdale Boulevard (Signal)	-	16	-	-	16	-	16	-	16	-	-	-
4	Alameda de Las Pulgas & Hillsdale Boulevard (AWSC)	-	>20	-	-	>20	-	-	15	-	-	12	-

Notes: LT=Left-Turn Movements; TH = Through Movements; RT=Right-Turn Movements; '-' = Particular movement is not relevant to the intersection.

Table 11: 95th Percentile Queue Lengths for Existing Conditions

#	Location (Control)	Scenario	95th Percentile Queue Length (number of vehicles)											
			Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Weekday AM Peak Hour														
1	Campus Drive & Hillsdale Boulevard (Signal)	No Project	5	2	-	-	8	-	-	-	-	2	-	2
2	SR-92 Westbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	6	0	**18**	6	-	-	-	-	6	-	0
3	SR-92 Eastbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	4	-	-	13	-	**>20**	-	9	-	-	-
4	Alameda de Las Pulgas & Hillsdale Boulevard (AWSC)	No Project	9			14			**19**			**13**		
Weekday PM Peak Hour														
1	Campus Drive & Hillsdale Boulevard (Signal)	No Project	3	3	-	-	5	-	-	-	-	4	-	3
2	SR-92 Westbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	9	0	**>20**	3	-	-	-	-	6	-	0
3	SR-92 Eastbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	2	-	-	12	-	6	-	5	-	-	-
4	Alameda de Las Pulgas & Hillsdale Boulevard (AWSC)	No Project	11			9			**>20**			12		

Notes: EBL = Eastbound Left; EBT = Eastbound Through; EBR = Eastbound Right; similar for W = Westbound, N = Northbound, and S = Southbound movements; AWSC: All-Way Stop Control
'-' = Particular movement is not relevant to the intersection
Bold and shaded cells indicate that the queue lengths exceed the storage lengths for the movement.

Table 12: 95th Percentile Queue Lengths for Baseline and Baseline with Project Conditions

#	Location (Control)	Scenario	95th Percentile Queue Length (number of vehicles)											
			Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Weekday AM Peak Hour														
1	Campus Drive & Hillsdale Boulevard (Signal)	No Project	5	2	-	-	8	-	-	-	-	2	-	3
		Plus Project	4	2	-	-	7	-	-	-	-	2	-	5
2	SR-92 Westbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	6	0	**18**	6	-	-	-	-	6	-	0
		Plus Project	-	6	0	**18**	6	-	-	-	-	6	-	0
3	SR-92 Eastbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	4	-	-	14	-	**>20**	-	9	-	-	-
		Plus Project	-	4	-	-	15	-	**>20**	-	6	-	-	-
4	Alameda de Las Pulgas & Hillsdale Boulevard (AWSC)	No Project	9			14			**19**			**13**		
		Plus Project	9			14			**>20**			12		
Weekday PM Peak Hour														
1	Campus Drive & Hillsdale Boulevard (Signal)	No Project	3	3	-	-	6	-	-	-	-	4	-	7
		Plus Project	4	3	-	-	6	-	-	-	-	3	-	6
2	SR-92 Westbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	9	0	**>20**	3	-	-	-	-	6	-	0
		Plus Project	-	9	0	**>20**	3	-	-	-	-	6	-	0
3	SR-92 Eastbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	2	-	-	7	-	6	-	5	-	-	-
		Plus Project	-	3	-	-	12	-	6	-	7	-	-	-
4	Alameda de Las Pulgas & Hillsdale Boulevard (AWSC)	No Project	11			9			**>20**			12		
		Plus Project	11			10			**19**			12		

Notes: EBL = Eastbound Left; EBT = Eastbound Through; EBR = Eastbound Right; similar for W = Westbound, N = Northbound, and S = Southbound movements; AWSC: All-Way Stop Control
'-' = Particular movement is not relevant to the intersection
Bold and shaded cells indicate that the queue lengths exceed the storage lengths for the movement.

Table 13: 95th Percentile Queue Lengths for Cumulative and Cumulative with Project Conditions

#	Location (Control)	Scenario	95th Percentile Queue Length (vehicles)											
			Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Weekday AM Peak Hour														
1	Campus Drive & Hillsdale Boulevard (Signal)	No Project	5	3	-	-	10	-	-	-	-	2	-	4
		Plus Project	4	3	-	-	9	-	-	-	-	2	-	5
2	SR-92 Westbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	8	0	**>20**	7	-	-	-	-	7	-	0
		Plus Project	-	7	0	**>20**	7	-	-	-	-	7	-	0
3	SR-92 Eastbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	5	-	-	**17**	-	**>20**	-	**>20**	-	-	-
		Plus Project	-	5	-	-	**19**	-	**>20**	-	14	-	-	-
4	Alameda de Las Pulgas & Hillsdale Boulevard (Signal)	No Project	4	4	-	6	6	-	2	8	-	5	4	-
		Plus Project	4	4	-	6	6	-	2	9	-	5	3	-
Weekday PM Peak Hour														
1	Campus Drive & Hillsdale Boulevard (Signal)	No Project	3	4	-	-	10	-	-	-	-	4	-	8
		Plus Project	4	3	-	-	9	-	-	-	-	3	-	7
2	SR-92 Westbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	13	0	**>20**	3	-	-	-	-	8	-	0
		Plus Project	-	13	0	**>20**	3	-	-	-	-	8	-	0
3	SR-92 Eastbound Ramps & Hillsdale Boulevard (Signal)	No Project	-	4	-	-	**17**	-	7	-	14	-	-	-
		Plus Project	-	4	-	-	16	-	7	-	16	-	-	-
4	Alameda de Las Pulgas & Hillsdale Boulevard (Signal)	No Project	5	6	-	8	5	-	2	10	-	4	4	-
		Plus Project	5	6	-	8	5	-	2	10	-	4	4	-

Notes: EBL = Eastbound Left; EBT = Eastbound Through; EBR = Eastbound Right; similar for W = Westbound, N = Northbound, and S = Southbound movements
'-' = Particular movement is not relevant to the intersection
Bold and shaded cells indicate that the queue lengths exceed the storage lengths for the movement.

TECHNICAL APPENDIX

Appendix A: Traffic Volume Estimation Memo

KITTELSON & ASSOCIATES
155 GRAND AVENUE, SUITE 505
OAKLAND, CA 94612
P 510.839.1742 F 510.839.0871

MEMORANDUM - FINAL

Date: August 13, 2020 Project #: 24837

To: Rendell Bustos
City of San Mateo
330 West 20th Avenue
San Mateo, CA 94403

Cc: Sue-Ellen Atkinson, Bethany Lopez

From: Amanda Leahy, AICP and Anusha Musunuru, PhD

Project: Peninsula Heights Traffic Impact Analysis

Subject: Traffic Volume Estimation Memorandum – Final

Kittelson & Associates, Inc. (Kittelson) has prepared this traffic volume estimation memorandum for the proposed Peninsula Heights development in San Mateo, California. The purpose of this memorandum is to summarize the methodology associated with estimating traffic volumes for the existing conditions because new data collection at the site is not recommended due to COVID-19 conditions.[1] The project description, trip generation and trip distribution are covered in detail in the Trip Generation Memorandum submitted on August 5, 2020.

STUDY INTERSECTIONS

The study area and study intersections for this traffic impact analysis are based on the forecast trip generation of the development and the anticipated background traffic in the vicinity of the development. The proposed study intersections are:

1. Campus Drive at Hillsdale Boulevard
2. SR-92 Westbound Ramps at Hillsdale Boulevard
3. SR-92 Eastbound Ramps at Hillsdale Boulevard
4. Alameda de Las Pulgas at Hillsdale Boulevard

[1] The COVID-19 pandemic has resulted in shelter-in-place orders across the Bay Area and travel demand is significantly reduced across all modes. Travel patterns have also changed substantially. These changes are the result of multiple factors such as school closures, restrictions on business operations, and an increased amount of telecommuting.

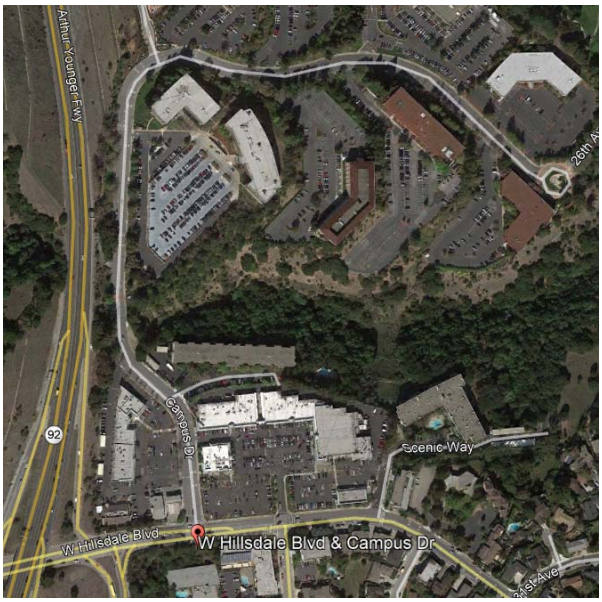
TRAFFIC VOLUMES

Due to the current atypical traffic conditions associated with the COVID-19 pandemic, Kittelson proposes to develop an existing conditions analysis using historic traffic count data and engineering judgment to produce reasonable estimates of existing traffic volumes under a normal (i.e., non-pandemic) design time period. The historic turning movement counts will be adjusted to estimate reasonable baseline traffic demand in 2020. The following historical turning movement and average daily traffic (ADT) counts have been identified for use.

- Campus Drive at Hillsdale Boulevard: 2018 counts – AM & PM peak hours and 2020 ADT for Campus Drive
- SR-92 Westbound Ramps at Hillsdale Boulevard: 2014 counts – AM & PM peak hours
- SR-92 Eastbound Ramps at Hillsdale Boulevard: 2014 counts – AM & PM peak hours
- Alameda de Las Pulgas at Hillsdale Boulevard: 2016 counts – AM & PM peak hours and 2018 ADT for Hillsdale Boulevard and Alameda de Las Pulgas.

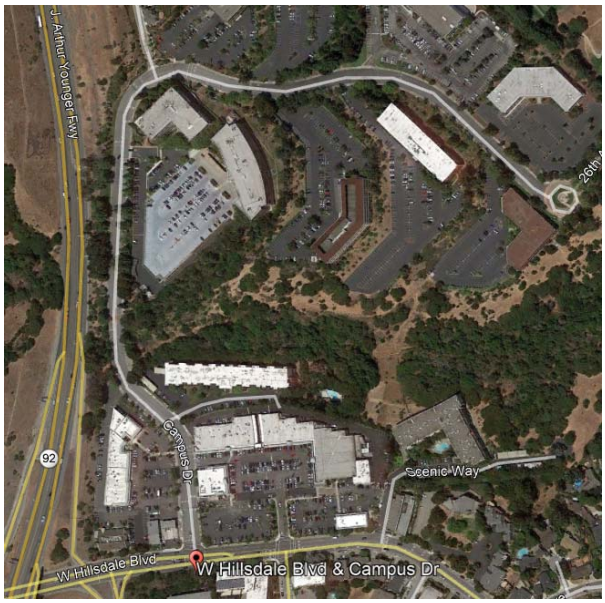
We propose to adjust the traffic counts above to estimated 2020 traffic conditions. The adjustments will reflect a variety of factors including local development, and growth in regional traffic. Exhibits 1 and 2 are aerial photos illustrating the study area in 2014 and imagery for the latest date available (2018, in this case) for context. As is notable from the aerials, no new development has occurred along Hillsdale Boulevard or Campus Drive, i.e. near the project vicinity.

Exhibit 1. Aerial of Study Area in 2014



Source: Google Earth 2/23/2014

Exhibit 2. Aerial of Study Area in 2018



Source: Google Earth 8/9/2020

Assuming City staff concur with the general methodology above, we will proceed with a detailed derivation of 2020 counts and preview the estimate with City staff.

The growth rates for Campus Drive, Hillsdale Boulevard, and Alameda de Las Pulgas were obtained by interpolating the intersection counts at those locations to the available ADT data on those segments. Once the annual growth rate was calculated for Hillsdale Boulevard, the SR-92 Westbound and Eastbound ramp segments were assumed to have similar growth rate as the side arterial street, i.e. Hillsdale Boulevard as two percent. Specifically, the annual growth rate was calculated for Hillsdale Boulevard using intersection counts at Alameda de Las Pulgas/Hillsdale Boulevard and ADT counts on Hillsdale Boulevard. This growth rate for Hillsdale Boulevard was used at other study locations considering the vicinity of the location (the distance between two farthest study intersections is 1.4 miles), and the count data availability.

Our steps will include:

- Adjust Campus Drive/Hillsdale Boulevard to 1) reflect the calculated annual growth rate of 2 percent on Hillsdale Boulevard and 2) reflect through traffic growth of one percent annually from 2018 to 2020 on Campus Drive (the annual growth rate for Campus Drive was computed using the 2018 intersection counts and 2020 ADT data on Campus Drive at Campus Drive/Hillsdale Boulevard location; the annual growth rate for Hillsdale Boulevard was computed using the 2016 intersection counts and 2018 ADT data on Hillsdale Boulevard at Alameda de Las Pulgas/Hillsdale Boulevard location. The same growth rate that was calculated at that intersection for Hillsdale Boulevard was used at this location as well).
- Adjust SR-92 Westbound Ramps/Hillsdale Boulevard to 1) reflect the calculated annual growth rate of 2 percent on Hillsdale Boulevard and 2) reflect through traffic growth of 2 percent annually on SR-92 Westbound Ramps (the annual growth rate for Hillsdale Boulevard was calculated by interpolating intersection counts to the available ADT data, the SR-92 Westbound ramp segments were assumed to have a similar growth rate as the side arterial street, i.e. Hillsdale Boulevard).
- Adjust SR-92 Eastbound Ramps /Hillsdale Boulevard to 1) reflect the calculated annual growth rate of 2 percent on Hillsdale Boulevard and 2) reflect through traffic growth of 2 percent annually on SR-92 Eastbound Ramps (the annual growth rate for Hillsdale Boulevard was calculated by interpolating intersection counts to the available ADT data, the SR-92 Eastbound ramp segments were assumed to have a similar growth rate as the side arterial street, i.e. Hillsdale Boulevard).
- Adjust Alameda de Las Pulgas/Hillsdale Boulevard to 1) reflect the calculated annual growth rate of 2 percent on Hillsdale Boulevard and 2) reflect through traffic growth of 2 and half percent annually from 2016 to 2020 on Alameda de Las Pulgas (the annual growth rates for Alameda de Las Pulgas and Hillsdale Boulevard were computed by interpolating 2016 intersection counts to the available 2020 ADT data).

The historic traffic counts for the intersections, and the baseline 2020 counts estimated using the methodology above are provided in Table 1 and Table 2, respectively.

NEXT STEPS

This memorandum has provided Kittelson's proposed methodology for adjusting historic, pre-COVID-19 conditions to represent reasonable baseline conditions in 2020. Upon City review and approval of the methodology and outputs, Kittelson will proceed with the analysis.

Table 1: Historic Traffic Counts at Study Intersections

Intersection (Year)	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
AM Peak Hour													
Campus Dr/Hillsdale Blvd (2018)	0	0	0	22	0	145	332	573	0	0	795	49	1.00
SR 92 WB Ramps/Hillsdale Blvd (2014)	0	0	0	309	0	696	0	310	156	508	795	0	0.92
SR 92 EB Ramps/Hillsdale Blvd (2014)	679	0	591	0	0	0	0	413	206	0	669	224	0.95
Alameda de Las Pulgas/ Hillsdale Blvd (2016)	105	415	124	98	326	32	58	216	105	88	163	66	0.88
PM Peak Hour													
Campus Dr/Hillsdale Blvd (2018)	0	0	0	103	0	437	195	929	0	0	562	51	1.00
SR 92 WB Ramps/Hillsdale Blvd (2014)	0	0	0	291	0	283	0	453	316	602	442	0	0.91
SR 92 EB Ramps/Hillsdale Blvd (2014)	196	0	582	0	0	0	0	463	317	0	809	344	0.95
Alameda de Las Pulgas/ Hillsdale Blvd (2016)	117	335	72	127	372	37	32	282	116	101	175	59	0.96

Table 2: Baseline (2020) Traffic Counts at Study Intersections

Intersection (Year)	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
AM Peak Hour													
Campus Dr/Hillsdale Blvd	0	0	0	23	0	148	346	596	0	0	827	51	1.00
SR 92 WB Ramps/Hillsdale Blvd	0	0	0	347	0	780	0	348	175	608	951	0	0.92
SR 92 EB Ramps/Hillsdale Blvd	761	0	662	0	0	0	0	463	231	0	750	251	0.95
Alameda de Las Pulgas/ Hillsdale Blvd	116	457	137	108	359	36	63	234	114	96	177	72	0.88
PM Peak Hour													
Campus Dr/Hillsdale Blvd	0	0	0	106	0	446	203	967	0	0	585	54	1.00

SR 92 WB Ramps/Hillsdale Blvd	0	0	0	326	0	317	0	508	354	675	496	0	0.91
SR 92 EB Ramps/Hillsdale Blvd	220	0	652	0	0	0	0	519	356	0	907	386	0.95
Alameda de Las Pulgas/ Hillsdale Blvd	129	369	80	140	405	41	35	305	125	110	189	64	0.96

Appendix B: Existing Conditions Synchro Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	346	596	827	51	23	148
Future Volume (veh/h)	346	596	827	51	23	148
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	346	596	827	51	23	22
Adj No. of Lanes	2	2	2	0	1	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	512	3045	2284	141	103	577
Arrive On Green	0.10	0.58	0.67	0.67	0.06	0.06
Sat Flow, veh/h	3442	3632	3480	209	1774	2787
Grp Volume(v), veh/h	346	596	432	446	23	22
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1826	1774	1393
Q Serve(g_s), s	7.8	6.4	8.4	8.4	1.0	0.5
Cycle Q Clear(g_c), s	7.8	6.4	8.4	8.4	1.0	0.5
Prop In Lane	1.00			0.11	1.00	1.00
Lane Grp Cap(c), veh/h	512	3045	1193	1231	103	577
V/C Ratio(X)	0.68	0.20	0.36	0.36	0.22	0.04
Avail Cap(c_a), veh/h	1420	3045	1193	1231	266	832
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.2	3.7	5.6	5.6	35.9	25.4
Incr Delay (d2), s/veh	0.5	0.1	0.9	0.8	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	3.2	4.4	4.5	0.5	0.4
LnGrp Delay(d),s/veh	34.7	3.9	6.5	6.4	36.3	25.4
LnGrp LOS	C	A	A	A	D	C
Approach Vol, veh/h		942	878		45	
Approach Delay, s/veh		15.2	6.5		31.0	
Approach LOS		B	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		72.3		7.7	14.9	57.4		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		60.0		10.5	31.5	24.0		
Max Q Clear Time (g_c+I1), s		8.4		3.0	9.8	10.4		
Green Ext Time (p_c), s		6.9		0.0	0.6	6.2		

Intersection Summary	
HCM 2010 Ctrl Delay	11.4
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	348	175	608	951	0	0	0	0	347	0	780
Future Volume (veh/h)	0	348	175	608	951	0	0	0	0	347	0	780
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	378	0	661	1034	0				377	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	813	364	742	2541	0				593	0	273
Arrive On Green	0.00	0.23	0.00	0.42	0.72	0.00				0.17	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	378	0	661	1034	0				377	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	4.6	0.0	17.3	5.8	0.0				5.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.6	0.0	17.3	5.8	0.0				5.1	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	813	364	742	2541	0				593	0	273
V/C Ratio(X)	0.00	0.47	0.00	0.89	0.41	0.00				0.64	0.00	0.00
Avail Cap(c_a), veh/h	0	2862	1281	1506	2580	0				1546	0	711
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	16.6	0.0	13.5	2.8	0.0				19.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	1.5	0.0	0.0				0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.3	0.0	8.6	2.7	0.0				2.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	16.8	0.0	15.0	2.9	0.0				19.7	0.0	0.0
LnGrp LOS		B		B	A					B		
Approach Vol, veh/h		378			1695						377	
Approach Delay, s/veh		16.8			7.6						19.7	
Approach LOS		B			A						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	24.4	15.0		10.6		39.4		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	19.3	6.6		7.1		7.8		
Green Ext Time (p_c), s	0.1	0.5		0.1		1.5		

Intersection Summary	
HCM 2010 Ctrl Delay	10.9
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	463	231	0	750	251	761	0	662	0	0	0
Future Volume (veh/h)	0	463	231	0	750	251	761	0	662	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	487	0	0	789	264	801	0	578			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2340	0	0	1199	401	847	0	756			
Arrive On Green	0.00	0.46	0.00	0.00	0.15	0.15	0.48	0.00	0.48			
Sat Flow, veh/h	0	5421	0	0	2700	872	1774	0	1583			
Grp Volume(v), veh/h	0	487	0	0	536	517	801	0	578			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1709	1774	0	1583			
Q Serve(g_s), s	0.0	4.6	0.0	0.0	22.8	22.8	34.4	0.0	24.0			
Cycle Q Clear(g_c), s	0.0	4.6	0.0	0.0	22.8	22.8	34.4	0.0	24.0			
Prop In Lane	0.00		0.00	0.00		0.51	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2340	0	0	814	786	847	0	756			
V/C Ratio(X)	0.00	0.21	0.00	0.00	0.66	0.66	0.95	0.00	0.76			
Avail Cap(c_a), veh/h	0	2340	0	0	814	786	942	0	841			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.76	0.00	0.00	0.93	0.93	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	12.9	0.0	0.0	28.0	28.0	19.9	0.0	17.2			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	3.9	4.0	16.1	0.0	3.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	2.2	0.0	0.0	12.0	11.7	20.5	0.0	11.1			
LnGrp Delay(d),s/veh	0.0	13.0	0.0	0.0	31.9	32.0	36.1	0.0	20.4			
LnGrp LOS		B			C	C	D		C			
Approach Vol, veh/h		487			1053			1379				
Approach Delay, s/veh		13.0			31.9			29.5				
Approach LOS		B			C			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		39.8				39.8		40.2
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		31.0				31.0		41.0
Max Q Clear Time (g_c+I1), s		6.6				24.8		36.4
Green Ext Time (p_c), s		0.8				1.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	27.6
HCM 2010 LOS	C

Intersection	
Intersection Delay, s/veh	95.3
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	108	359	36	116	457	137	63	234	114	96	177	72
Future Vol, veh/h	108	359	36	116	457	137	63	234	114	96	177	72
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	123	408	41	132	519	156	72	266	130	109	201	82
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	47.6	102.6	145.8	89.4
HCM LOS	E	F	F	F

Lane	NELn1	NWLn1	NWLn2	SELn1	SELn2	SWLn1
Vol Left, %	15%	34%	0%	38%	0%	28%
Vol Thru, %	57%	66%	63%	62%	83%	51%
Vol Right, %	28%	0%	37%	0%	17%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	411	345	366	288	216	345
LT Vol	63	116	0	108	0	96
Through Vol	234	229	229	180	180	177
RT Vol	114	0	137	0	36	72
Lane Flow Rate	467	391	415	327	245	392
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	1.208	1.067	1.082	0.9	0.654	1.031
Departure Headway (Hd)	9.675	10.589	10.133	10.656	10.333	10.211
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	378	345	361	343	353	357
Service Time	7.675	8.289	7.833	8.356	8.033	8.211
HCM Lane V/C Ratio	1.235	1.133	1.15	0.953	0.694	1.098
HCM Control Delay	145.8	101.2	103.9	60.3	30.6	89.4
HCM Lane LOS	F	F	F	F	D	F
HCM 95th-tile Q	18.7	13.2	14	8.8	4.4	12.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	203	967	585	54	106	446
Future Volume (veh/h)	203	967	585	54	106	446
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	203	967	585	54	106	320
Adj No. of Lanes	2	2	2	0	1	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	369	2674	1984	183	269	722
Arrive On Green	0.14	1.00	0.61	0.61	0.15	0.15
Sat Flow, veh/h	3442	3632	3370	302	1774	2787
Grp Volume(v), veh/h	203	967	315	324	106	320
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1809	1774	1393
Q Serve(g_s), s	3.8	0.0	6.0	6.0	3.8	6.7
Cycle Q Clear(g_c), s	3.8	0.0	6.0	6.0	3.8	6.7
Prop In Lane	1.00			0.17	1.00	1.00
Lane Grp Cap(c), veh/h	369	2674	1071	1095	269	722
V/C Ratio(X)	0.55	0.36	0.29	0.30	0.39	0.44
Avail Cap(c_a), veh/h	983	2674	1071	1095	355	856
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.91	0.91	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.4	0.0	6.6	6.6	26.8	21.7
Incr Delay (d2), s/veh	0.4	0.3	0.7	0.7	0.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.1	3.1	3.2	1.9	5.4
LnGrp Delay(d),s/veh	28.9	0.3	7.3	7.3	27.1	21.9
LnGrp LOS	C	A	A	A	C	C
Approach Vol, veh/h		1170	639		426	
Approach Delay, s/veh		5.3	7.3		23.2	
Approach LOS		A	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		56.4		13.6	10.5	45.9		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		48.0		12.5	18.5	25.0		
Max Q Clear Time (g_c+I1), s		2.0		8.7	5.8	8.0		
Green Ext Time (p_c), s		13.0		0.4	0.3	5.0		

Intersection Summary	
HCM 2010 Ctrl Delay	9.3
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	508	354	675	496	0	0	0	0	326	0	317
Future Volume (veh/h)	0	508	354	675	496	0	0	0	0	326	0	317
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	558	0	742	545	0				358	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	787	352	810	2623	0				553	0	254
Arrive On Green	0.00	0.22	0.00	0.46	0.74	0.00				0.16	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	558	0	742	545	0				358	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	8.2	0.0	21.9	2.6	0.0				5.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.2	0.0	21.9	2.6	0.0				5.5	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	787	352	810	2623	0				553	0	254
V/C Ratio(X)	0.00	0.71	0.00	0.92	0.21	0.00				0.65	0.00	0.00
Avail Cap(c_a), veh/h	0	2559	1145	1346	2623	0				1382	0	636
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	20.1	0.0	14.2	2.2	0.0				22.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	3.9	0.0	0.0				0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.0	0.0	11.4	1.2	0.0				2.6	0.0	0.0
LnGrp Delay(d),s/veh	0.0	20.6	0.0	18.1	2.2	0.0				22.5	0.0	0.0
LnGrp LOS		C		B	A					C		
Approach Vol, veh/h		558			1287						358	
Approach Delay, s/veh		20.6			11.4						22.5	
Approach LOS		C			B						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	29.1	16.0		11.0		45.0		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	23.9	10.2		7.5		4.6		
Green Ext Time (p_c), s	0.2	0.8		0.1		0.7		

Intersection Summary	
HCM 2010 Ctrl Delay	15.5
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	519	356	0	907	386	220	0	652	0	0	0
Future Volume (veh/h)	0	519	356	0	907	386	220	0	652	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	546	0	0	955	406	232	0	446			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3106	0	0	1485	624	564	0	503			
Arrive On Green	0.00	0.61	0.00	0.00	0.61	0.61	0.32	0.00	0.32			
Sat Flow, veh/h	0	5421	0	0	2524	1022	1774	0	1583			
Grp Volume(v), veh/h	0	546	0	0	692	669	232	0	446			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1682	1774	0	1583			
Q Serve(g_s), s	0.0	3.3	0.0	0.0	17.5	18.0	7.2	0.0	18.7			
Cycle Q Clear(g_c), s	0.0	3.3	0.0	0.0	17.5	18.0	7.2	0.0	18.7			
Prop In Lane	0.00		0.00	0.00		0.61	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3106	0	0	1081	1028	564	0	503			
V/C Ratio(X)	0.00	0.18	0.00	0.00	0.64	0.65	0.41	0.00	0.89			
Avail Cap(c_a), veh/h	0	3106	0	0	1081	1028	570	0	509			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.64	0.00	0.00	0.94	0.94	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	5.9	0.0	0.0	8.7	8.8	18.7	0.0	22.7			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	2.8	3.0	0.2	0.0	16.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	1.5	0.0	0.0	9.3	9.0	3.5	0.0	10.5			
LnGrp Delay(d),s/veh	0.0	6.0	0.0	0.0	11.5	11.8	18.9	0.0	39.0			
LnGrp LOS		A			B	B	B		D			
Approach Vol, veh/h		546			1361			678				
Approach Delay, s/veh		6.0			11.6			32.2				
Approach LOS		A			B			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		45.8				45.8		24.2
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		41.0				41.0		21.0
Max Q Clear Time (g_c+I1), s		5.3				20.0		20.7
Green Ext Time (p_c), s		0.9				1.8		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	15.8
HCM 2010 LOS	B

Intersection	
Intersection Delay, s/veh	86.4
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	140	405	41	129	369	80	35	305	125	110	189	64
Future Vol, veh/h	140	405	41	129	369	80	35	305	125	110	189	64
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	146	422	43	134	384	83	36	318	130	115	197	67
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	57.3	48.5	175.3	79.7
HCM LOS	F	E	F	F

Lane	NELn1	NWLn1	NWLn2	SELn1	SELn2	SWLn1
Vol Left, %	8%	41%	0%	41%	0%	30%
Vol Thru, %	66%	59%	70%	59%	83%	52%
Vol Right, %	27%	0%	30%	0%	17%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	465	314	265	343	244	363
LT Vol	35	129	0	140	0	110
Through Vol	305	185	185	203	203	189
RT Vol	125	0	80	0	41	64
Lane Flow Rate	484	327	276	357	254	378
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	1.286	0.893	0.721	0.971	0.668	0.991
Departure Headway (Hd)	9.56	10.765	10.323	10.715	10.373	10.445
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	383	340	353	342	350	352
Service Time	7.56	8.465	8.023	8.415	8.073	8.445
HCM Lane V/C Ratio	1.264	0.962	0.782	1.044	0.726	1.074
HCM Control Delay	175.3	59.4	35.6	75.6	31.6	79.7
HCM Lane LOS	F	F	E	F	D	F
HCM 95th-tile Q	21.8	8.6	5.4	10.5	4.6	11.1

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	346	596	878	23	148
v/c Ratio	0.57	0.21	0.41	0.13	0.16
Control Delay	34.2	1.4	9.8	33.7	11.6
Queue Delay	0.0	0.0	0.1	0.0	0.0
Total Delay	34.2	1.4	9.9	33.7	11.6
Queue Length 50th (ft)	82	14	109	11	18
Queue Length 95th (ft)	122	33	181	31	35
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	1416	2894	2120	265	1553
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	370	0	5
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.24	0.21	0.50	0.09	0.10

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	378	190	661	1034	377	848
v/c Ratio	0.59	0.12	0.71	0.39	0.62	0.54
Control Delay	32.8	0.2	19.8	4.1	33.4	1.3
Queue Delay	0.0	0.0	1.1	0.1	0.0	0.0
Total Delay	32.8	0.2	21.0	4.2	33.4	1.3
Queue Length 50th (ft)	82	0	203	64	80	0
Queue Length 95th (ft)	145	0	435	132	137	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1970	1583	1034	3525	1061	1583
Starvation Cap Reductn	0	0	175	943	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.12	0.77	0.40	0.36	0.54

Intersection Summary

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	730	1053	801	578
v/c Ratio	0.33	0.71	0.91	0.64
Control Delay	11.6	18.7	33.7	11.7
Queue Delay	0.0	1.5	0.0	0.0
Total Delay	11.6	20.3	33.7	11.7
Queue Length 50th (ft)	63	250	323	107
Queue Length 95th (ft)	92	325	#562	205
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	2226	1494	941	948
Starvation Cap Reductn	0	255	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.33	0.85	0.85	0.61

Intersection Summary

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

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	203	967	639	106	446
v/c Ratio	0.41	0.36	0.32	0.42	0.41
Control Delay	29.8	3.0	9.0	31.6	8.0
Queue Delay	0.0	0.2	0.0	0.0	0.0
Total Delay	29.8	3.2	9.0	31.6	8.0
Queue Length 50th (ft)	40	59	67	42	34
Queue Length 95th (ft)	68	71	121	81	59
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	980	2702	2017	354	1424
Starvation Cap Reductn	0	870	0	0	0
Spillback Cap Reductn	0	0	131	0	9
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.21	0.53	0.34	0.30	0.32

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	558	389	742	545	358	348
v/c Ratio	0.74	0.25	0.80	0.20	0.65	0.22
Control Delay	37.1	0.4	26.6	3.0	38.6	0.3
Queue Delay	0.0	0.0	15.5	0.0	0.0	0.0
Total Delay	37.1	0.4	42.0	3.0	38.6	0.3
Queue Length 50th (ft)	140	0	288	28	89	0
Queue Length 95th (ft)	212	0	#648	61	142	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1763	1583	925	3478	950	1583
Starvation Cap Reductn	0	0	182	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.25	1.00	0.16	0.38	0.22

Intersection Summary

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

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	921	1361	232	446
v/c Ratio	0.26	0.55	0.66	0.76
Control Delay	2.4	5.8	34.2	15.6
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	2.4	6.0	34.2	15.6
Queue Length 50th (ft)	19	105	94	40
Queue Length 95th (ft)	47	277	140	117
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	3587	2467	568	739
Starvation Cap Reductn	0	349	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.64	0.41	0.60

Intersection Summary

Appendix C: Baseline Conditions Synchro Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	346	596	827	51	23	148
Future Volume (veh/h)	346	596	827	51	23	148
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	346	596	827	51	23	22
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	512	3045	2284	141	103	328
Arrive On Green	0.10	0.58	0.67	0.67	0.06	0.06
Sat Flow, veh/h	3442	3632	3480	209	1774	1583
Grp Volume(v), veh/h	346	596	432	446	23	22
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1826	1774	1583
Q Serve(g_s), s	7.8	6.4	8.4	8.4	1.0	0.9
Cycle Q Clear(g_c), s	7.8	6.4	8.4	8.4	1.0	0.9
Prop In Lane	1.00			0.11	1.00	1.00
Lane Grp Cap(c), veh/h	512	3045	1193	1231	103	328
V/C Ratio(X)	0.68	0.20	0.36	0.36	0.22	0.07
Avail Cap(c_a), veh/h	1420	3045	1193	1231	266	473
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.2	3.7	5.6	5.6	35.9	25.5
Incr Delay (d2), s/veh	0.5	0.1	0.9	0.8	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	3.2	4.4	4.5	0.5	0.9
LnGrp Delay(d),s/veh	34.7	3.9	6.5	6.4	36.3	25.5
LnGrp LOS	C	A	A	A	D	C
Approach Vol, veh/h		942	878		45	
Approach Delay, s/veh		15.2	6.5		31.1	
Approach LOS		B	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		72.3		7.7	14.9	57.4		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		60.0		10.5	31.5	24.0		
Max Q Clear Time (g_c+I1), s		8.4		3.0	9.8	10.4		
Green Ext Time (p_c), s		6.9		0.0	0.6	6.2		

Intersection Summary	
HCM 2010 Ctrl Delay	11.5
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	348	175	608	951	0	0	0	0	347	0	780
Future Volume (veh/h)	0	348	175	608	951	0	0	0	0	347	0	780
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	378	0	661	1034	0				377	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	813	364	742	2541	0				593	0	273
Arrive On Green	0.00	0.23	0.00	0.42	0.72	0.00				0.17	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	378	0	661	1034	0				377	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	4.6	0.0	17.3	5.8	0.0				5.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.6	0.0	17.3	5.8	0.0				5.1	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	813	364	742	2541	0				593	0	273
V/C Ratio(X)	0.00	0.47	0.00	0.89	0.41	0.00				0.64	0.00	0.00
Avail Cap(c_a), veh/h	0	2862	1281	1506	2580	0				1546	0	711
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	16.6	0.0	13.5	2.8	0.0				19.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	1.5	0.0	0.0				0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.3	0.0	8.6	2.7	0.0				2.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	16.8	0.0	15.0	2.9	0.0				19.7	0.0	0.0
LnGrp LOS		B		B	A					B		
Approach Vol, veh/h		378			1695						377	
Approach Delay, s/veh		16.8			7.6						19.7	
Approach LOS		B			A						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	24.4	15.0		10.6		39.4		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	19.3	6.6		7.1		7.8		
Green Ext Time (p_c), s	0.1	0.5		0.1		1.5		

Intersection Summary	
HCM 2010 Ctrl Delay	10.9
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	463	231	0	750	251	761	0	662	0	0	0
Future Volume (veh/h)	0	463	231	0	750	251	761	0	662	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	487	0	0	789	264	801	0	578			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2340	0	0	1199	401	847	0	756			
Arrive On Green	0.00	0.46	0.00	0.00	0.15	0.15	0.48	0.00	0.48			
Sat Flow, veh/h	0	5421	0	0	2700	872	1774	0	1583			
Grp Volume(v), veh/h	0	487	0	0	536	517	801	0	578			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1709	1774	0	1583			
Q Serve(g_s), s	0.0	4.6	0.0	0.0	22.8	22.8	34.4	0.0	24.0			
Cycle Q Clear(g_c), s	0.0	4.6	0.0	0.0	22.8	22.8	34.4	0.0	24.0			
Prop In Lane	0.00		0.00	0.00		0.51	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2340	0	0	814	786	847	0	756			
V/C Ratio(X)	0.00	0.21	0.00	0.00	0.66	0.66	0.95	0.00	0.76			
Avail Cap(c_a), veh/h	0	2340	0	0	814	786	942	0	841			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.76	0.00	0.00	0.92	0.92	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	12.9	0.0	0.0	28.0	28.0	19.9	0.0	17.2			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	3.8	3.9	16.1	0.0	3.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	2.2	0.0	0.0	12.0	11.7	20.5	0.0	11.1			
LnGrp Delay(d),s/veh	0.0	13.0	0.0	0.0	31.8	31.9	36.1	0.0	20.4			
LnGrp LOS		B			C	C	D		C			
Approach Vol, veh/h		487			1053			1379				
Approach Delay, s/veh		13.0			31.9			29.5				
Approach LOS		B			C			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		39.8				39.8		40.2
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		31.0				31.0		41.0
Max Q Clear Time (g_c+I1), s		6.6				24.8		36.4
Green Ext Time (p_c), s		0.8				1.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	27.6
HCM 2010 LOS	C

Intersection	
Intersection Delay, s/veh	95.3
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	108	359	36	116	457	137	63	234	114	96	177	72
Future Vol, veh/h	108	359	36	116	457	137	63	234	114	96	177	72
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	123	408	41	132	519	156	72	266	130	109	201	82
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	47.6	102.6	145.8	89.4
HCM LOS	E	F	F	F

Lane	NELn1	NWLn1	NWLn2	SELn1	SELn2	SWLn1
Vol Left, %	15%	34%	0%	38%	0%	28%
Vol Thru, %	57%	66%	63%	62%	83%	51%
Vol Right, %	28%	0%	37%	0%	17%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	411	345	366	288	216	345
LT Vol	63	116	0	108	0	96
Through Vol	234	229	229	180	180	177
RT Vol	114	0	137	0	36	72
Lane Flow Rate	467	391	415	327	245	392
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	1.208	1.067	1.082	0.9	0.654	1.031
Departure Headway (Hd)	9.675	10.589	10.133	10.656	10.333	10.211
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	378	345	361	343	353	357
Service Time	7.675	8.289	7.833	8.356	8.033	8.211
HCM Lane V/C Ratio	1.235	1.133	1.15	0.953	0.694	1.098
HCM Control Delay	145.8	101.2	103.9	60.3	30.6	89.4
HCM Lane LOS	F	F	F	F	D	F
HCM 95th-tile Q	18.7	13.2	14	8.8	4.4	12.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	203	967	585	54	106	446
Future Volume (veh/h)	203	967	585	54	106	446
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	203	967	585	54	106	320
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	373	2503	1822	168	355	488
Arrive On Green	0.11	0.71	0.56	0.56	0.20	0.20
Sat Flow, veh/h	3442	3632	3370	302	1774	1583
Grp Volume(v), veh/h	203	967	315	324	106	320
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1809	1774	1583
Q Serve(g_s), s	3.9	7.7	6.7	6.8	3.6	12.3
Cycle Q Clear(g_c), s	3.9	7.7	6.7	6.8	3.6	12.3
Prop In Lane	1.00			0.17	1.00	1.00
Lane Grp Cap(c), veh/h	373	2503	984	1006	355	488
V/C Ratio(X)	0.54	0.39	0.32	0.32	0.30	0.66
Avail Cap(c_a), veh/h	983	2503	984	1006	355	488
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.91	0.91	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.6	4.1	8.4	8.4	23.8	21.0
Incr Delay (d2), s/veh	0.4	0.4	0.9	0.8	0.2	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	3.8	3.5	3.6	1.8	10.8
LnGrp Delay(d),s/veh	30.0	4.5	9.3	9.2	24.0	23.5
LnGrp LOS	C	A	A	A	C	C
Approach Vol, veh/h		1170	639		426	
Approach Delay, s/veh		9.0	9.3		23.6	
Approach LOS		A	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		53.0		17.0	10.6	42.4		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		48.0		12.5	18.5	25.0		
Max Q Clear Time (g_c+I1), s		9.7		14.3	5.9	8.8		
Green Ext Time (p_c), s		12.3		0.0	0.3	4.9		

Intersection Summary	
HCM 2010 Ctrl Delay	11.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	508	354	675	496	0	0	0	0	326	0	317
Future Volume (veh/h)	0	508	354	675	496	0	0	0	0	326	0	317
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	558	0	742	545	0				358	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	787	352	810	2623	0				553	0	254
Arrive On Green	0.00	0.22	0.00	0.46	0.74	0.00				0.16	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	558	0	742	545	0				358	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	8.2	0.0	21.9	2.6	0.0				5.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.2	0.0	21.9	2.6	0.0				5.5	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	787	352	810	2623	0				553	0	254
V/C Ratio(X)	0.00	0.71	0.00	0.92	0.21	0.00				0.65	0.00	0.00
Avail Cap(c_a), veh/h	0	2559	1145	1346	2623	0				1382	0	636
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	20.1	0.0	14.2	2.2	0.0				22.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	3.9	0.0	0.0				0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.0	0.0	11.4	1.2	0.0				2.6	0.0	0.0
LnGrp Delay(d),s/veh	0.0	20.6	0.0	18.1	2.2	0.0				22.5	0.0	0.0
LnGrp LOS		C		B	A					C		
Approach Vol, veh/h		558			1287						358	
Approach Delay, s/veh		20.6			11.4						22.5	
Approach LOS		C			B						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	29.1	16.0		11.0		45.0		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	23.9	10.2		7.5		4.6		
Green Ext Time (p_c), s	0.2	0.8		0.1		0.7		

Intersection Summary	
HCM 2010 Ctrl Delay	15.5
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	519	356	0	907	386	220	0	652	0	0	0
Future Volume (veh/h)	0	519	356	0	907	386	220	0	652	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	546	0	0	955	406	232	0	446			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3106	0	0	1485	624	564	0	503			
Arrive On Green	0.00	0.61	0.00	0.00	0.61	0.61	0.32	0.00	0.32			
Sat Flow, veh/h	0	5421	0	0	2524	1022	1774	0	1583			
Grp Volume(v), veh/h	0	546	0	0	692	669	232	0	446			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1682	1774	0	1583			
Q Serve(g_s), s	0.0	3.3	0.0	0.0	17.5	18.0	7.2	0.0	18.7			
Cycle Q Clear(g_c), s	0.0	3.3	0.0	0.0	17.5	18.0	7.2	0.0	18.7			
Prop In Lane	0.00		0.00	0.00		0.61	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3106	0	0	1081	1028	564	0	503			
V/C Ratio(X)	0.00	0.18	0.00	0.00	0.64	0.65	0.41	0.00	0.89			
Avail Cap(c_a), veh/h	0	3106	0	0	1081	1028	570	0	509			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.64	0.00	0.00	0.88	0.88	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	5.9	0.0	0.0	8.7	8.8	18.7	0.0	22.7			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	2.6	2.8	0.2	0.0	16.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	1.5	0.0	0.0	9.2	9.0	3.5	0.0	10.5			
LnGrp Delay(d),s/veh	0.0	6.0	0.0	0.0	11.3	11.6	18.9	0.0	39.0			
LnGrp LOS		A			B	B	B		D			
Approach Vol, veh/h		546			1361			678				
Approach Delay, s/veh		6.0			11.4			32.2				
Approach LOS		A			B			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		45.8				45.8		24.2
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		41.0				41.0		21.0
Max Q Clear Time (g_c+I1), s		5.3				20.0		20.7
Green Ext Time (p_c), s		0.9				1.8		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	15.7
HCM 2010 LOS	B

Intersection	
Intersection Delay, s/veh	86.4
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	140	405	41	129	369	80	35	305	125	110	189	64
Future Vol, veh/h	140	405	41	129	369	80	35	305	125	110	189	64
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	146	422	43	134	384	83	36	318	130	115	197	67
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	57.3	48.5	175.3	79.7
HCM LOS	F	E	F	F

Lane	NELn1	NWLn1	NWLn2	SELn1	SELn2	SWLn1
Vol Left, %	8%	41%	0%	41%	0%	30%
Vol Thru, %	66%	59%	70%	59%	83%	52%
Vol Right, %	27%	0%	30%	0%	17%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	465	314	265	343	244	363
LT Vol	35	129	0	140	0	110
Through Vol	305	185	185	203	203	189
RT Vol	125	0	80	0	41	64
Lane Flow Rate	484	327	276	357	254	378
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	1.286	0.893	0.721	0.971	0.668	0.991
Departure Headway (Hd)	9.56	10.765	10.323	10.715	10.373	10.445
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	383	340	353	342	350	352
Service Time	7.56	8.465	8.023	8.415	8.073	8.445
HCM Lane V/C Ratio	1.264	0.962	0.782	1.044	0.726	1.074
HCM Control Delay	175.3	59.4	35.6	75.6	31.6	79.7
HCM Lane LOS	F	F	E	F	D	F
HCM 95th-tile Q	21.8	8.6	5.4	10.5	4.6	11.1

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	346	596	878	23	148
v/c Ratio	0.57	0.21	0.43	0.10	0.27
Control Delay	33.5	1.8	11.1	31.0	14.8
Queue Delay	0.0	0.0	0.2	0.0	0.0
Total Delay	33.5	1.8	11.2	31.0	14.8
Queue Length 50th (ft)	79	18	120	10	40
Queue Length 95th (ft)	120	37	192	31	74
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	1416	2810	2036	265	917
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	410	0	3
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.24	0.21	0.54	0.09	0.16

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	378	190	661	1034	377	848
v/c Ratio	0.59	0.12	0.71	0.39	0.62	0.54
Control Delay	32.8	0.2	19.8	4.1	33.4	1.3
Queue Delay	0.0	0.0	1.1	0.1	0.0	0.0
Total Delay	32.8	0.2	21.0	4.2	33.4	1.3
Queue Length 50th (ft)	82	0	203	64	80	0
Queue Length 95th (ft)	145	0	435	132	137	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1970	1583	1034	3525	1061	1583
Starvation Cap Reductn	0	0	175	943	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.12	0.77	0.40	0.36	0.54

Intersection Summary

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	730	1053	801	578
v/c Ratio	0.33	0.71	0.91	0.64
Control Delay	11.6	18.6	33.7	11.7
Queue Delay	0.0	1.4	0.0	0.0
Total Delay	11.6	20.0	33.7	11.7
Queue Length 50th (ft)	63	254	323	107
Queue Length 95th (ft)	92	334	#562	205
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	2226	1494	941	948
Starvation Cap Reductn	0	245	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.33	0.84	0.85	0.61

Intersection Summary

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

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	203	967	639	106	446
v/c Ratio	0.38	0.38	0.35	0.32	0.64
Control Delay	28.1	4.1	11.4	26.9	15.4
Queue Delay	0.0	0.3	0.0	0.0	0.0
Total Delay	28.1	4.3	11.5	26.9	15.4
Queue Length 50th (ft)	39	72	78	39	101
Queue Length 95th (ft)	61	72	138	80	159
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	980	2540	1818	354	887
Starvation Cap Reductn	0	794	0	0	0
Spillback Cap Reductn	0	0	98	0	3
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.21	0.55	0.37	0.30	0.50

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	558	389	742	545	358	348
v/c Ratio	0.74	0.25	0.80	0.20	0.65	0.22
Control Delay	37.1	0.4	26.6	3.0	38.6	0.3
Queue Delay	0.0	0.0	15.5	0.0	0.0	0.0
Total Delay	37.1	0.4	42.0	3.0	38.6	0.3
Queue Length 50th (ft)	140	0	288	28	89	0
Queue Length 95th (ft)	212	0	#648	61	142	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1763	1583	925	3478	950	1583
Starvation Cap Reductn	0	0	182	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.25	1.00	0.16	0.38	0.22

Intersection Summary

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

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	921	1361	232	446
v/c Ratio	0.26	0.55	0.66	0.76
Control Delay	2.4	5.6	34.2	15.6
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	2.4	5.8	34.2	15.6
Queue Length 50th (ft)	19	86	94	40
Queue Length 95th (ft)	47	153	140	117
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	3587	2467	568	739
Starvation Cap Reductn	0	357	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.65	0.41	0.60

Intersection Summary

Appendix D: Baseline with Project Conditions Synchro Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	242	596	827	25	37	206
Future Volume (veh/h)	242	596	827	25	37	206
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	242	596	827	25	37	80
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	406	2961	2390	72	146	317
Arrive On Green	0.04	0.28	0.68	0.68	0.08	0.08
Sat Flow, veh/h	3442	3632	3601	106	1774	1583
Grp Volume(v), veh/h	242	596	417	435	37	80
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1844	1774	1583
Q Serve(g_s), s	5.5	10.3	7.9	7.9	1.6	3.4
Cycle Q Clear(g_c), s	5.5	10.3	7.9	7.9	1.6	3.4
Prop In Lane	1.00			0.06	1.00	1.00
Lane Grp Cap(c), veh/h	406	2961	1206	1256	146	317
V/C Ratio(X)	0.60	0.20	0.35	0.35	0.25	0.25
Avail Cap(c_a), veh/h	1420	2961	1206	1256	266	424
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.6	8.5	5.3	5.3	34.4	27.0
Incr Delay (d2), s/veh	0.5	0.1	0.8	0.8	0.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	5.1	4.1	4.2	0.8	3.2
LnGrp Delay(d),s/veh	37.1	8.6	6.1	6.1	34.8	27.1
LnGrp LOS	D	A	A	A	C	C
Approach Vol, veh/h		838	852		117	
Approach Delay, s/veh		16.8	6.1		29.5	
Approach LOS		B	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		70.4		9.6	12.4	58.0		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		60.0		10.5	31.5	24.0		
Max Q Clear Time (g_c+I1), s		12.3		5.4	7.5	9.9		
Green Ext Time (p_c), s		6.9		0.1	0.4	6.2		

Intersection Summary	
HCM 2010 Ctrl Delay	12.6
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	322	175	630	965	0	0	0	0	321	0	780
Future Volume (veh/h)	0	322	175	630	965	0	0	0	0	321	0	780
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	350	0	685	1049	0				349	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	805	360	764	2574	0				564	0	259
Arrive On Green	0.00	0.23	0.00	0.43	0.73	0.00				0.16	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	350	0	685	1049	0				349	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	4.3	0.0	18.1	5.8	0.0				4.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.3	0.0	18.1	5.8	0.0				4.8	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	805	360	764	2574	0				564	0	259
V/C Ratio(X)	0.00	0.43	0.00	0.90	0.41	0.00				0.62	0.00	0.00
Avail Cap(c_a), veh/h	0	2836	1269	1492	2574	0				1532	0	705
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	16.7	0.0	13.4	2.7	0.0				19.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	1.6	0.0	0.0				0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.1	0.0	9.1	2.8	0.0				2.3	0.0	0.0
LnGrp Delay(d),s/veh	0.0	16.9	0.0	14.9	2.7	0.0				20.1	0.0	0.0
LnGrp LOS		B		B	A					C		
Approach Vol, veh/h		350			1734						349	
Approach Delay, s/veh		16.9			7.5						20.1	
Approach LOS		B			A						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	25.3	15.0		10.3		40.3		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	20.1	6.3		6.8		7.8		
Green Ext Time (p_c), s	0.2	0.5		0.1		1.5		

Intersection Summary	
HCM 2010 Ctrl Delay	10.7
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	411	231	0	786	273	761	0	610	0	0	0
Future Volume (veh/h)	0	411	231	0	786	273	761	0	610	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	433	0	0	827	287	801	0	501			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2340	0	0	1187	412	847	0	756			
Arrive On Green	0.00	0.46	0.00	0.00	0.15	0.15	0.48	0.00	0.48			
Sat Flow, veh/h	0	5421	0	0	2673	894	1774	0	1583			
Grp Volume(v), veh/h	0	433	0	0	567	547	801	0	501			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1705	1774	0	1583			
Q Serve(g_s), s	0.0	4.0	0.0	0.0	24.3	24.4	34.4	0.0	19.4			
Cycle Q Clear(g_c), s	0.0	4.0	0.0	0.0	24.3	24.4	34.4	0.0	19.4			
Prop In Lane	0.00		0.00	0.00		0.52	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2340	0	0	814	785	847	0	756			
V/C Ratio(X)	0.00	0.19	0.00	0.00	0.70	0.70	0.95	0.00	0.66			
Avail Cap(c_a), veh/h	0	2340	0	0	814	785	942	0	841			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.77	0.00	0.00	0.92	0.92	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	12.7	0.0	0.0	28.6	28.6	19.9	0.0	16.0			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	4.5	4.7	16.2	0.0	1.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	1.9	0.0	0.0	12.9	12.5	20.5	0.0	8.6			
LnGrp Delay(d),s/veh	0.0	12.9	0.0	0.0	33.1	33.3	36.1	0.0	17.2			
LnGrp LOS		B			C	C	D		B			
Approach Vol, veh/h		433			1114			1302				
Approach Delay, s/veh		12.9			33.2			28.8				
Approach LOS		B			C			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		39.8				39.8		40.2
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		31.0				31.0		41.0
Max Q Clear Time (g_c+I1), s		6.0				26.4		36.4
Green Ext Time (p_c), s		0.7				0.9		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	28.1
HCM 2010 LOS	C

Intersection	
Intersection Delay, s/veh	95.9
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	108	359	29	110	457	137	66	242	117	96	164	72
Future Vol, veh/h	108	359	29	110	457	137	66	242	117	96	164	72
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	123	408	33	125	519	156	75	275	133	109	186	82
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	46.9	98.4	162	79.2
HCM LOS	E	F	F	F

Lane	NELn1	NWLn1	NWLn2	SELn1	SELn2	SWLn1
Vol Left, %	16%	32%	0%	38%	0%	29%
Vol Thru, %	57%	68%	63%	62%	86%	49%
Vol Right, %	28%	0%	37%	0%	14%	22%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	425	339	366	288	209	332
LT Vol	66	110	0	108	0	96
Through Vol	242	229	229	180	180	164
RT Vol	117	0	137	0	29	72
Lane Flow Rate	483	385	415	327	237	377
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	1.252	1.043	1.077	0.897	0.631	0.991
Departure Headway (Hd)	9.568	10.585	10.135	10.668	10.366	10.321
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	382	346	361	343	351	355
Service Time	7.568	8.285	7.835	8.368	8.066	8.321
HCM Lane V/C Ratio	1.264	1.113	1.15	0.953	0.675	1.062
HCM Control Delay	162	94.1	102.4	59.8	29.2	79.2
HCM Lane LOS	F	F	F	F	D	F
HCM 95th-tile Q	20.5	12.5	13.8	8.7	4.1	11.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	261	967	585	69	87	370
Future Volume (veh/h)	261	967	585	69	87	370
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	261	967	585	69	87	244
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	435	2580	1786	210	316	482
Arrive On Green	0.13	0.73	0.56	0.56	0.18	0.18
Sat Flow, veh/h	3442	3632	3284	376	1774	1583
Grp Volume(v), veh/h	261	967	324	330	87	244
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1796	1774	1583
Q Serve(g_s), s	5.0	7.1	6.9	6.9	3.0	8.9
Cycle Q Clear(g_c), s	5.0	7.1	6.9	6.9	3.0	8.9
Prop In Lane	1.00			0.21	1.00	1.00
Lane Grp Cap(c), veh/h	435	2580	990	1005	316	482
V/C Ratio(X)	0.60	0.37	0.33	0.33	0.28	0.51
Avail Cap(c_a), veh/h	983	2580	990	1005	355	517
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.9	3.5	8.3	8.3	24.9	20.0
Incr Delay (d2), s/veh	0.4	0.4	0.9	0.9	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	3.5	3.6	3.6	1.5	8.0
LnGrp Delay(d),s/veh	29.3	3.9	9.2	9.2	25.0	20.3
LnGrp LOS	C	A	A	A	C	C
Approach Vol, veh/h		1228	654		331	
Approach Delay, s/veh		9.3	9.2		21.6	
Approach LOS		A	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		54.5		15.5	11.9	42.7		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		48.0		12.5	18.5	25.0		
Max Q Clear Time (g_c+I1), s		9.1		10.9	7.0	8.9		
Green Ext Time (p_c), s		12.4		0.1	0.4	5.0		

Intersection Summary	
HCM 2010 Ctrl Delay	11.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	523	354	646	477	0	0	0	0	341	0	317
Future Volume (veh/h)	0	523	354	646	477	0	0	0	0	341	0	317
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	575	0	710	524	0				375	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	810	362	781	2594	0				573	0	264
Arrive On Green	0.00	0.23	0.00	0.44	0.73	0.00				0.17	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	575	0	710	524	0				375	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	8.2	0.0	20.5	2.5	0.0				5.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.2	0.0	20.5	2.5	0.0				5.6	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	810	362	781	2594	0				573	0	264
V/C Ratio(X)	0.00	0.71	0.00	0.91	0.20	0.00				0.65	0.00	0.00
Avail Cap(c_a), veh/h	0	2617	1171	1377	2594	0				1414	0	650
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	19.4	0.0	14.3	2.3	0.0				21.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	2.4	0.0	0.0				0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.0	0.0	10.4	1.2	0.0				2.7	0.0	0.0
LnGrp Delay(d),s/veh	0.0	19.9	0.0	16.7	2.3	0.0				21.8	0.0	0.0
LnGrp LOS		B		B	A					C		
Approach Vol, veh/h		575			1234						375	
Approach Delay, s/veh		19.9			10.6						21.8	
Approach LOS		B			B						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	27.6	16.0		11.1		43.6		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	22.5	10.2		7.6		4.5		
Green Ext Time (p_c), s	0.2	0.8		0.1		0.7		

Intersection Summary	
HCM 2010 Ctrl Delay	15.0
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	548	356	0	859	357	220	0	681	0	0	0
Future Volume (veh/h)	0	548	356	0	859	357	220	0	681	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	577	0	0	904	376	232	0	509			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3088	0	0	1484	613	570	0	509			
Arrive On Green	0.00	0.61	0.00	0.00	0.61	0.61	0.32	0.00	0.32			
Sat Flow, veh/h	0	5421	0	0	2538	1010	1774	0	1583			
Grp Volume(v), veh/h	0	577	0	0	653	627	232	0	509			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1685	1774	0	1583			
Q Serve(g_s), s	0.0	3.5	0.0	0.0	16.1	16.3	7.1	0.0	22.5			
Cycle Q Clear(g_c), s	0.0	3.5	0.0	0.0	16.1	16.3	7.1	0.0	22.5			
Prop In Lane	0.00		0.00	0.00		0.60	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3088	0	0	1074	1023	570	0	509			
V/C Ratio(X)	0.00	0.19	0.00	0.00	0.61	0.61	0.41	0.00	1.00			
Avail Cap(c_a), veh/h	0	3088	0	0	1074	1023	570	0	509			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.62	0.00	0.00	0.91	0.91	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	6.1	0.0	0.0	8.6	8.6	18.5	0.0	23.8			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	2.3	2.5	0.2	0.0	39.9			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	1.6	0.0	0.0	8.3	8.2	3.5	0.0	15.4			
LnGrp Delay(d),s/veh	0.0	6.2	0.0	0.0	10.9	11.1	18.7	0.0	63.7			
LnGrp LOS		A			B	B	B		F			
Approach Vol, veh/h		577			1280			741				
Approach Delay, s/veh		6.2			11.0			49.6				
Approach LOS		A			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		45.5				45.5		24.5
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		41.0				41.0		21.0
Max Q Clear Time (g_c+I1), s		5.5				18.3		24.5
Green Ext Time (p_c), s		0.9				1.6		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	20.9
HCM 2010 LOS	C

Intersection	
Intersection Delay, s/veh	80.9
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	140	405	44	135	369	80	31	295	121	110	195	64
Future Vol, veh/h	140	405	44	135	369	80	31	295	121	110	195	64
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	146	422	46	141	384	83	32	307	126	115	203	67
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	57.9	50.6	148.6	83.7
HCM LOS	F	F	F	F

Lane	NELn1	NWLn1	NWLn2	SELn1	SELn2	SWLn1
Vol Left, %	7%	42%	0%	41%	0%	30%
Vol Thru, %	66%	58%	70%	59%	82%	53%
Vol Right, %	27%	0%	30%	0%	18%	17%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	447	320	265	343	247	369
LT Vol	31	135	0	140	0	110
Through Vol	295	185	185	203	203	195
RT Vol	121	0	80	0	44	64
Lane Flow Rate	466	333	276	357	257	384
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	1.216	0.914	0.724	0.976	0.679	1.009
Departure Headway (Hd)	9.627	10.668	10.22	10.622	10.274	10.285
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	382	343	355	342	354	357
Service Time	7.627	8.368	7.92	8.322	7.974	8.285
HCM Lane V/C Ratio	1.22	0.971	0.777	1.044	0.726	1.076
HCM Control Delay	148.6	63	35.6	76.4	32.2	83.7
HCM Lane LOS	F	F	E	F	D	F
HCM 95th-tile Q	19	9.1	5.4	10.6	4.7	11.7

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	242	596	852	37	206
v/c Ratio	0.49	0.22	0.40	0.15	0.39
Control Delay	34.3	2.0	9.8	31.4	19.1
Queue Delay	0.0	0.0	0.3	0.0	0.0
Total Delay	34.3	2.0	10.1	31.4	19.1
Queue Length 50th (ft)	56	23	111	16	64
Queue Length 95th (ft)	91	33	167	43	113
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	1416	2764	2110	265	936
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	593	0	5
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.17	0.22	0.56	0.14	0.22

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	350	190	685	1049	349	848
v/c Ratio	0.59	0.12	0.70	0.39	0.61	0.54
Control Delay	34.0	0.2	18.6	3.9	34.4	1.3
Queue Delay	0.0	0.0	2.6	0.1	0.0	0.0
Total Delay	34.0	0.2	21.2	4.0	34.4	1.3
Queue Length 50th (ft)	77	0	203	61	76	0
Queue Length 95th (ft)	135	0	449	135	125	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1901	1583	998	3535	1024	1583
Starvation Cap Reductn	0	0	196	964	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.12	0.85	0.41	0.34	0.54

Intersection Summary

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	676	1114	801	501
v/c Ratio	0.30	0.75	0.91	0.54
Control Delay	10.6	22.4	33.8	7.7
Queue Delay	0.0	3.1	0.0	0.0
Total Delay	10.6	25.4	33.8	7.7
Queue Length 50th (ft)	53	271	323	59
Queue Length 95th (ft)	80	361	#562	133
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	2230	1492	940	968
Starvation Cap Reductn	0	270	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.30	0.91	0.85	0.52

Intersection Summary

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

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	261	967	654	87	370
v/c Ratio	0.48	0.37	0.36	0.28	0.54
Control Delay	29.1	3.9	11.1	26.6	12.4
Queue Delay	0.0	0.2	0.1	0.0	0.0
Total Delay	29.1	4.2	11.2	26.6	12.4
Queue Length 50th (ft)	51	84	84	32	66
Queue Length 95th (ft)	m82	66	132	68	127
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	980	2587	1840	354	866
Starvation Cap Reductn	0	815	0	0	0
Spillback Cap Reductn	0	0	197	0	8
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.27	0.55	0.40	0.25	0.43

Intersection Summary

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

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	575	389	710	524	375	348
v/c Ratio	0.75	0.25	0.78	0.19	0.67	0.22
Control Delay	37.3	0.4	25.7	3.0	39.4	0.3
Queue Delay	0.0	0.0	11.3	0.0	0.0	0.0
Total Delay	37.3	0.4	37.0	3.0	39.4	0.3
Queue Length 50th (ft)	145	0	277	28	94	0
Queue Length 95th (ft)	218	0	#615	58	150	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1742	1583	914	3467	939	1583
Starvation Cap Reductn	0	0	186	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.25	0.98	0.15	0.40	0.22

Intersection Summary

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

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	952	1280	232	509
v/c Ratio	0.27	0.54	0.58	0.84
Control Delay	3.1	6.7	28.7	22.4
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	3.1	6.8	28.7	22.4
Queue Length 50th (ft)	23	102	91	76
Queue Length 95th (ft)	60	293	126	159
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	3512	2406	583	735
Starvation Cap Reductn	0	361	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.27	0.63	0.40	0.69

Intersection Summary

Appendix E: Cumulative Conditions Synchro Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	360	828	975	51	25	152
Future Volume (veh/h)	360	828	975	51	25	152
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	360	828	975	51	25	26
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	533	3035	2277	119	108	342
Arrive On Green	0.05	0.28	0.67	0.67	0.06	0.06
Sat Flow, veh/h	3442	3632	3515	179	1774	1583
Grp Volume(v), veh/h	360	828	504	522	25	26
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1831	1774	1583
Q Serve(g_s), s	8.2	14.5	10.7	10.7	1.1	1.0
Cycle Q Clear(g_c), s	8.2	14.5	10.7	10.7	1.1	1.0
Prop In Lane	1.00			0.10	1.00	1.00
Lane Grp Cap(c), veh/h	533	3035	1177	1218	108	342
V/C Ratio(X)	0.68	0.27	0.43	0.43	0.23	0.08
Avail Cap(c_a), veh/h	1420	3035	1177	1218	266	483
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.0	9.3	6.3	6.3	35.8	25.0
Incr Delay (d2), s/veh	0.4	0.2	1.1	1.1	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	7.2	5.6	5.7	0.5	1.0
LnGrp Delay(d),s/veh	36.4	9.5	7.4	7.4	36.2	25.0
LnGrp LOS	D	A	A	A	D	C
Approach Vol, veh/h		1188	1026		51	
Approach Delay, s/veh		17.6	7.4		30.5	
Approach LOS		B	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		72.1		7.9	15.4	56.7		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		60.0		10.5	31.5	24.0		
Max Q Clear Time (g_c+I1), s		16.5		3.1	10.2	12.7		
Green Ext Time (p_c), s		10.3		0.0	0.7	6.4		

Intersection Summary	
HCM 2010 Ctrl Delay	13.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	422	175	669	1070	0	0	0	0	426	0	780
Future Volume (veh/h)	0	422	175	669	1070	0	0	0	0	426	0	780
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	459	0	727	1163	0				463	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	720	322	795	2525	0				652	0	300
Arrive On Green	0.00	0.20	0.00	0.45	0.71	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	459	0	727	1163	0				463	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	6.7	0.0	21.7	7.9	0.0				7.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	6.7	0.0	21.7	7.9	0.0				7.1	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	720	322	795	2525	0				652	0	300
V/C Ratio(X)	0.00	0.64	0.00	0.91	0.46	0.00				0.71	0.00	0.00
Avail Cap(c_a), veh/h	0	2536	1134	1334	2525	0				1370	0	630
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	20.6	0.0	14.6	3.5	0.0				21.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	3.6	0.0	0.0				0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.3	0.0	11.3	3.7	0.0				3.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	21.0	0.0	18.2	3.5	0.0				22.0	0.0	0.0
LnGrp LOS		C		B	A					C		
Approach Vol, veh/h		459			1890						463	
Approach Delay, s/veh		21.0			9.2						22.0	
Approach LOS		C			A						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	28.8	15.0		12.7		43.8		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	23.7	8.7		9.1		9.9		
Green Ext Time (p_c), s	0.2	0.7		0.1		1.7		

Intersection Summary	
HCM 2010 Ctrl Delay	13.2
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	570	231	0	809	347	884	0	801	0	0	0
Future Volume (veh/h)	0	570	231	0	809	347	884	0	801	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	600	0	0	852	365	931	0	767			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2066	0	0	983	419	942	0	841			
Arrive On Green	0.00	0.41	0.00	0.00	0.13	0.13	0.53	0.00	0.53			
Sat Flow, veh/h	0	5421	0	0	2512	1032	1774	0	1583			
Grp Volume(v), veh/h	0	600	0	0	622	595	931	0	767			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1681	1774	0	1583			
Q Serve(g_s), s	0.0	6.4	0.0	0.0	27.6	27.8	41.4	0.0	35.2			
Cycle Q Clear(g_c), s	0.0	6.4	0.0	0.0	27.6	27.8	41.4	0.0	35.2			
Prop In Lane	0.00		0.00	0.00		0.61	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2066	0	0	719	683	942	0	841			
V/C Ratio(X)	0.00	0.29	0.00	0.00	0.87	0.87	0.99	0.00	0.91			
Avail Cap(c_a), veh/h	0	2066	0	0	719	683	942	0	841			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.64	0.00	0.00	0.87	0.87	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	16.0	0.0	0.0	32.5	32.6	18.5	0.0	17.0			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	11.8	12.7	26.2	0.0	13.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	3.0	0.0	0.0	15.8	15.4	26.8	0.0	18.3			
LnGrp Delay(d),s/veh	0.0	16.2	0.0	0.0	44.3	45.3	44.7	0.0	30.8			
LnGrp LOS		B			D	D	D		C			
Approach Vol, veh/h		600			1217			1698				
Approach Delay, s/veh		16.2			44.8			38.4				
Approach LOS		B			D			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		35.5				35.5		44.5
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		31.0				31.0		41.0
Max Q Clear Time (g_c+I1), s		8.4				29.8		43.4
Green Ext Time (p_c), s		0.9				0.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	36.8
HCM 2010 LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	108	579	37	192	660	165	95	239	250	142	177	74
Future Volume (veh/h)	108	579	37	192	660	165	95	239	250	142	177	74
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	123	658	42	218	750	188	108	272	284	161	201	84
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	268	1352	86	350	1122	281	472	334	349	256	500	209
Arrive On Green	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43
Sat Flow, veh/h	595	3379	215	743	2805	703	1090	836	873	849	1249	522
Grp Volume(v), veh/h	123	344	356	218	473	465	108	0	556	161	0	285
Grp Sat Flow(s),veh/h/ln	595	1770	1825	743	1770	1739	1090	0	1709	849	0	1771
Q Serve(g_s), s	8.1	6.5	6.5	11.5	9.9	9.8	3.5	0.0	12.9	5.1	0.0	5.1
Cycle Q Clear(g_c), s	18.0	6.5	6.5	18.0	9.9	9.8	8.7	0.0	12.9	18.0	0.0	5.1
Prop In Lane	1.00		0.12	1.00		0.40	1.00		0.51	1.00		0.29
Lane Grp Cap(c), veh/h	268	708	730	350	708	695	472	0	683	256	0	708
V/C Ratio(X)	0.46	0.49	0.49	0.62	0.67	0.67	0.23	0.00	0.81	0.63	0.00	0.40
Avail Cap(c_a), veh/h	268	708	730	350	708	695	472	0	683	256	0	708
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.9	10.1	10.0	17.5	11.1	10.8	12.7	0.0	11.6	21.0	0.0	9.5
Incr Delay (d2), s/veh	5.6	2.4	2.3	8.1	5.0	5.0	1.1	0.0	10.2	11.2	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	3.6	3.7	3.5	5.7	5.6	1.2	0.0	7.9	2.8	0.0	2.8
LnGrp Delay(d),s/veh	24.5	12.4	12.3	25.7	16.0	15.8	13.9	0.0	21.9	32.2	0.0	11.2
LnGrp LOS	C	B	B	C	B	B	B		C	C		B
Approach Vol, veh/h		823			1156			664			446	
Approach Delay, s/veh		14.2			17.8			20.6			18.8	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		20.0		14.9		20.0		20.0
Green Ext Time (p_c), s		0.0		1.3		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	17.6
HCM 2010 LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	225	1194	844	64	106	458
Future Volume (veh/h)	225	1194	844	64	106	458
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	225	1194	844	64	106	332
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	401	2503	1827	139	355	501
Arrive On Green	0.08	0.47	0.55	0.55	0.20	0.20
Sat Flow, veh/h	3442	3632	3428	253	1774	1583
Grp Volume(v), veh/h	225	1194	448	460	106	332
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1818	1774	1583
Q Serve(g_s), s	4.4	16.1	10.7	10.7	3.6	12.7
Cycle Q Clear(g_c), s	4.4	16.1	10.7	10.7	3.6	12.7
Prop In Lane	1.00			0.14	1.00	1.00
Lane Grp Cap(c), veh/h	401	2503	970	996	355	501
V/C Ratio(X)	0.56	0.48	0.46	0.46	0.30	0.66
Avail Cap(c_a), veh/h	983	2503	970	996	355	501
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.5	9.6	9.6	9.6	23.8	20.7
Incr Delay (d2), s/veh	0.4	0.5	1.6	1.5	0.2	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	8.0	5.7	5.8	1.8	11.1
LnGrp Delay(d),s/veh	30.9	10.2	11.2	11.1	24.0	23.3
LnGrp LOS	C	B	B	B	C	C
Approach Vol, veh/h		1419	908		438	
Approach Delay, s/veh		13.4	11.1		23.5	
Approach LOS		B	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		53.0		17.0	11.1	41.9		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		48.0		12.5	18.5	25.0		
Max Q Clear Time (g_c+I1), s		18.1		14.7	6.4	12.7		
Green Ext Time (p_c), s		14.6		0.0	0.3	6.1		

Intersection Summary	
HCM 2010 Ctrl Delay	14.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	697	428	935	548	0	0	0	0	394	0	317
Future Volume (veh/h)	0	697	428	935	548	0	0	0	0	394	0	317
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	766	0	1027	602	0				433	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	911	408	851	2749	0				554	0	255
Arrive On Green	0.00	0.26	0.00	0.48	0.78	0.00				0.16	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	766	0	1027	602	0				433	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	18.2	0.0	42.5	4.1	0.0				10.7	0.0	0.0
Cycle Q Clear(g_c), s	0.0	18.2	0.0	42.5	4.1	0.0				10.7	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	911	408	851	2749	0				554	0	255
V/C Ratio(X)	0.00	0.84	0.00	1.21	0.22	0.00				0.78	0.00	0.00
Avail Cap(c_a), veh/h	0	1618	724	851	2749	0				874	0	402
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	31.2	0.0	23.0	2.7	0.0				35.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.8	0.0	103.9	0.0	0.0				0.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	8.9	0.0	45.1	1.9	0.0				5.1	0.0	0.0
LnGrp Delay(d),s/veh	0.0	32.0	0.0	126.9	2.7	0.0				36.6	0.0	0.0
LnGrp LOS		C		F	A					D		
Approach Vol, veh/h		766			1629						433	
Approach Delay, s/veh		32.0			81.0						36.6	
Approach LOS		C			F						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	46.0	26.3		16.3		72.3		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	44.5	20.2		12.7		6.1		
Green Ext Time (p_c), s	0.0	1.1		0.1		0.8		

Intersection Summary	
HCM 2010 Ctrl Delay	60.9
HCM 2010 LOS	E

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	783	356	0	1156	414	276	0	652	0	0	0
Future Volume (veh/h)	0	783	356	0	1156	414	276	0	652	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	824	0	0	1217	436	291	0	556			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3088	0	0	1565	545	570	0	509			
Arrive On Green	0.00	0.61	0.00	0.00	0.20	0.20	0.32	0.00	0.32			
Sat Flow, veh/h	0	5421	0	0	2670	897	1774	0	1583			
Grp Volume(v), veh/h	0	824	0	0	824	829	291	0	556			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1704	1774	0	1583			
Q Serve(g_s), s	0.0	5.3	0.0	0.0	30.8	32.4	9.3	0.0	22.5			
Cycle Q Clear(g_c), s	0.0	5.3	0.0	0.0	30.8	32.4	9.3	0.0	22.5			
Prop In Lane	0.00		0.00	0.00		0.53	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3088	0	0	1074	1035	570	0	509			
V/C Ratio(X)	0.00	0.27	0.00	0.00	0.77	0.80	0.51	0.00	1.09			
Avail Cap(c_a), veh/h	0	3088	0	0	1074	1035	570	0	509			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.53	0.00	0.00	0.79	0.79	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	6.4	0.0	0.0	23.3	24.0	19.3	0.0	23.8			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	4.2	5.2	0.3	0.0	67.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	2.5	0.0	0.0	16.4	16.8	4.6	0.0	19.3			
LnGrp Delay(d),s/veh	0.0	6.6	0.0	0.0	27.5	29.2	19.6	0.0	91.2			
LnGrp LOS		A			C	C	B		F			
Approach Vol, veh/h		824			1653			847				
Approach Delay, s/veh		6.6			28.4			66.6				
Approach LOS		A			C			E				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		45.5				45.5		24.5
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		41.0				41.0		21.0
Max Q Clear Time (g_c+I1), s		7.3				34.4		24.5
Green Ext Time (p_c), s		1.3				1.8		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	32.7
HCM 2010 LOS	C

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	159	778	90	215	640	80	70	305	239	113	198	69
Future Volume (veh/h)	159	778	90	215	640	80	70	305	239	113	198	69
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	166	810	94	224	667	83	73	318	249	118	206	72
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	330	1278	148	281	1268	158	478	388	304	252	528	185
Arrive On Green	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43
Sat Flow, veh/h	709	3196	371	614	3169	394	1097	970	759	841	1320	461
Grp Volume(v), veh/h	166	448	456	224	372	378	73	0	567	118	0	278
Grp Sat Flow(s),veh/h/ln	709	1770	1797	614	1770	1793	1097	0	1729	841	0	1781
Q Serve(g_s), s	10.4	9.2	9.1	8.8	7.2	7.2	2.3	0.0	13.1	4.9	0.0	4.9
Cycle Q Clear(g_c), s	17.6	9.2	9.1	18.0	7.2	7.2	7.2	0.0	13.1	18.0	0.0	4.9
Prop In Lane	1.00		0.21	1.00		0.22	1.00		0.44	1.00		0.26
Lane Grp Cap(c), veh/h	330	708	719	281	708	717	478	0	692	252	0	713
V/C Ratio(X)	0.50	0.63	0.63	0.80	0.53	0.53	0.15	0.00	0.82	0.47	0.00	0.39
Avail Cap(c_a), veh/h	330	708	719	281	708	717	478	0	692	252	0	713
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.0	10.8	10.7	20.1	10.3	10.1	12.1	0.0	11.7	20.6	0.0	9.4
Incr Delay (d2), s/veh	5.4	4.3	4.2	20.7	2.8	2.8	0.7	0.0	10.5	6.2	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	5.2	5.3	4.4	4.0	4.0	0.8	0.0	8.1	1.9	0.0	2.7
LnGrp Delay(d),s/veh	22.3	15.1	14.9	40.8	13.0	12.9	12.8	0.0	22.2	26.7	0.0	11.1
LnGrp LOS	C	B	B	D	B	B	B		C	C		B
Approach Vol, veh/h		1070			974			640			396	
Approach Delay, s/veh		16.2			19.4			21.2			15.7	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		20.0		15.1		19.6		20.0
Green Ext Time (p_c), s		0.0		1.2		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	18.2
HCM 2010 LOS	B

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	360	828	1026	25	152
v/c Ratio	0.58	0.30	0.51	0.11	0.27
Control Delay	36.3	2.1	12.3	30.9	16.7
Queue Delay	0.0	0.3	1.1	0.0	0.0
Total Delay	36.3	2.5	13.5	30.9	16.7
Queue Length 50th (ft)	91	26	154	11	47
Queue Length 95th (ft)	m114	m57	237	32	81
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	1416	2792	2008	265	913
Starvation Cap Reductn	0	1266	0	0	0
Spillback Cap Reductn	0	0	686	0	2
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.25	0.54	0.78	0.09	0.17

Intersection Summary

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

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	459	190	727	1163	463	848
v/c Ratio	0.69	0.12	0.79	0.44	0.73	0.54
Control Delay	37.3	0.2	25.6	4.9	38.8	1.3
Queue Delay	0.0	0.0	13.1	0.1	0.0	0.0
Total Delay	37.3	0.2	38.7	5.0	38.8	1.3
Queue Length 50th (ft)	115	0	282	93	115	0
Queue Length 95th (ft)	177	0	#607	164	175	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1759	1583	923	3492	948	1583
Starvation Cap Reductn	0	0	186	968	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.12	0.99	0.46	0.49	0.54

Intersection Summary

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

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	843	1217	931	767
v/c Ratio	0.41	0.90	0.98	0.83
Control Delay	14.4	28.9	45.5	22.4
Queue Delay	0.0	47.2	0.0	0.0
Total Delay	14.4	76.0	45.5	22.4
Queue Length 50th (ft)	85	305	430	247
Queue Length 95th (ft)	117	#424	#709	#498
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	2068	1373	949	921
Starvation Cap Reductn	0	319	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.41	1.15	0.98	0.83

Intersection Summary

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

Lane Group	SEL	SET	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	123	700	218	938	108	556	161	285
v/c Ratio	0.75	0.50	0.88	0.66	0.26	0.73	0.82	0.38
Control Delay	45.8	11.3	53.2	12.7	11.1	16.4	51.0	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.8	11.3	53.2	12.7	11.1	16.4	51.0	9.4
Queue Length 50th (ft)	26	65	49	87	18	86	35	38
Queue Length 95th (ft)	#97	98	#148	133	43	#192	#118	79
Internal Link Dist (ft)		496		552		1829		1881
Turn Bay Length (ft)								
Base Capacity (vph)	165	1413	248	1422	421	762	196	746
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.50	0.88	0.66	0.26	0.73	0.82	0.38

Intersection Summary

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

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	225	1194	908	106	458
v/c Ratio	0.37	0.48	0.53	0.30	0.66
Control Delay	28.3	3.8	14.8	26.6	18.6
Queue Delay	0.0	0.4	2.4	0.0	0.0
Total Delay	28.3	4.2	17.2	26.6	18.6
Queue Length 50th (ft)	48	62	125	39	141
Queue Length 95th (ft)	m61	m76	228	80	183
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	980	2507	1711	354	849
Starvation Cap Reductn	0	700	0	0	0
Spillback Cap Reductn	0	0	643	0	9
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.23	0.66	0.85	0.30	0.55

Intersection Summary

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

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	766	470	1027	602	433	348
v/c Ratio	0.81	0.30	1.24	0.22	0.73	0.22
Control Delay	39.5	0.5	144.6	3.5	44.2	0.3
Queue Delay	0.0	0.0	0.9	0.1	0.0	0.0
Total Delay	39.5	0.5	145.4	3.6	44.2	0.3
Queue Length 50th (ft)	217	0	~743	40	122	0
Queue Length 95th (ft)	308	0	#1206	75	190	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1577	1583	827	3283	849	1583
Starvation Cap Reductn	0	0	112	1384	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.30	1.44	0.32	0.51	0.22

Intersection Summary

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

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

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	1199	1653	291	556
v/c Ratio	0.38	0.78	0.55	0.92
Control Delay	5.3	12.6	24.3	38.6
Queue Delay	0.0	1.6	0.0	0.0
Total Delay	5.3	14.2	24.3	38.6
Queue Length 50th (ft)	67	327	94	144
Queue Length 95th (ft)	83	416	170	#341
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	3182	2155	580	643
Starvation Cap Reductn	0	313	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.38	0.90	0.50	0.86

Intersection Summary

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

Lane Group	SEL	SET	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	166	904	224	750	73	567	118	278
v/c Ratio	0.73	0.64	1.35	0.53	0.17	0.77	0.63	0.37
Control Delay	36.5	13.0	214.2	11.5	10.0	19.7	31.4	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	13.0	214.2	11.5	10.0	19.7	31.4	9.6
Queue Length 50th (ft)	34	89	~80	68	11	102	23	39
Queue Length 95th (ft)	#118	137	#181	108	31	#248	#89	81
Internal Link Dist (ft)		496		552		1829		1881
Turn Bay Length (ft)								
Base Capacity (vph)	226	1413	166	1412	428	739	188	744
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.64	1.35	0.53	0.17	0.77	0.63	0.37

Intersection Summary

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

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

Appendix F: Cumulative with Project Conditions Synchro Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	256	828	975	25	39	210
Future Volume (veh/h)	256	828	975	25	39	210
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	256	828	975	25	39	84
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	421	2953	2378	61	150	327
Arrive On Green	0.04	0.28	0.67	0.67	0.08	0.08
Sat Flow, veh/h	3442	3632	3619	90	1774	1583
Grp Volume(v), veh/h	256	828	489	511	39	84
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1847	1774	1583
Q Serve(g_s), s	5.9	14.7	10.0	10.0	1.6	3.6
Cycle Q Clear(g_c), s	5.9	14.7	10.0	10.0	1.6	3.6
Prop In Lane	1.00			0.05	1.00	1.00
Lane Grp Cap(c), veh/h	421	2953	1194	1246	150	327
V/C Ratio(X)	0.61	0.28	0.41	0.41	0.26	0.26
Avail Cap(c_a), veh/h	1420	2953	1194	1246	266	431
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.5	10.1	5.9	5.9	34.3	26.6
Incr Delay (d2), s/veh	0.4	0.2	1.0	1.0	0.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	7.3	5.1	5.3	0.8	3.3
LnGrp Delay(d),s/veh	36.9	10.3	6.9	6.9	34.6	26.7
LnGrp LOS	D	B	A	A	C	C
Approach Vol, veh/h		1084	1000		123	
Approach Delay, s/veh		16.6	6.9		29.2	
Approach LOS		B	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		70.2		9.8	12.8	57.5		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		60.0		10.5	31.5	24.0		
Max Q Clear Time (g_c+I1), s		16.7		5.6	7.9	12.0		
Green Ext Time (p_c), s		10.3		0.1	0.5	6.5		

Intersection Summary	
HCM 2010 Ctrl Delay	12.9
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	396	175	691	1084	0	0	0	0	400	0	780
Future Volume (veh/h)	0	396	175	691	1084	0	0	0	0	400	0	780
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	430	0	751	1178	0				435	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	712	319	817	2558	0				623	0	287
Arrive On Green	0.00	0.20	0.00	0.46	0.72	0.00				0.18	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	430	0	751	1178	0				435	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	6.3	0.0	22.6	7.9	0.0				6.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	6.3	0.0	22.6	7.9	0.0				6.8	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	712	319	817	2558	0				623	0	287
V/C Ratio(X)	0.00	0.60	0.00	0.92	0.46	0.00				0.70	0.00	0.00
Avail Cap(c_a), veh/h	0	2508	1122	1319	2558	0				1355	0	623
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	20.8	0.0	14.4	3.3	0.0				21.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	4.6	0.0	0.0				0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.1	0.0	11.9	3.8	0.0				3.2	0.0	0.0
LnGrp Delay(d),s/veh	0.0	21.1	0.0	19.1	3.3	0.0				22.5	0.0	0.0
LnGrp LOS		C		B	A					C		
Approach Vol, veh/h		430			1929						435	
Approach Delay, s/veh		21.1			9.5						22.5	
Approach LOS		C			A						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	29.8	15.0		12.3		44.8		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	24.6	8.3		8.8		9.9		
Green Ext Time (p_c), s	0.2	0.6		0.1		1.7		

Intersection Summary	
HCM 2010 Ctrl Delay	13.3
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	518	231	0	845	369	884	0	749	0	0	0
Future Volume (veh/h)	0	518	231	0	845	369	884	0	749	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	545	0	0	889	388	931	0	694			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2066	0	0	977	424	942	0	841			
Arrive On Green	0.00	0.41	0.00	0.00	0.13	0.13	0.53	0.00	0.53			
Sat Flow, veh/h	0	5421	0	0	2499	1043	1774	0	1583			
Grp Volume(v), veh/h	0	545	0	0	652	625	931	0	694			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1679	1774	0	1583			
Q Serve(g_s), s	0.0	5.7	0.0	0.0	29.1	29.4	41.4	0.0	29.3			
Cycle Q Clear(g_c), s	0.0	5.7	0.0	0.0	29.1	29.4	41.4	0.0	29.3			
Prop In Lane	0.00		0.00	0.00		0.62	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2066	0	0	719	682	942	0	841			
V/C Ratio(X)	0.00	0.26	0.00	0.00	0.91	0.92	0.99	0.00	0.83			
Avail Cap(c_a), veh/h	0	2066	0	0	719	682	942	0	841			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.67	0.00	0.00	0.88	0.88	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	15.8	0.0	0.0	33.2	33.3	18.5	0.0	15.6			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	15.7	17.4	26.2	0.0	6.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	2.7	0.0	0.0	17.4	17.0	26.8	0.0	14.0			
LnGrp Delay(d),s/veh	0.0	16.0	0.0	0.0	48.9	50.7	44.7	0.0	22.0			
LnGrp LOS		B			D	D	D		C			
Approach Vol, veh/h		545			1277			1625				
Approach Delay, s/veh		16.0			49.8			35.0				
Approach LOS		B			D			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		35.5				35.5		44.5
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		31.0				31.0		41.0
Max Q Clear Time (g_c+I1), s		7.7				31.4		43.4
Green Ext Time (p_c), s		0.9				0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	37.5
HCM 2010 LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	108	579	30	185	660	165	98	247	253	142	164	74
Future Volume (veh/h)	108	579	30	185	660	165	98	247	253	142	164	74
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	123	658	34	210	750	188	111	281	288	161	186	84
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	268	1370	71	353	1122	281	484	338	346	246	487	220
Arrive On Green	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43
Sat Flow, veh/h	595	3424	177	749	2805	703	1105	844	866	839	1216	549
Grp Volume(v), veh/h	123	340	352	210	473	465	111	0	569	161	0	270
Grp Sat Flow(s),veh/h/ln	595	1770	1832	749	1770	1739	1105	0	1710	839	0	1766
Q Serve(g_s), s	8.1	6.4	6.4	11.6	9.9	9.8	3.6	0.0	13.4	4.6	0.0	4.8
Cycle Q Clear(g_c), s	18.0	6.4	6.4	18.0	9.9	9.8	8.4	0.0	13.4	18.0	0.0	4.8
Prop In Lane	1.00		0.10	1.00		0.40	1.00		0.51	1.00		0.31
Lane Grp Cap(c), veh/h	268	708	733	353	708	695	484	0	684	246	0	706
V/C Ratio(X)	0.46	0.48	0.48	0.60	0.67	0.67	0.23	0.00	0.83	0.65	0.00	0.38
Avail Cap(c_a), veh/h	268	708	733	353	708	695	484	0	684	246	0	706
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.9	10.0	10.0	17.2	11.1	10.8	12.5	0.0	11.8	21.3	0.0	9.4
Incr Delay (d2), s/veh	5.6	2.3	2.3	7.2	5.0	5.0	1.1	0.0	11.3	12.7	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	3.6	3.7	3.3	5.7	5.6	1.2	0.0	8.3	2.8	0.0	2.6
LnGrp Delay(d),s/veh	24.5	12.3	12.2	24.4	16.0	15.8	13.6	0.0	23.1	34.0	0.0	10.9
LnGrp LOS	C	B	B	C	B	B	B		C	C		B
Approach Vol, veh/h		815			1148			680			431	
Approach Delay, s/veh		14.1			17.5			21.5			19.6	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		20.0		15.4		20.0		20.0
Green Ext Time (p_c), s		0.0		1.1		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	17.8
HCM 2010 LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	283	1194	844	79	87	382
Future Volume (veh/h)	283	1194	844	79	87	382
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	283	1194	844	79	87	256
Adj No. of Lanes	2	2	2	0	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	463	2563	1789	167	324	503
Arrive On Green	0.09	0.49	0.55	0.55	0.18	0.18
Sat Flow, veh/h	3442	3632	3365	306	1774	1583
Grp Volume(v), veh/h	283	1194	456	467	87	256
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1809	1774	1583
Q Serve(g_s), s	5.5	15.7	11.0	11.0	2.9	9.2
Cycle Q Clear(g_c), s	5.5	15.7	11.0	11.0	2.9	9.2
Prop In Lane	1.00			0.17	1.00	1.00
Lane Grp Cap(c), veh/h	463	2563	968	989	324	503
V/C Ratio(X)	0.61	0.47	0.47	0.47	0.27	0.51
Avail Cap(c_a), veh/h	983	2563	968	989	355	530
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.1	9.0	9.7	9.7	24.6	19.4
Incr Delay (d2), s/veh	0.4	0.5	1.6	1.6	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	7.8	5.8	5.9	1.5	8.3
LnGrp Delay(d),s/veh	30.5	9.5	11.3	11.3	24.7	19.7
LnGrp LOS	C	A	B	B	C	B
Approach Vol, veh/h		1477	923		343	
Approach Delay, s/veh		13.5	11.3		21.0	
Approach LOS		B	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		54.2		15.8	12.4	41.8		
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0		
Max Green Setting (Gmax), s		48.0		12.5	18.5	25.0		
Max Q Clear Time (g_c+I1), s		17.7		11.2	7.5	13.0		
Green Ext Time (p_c), s		14.7		0.1	0.4	6.1		

Intersection Summary	
HCM 2010 Ctrl Delay	13.7
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	712	428	906	529	0	0	0	0	409	0	317
Future Volume (veh/h)	0	712	428	906	529	0	0	0	0	409	0	317
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1863	1863	1863	0				1863	0	1863
Adj Flow Rate, veh/h	0	782	0	996	581	0				449	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	925	414	840	2738	0				568	0	261
Arrive On Green	0.00	0.26	0.00	0.47	0.77	0.00				0.17	0.00	0.00
Sat Flow, veh/h	0	3632	1583	1774	3632	0				3442	0	1583
Grp Volume(v), veh/h	0	782	0	996	581	0				449	0	0
Grp Sat Flow(s),veh/h/ln	0	1770	1583	1774	1770	0				1721	0	1583
Q Serve(g_s), s	0.0	18.8	0.0	42.5	4.0	0.0				11.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	18.8	0.0	42.5	4.0	0.0				11.2	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	925	414	840	2738	0				568	0	261
V/C Ratio(X)	0.00	0.85	0.00	1.19	0.21	0.00				0.79	0.00	0.00
Avail Cap(c_a), veh/h	0	1596	714	840	2738	0				862	0	397
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	31.4	0.0	23.6	2.8	0.0				36.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.8	0.0	95.7	0.0	0.0				1.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.2	0.0	42.9	1.9	0.0				5.5	0.0	0.0
LnGrp Delay(d),s/veh	0.0	32.3	0.0	119.4	2.8	0.0				37.4	0.0	0.0
LnGrp LOS		C		F	A					D		
Approach Vol, veh/h		782			1577						449	
Approach Delay, s/veh		32.3			76.4						37.4	
Approach LOS		C			E						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	46.0	27.0		16.8		73.0		
Change Period (Y+Rc), s	5.0	* 5		3.5		5.0		
Max Green Setting (Gmax), s	41.0	* 39		21.0		35.0		
Max Q Clear Time (g_c+I1), s	44.5	20.8		13.2		6.0		
Green Ext Time (p_c), s	0.0	1.2		0.1		0.7		

Intersection Summary	
HCM 2010 Ctrl Delay	57.9
HCM 2010 LOS	E

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	812	356	0	1109	385	276	0	681	0	0	0
Future Volume (veh/h)	0	812	356	0	1109	385	276	0	681	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1863	1900	0	1863	1900	1863	0	1863			
Adj Flow Rate, veh/h	0	855	0	0	1167	405	291	0	602			
Adj No. of Lanes	0	3	0	0	2	0	1	0	1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3088	0	0	1576	535	570	0	509			
Arrive On Green	0.00	0.61	0.00	0.00	0.20	0.20	0.32	0.00	0.32			
Sat Flow, veh/h	0	5421	0	0	2689	881	1774	0	1583			
Grp Volume(v), veh/h	0	855	0	0	787	785	291	0	602			
Grp Sat Flow(s),veh/h/ln	0	1695	0	0	1770	1707	1774	0	1583			
Q Serve(g_s), s	0.0	5.6	0.0	0.0	29.2	30.3	9.3	0.0	22.5			
Cycle Q Clear(g_c), s	0.0	5.6	0.0	0.0	29.2	30.3	9.3	0.0	22.5			
Prop In Lane	0.00		0.00	0.00		0.52	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3088	0	0	1074	1037	570	0	509			
V/C Ratio(X)	0.00	0.28	0.00	0.00	0.73	0.76	0.51	0.00	1.18			
Avail Cap(c_a), veh/h	0	3088	0	0	1074	1037	570	0	509			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.00	0.51	0.00	0.00	0.83	0.83	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	6.5	0.0	0.0	22.7	23.1	19.3	0.0	23.8			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	3.7	4.3	0.3	0.0	100.9			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	2.6	0.0	0.0	15.4	15.6	4.6	0.0	24.0			
LnGrp Delay(d),s/veh	0.0	6.6	0.0	0.0	26.4	27.4	19.6	0.0	124.7			
LnGrp LOS		A			C	C	B		F			
Approach Vol, veh/h		855			1572			893				
Approach Delay, s/veh		6.6			26.9			90.4				
Approach LOS		A			C			F				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		45.5				45.5		24.5
Change Period (Y+Rc), s		4.5				4.5		3.5
Max Green Setting (Gmax), s		41.0				41.0		21.0
Max Q Clear Time (g_c+I1), s		7.6				32.3		24.5
Green Ext Time (p_c), s		1.4				1.8		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	38.8
HCM 2010 LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	159	778	93	221	640	80	66	295	235	113	204	69
Future Volume (veh/h)	159	778	93	221	640	80	66	295	235	113	204	69
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	166	810	97	230	667	83	69	307	245	118	212	72
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	330	1274	152	280	1268	158	474	384	307	263	532	181
Arrive On Green	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43	0.40	0.40	0.43
Sat Flow, veh/h	709	3184	381	612	3169	394	1091	961	767	852	1331	452
Grp Volume(v), veh/h	166	450	457	230	372	378	69	0	552	118	0	284
Grp Sat Flow(s),veh/h/ln	709	1770	1795	612	1770	1793	1091	0	1727	852	0	1783
Q Serve(g_s), s	10.4	9.2	9.2	8.8	7.2	7.2	2.2	0.0	12.6	5.4	0.0	5.1
Cycle Q Clear(g_c), s	17.6	9.2	9.2	18.0	7.2	7.2	7.2	0.0	12.6	18.0	0.0	5.1
Prop In Lane	1.00		0.21	1.00		0.22	1.00		0.44	1.00		0.25
Lane Grp Cap(c), veh/h	330	708	718	280	708	717	474	0	691	263	0	713
V/C Ratio(X)	0.50	0.64	0.64	0.82	0.53	0.53	0.15	0.00	0.80	0.45	0.00	0.40
Avail Cap(c_a), veh/h	330	708	718	280	708	717	474	0	691	263	0	713
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.0	10.9	10.7	20.2	10.3	10.1	12.2	0.0	11.6	20.1	0.0	9.5
Incr Delay (d2), s/veh	5.4	4.3	4.3	23.1	2.8	2.8	0.6	0.0	9.4	5.5	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	5.2	5.3	4.6	4.0	4.0	0.7	0.0	7.7	1.8	0.0	2.8
LnGrp Delay(d),s/veh	22.3	15.2	15.0	43.4	13.0	12.9	12.8	0.0	21.0	25.6	0.0	11.1
LnGrp LOS	C	B	B	D	B	B	B		C	C		B
Approach Vol, veh/h		1073			980			621			402	
Approach Delay, s/veh		16.2			20.1			20.1			15.4	
Approach LOS		B			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		20.0		14.6		19.6		20.0
Green Ext Time (p_c), s		0.0		1.4		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	18.1
HCM 2010 LOS	B

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	256	828	1000	39	210
v/c Ratio	0.50	0.30	0.48	0.16	0.40
Control Delay	37.6	2.1	10.9	31.4	20.7
Queue Delay	0.0	0.3	1.7	0.0	0.0
Total Delay	37.6	2.4	12.6	31.4	20.7
Queue Length 50th (ft)	65	26	140	17	72
Queue Length 95th (ft)	m92	54	207	44	121
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	1416	2750	2082	265	932
Starvation Cap Reductn	0	1206	0	0	0
Spillback Cap Reductn	0	0	860	0	3
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.18	0.54	0.82	0.15	0.23

Intersection Summary

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

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	430	190	751	1178	435	848
v/c Ratio	0.67	0.12	0.80	0.44	0.71	0.54
Control Delay	36.5	0.2	25.1	4.6	38.0	1.3
Queue Delay	0.0	0.0	14.2	0.1	0.0	0.0
Total Delay	36.5	0.2	39.3	4.7	38.0	1.3
Queue Length 50th (ft)	106	0	281	89	105	0
Queue Length 95th (ft)	163	0	#612	157	162	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1794	1583	941	3509	967	1583
Starvation Cap Reductn	0	0	185	956	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.12	0.99	0.46	0.45	0.54

Intersection Summary

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

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	788	1277	931	694
v/c Ratio	0.38	0.94	0.98	0.74
Control Delay	13.5	35.5	46.3	16.2
Queue Delay	0.0	45.3	0.0	0.0
Total Delay	13.5	80.8	46.3	16.2
Queue Length 50th (ft)	75	326	430	184
Queue Length 95th (ft)	105	#460	#709	330
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	2071	1371	946	933
Starvation Cap Reductn	0	292	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.38	1.18	0.98	0.74

Intersection Summary

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

Lane Group	SEL	SET	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	123	692	210	938	111	569	161	270
v/c Ratio	0.75	0.49	0.83	0.66	0.26	0.75	0.86	0.36
Control Delay	45.8	11.3	45.7	12.7	11.0	17.2	58.9	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.8	11.3	45.7	12.7	11.0	17.2	58.9	9.0
Queue Length 50th (ft)	26	64	46	87	18	90	36	35
Queue Length 95th (ft)	#97	97	#140	133	44	#222	#121	73
Internal Link Dist (ft)		496		552		1829		1881
Turn Bay Length (ft)								
Base Capacity (vph)	165	1414	252	1422	435	762	187	746
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.49	0.83	0.66	0.26	0.75	0.86	0.36

Intersection Summary

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

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	283	1194	923	87	382
v/c Ratio	0.49	0.47	0.52	0.26	0.57
Control Delay	31.8	3.4	13.8	25.9	16.8
Queue Delay	0.0	0.4	0.7	0.0	0.0
Total Delay	31.8	3.8	14.4	25.9	16.8
Queue Length 50th (ft)	62	58	133	32	103
Queue Length 95th (ft)	m80	m71	208	68	163
Internal Link Dist (ft)		270	767	1297	
Turn Bay Length (ft)	155			150	150
Base Capacity (vph)	980	2530	1759	354	849
Starvation Cap Reductn	0	734	0	0	0
Spillback Cap Reductn	0	0	453	0	6
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.29	0.66	0.71	0.25	0.45

Intersection Summary

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

Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	782	470	996	581	449	348
v/c Ratio	0.82	0.30	1.22	0.21	0.74	0.22
Control Delay	39.9	0.5	136.1	3.6	45.0	0.3
Queue Delay	0.0	0.0	0.9	0.0	0.0	0.0
Total Delay	39.9	0.5	137.0	3.6	45.0	0.3
Queue Length 50th (ft)	225	0	~724	40	129	0
Queue Length 95th (ft)	317	0	#1174	73	200	0
Internal Link Dist (ft)	592			325		
Turn Bay Length (ft)			200		250	300
Base Capacity (vph)	1557	1583	817	3251	839	1583
Starvation Cap Reductn	0	0	117	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.30	1.42	0.18	0.54	0.22

Intersection Summary

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

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

Lane Group	EBT	WBT	NBL	NBR
Lane Group Flow (vph)	1230	1572	291	602
v/c Ratio	0.41	0.78	0.50	0.94
Control Delay	6.0	13.0	22.3	42.6
Queue Delay	0.0	1.9	0.0	0.0
Total Delay	6.0	14.9	22.3	42.6
Queue Length 50th (ft)	68	281	97	182
Queue Length 95th (ft)	87	381	170	#397
Internal Link Dist (ft)	325	270		
Turn Bay Length (ft)				400
Base Capacity (vph)	3079	2080	595	647
Starvation Cap Reductn	0	338	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.40	0.90	0.49	0.93

Intersection Summary

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

Lane Group	SEL	SET	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	166	907	230	750	69	552	118	285
v/c Ratio	0.73	0.64	1.39	0.53	0.16	0.75	0.59	0.38
Control Delay	36.5	13.0	228.6	11.5	10.0	18.6	27.9	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	13.0	228.6	11.5	10.0	18.6	27.9	9.8
Queue Length 50th (ft)	34	89	~84	68	11	98	23	40
Queue Length 95th (ft)	#118	138	#185	108	30	#238	#86	84
Internal Link Dist (ft)		496		552		1829		1881
Turn Bay Length (ft)								
Base Capacity (vph)	226	1413	166	1412	421	739	199	743
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.64	1.39	0.53	0.16	0.75	0.59	0.38

Intersection Summary

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

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