Transportation Impact Analysis

Hayward Park Station TIA

San Mateo, California

FINAL

June 2022

Transportation Impact Analysis

Hayward Park Station TIA

San Mateo, California

Prepared For:
Wendy Lao
City of San Mateo
330 West 20th Avenue
San Mateo, CA 94403
(650) 522-7219

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

Project Analysts: Azhagan Avr, Megan Mannion
Project Manager: Anusha Musunuru, PhD
Project Principal: Damian Stefanakis

Project No. 24837.004

June 2022

TABLE OF CONTENTS

Table of Contents iii

Executive Summary vii

Project Trip Generation vii

CEQA Analysis vii

Local Transportation Analysis vii

Introduction 8

Project Description 8

Scope of Study 11

CEQA Analysis 12

Screening Criteria 12

VMT Impact Discussion 13

Local Transportation Analysis 17

Scope of Study 17

Existing Conditions 21

Baseline Conditions 30

Project Travel Demand 32

Baseline with Project Conditions 33

Cumulative Conditions 38

Cumulative with Project Conditions 40

95th Percentile Queue Analysis 43

Tehnical Appendix 48

LIST OF TABLES

Table 1: Parking Ratios for Neighboring Approved Projects in the Project Vicinity 13
Table 2: Level of Service Definition for Intersections 19
Table 3: Existing Bus Service 24
Table 4: Existing Conditions Intersection Operations Results 27
Table 5: Baseline Conditions Intersection Operations Results 30
Table 6: Project Trip Generation 32
Table 7: Baseline + Project Conditions Intersection Operations Results 36
Table 8: Cumulative Conditions Intersection Operations Results 38
Table 9: Cumulative with Project Conditions Intersection Operations Results 40
Table 10: Cumulative with Project Conditions (Optimized) Intersection Operations Results 41
Table 11: Existing Storage Lengths 44
Table 12: 95th Percentile Queue Lengths for Existing Conditions 45
Table 13: 95th Percentile Queue Lengths for Baseline and Baseline with Project Conditions 46
Table 14: 95th Percentile Queue Lengths for Cumulative and Cumulative with Project Conditions 47

LIST OF FIGURES

Figure 1: Project Location 9
Figure 2: Site Plan 10
Figure 3: HQTA Map 14
Figure 4: VMT Per Capita Map 15
Figure 5: City of San Mateo Traffic Analysis Zones (TAZ) Map 16
Figure 6: Study Intersections 20
Figure 7: Existing Bicycle Network 25
Figure 8: Existing Transit Service 26
Figure 9: Existing Conditions Traffic Control and Lane Configurations 28
Figure 10: Existing Conditions Peak Hour Turning Movement Volumes 29
Figure 11: Baseline Conditions Peak Hour Turning Movement Volumes 31
Figure 12: Baseline with Project Conditions Peak Hour Turning Movement Volumes 37
Figure 13: Cumulative Conditions Peak Hour Turning Movement Volumes 39
Figure 14: Cumulative with Project Conditions Peak Hour Turning Movement Volumes 42

APPENDICES

Appendix A: Traffic Volume Estimation Memo 49
Appendix B: Existing Conditions Synchro Worksheets 50
Appendix C: Baseline Conditions Synchro Worksheets 51
Appendix D: Baseline with Project Conditions Synchro Worksheets 52
Appendix E: Cumulative Conditions Synchro Worksheets 53
Appendix F: Cumulative with Project Conditions Synchro Worksheets 54
Appendix G: Queue Analysis Worksheets 55
Appendix H: Supplemental Queueing Analysis 56

EXECUTIVE SUMMARY

PROJECT TRIP GENERATION

The proposed project is estimated to generate 62 vehicle trips (35 inbound, 27 outbound) during the weekday AM peak hour and 55 vehicle trips (24 inbound, 31 outbound) during the weekday PM peak hour. Therefore, 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) 1979, which has a vehicle miles traveled (VMT) per Capita of 17.6 and exceeds the countywide regional average of 15.5 VMT per Capita. Given the project is within a half mile of the San Mateo Hayward Park Caltrain station, and it meets the detailed screening criteria requirements under the *High-Quality Transit Area (HQTA)* criterion of the City VMT Guidelines, the project can be presumed to result in a less than significant VMT impact and therefore exempted from the detailed VMT analysis.

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 (with the proposed mitigation measure of signal timing optimization at select study intersections), as specified in the City of San Mateo TIA guidelines[1].

[1] City of San Mateo Transportation Impact Analysis Guidelines, 2020.

INTRODUCTION

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

PROJECT DESCRIPTION

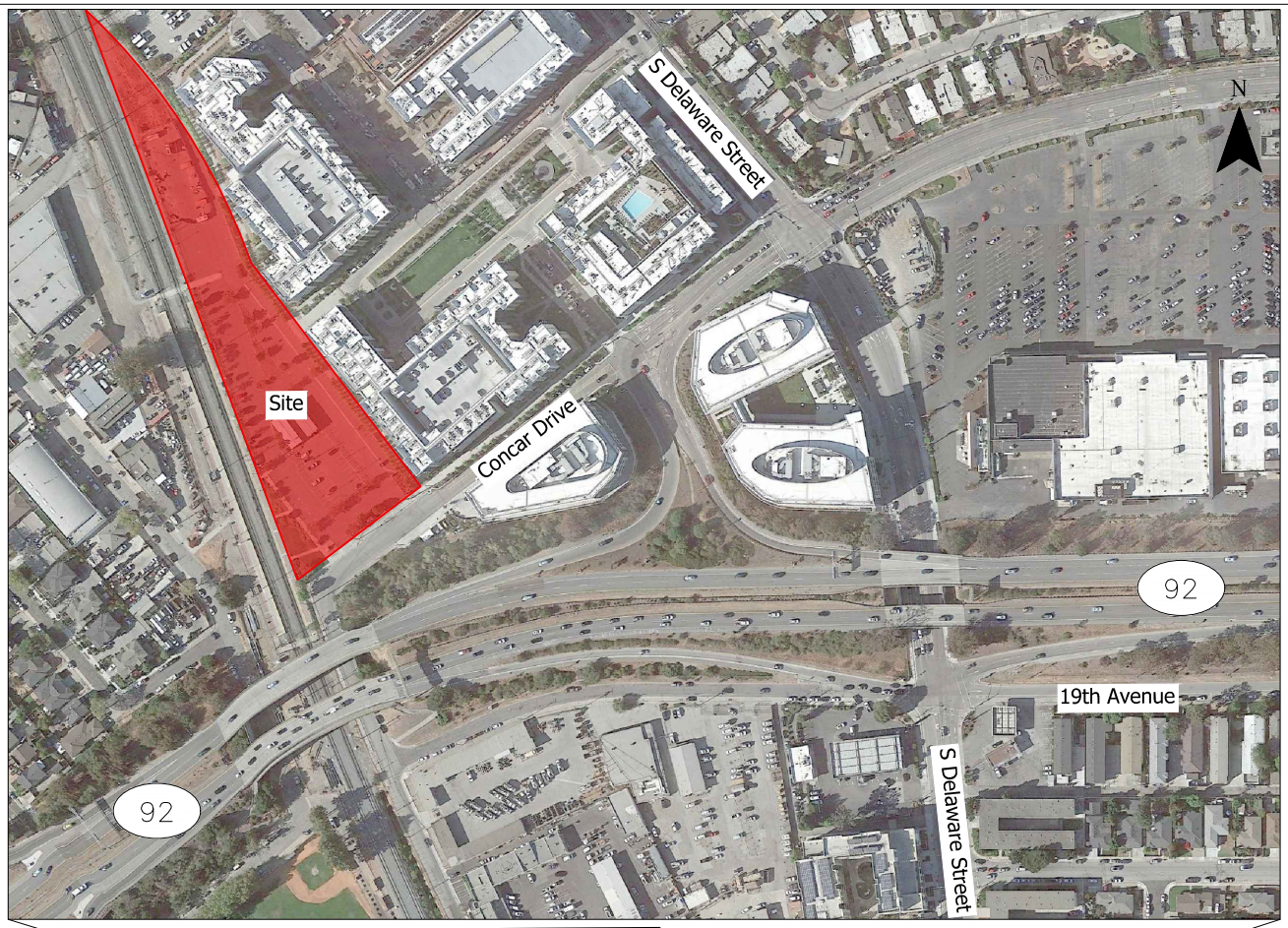
Project Location

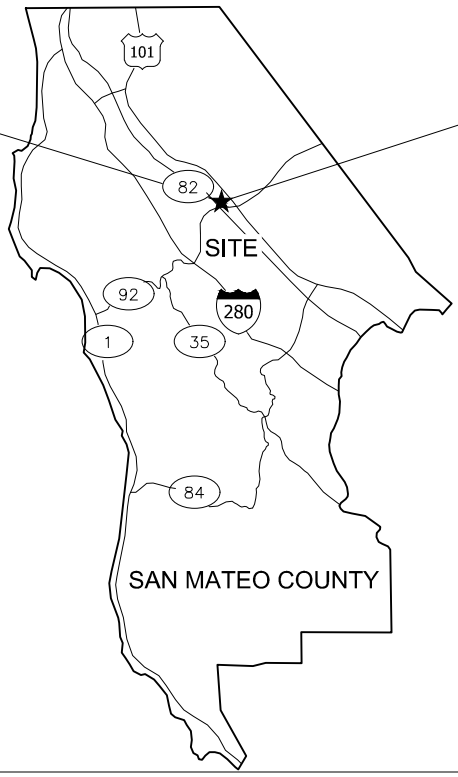
The proposed project is located on 401 Concar Drive immediately adjacent to the Hayward Park Caltrain station and will be constructed on the existing Caltrain parking lot, shown in Figure 1. Access to the project site would be primarily provided by Concar Drive. Nearby land uses include residential, commercial/retail, recreational, and institutional. There is also a park to the southwest of the site.

Existing and Proposed Uses

The existing site is a Hayward Park Caltrain parking lot consisting of 225 parking spaces. The property is designated at the center of the San Mateo Rail Corridor Transit-Oriented Development (TOD) Plan, approved in 2005. The TOD Plan encourages housing at the Hayward Park Caltrain Station and permits maximum height of buildings to be 55 feet. The existing site is both within the density and height limits of the Rail Corridor TOD Plan.

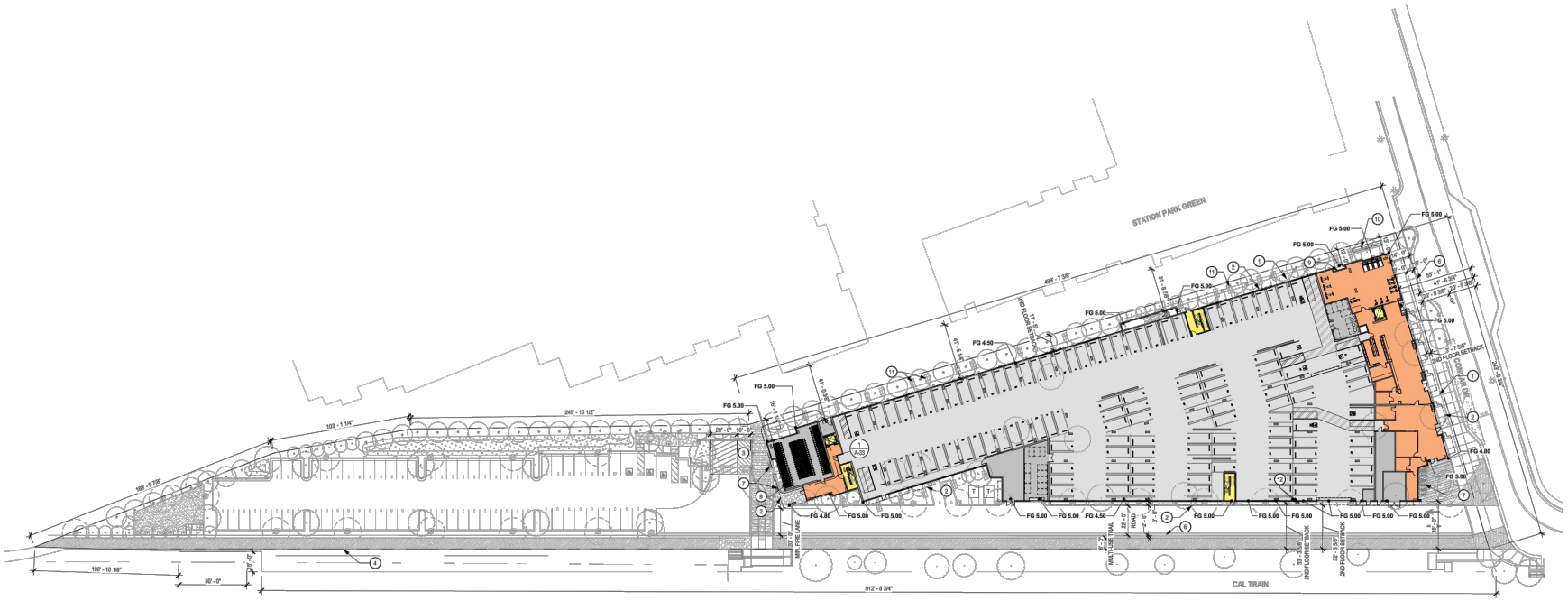
The Joint Powers Board and Sares Regis Group of Northern California, LLC (SRGNC) in a public private partnership is proposing to replace the existing Hayward Park Caltrain Station parking lot with apartment homes. This will include 191 studio, one-, and two-bedroom apartment homes totaling 235,195 square feet. The project site is 122,875 square feet located on the 138,521 square foot parking lot (Figure 2). Each unit would range between 499 to 1,271 square feet. Of these, 16 apartment homes will be reserved for households earning “very low income” and 12 apartment homes will be reserved for households earning “moderate income”. Additional amenities include private patios, game areas, open seating spaces, seating lounge nooks, outdoor dining area, television, 192 parking spaces for residents, bike fix-it station, and a connection to neighborhood ped/bike trail system with artful gateway monuments, project signage, and wayfinding. Regional access to the project site would be primarily provided by State Route (SR) 92 via the interchanges at Concar Drive and at S Delaware Street. Local access to the project site would be provided by Concar Drive.





Project Location

Figure 1



NOTES:

A. SEE CIVIL DRAWINGS FOR TOPOGRAHIC INFORMATION
B. SEE LANDSCAPE PLANS FOR LANDSCAPE INFORMATION
C. SEE LANDSCAPE PLAN FOR TREE INFORMATION
D. SEE LANDSCAPE DRAWINGS FOR SHORT TERM BIKE DETAILS
E. FG = FINISH GRADE; SEE BUILDING HEIGHT EXHIBIT ON A-31
F. TOP OF SLAB/ARCH 0'-0" = CIVIL 5.00

1. SIDEWALK, SCD
2. BUILDING PROJECTION ABOVE
3. LOADING ZONE, SCD
4. FENCE, SLD
5. TRASH STAGING AREA, SLD
6. CURB LINE, SCD
7. SHORT TERM BIKE PARKING, SLD
8. LONG TERM BIKE PARKING, SEE A-33
9. GAS ALCOVE, SCD
10. BACKFLOW VAULTS
11. LADDER PADS, SLD
12. WATER METERS, SCD

0' 16' 32' 64'

BDE ARCHITECTURE | SARES REGIS | WILSEY HAM Engineering, Surveying & Planning | TGP The Guzzardo Partnership, Inc. Landscape Architects | Land Planners

SAN MATEO, CALIFORNIA | 03/18/2022 | SITE PLAN A-0

Site Plan

Figure 2

KITTELSON & ASSOCIATES

Transportation Demand Management Plan

The 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 TDM Plan is being developed by Steer Group as part of this project.

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 developed updated Traffic Impact Analysis Guidelines consistent with the City's General Plan and OPR requirements in July 2020. 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 adjacent to the Hayward Park Caltrain Station. 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[2] and the more specific City VMT/TIA Guidelines[3], a project may require a detailed VMT analysis unless it meets at least one of the City's five screening criteria:

1. *Small Projects* – As per the OPR advisory and the City VMT/TIA Guidelines, projects that generate or attract fewer than 110 vehicle trips per day are classified as 'small projects'. This proposed project has 191 residential units and generates 907 vehicle trips per day**.** (Detailed trip generation is described in technical memo from Kittelson, dated December 17, 2021). – **no, project does not meet this criterion.**
2. *Affordable Housing* – As per the guidelines, residential projects with 100 percent deed restricted affordable housing are presumed to have a less than significant impact. If a project contains less than 100 percent affordable housing, the portion that is affordable should be screened out of needing a detailed VMT analysis. The affordable housing for the proposed project is 15 percent, hence 15% of the units, i.e., 28 of 191 units will be screened out of needing a detailed VMT analysis – **no, project does not meet this criterion.**
3. *Local-Serving Retail and Public Services* – **n/a** (the proposed project is 100 percent residential, so this criterion does not apply).
4. *High-Quality Transit Area (HQTA)* – The proposed project is located in a high-quality transit area as specified in Attachment A of the guidelines (See Figure 3) – **yes, project does meet this criterion**. This presumption might not be applicable if the project:
    a. *has a floor area ratio (FAR) of less than 0.75* - (the FAR for proposed project is 1.93[4]) – **no.**
    b. *includes more parking for use by residents, customers, or employees of the project than required by the jurisdiction* - The proposed project is providing 192 parking spaces. This project is within the Rail Corridor Transit-Oriented Development Plan area and hence the City of San Mateo off-street parking requirements[5] do not apply to this project. City staff provided project data for the parking demand ratios for recently approved projects near the proposed Hayward Park Station project, including the Station Park Green and Concar Passage projects. The parking ratios provided for these neighboring approved projects and the parking calculation based on these parking ratios for the proposed Hayward Park Station project are provided in Table 1. Based on the parking ratios for previously approved projects in the near vicinity, a project with 191 dwelling units may be expected to provide up to 238 parking spaces.

[2] Technical Advisory on Evaluating Transportation Impacts in CEQA, Governor's Office of Planning and Research, December 2018.
[3] City of San Mateo Transportation Impact Analysis Guidelines, 2020.
[4] From the City of San Mateo – Hayward Park Station Development Plans, 2021.
[5] Chapter 27.64 Off-Street Parking Standards, https://www.cityofsanmateo.org/DocumentCenter/View/9881/CH27-64, Accessed 2022.

Table 1: Parking Ratios for Neighboring Approved Projects in the Project Vicinity[6]

Dwelling Unit	Off-Street Parking Ratios for Prior Projects	Proposed Project Parking Calcs	
	Total	Total Units	Parking Spaces
Studio	1.0	73	73
One-bedroom	1.3	63	82
Two-bedroom	1.5	55	83
		Total	**238**

A review of the neighboring approved projects in the Hayward Park Station project vicinity and the approved off-street parking ratios for prior projects show that the proposed development would not provide more parking than has been previously approved for the proposed use – **no**.

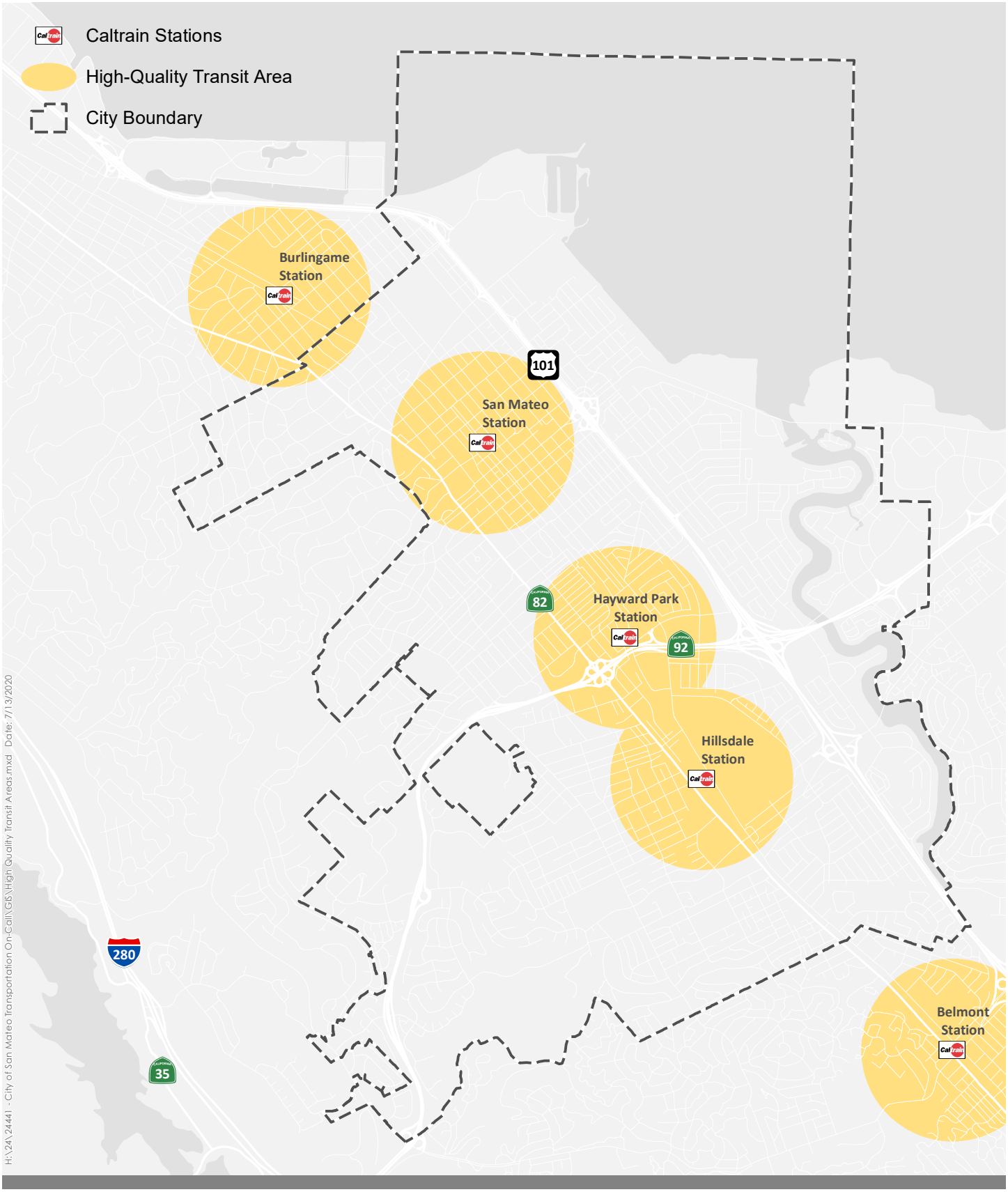
c. is inconsistent with the applicable Metropolitan Transportation Commission's (MTC) Sustainable Communities Strategy (SCS), as determined by the city – **no.**
d. replaces affordable residential units with a smaller number of moderate- or high-income residential units – **no.**

5. *Project Located in Low VMT Areas* – The proposed project is in TAZ 1979 with VMT per Capita of 17.6. 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. Therefore, the project is not located within a sufficiently low VMT area to screen out (See Figure 4 and Figure 5). **no, project does not meet this criterion.**

VMT IMPACT DISCUSSION

Initial screening indicates that the Project satisfies one of the five screening criteria. The project is within a half-mile of high-quality transit. Kittelson also reviewed all requirements in the Governor's Office of Planning and Research (OPR) Technical Advisory[7], and City VMT/TIA Guidelines to ensure the Project meets the HQTA detailed screening criteria. As mentioned under the screening criteria No. 4 proposed project near HQTA, we presume that the project will not generate significant levels of VMT. Hence it can be presumed to result in a less than significant VMT impact and therefore is exempted from detailed VMT analysis.

[6] City of San Mateo's email on 4/7/2022 regarding parking ratios of Station Park Green and Concar Passage projects.
[7] Technical Advisory on Evaluating Transportation Impacts in CEQA, Governor's Office of Planning and Research, December 2018.



High-quality transit areas are within 1/2 mile of an existing major transit stop or an existing stop along a high-qualiity transit corridor

0 3,900 Feet

KITTELSON & ASSOCIATES

Figure 03: High-Quality Transit Areas City of San Mateo, CA

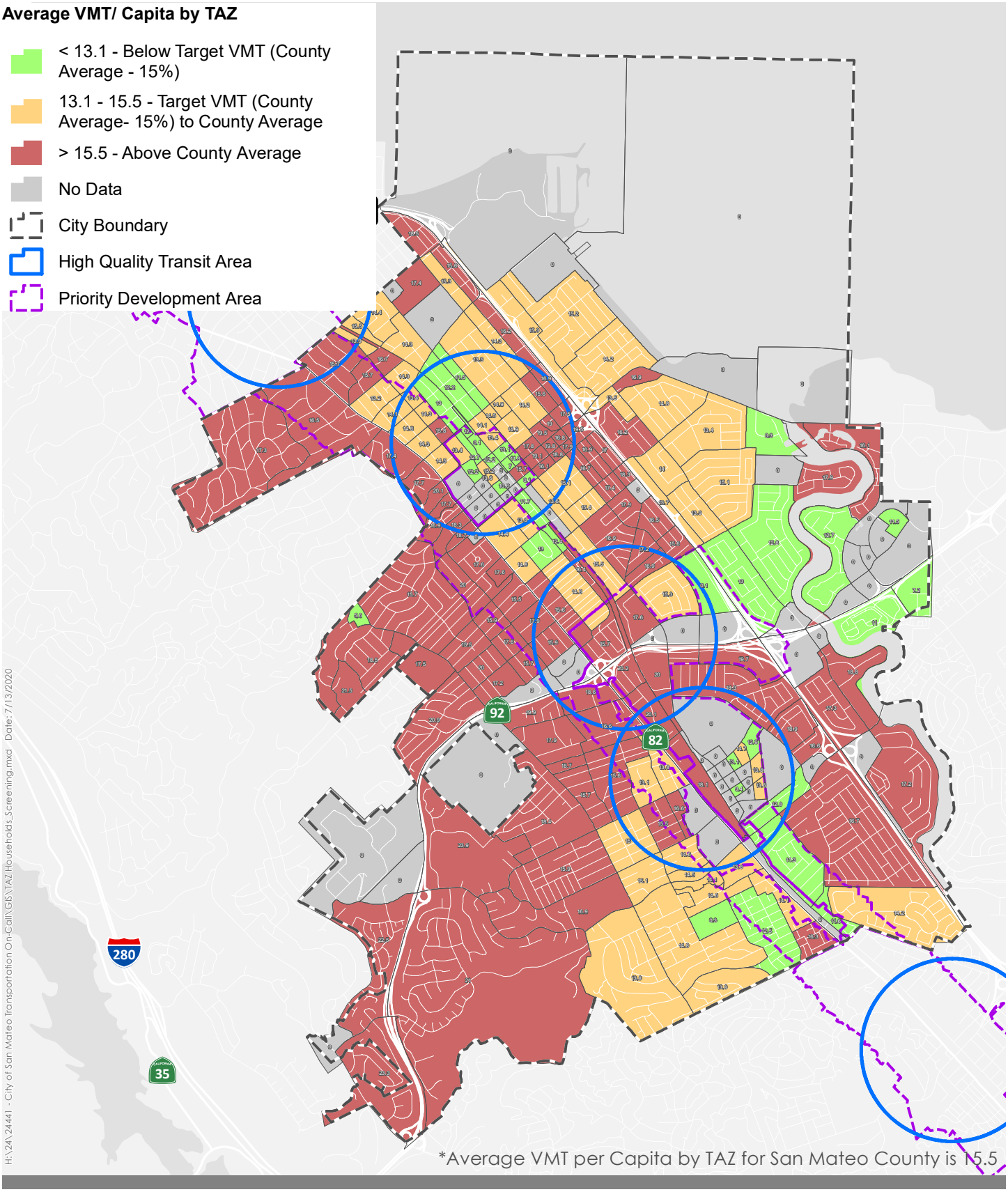
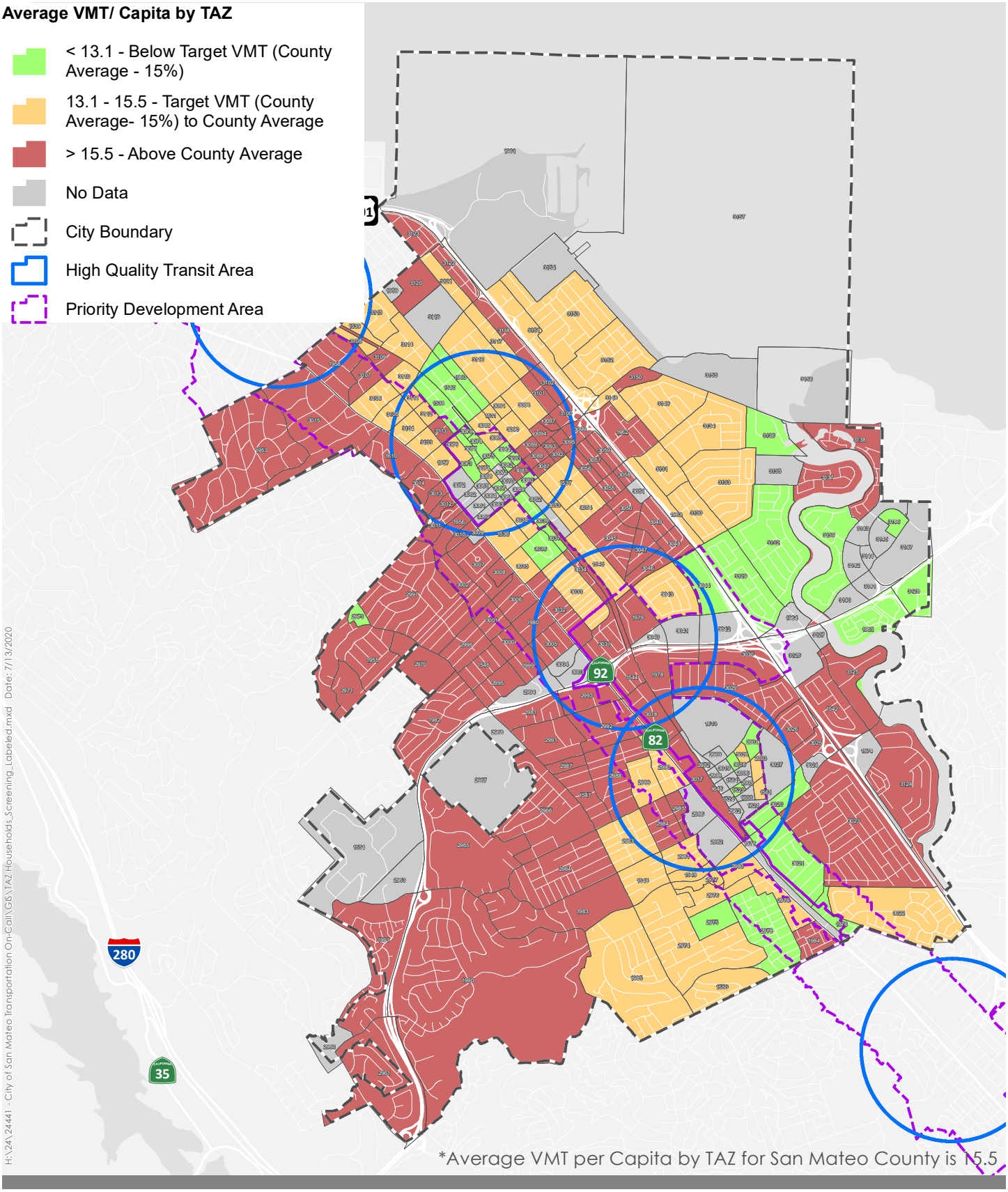


Figure 04: Average VMT per Capita by TAZ
VMT per Capita Labeled
City of San Mateo, CA

KITTELSON & ASSOCIATES



0 3,900 Feet

FIGURE 05: Average VMT per Capita by TAZ
TAZ Number Labeled
City of San Mateo, CA

KITTELSON & ASSOCIATES

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[8] conditions.
- *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 (2021) 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.

[8] 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 6.

1. SR-92 Westbound (WB) Ramps/Concar Drive
2. S Delaware Street/Concar Drive
3. S Delaware Street/19th Avenue/SR-92 Eastbound (EB) Ramps
4. Project driveway on Concar Drive

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) methodology[9] (Transportation Research Board, Washington, D.C., 2010), calculated with Synchro 11 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. 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. The City adopted Transportation Impact Analysis (TIA) Guidelines in August 2020 to include LOS standards for unsignalized intersections. According to the City of San Mateo standard, unsignalized intersections should maintain a LOS no worse than LOS E.

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

[9] The 2010 HCM methodology was used instead of the HCM 6th Edition because in Synchro (traffic operations analysis software), the 2010 HCM methodology estimates right turn on red (RTOR) volumes, whereas HCM 6th does not assume any RTOR volumes, thus artificially increasing the right-turn delay at intersections.

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)

Study Intersections

Figure 6

KITTELSON & ASSOCIATES

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

a) The level of service at the intersection drops from LOS E or better to LOS F (average delay of more than 50 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.

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 (SR) 92 via the interchange at Concar Drive and S Delaware Street.

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 Concar Drive and S Delaware Street.

Concar Drive is a collector-arterial roadway that extends in an east-west direction from Pacific Boulevard to Amphlett Boulevard. It is a collector street from Pacific Boulevard until the SR 92 WB on-ramp and is an arterial roadway until Grant Street and quickly transitions to a local roadway from Grant Street to Amphlett Boulevard. Collector streets are designed to channel traffic from local streets to arterials, and to handle short trips within the neighborhoods. In the vicinity of the project site, Concar Drive has two lanes, and provides direct access to the project site via a driveway.

S Delaware Street is a north-south, two to four-lane arterial roadway extending from Peninsula Avenue on the north and transitioning into Pacific Boulevard in the south. Arterial roads link residential and commercial districts and serve shorter through traffic needs. In the vicinity of the project site, S Delaware Street has three to four lanes, and provides access to the project site via Concar Drive.

19th Avenue is an east-west, two lane roadway extending from Pacific Boulevard on the west and transitioning into Fashion Island Boulevard. It is classified as a local road west of S Delaware Street and transitions to an arterial roadway east of S Delaware Street. Local roads are designed to serve only adjacent land uses and are intended to protect residents from through traffic impacts. 19th Avenue provides access to the project site via S Delaware Street and Concar 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 Concar Drive, S Delaware Street, and on one side of 19th Avenue, providing pedestrian access to and from the project site. Marked crosswalks with pedestrian signal heads and push buttons are provided at the SR-92 WB Ramps/Concar Drive, S Delaware Street/Concar Drive, and S Delaware Street/19th Avenue/SR-92 EB Ramps intersections. A marked crosswalk is provided at the project driveway at Concar Drive. The overall network of sidewalks and crosswalks in the study area has good connectivity and provides pedestrian with safe routes to maneuver.

Bicycle Facilities and Amenities

Bicycle facilities are defined by the following four classes[10]:

- **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 crossflows by pedestrians and motorists permitted.

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

- **Class III** (Bike Route) – Provides a right-of-way designated by signs or permanent markings and shared with 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[11] bicycle routes within the study area are described below. The existing bicycle network is shown in Figure 7.

Concar Drive – There is an existing bicycle facility along Concar Drive, which is a Class I multi-use path along the site frontage of the Station Park Green development. This project proposes to extend the multi-use path to connect directly to the Hayward Park Caltrain station. The 2020 Bicycle Master Plan proposes a separated bike lane (Class IV) along Concar Drive from east of S Delaware Street to S Grant Street.

S Delaware Street – This corridor is currently composed of a combination of bike lanes (Class II) and a signed bicycle route (Class III). Notably, the stretch of corridor closest to the project site, from Charles Lane/Station Park Circle to 19th Avenue is classified as a bicycle route (Class III). The 2020 Bicycle Master Plan proposes upgrading the corridor from E 5th Avenue to Concar Drive to a buffered bike lane (Class II) and Concar Drive to 28th Avenue to a separated bike lane (Class IV).

Neighborhood Ped/Bike Trail (Shared Use Path) – There is an existing shared use path (Class I) north of the site vicinity, running from E 16th Avenue to the entrance of the existing parking lot. The 2020 Bicycle Master Plan proposes extending this shared use path (Class I) through the proposed site to connect directly to the Hayward Park Caltrain platform. The proposed project provides the connection to the neighborhood ped/bike trail system.

19th Avenue – There are currently no bicycle facilities provided west of S Delaware Street and bike lanes (Class II) are provided along 19th Avenue east of S Delaware Street. The 2020 Bicycle Master Plan proposes a separated bike lane (Class IV) along 19th Avenue from Pacific Boulevard to Fashion Island Boulevard that incorporates adding the Class IV bike lane west of S Delaware Street and upgrading the existing bike lanes east of S Delaware Street.

Pacific Boulevard – There are currently no bicycle facilitates provided along Pacific Boulevard. The 2020 Bicycle Master Plan proposes a bicycle boulevard (Class III) from Concar Drive to S Delaware Street.

Transit Service

The existing transit service to the study area is provided by the San Mateo County Transit District (SamTrans) and Caltrain. The project site has three bus routes nearby (Route 292, 397, and ECR), operated by SamTrans with the nearest bus stops located at the intersections of S Delaware Street/Bermuda Drive

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

and El Camino Real/20th Avenue. An additional bus route (school-day only) Route 53 operates in the vicinity of the project site. The bus routes that provide the peak-hour services near the project site are described in Table 3 and are shown in Figure 8. Access to transit facilities will not change with the proposed site plan.

Caltrain Service

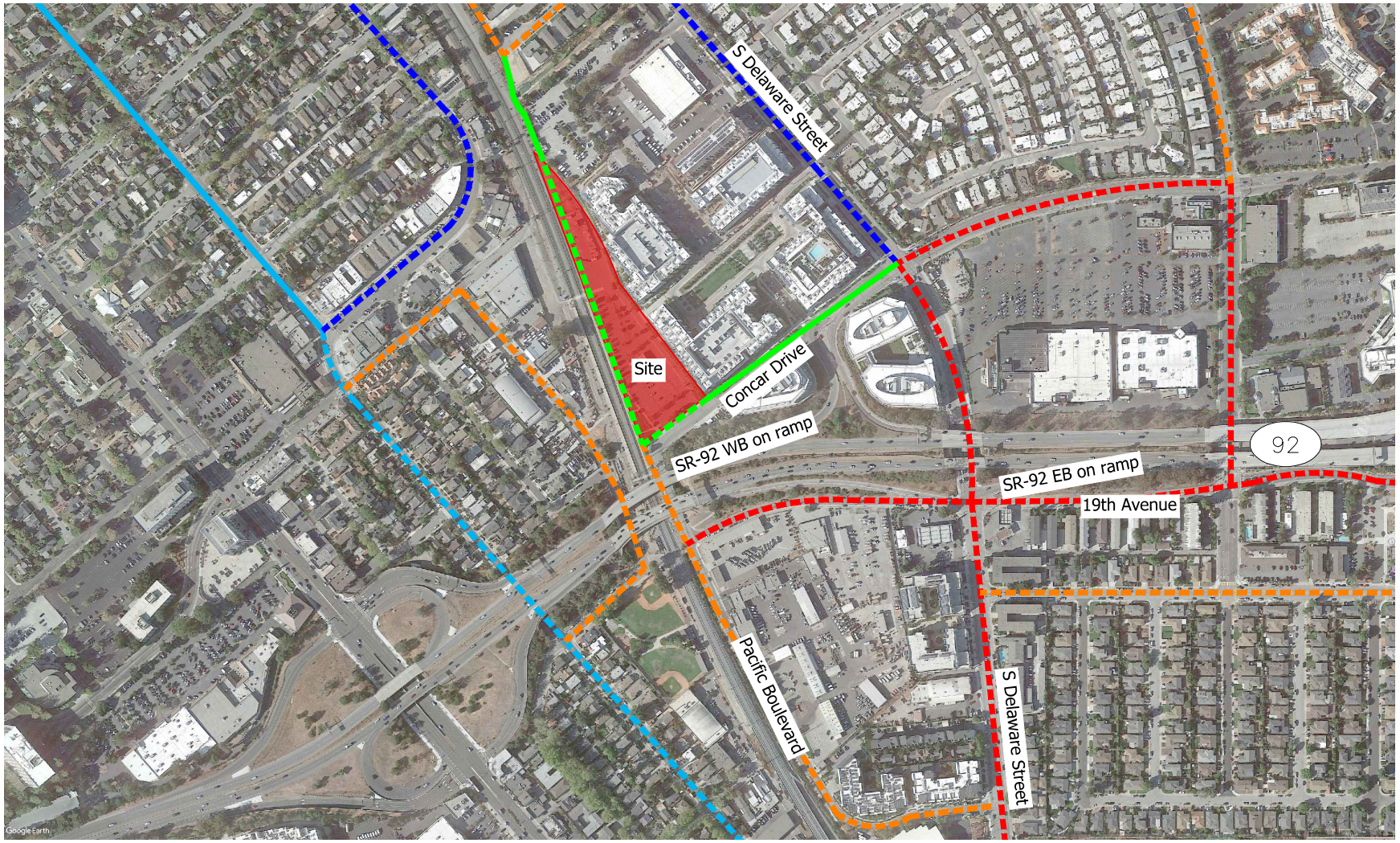
Commuter rail service between San Francisco and Gilroy is provided by Caltrain. The project site is located adjacent to the Hayward Park Caltrain Station. Currently, Caltrain provides northbound and southbound service at this station at a one-hour frequency during the weekday and weekend AM and PM commute hours, midday, and at nights.

Emergency Vehicle Access

The proposed project developer proposes to maintain the existing emergency vehicle access (EVA) road on Station Park Green Promenade connecting to Concar Drive on the South and Garvey Way on the north as an EVA. The nearest fire station is located approximately 1.2 miles from the project site at 1452 Shafter Street.

Table 3: Existing Bus Service

Bus Route	Description	Operating Hours	Peak-Hour Headway	Closest Bus Stop
53	Borel Middle School – Peninsula/Humboldt (School-day only)	7:30 AM – 8:00 AM, 1:00 PM – 1:30 PM (W), and 3:00 PM – 3:30 PM (M,T,TH,F)	NA	S Delaware Street/ Charles Lane
292	San Francisco – Hillsdale Mall – Serves SF Airport	24 hours	30 minutes	S Delaware Street/ Bermuda Drive
397	San Francisco – Palo Alto Transit Center – Serves SF Airport	12:45 AM – 6:30 AM	60 minutes	El Camino Real/ 20th Avenue, El Camino Real/17th Avenue
ECR	El Camino Real – Palo Alto Transit Center to Daly City BART Station	24 hours	15 minutes	El Camino Real/ 20th Avenue, El Camino Real/17th Avenue



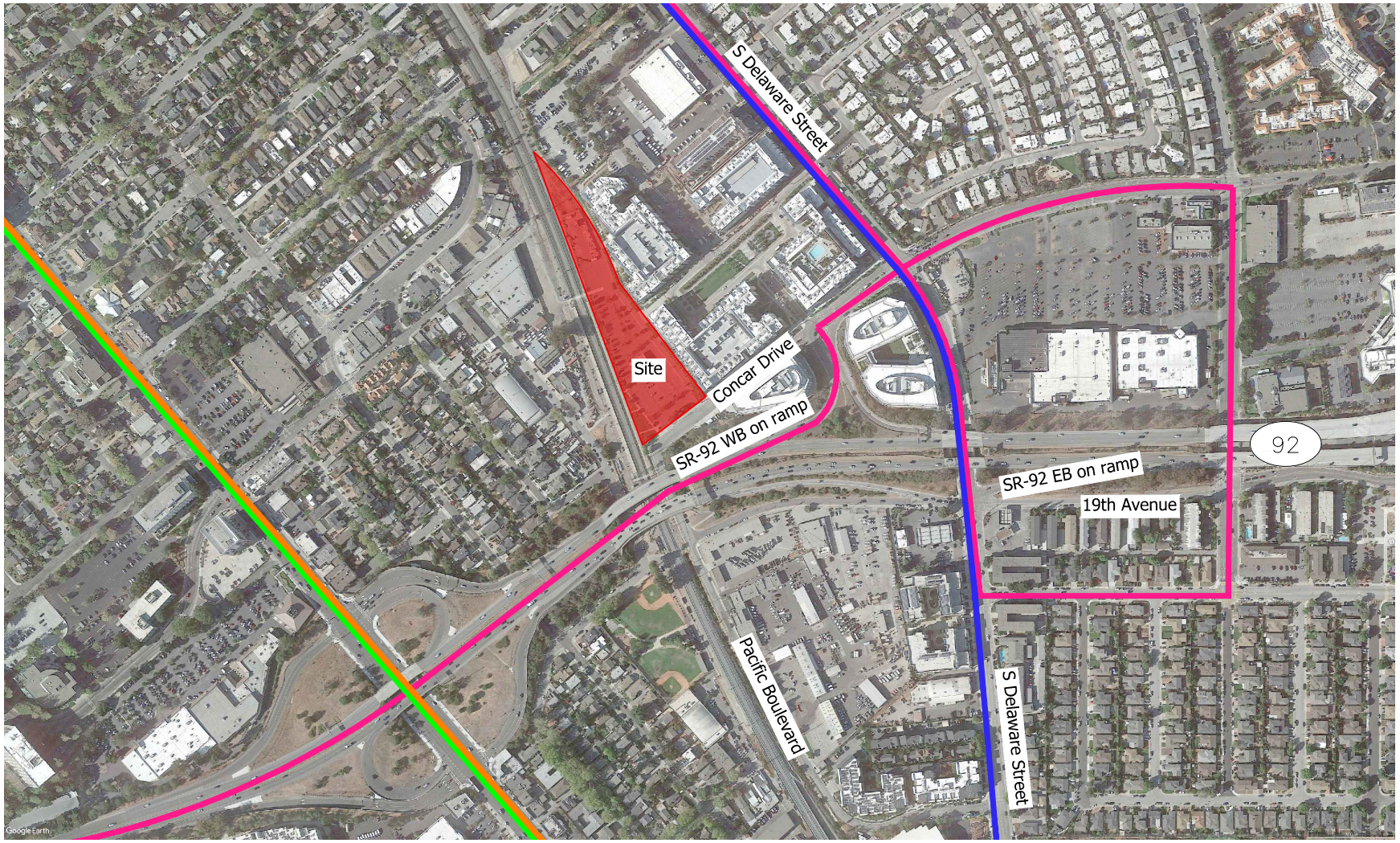
Legend:

- Existing Shared Use Path
- Existing Bike Lane
- Proposed Shared Use Path
- Proposed Separated Bike Lane
- Proposed Buffered Bike Lane
- Proposed Bike Lane
- Proposed Bicycle Boulevard

Existing and Proposed Bicycle Network

Figure 7

KITTELSON & ASSOCIATES



Legend:

- Route 292
- Route 397
- Route 53 (School Days)
- ECR

Existing Transit Services

Figure 8

KITTELSON & ASSOCIATES

Traffic Volumes

Multimodal turning movement counts were estimated at the four study intersections shown in Figure 6 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 lane configurations and traffic control are shown in 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. The projected turning movement volumes for each peak hour under Existing Conditions are provided in Figure 10. 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.

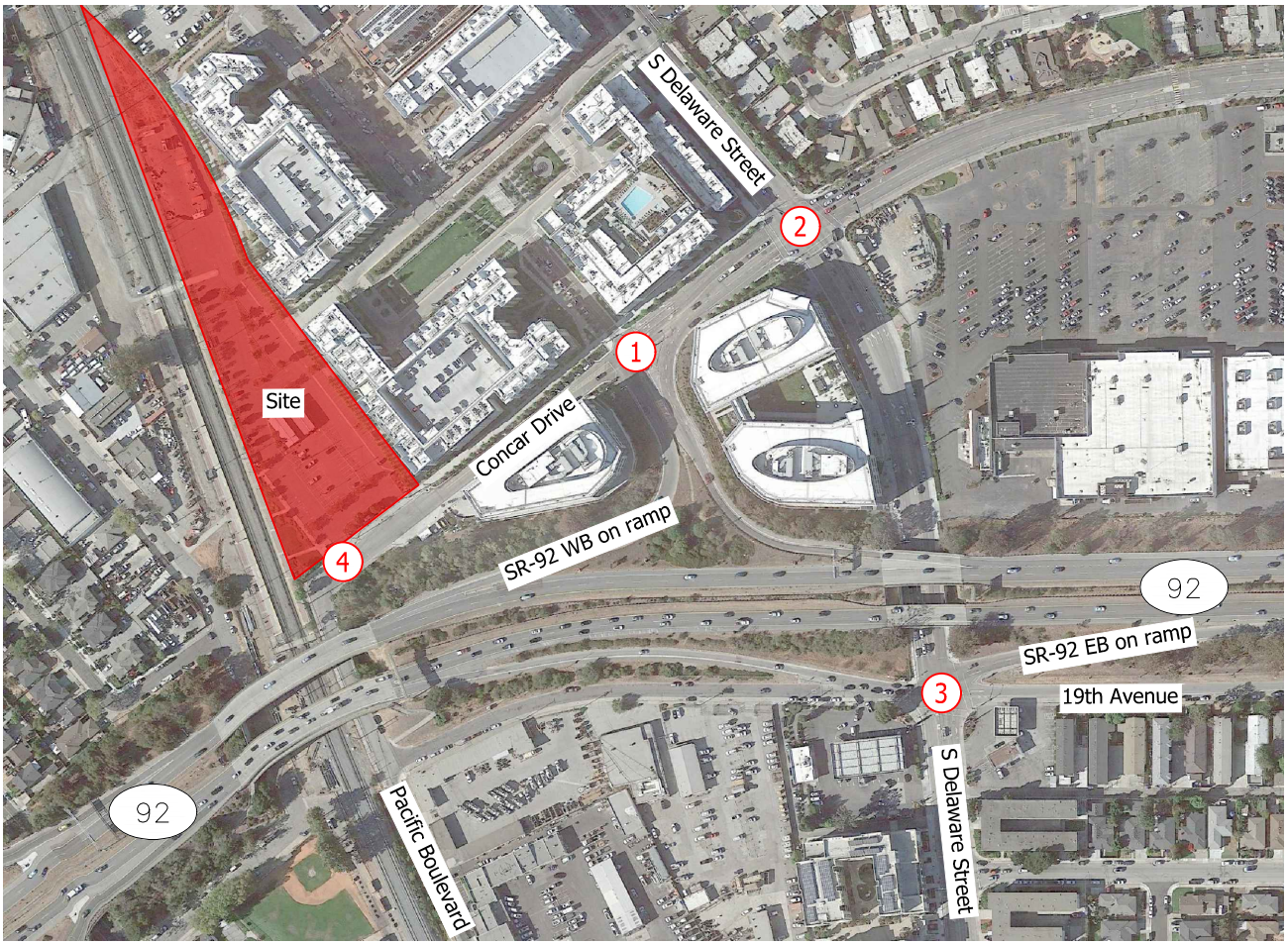
Table 4: Existing Conditions Intersection Operations Results

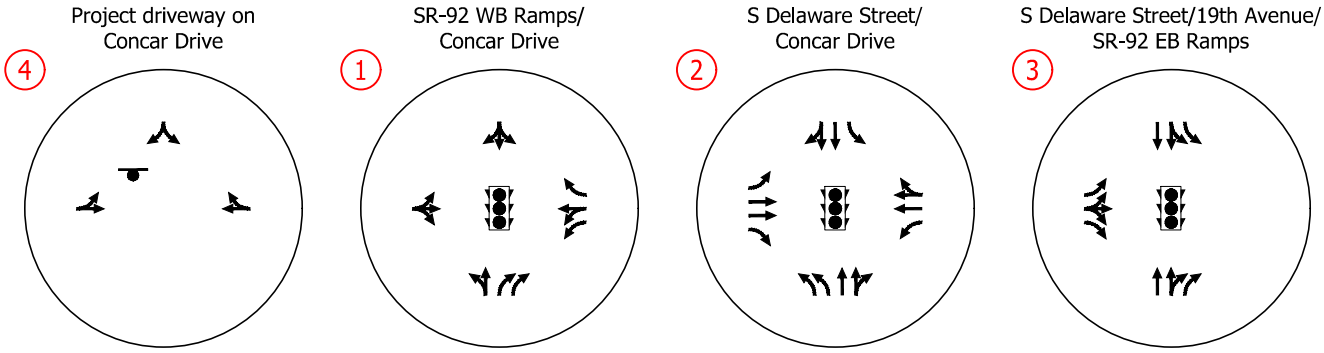
#	Location	Control	Existing AM		Existing PM	
			Delay	LOS	Delay	LOS
1	SR-92 Westbound Ramps & Concar Drive	Signal	10.0	B	7.6	A
2	S Delaware Street & Concar Drive	Signal	30.9	C	32.5	C
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	Signal	35.0	C	**72.9**	**E**
4	Project Driveway on Concar Drive	TWSC	0.0	A	0.0	A

Notes: Bold lettering indicates an intersection that does not meet the City's minimum acceptable design level of service (LOS D for Signalized intersections); TWSC = Two-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: 2010 Highway Capacity Manual; Kittelson & Associates, 2022

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) methodology, calculated with Synchro 11 software.

As shown in Table 4, all intersections operate to the City's standards under existing conditions, with the exception of S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps, which operates at LOS E in the PM peak hour.

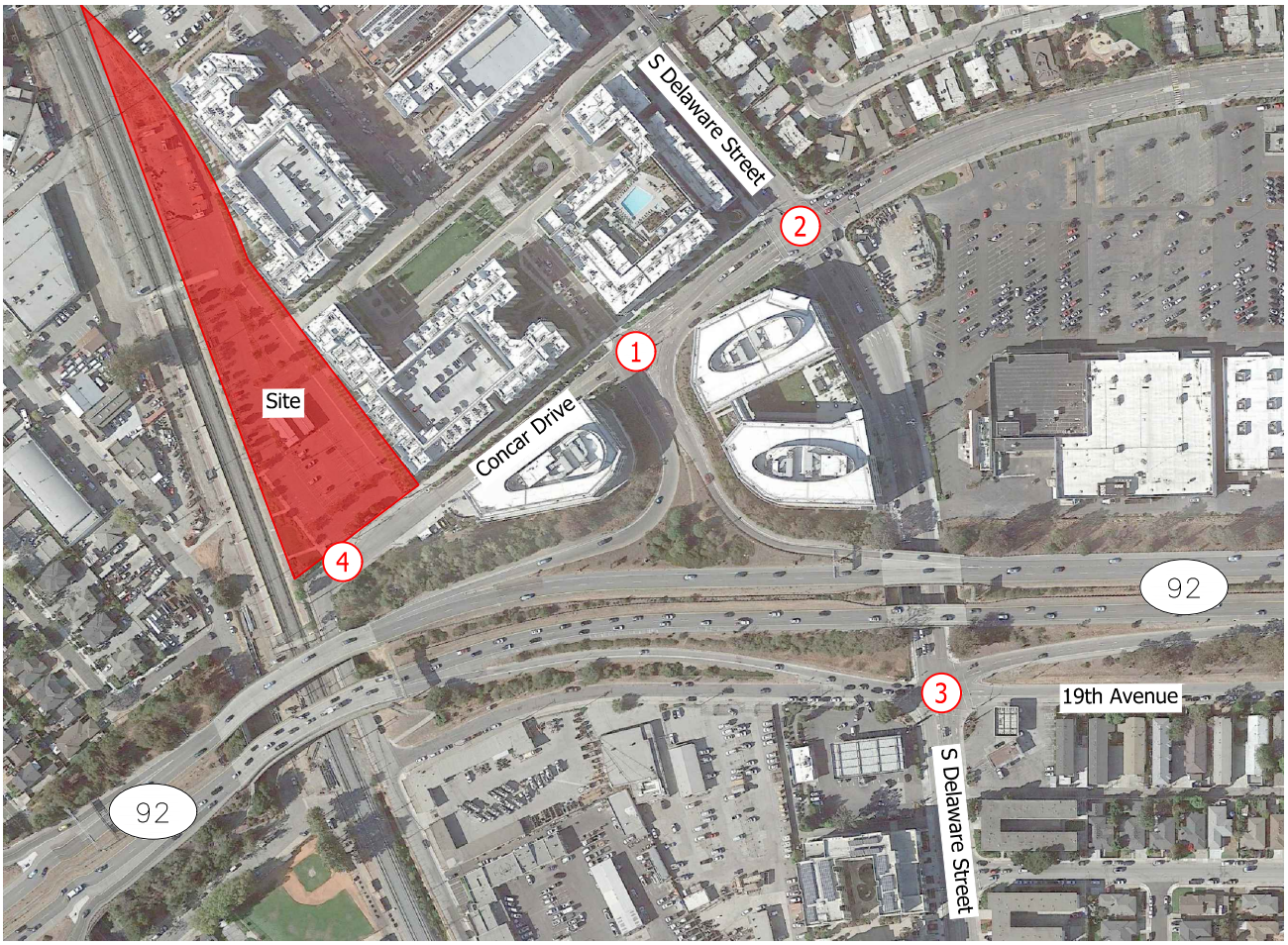


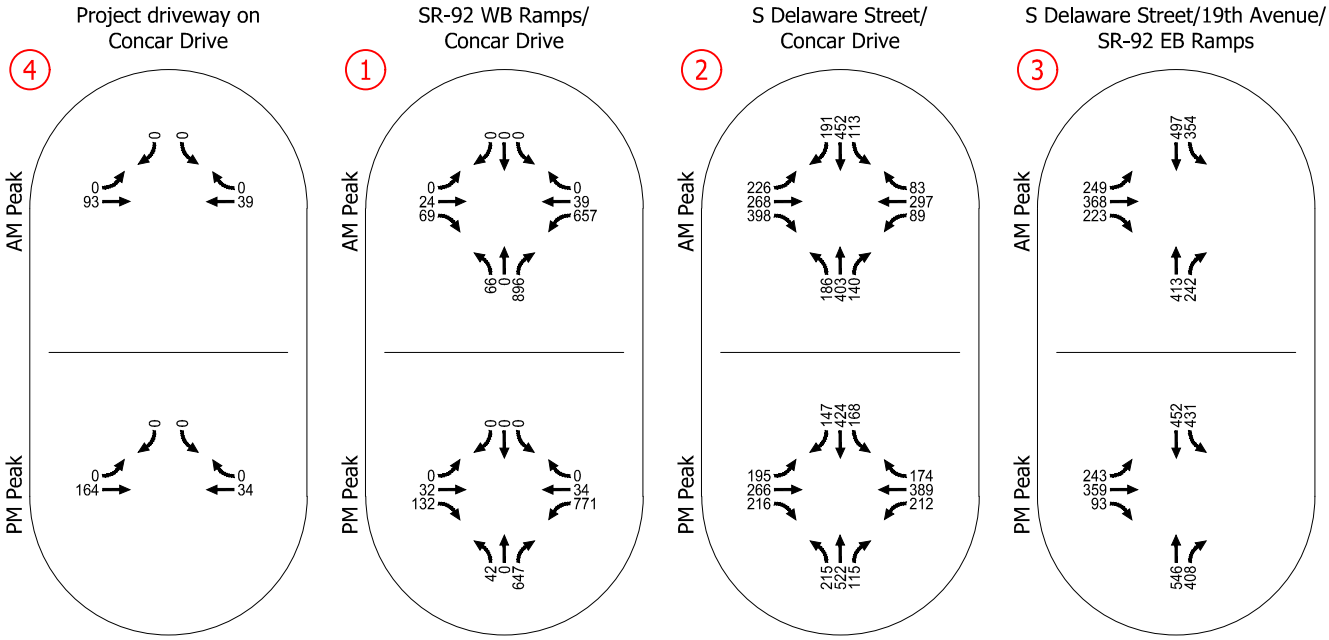


- Stop Sign
- Traffic Signal

Traffic Control and Lane Configurations

Figure 9





Existing Conditions
Peak Hour Turning Movement Volumes

Figure
10

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 project vicinity.

Transportation Network

The Baseline Conditions analysis assumes the same lane configuration and traffic control at all the intersections, as the existing conditions shown in Figure 9.

Intersection Level of Service

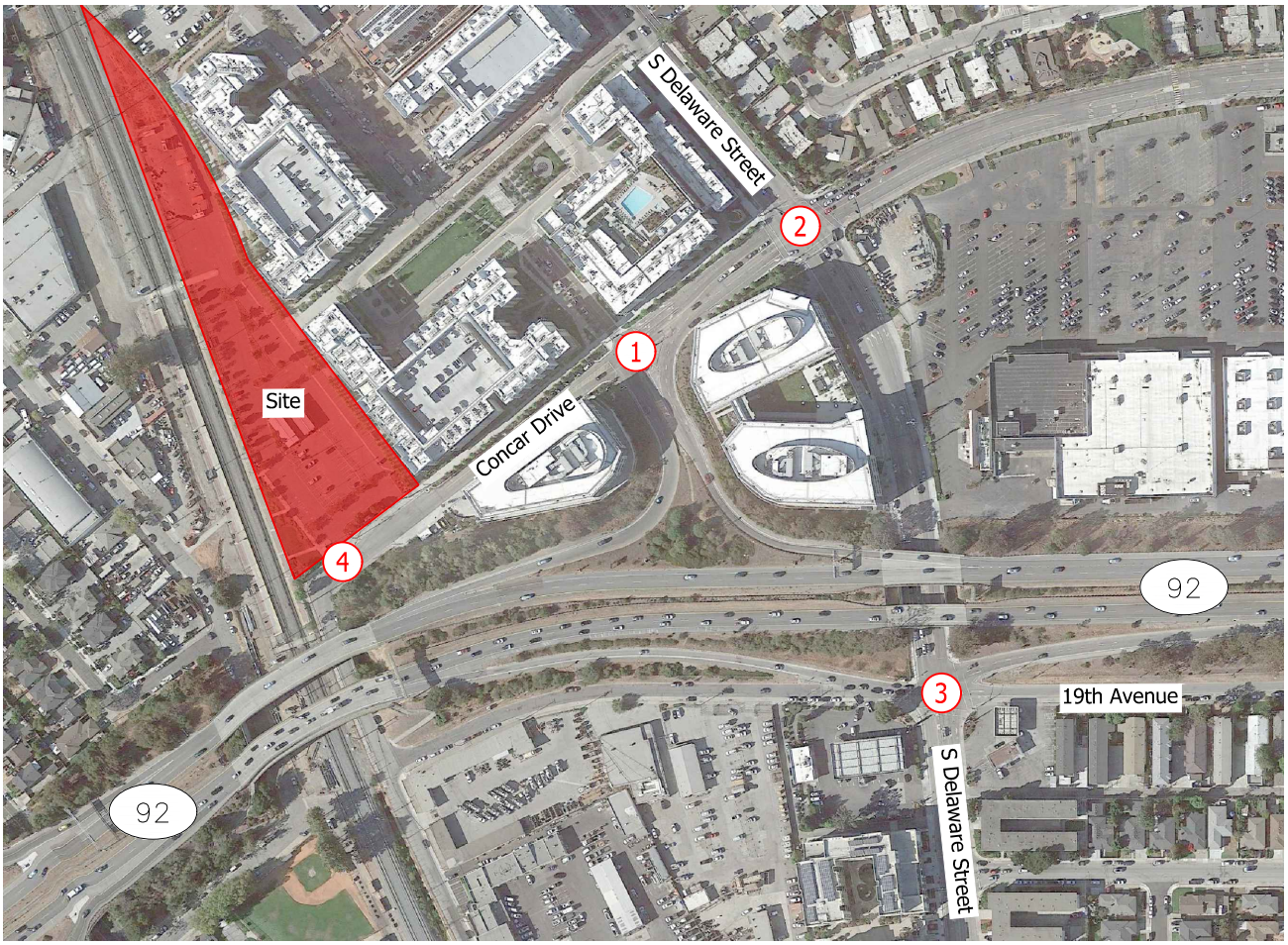
Traffic volumes for the Baseline Conditions were calculated using the existing estimated traffic volumes, shown in Figure 10, plus the traffic volumes generated by new developments within the site vicinity. Through conversations with the city, the new developments added to the existing volumes include the AAA Site, Station Park Green Development, and Bay Meadows II Phase III. The projected turning movement volumes for each peak hour under Baseline Conditions are provided in Figure 11. 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.

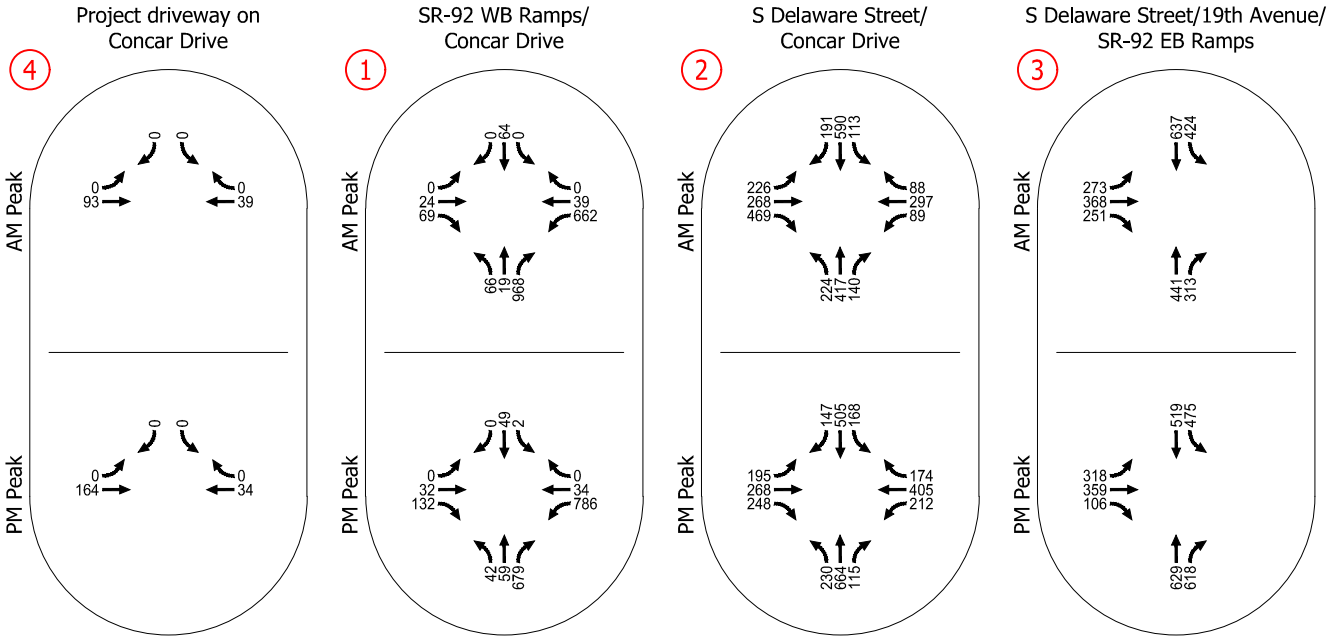
Table 5: Baseline Conditions Intersection Operations Results

#	Location	Control	Baseline AM		Baseline PM	
			Delay	LOS	Delay	LOS
1	SR-92 Westbound Ramps & Concar Drive	Signal	15.5	B	11.3	B
2	S Delaware Street & Concar Drive	Signal	35.9	D	33.8	C
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	Signal	**66.4**	**E**	**93.7**	**F**
4	Project Driveway on Concar Drive	TWSC	0.0	A	0.0	A

Notes: Bold lettering indicates an intersection that does not meet the City's minimum acceptable design level of service (LOS D for Signalized intersections); TWSC = Two-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: 2010 Highway Capacity Manual; Kittelson & Associates, 2022.

As shown in Table 5, under Baseline Conditions, the intersection of S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps is expected to operate below City standards. This intersection operates at LOS E and LOS F in the AM and PM peak hour, respectively.





Baseline Conditions
Peak Hour Turning Movement Volumes

Figure
11

PROJECT TRAVEL DEMAND

Trip Generation

Consistent with the City of San Mateo *Transportation Impact Analysis Guidelines* (June 2020)[12], vehicle trips generated by the proposed project were estimated for weekday daily, weekday morning (AM) peak hour, and weekday afternoon (PM) peak hours using the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition*. The trips generated from the proposed residential units (ITE Land Use Code 221 for mid-rise multifamily housing close to rail transit) were estimated using the average rate. In correspondence with the City of San Mateo, it was determined that the trips generated by the existing park-and-ride lot should not be discounted in the net new trips generated from the proposed project trip generation calculations.

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. Furthermore, additional trip reduction for mode split associated with the Caltrain station were not considered since the ITE category Code 221 already accounts for mode split.

As summarized in Table 6, the proposed project is estimated to generate 62 AM peak hour vehicle trips (35 inbound, 27 outbound) and 55 vehicle trips in the PM peak hour (24 inbound, 31 outbound). Therefore, 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.

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
Proposed Project Vehicle Trips										
Multifamily Housing (Mid-rise Close to Rail Transit)	221	191	DU	907	35	27	62	24	31	55

Notes:
[1] DU = Dwelling Unit.

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 directional 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 Concar Drive and the State Route 92 ramp terminal intersections.

[12] City of San Mateo. June 17, 2020. *Transportation Impact Analysis Guidelines.* Online: https://sanmateo.primegov.com/meetings/ItemWithTemplateType?id=3163&meetingTemplateType=2. Website accessed July 27, 2020.

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 Hayward Park Station Caltrain parking lot on site. The project proposes to construct garage entrance north of the intersection of Concar Drive and Pacific Boulevard (i.e., west of the project site), and lobby access on Concar Drive. The garage driveway is proposed to be 24 feet wide.

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)[13]. Stopping sight distance[14] 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 Concar 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 on-street parking in front of the Station Park Green development and no severe roadway curves along Concar Drive, hence the project driveways would all have adequate sight distance. The landscaping near the project driveways currently does 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 new street trees to be planted in the bulb out areas, and those need to be taken care of in such a way that they do not obscure the roadway visibility.

Vehicle Parking

The proposed project would include 192 on-site vehicle parking spaces, 178 of which are assigned residential stalls and 14 of which are unassigned (guest) residential stalls. Of these parking spaces, 120 are located in the garage and 72 parking spaces are on the surface parking lot, located at the north end of the proposed project site. The proposed project would include eight accessible parking stalls distributed across the garage and parking lot. There are 30 Electric Vehicle parking stalls in the proposed project site in the garage and parking lot. According to the City of San Mateo parking standards and

[13] Chapter 200 – Geometric Design and Structure Standards, Caltrans Highway Design Manual, July 2020.
[14] 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".

specifications[15], the length of the parking stalls for compact and standard stalls needs to be 17 feet and 18 feet respectively. According to the most recent concept design plans provided by the developer, the length of the parking stalls for compact and standard stalls were 15 feet and 16 feet respectively. The City staff allowed for a 2 feet overhang over the planting areas within the surface parking lot. The developer should make sure that the plants are maintained at a suitable height to allow for the overhang in the parking lot planting areas. All parking spaces appear to have sufficient space near the end of dead-end aisles for vehicles to turn around.

Passenger Loading

The project proposes a passenger loading zone near the project site, which would serve as a waiting area for residents. One move in or loading zone is shown in the proposed project site plan, which is 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. A 16 feet wide pedestrian pathway running through the site would provide residents and local pedestrians a direct connection from Station Park Green to the Caltrain platform. The project also proposes an 8 feet wide multiuse ped/bike promenade connection to the neighborhood ped/bike trail system with artful gateway monuments with signage and wayfinding. 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, neighborhood ped/bike train system, and the Caltrain station platform. 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) on the sidewalk and secure long-term bicycle parking (class I). The site would provide 16 short-term and 205 long-term parking spaces. Bicyclists would access the site via the multiuse path along the west side of the site or the shared use path (Class I) along Concar 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

The existing transit service to the study area is provided by the San Mateo County Transit District (SamTrans) and Caltrain. The project site has three bus routes nearby (Route 292, 397, and ECR), operated

[15] City of San Mateo Parking Standard Specifications, https://www.cityofsanmateo.org/DocumentCenter/View/8009/PW_Parking_Standard-Specifications?bidId=, Accessed 2022

by SamTrans with the nearest bus stops located at the intersections of S Delaware Street/Bermuda Drive and El Camino Real/20th Avenue. One bus route (school-day only) Route 53 operates in the vicinity of the project site. The bus routes that provide the peak-hour services near the project site are described in 3 and are shown in Figure 8.

Commuter rail service between San Francisco and Gilroy is provided by Caltrain. The project site is located adjacent to the Hayward Park Caltrain Station. Per the Hayward Park station parking assessment study and Caltrain website, the planned future service will reduce the frequency to 30 minutes. This project will reduce the number of parking spaces serving this Caltrain station.

Emergency Vehicle and Fire Truck Access

The project proposes to maintain and improve the existing emergency vehicle access (EVA) road on Station Park Green Promenade connecting to Concar Drive on the South and Garvey Way on the north as an EVA. The proposed site plan designates 20 feet unobstructed fire lane width, and the proposed internal streets would provide sufficient clear width to accommodate emergency vehicles and meet fire department requirements. The proposed project site plan also indicates the location of fire hydrants in the vicinity of the project site and the presence of a fire command center onsite. 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 two trash rooms, one on the northwest and one on the southeast corner of the project site on every floor of the building. Garbage trucks would enter and exit the project site via Concar Drive to access the proposed trash compactor rooms. Overall, garbage truck access and circulation would be adequate.

Intersection Level of Service

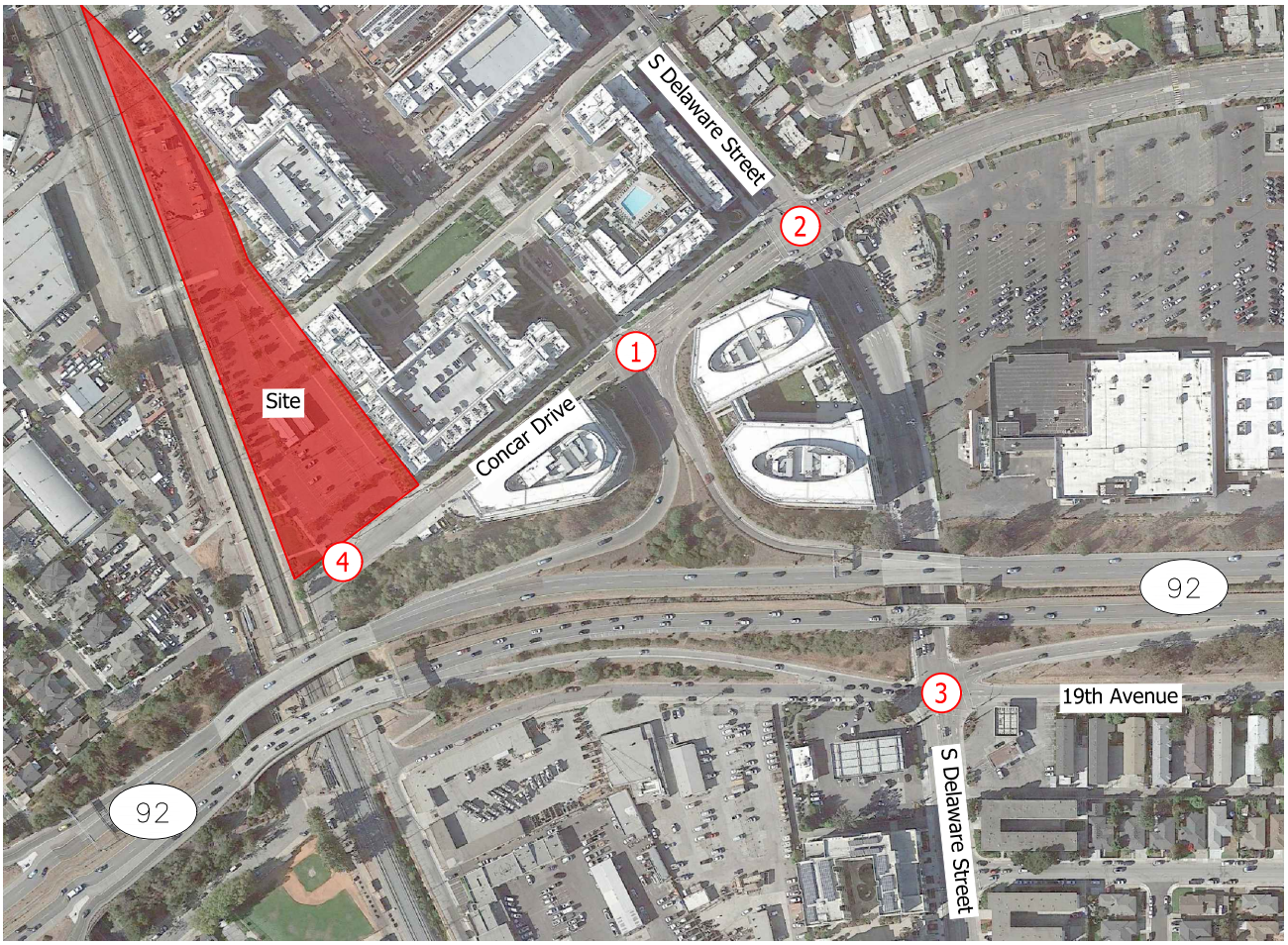
Traffic volumes for the Baseline with Project Conditions were developed by combining the baseline estimated traffic volumes with the project only volumes. The resulting Baseline with Project turning movement volumes are shown in Figure 12. Table 7 shows the Baseline with Project intersection operations for the AM and PM peak hours, respectively. Detailed calculation worksheets for the Baseline with Project Conditions are provided in Appendix D.

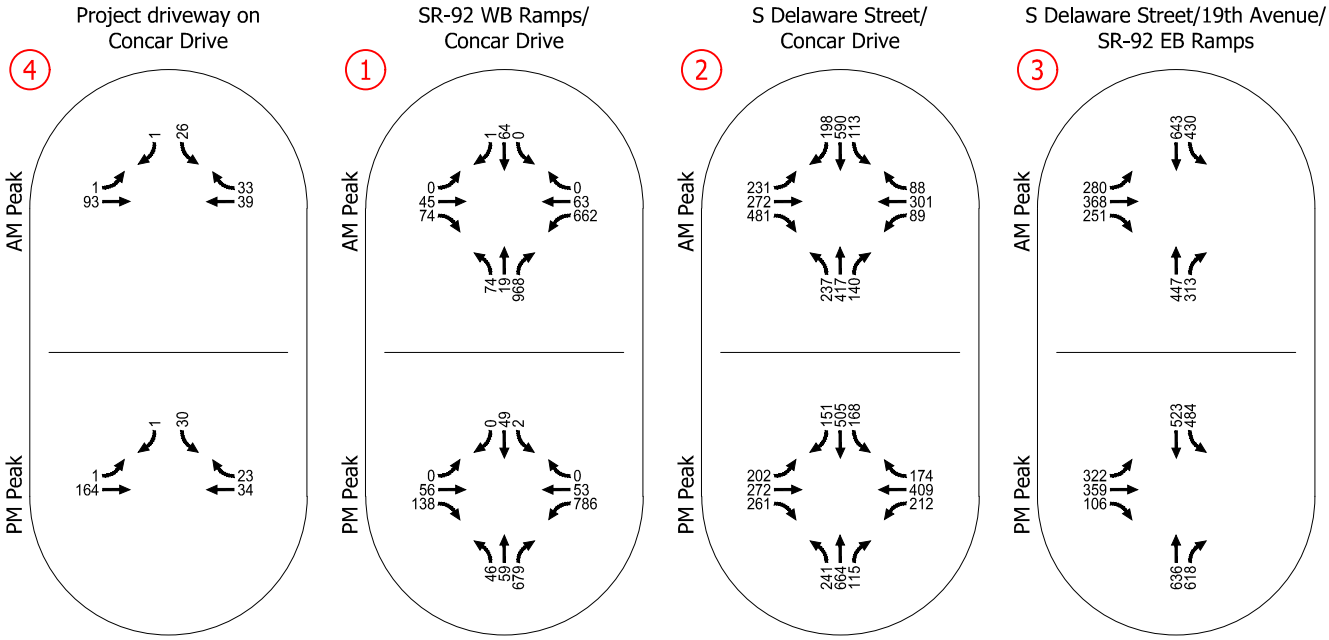
Table 7: Baseline + Project Conditions Intersection Operations Results

#	Location	Control	Scenario	Weekday AM Peak Hour		Weekday PM Peak Hour	
				Delay	LOS	Delay	LOS
1	SR-92 Westbound Ramps & Concar Drive	Signal	No Project	15.5	B	11.3	B
			Plus Project	17.2	B	11.6	B
2	S Delaware Street & Concar Drive	Signal	No Project	35.9	D	33.8	C
			Plus Project	37.1	D	34.2	C
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	Signal	No Project	**66.4**	**E**	**93.7**	**F**
			Plus Project	**69.3[1]**	**E**	**94.3[1]**	**F**
4	Project Driveway on Concar Drive	TWSC	No Project	0.0	A	0.0	A
			Plus Project	9.4	A	9.8	A

Notes: Bold lettering indicates an intersection that does not meet the City's minimum acceptable design level of service (LOS D for Signalized intersections); TWSC = Two-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: 2010 Highway Capacity Manual; Kittelson & Associates, 2022, [1] - Plus project delay does not exceed 4 seconds.

As shown in Table 7, under Baseline with Project conditions, the intersection of S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps is expected to operate below City standards. This intersection operates at LOS E and LOS F in the AM and PM peak hour, respectively for baseline and baseline plus project conditions. However, because the project-related delay does not exceed baseline conditions by more than four seconds, this is not considered an operational deficiency.





Baseline Plus Project Conditions
Peak Hour Turning Movement Volumes

Figure 12

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[16]. Base year (Year 2021) and future year (Year 2040) forecasts were extracted from the model and linearly interpolated to develop growth between the estimated existing traffic counts (2021) and the current model horizon year (2040) [17]. The intersection lane configurations under Cumulative Conditions were assumed to be the same as described under Existing Conditions.

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

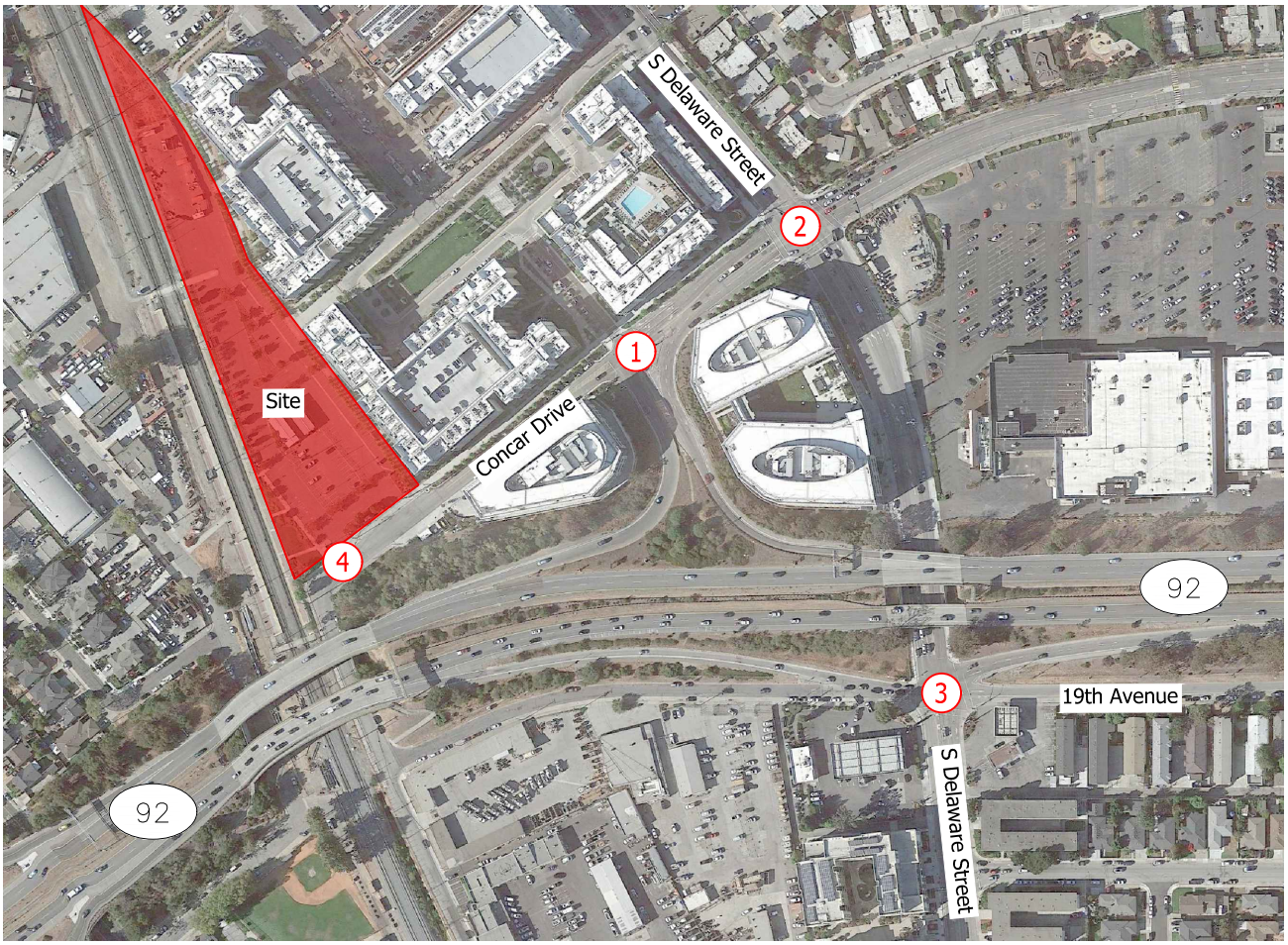
#	Location	Control	Cumulative AM		Cumulative PM	
			Delay	LOS	Delay	LOS
1	SR-92 Westbound Ramps & Concar Drive	Signal	**473.0**	**F**	**299.3**	**F**
2	S Delaware Street & Concar Drive	Signal	**229.1**	**F**	**147.6**	**F**
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	Signal	**234.8**	**F**	**219.8**	**F**
4	Project Driveway on Concar Drive	TWSC	0.0	A	0.0	A

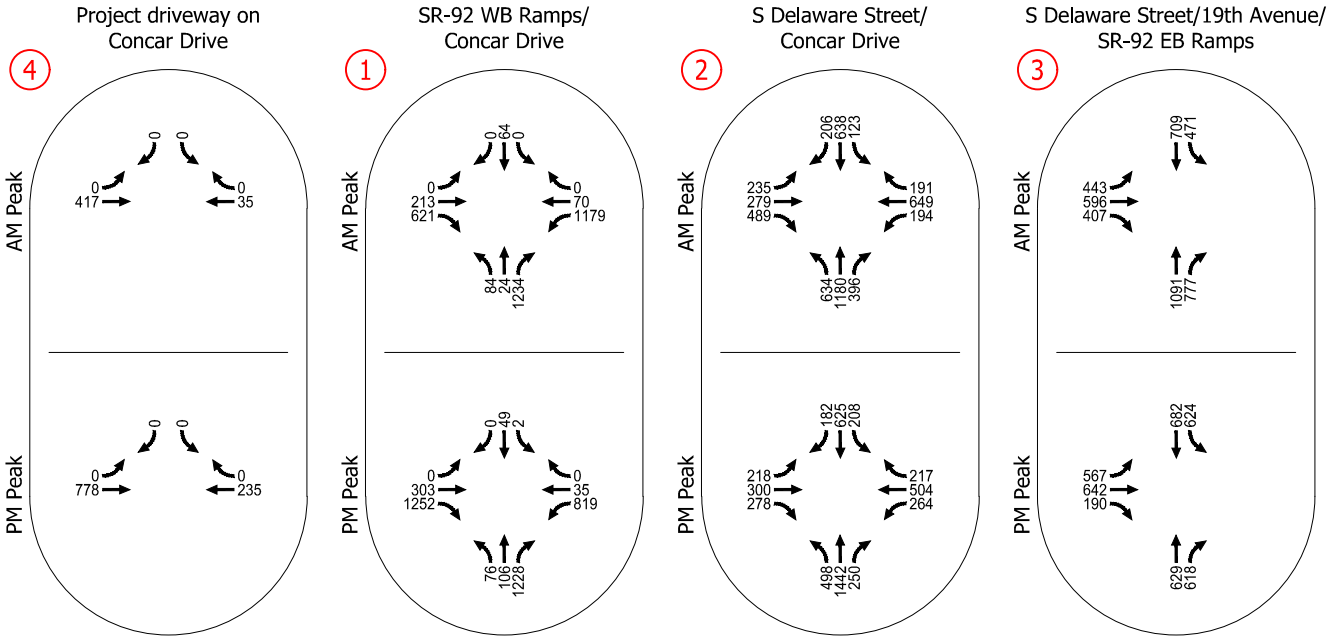
Notes: Bold lettering indicates an intersection that does not meet the City's minimum acceptable design level of service (LOS D for Signalized intersections); TWSC = Two-Way Stop Control; AM = weekday a.m. peak hour; PM = weekday p.m. peak hour; LOS = Level of Service; Delay reported in seconds per vehicle; No = intersection number. Source: 2010 Highway Capacity Manual; Kittelson & Associates, 2022

As shown in Table 8, the intersections of SR-92 Westbound Ramps & Concar Drive, S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps, and S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps are expected to operate below City standards, i.e., at LOS F during the AM and PM peak hours.

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

[17] For the site access intersection along Concar Drive, the initial volumes provided by the model were overestimating the traffic volumes at this location. Given there are site access driveways to the recent Station Park Green Development and WeWork Office Building located between the intersection of Concar Drive / S Delaware Street and the proposed site access driveway, projected eastbound and westbound volumes were reduced by one half to provide a more realistic traffic volume estimate for the proposed project site access intersection.





Cumulative Conditions
Peak Hour Turning Movement Volumes

Figure
13

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.

Intersection Level of Service

Based on these volumes and lane configurations, the Cumulative with Project volumes are shown in Figure 14 and the 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.

Table 9: Cumulative with Project Conditions Intersection Operations Results

#	Location	Control	Scenario	Weekday AM Peak Hour		Weekday PM Peak Hour	
				Delay	LOS	Delay	LOS
1	SR-92 Westbound Ramps & Concar Drive	Signal	No Project	**473.0**	**F**	**299.3**	**F**
			Plus Project	**504.6[1]**	**F**	**313.5[1]**	**F**
2	S Delaware Street & Concar Drive	Signal	No Project	**229.1**	**F**	**147.6**	**F**
			Plus Project	**233.6[1]**	**F**	**148.6**	**F**
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	Signal	No Project	**234.8**	**F**	**219.8**	**F**
			Plus Project	**237.9**	**F**	**221.4**	**F**
4	Project Driveway on Concar Drive	TWSC	No Project	0.0	A	0.0	A
			Plus Project	11.8	B	20.3	C

Note: 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); TWSC = Two-Way Stop Control, Source: 2010 Highway Capacity Manual; Kittelson & Associates, 2022, [1] - Plus project delay exceeds 4 seconds for the "light grey" shaded intersections

As shown in Table 9, under Cumulative with Project conditions, the intersections of SR-92 Westbound Ramps & Concar Drive, S Delaware Street & Concar Drive, and S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps operate below city standards, i.e., operate at LOS F. Even though intersections S Delaware Street & Concar Drive (PM peak hour) and S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps (AM and PM peak hour) operate at LOS F, the project trips did not increase the delay by more than 4 seconds – hence no operational deficiencies have been reported for these intersections. However, the intersection of SR-92 Westbound Ramps & Concar Drive (AM and PM peak hours) and S Delaware Street & Concar Drive (AM peak hour) change in delay exceeded 4 seconds, which creates an operational deficiency at these two intersections.

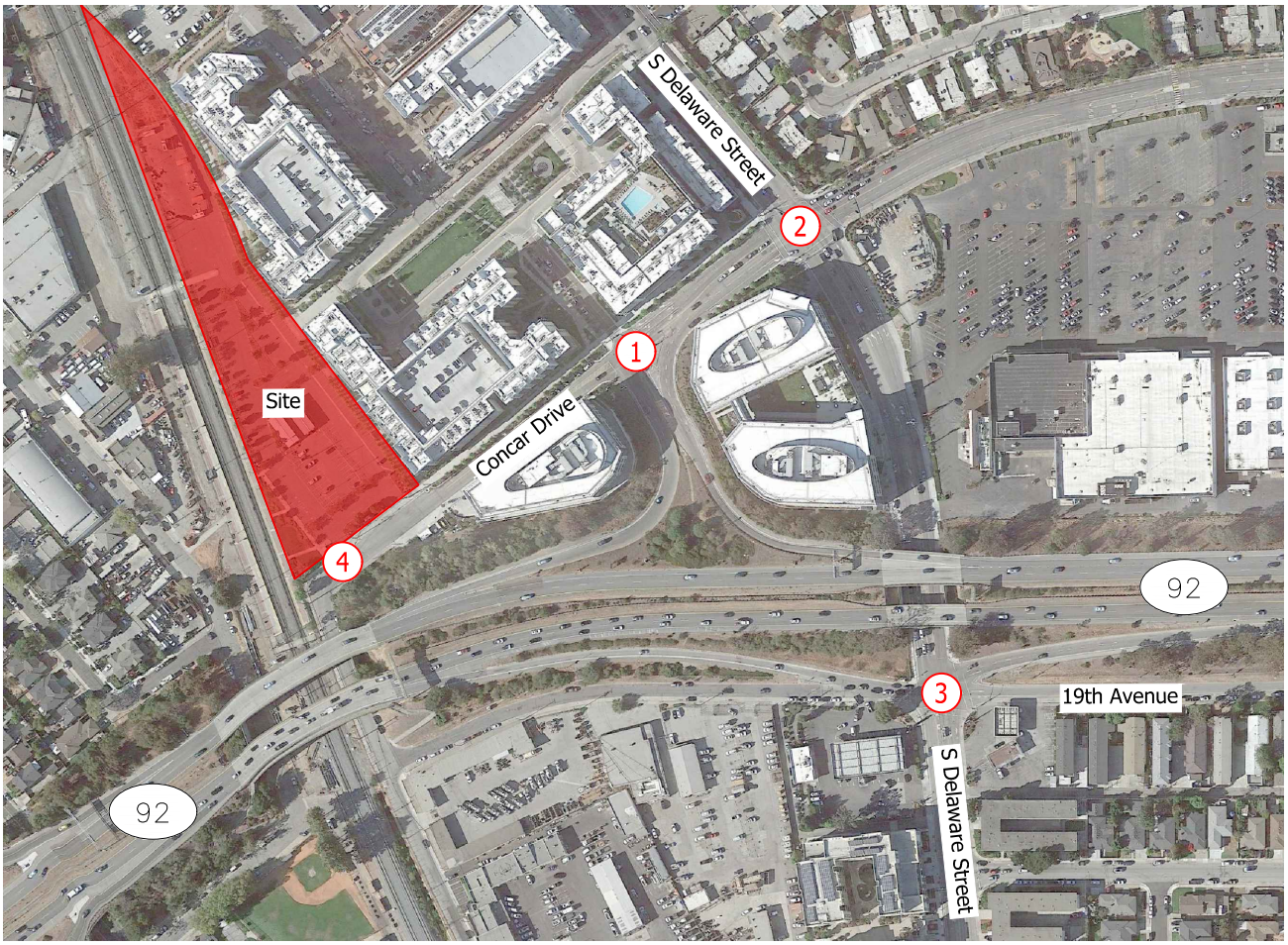
To mitigate the increase in delay, signal timing optimization was performed for the two intersections during the highlighted time periods as shown in Table 9. The optimized results for both AM and PM peak hours for these two intersections are shown below in Table 10.

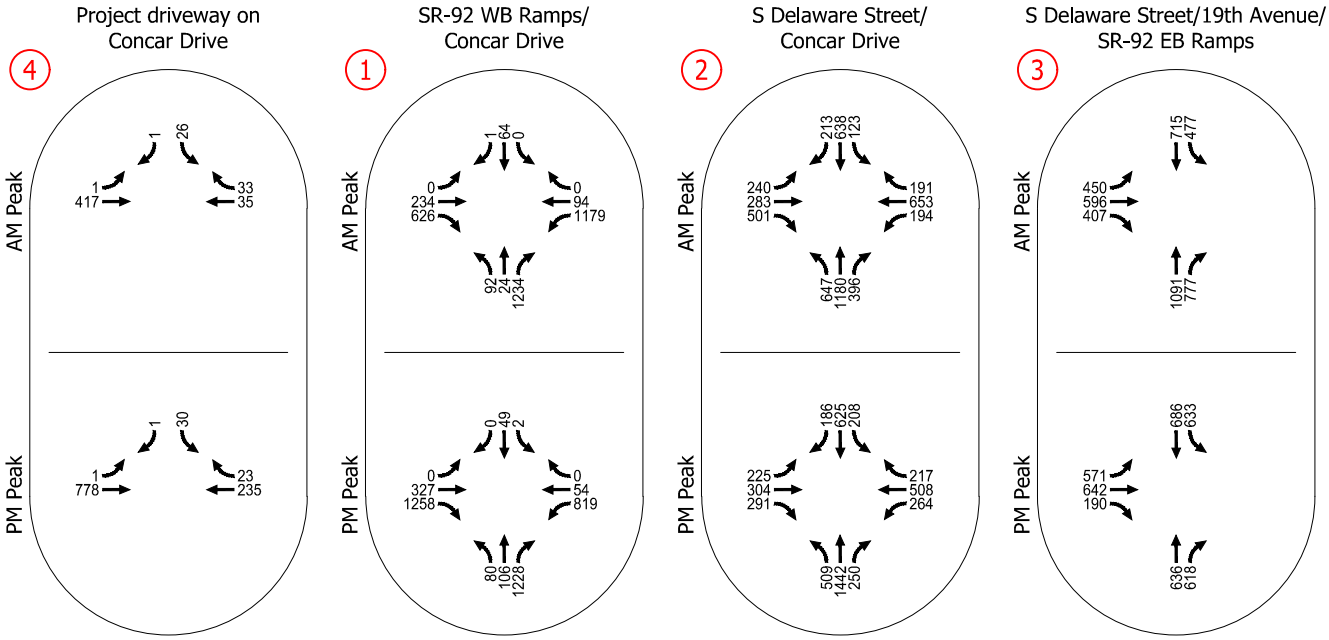
Table 10: Cumulative with Project Conditions (Optimized) Intersection Operations Results

#	Location	Control	Scenario	Weekday AM Peak Hour		Weekday PM Peak Hour	
				Delay	LOS	Delay	LOS
1	SR-92 Westbound Ramps & Concar Drive	Signal	No Project	**473.0**	**F**	**299.3**	**F**
			Plus Project	**337.1[1]**	**F**	**93.6[1]**	**F**
2	S Delaware Street & Concar Drive	Signal	No Project	**229.1**	**F**	**147.6**	**F**
			Plus Project	**115.7[1]**	**F**	**148.6**	**F**
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	Signal	No Project	**234.8**	**F**	**219.8**	**F**
			Plus Project	**237.9**	**F**	**221.4**	**F**
4	Project Driveway on Concar Drive	TWSC	No Project	0.0	A	0.0	A
			Plus Project	11.8	B	20.3	C

Note: 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); TWSC = Two-Way Stop Control, Source: 2010 Highway Capacity Manual; Kittelson & Associates, 2022, [1] - Signal timing optimized.

As shown in Table 10, under Cumulative with Project conditions (optimized), with signal timing optimization at the intersections of SR-92 Westbound Ramps & Concar Drive (AM and PM peak hours) and S Delaware Street & Concar Drive (AM peak hour), the change in delay due to added volumes from the proposed project does not exceed 4 seconds.





Cumulative Plus Project Conditions
Peak Hour Turning Movement Volumes

Figure
14

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 provides queue lengths and a supplemental analysis of addressing project-related queuing impacts at the request of the City. The 95th percentile queue length worksheets are provided in Appendix G. The queue lengths presented are derived from the outputs of the Synchro traffic analysis software and are representative of the 95th percentile traffic volumes[18].

Table 11 displays the existing storage lengths for each approach at the study intersections. Table 12 through Table 14 show the 95th percentile queue lengths for the Existing, Baseline, Baseline with Project, Cumulative and Cumulative with Project conditions. Movements where the expected 95th percentile queue length exceeds storage capacity during the weekday peak hours include:

- Existing Conditions:
  - Westbound left-turn at the SR-92 Westbound Ramps at Concar Drive,
  - Eastbound left-turn at S Delaware Street & Concar Drive, and
  - Eastbound through, Southbound left-turn movement and Northbound approach at the S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps.

- Baseline with Project Conditions:
  - Westbound approach at the SR-92 Westbound Ramps at Concar Drive,
  - Eastbound left-turn and Southbound through at S Delaware Street & Concar Drive, and
  - Eastbound through movement, Southbound and Northbound approach at the S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps.

- Cumulative with Project Conditions:
  - The Eastbound, Northbound, Southbound through movement and Westbound approach at the SR-92 Westbound Ramps at Concar Drive,
  - Eastbound left-turn and Westbound left-turn, Southbound through and Northbound approach at S Delaware Street & Concar Drive, and
  - Eastbound through movement, Southbound and Northbound approach at S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps.

To address project-related queuing impacts, i.e., to reduce 95th percentile queue lengths in Baseline plus project conditions to the Baseline conditions, Kittelson recommended adjustments in signal timing and proposed turn pocket extensions for selected movements at selected study intersections. These recommendations were provided for westbound movement at SR-92 Westbound Ramps at Concar Drive,

[18] 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.

eastbound left turn at S Delaware Street & Concar Drive, and southbound through movement at S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps. The details on each of the recommendations and the supplemental analysis on queue lengths are provided in Appendix H.

On implementing these recommendations, the Baseline plus project 95th percentile queue lengths are reduced, and they equal the Baseline 95th percentile queue lengths. However, the LOS and control delay does not change with respect to implementing these recommendations at the study intersections.

Table 11: 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	SR-92 Westbound Ramps & Concar Drive	17	17	17	4	11	3	6	6	9	3	3	3
2	S Delaware Street & Concar Drive	5	11	9	6	18	18	9	12	12	10	10	10
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	36	9	9	-	-	-	-	5	5	9	9	-
4	Project Driveway on Concar Drive	-	-	-	-	-	-	-	-	-	-	-	-

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

Table 12: 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	SR-92 Westbound Ramps & Concar Drive	No Project	-	3	-	9	9	-	-	2	5	-	-	-
2	S Delaware Street & Concar Drive	No Project	9	4	5	5	7	-	4	9	-	5	11	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	8	20	2	-	-	-	-	7	7	14	12	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	-	-	-
Weekday PM Peak Hour														
1	SR-92 Westbound Ramps & Concar Drive	No Project	-	4	-	8	8	-	-	1	2	-	-	-
2	S Delaware Street & Concar Drive	No Project	8	5	2	9	10	-	5	12	-	8	10	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	10	>20	1	-	-	-	-	9	10	12	9	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	-	-	-

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 cells are 95th percentile queue lengths greater than existing storage

Table 13: 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	SR-92 Westbound Ramps & Concar Drive	No Project	-	4	-	13	13	-	-	3	6	-	3	-
		Plus Project	-	5	-	14	14	-	-	4	6	-	3	-
2	S Delaware Street & Concar Drive	No Project	10	4	8	5	7	-	6	10	-	6	16	-
		Plus Project	10	4	9	5	7	-	6	10	-	6	16	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	9	20	2	-	-	-	-	8	10	19	16	-
		Plus Project	9	20	2	-	-	-	-	8	10	19	17	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	0	-	-
		Plus Project	-	-	-	-	-	-	-	-	-	0	-	-
Weekday PM Peak Hour														
1	SR-92 Westbound Ramps & Concar Drive	No Project	-	6	-	11	11	-	-	4	2	-	3	-
		Plus Project	-	7	-	12	12	-	-	4	2	-	3	-
2	S Delaware Street & Concar Drive	No Project	8	5	3	9	11	-	5	15	-	8	11	-
		Plus Project	9	5	3	9	11	-	5	15	-	8	11	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	14	>20	1	-	-	-	-	13	15	14	11	-
		Plus Project	14	>20	1	-	-	-	-	13	15	14	12	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	0	-	-
		Plus Project	-	-	-	-	-	-	-	-	-	0	-	-

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 cells are 95th percentile queue lengths greater than existing storage

Table 14: 95th Percentile Queue Lengths for Cumulative and Cumulative 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	SR-92 Westbound Ramps & Concar Drive	No Project	-	>20	-	>20	>20	-	-	4	10	-	3	-
		Plus Project	-	>20	-	>20	>20	-	-	11	8	-	6	-
2	S Delaware Street & Concar Drive	No Project	11	4	13	12	19	-	19	>20	-	6	18	-
		Plus Project	19	7	14	14	>20	-	19	>20	-	11	>20	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	18	>20	3	-	-	-	-	>20	>20	>20	19	-
		Plus Project	19	>20	3	-	-	-	-	>20	>20	>20	19	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	0	-	-
		Plus Project	-	-	-	-	-	-	-	-	-	0	-	-
Weekday PM Peak Hour														
1	SR-92 Westbound Ramps & Concar Drive	No Project	-	>20	-	13	13	-	-	6	2	-	3	-
		Plus Project	-	>20	-	>20	>20	-	-	11	4	-	4	-
2	S Delaware Street & Concar Drive	No Project	9	5	3	12	14	-	14	>20	-	10	14	-
		Plus Project	10	6	3	12	15	-	14	>20	-	10	14	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	>20	>20	3	-	-	-	-	13	15	20	17	-
		Plus Project	>20	>20	3	-	-	-	-	13	15	20	18	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	0	-	-
		Plus Project	-	-	-	-	-	-	-	-	-	0	-	-

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 cells are 95th percentile queue lengths greater than existing storage

TEHNICAL APPENDIX

Appendix A: Traffic Volume Estimation Memo

KITTELSON & ASSOCIATES
155 Grand Avenue, Suite 505
Oakland, CA 94612
P 510.839.1742

Technical Memorandum

January 20, 2022 Project# 24837.004

To: Wendy Lao
City of San Mateo
330 West 20th Avenue
San Mateo, California 94403

From: Azhagan Avr; Anusha Musunuru, PhD; Damian Stefanakis

CC: Bethany Lopez

RE: **San Mateo Hayward Park Station Traffic Impact Analysis – Traffic Volume Estimation Memorandum DRAFT**

Kittelson & Associates, Inc. (Kittelson) has prepared this traffic volume estimation memorandum for the proposed Hayward Park Station residential 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 DRAFT submitted on December 17, 2021. The project trip distribution and the cumulative volumes at the study intersections are not included as part of this memorandum. Kittelson will proceed with the project trip distribution and extraction of cumulative volumes from the San Mateo Citywide model after City's review and approval of the existing volumes estimation methodology.

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. SR-92 Westbound (WB) Ramps/Concar Drive
2. S Delaware Street/Concar Drive
3. S Delaware Street/19th Avenue/SR-92 Eastbound (EB) Ramps
4. Project driveway on Concar Drive

Exhibit 1 shows the study area and study intersections.

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

Exhibit 1: Map of Study Area and Study Intersections (Source: Google Earth)

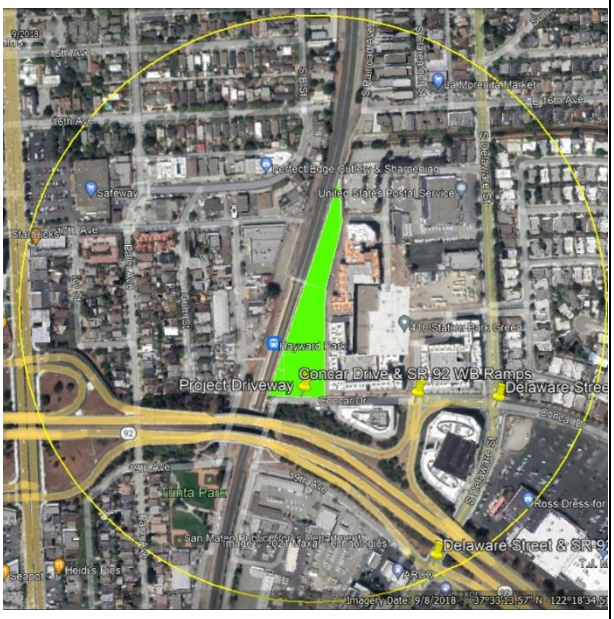
Traffic Volumes

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 existing traffic demand in 2021. The following historical turning movement counts have been identified for use.

1. SR-92 WB Ramps/Concar Drive: 2018 counts – AM & PM peak hours
2. S Delaware Street /Concar Drive: 2018 counts – AM & PM peak hours
3. S Delaware Street/19th Avenue/SR-92 EB Ramps: 2018 counts – AM & PM peak hours
4. Project driveway on Concar Drive: Count data (Not available) (Kittelson derived the eastbound and westbound through volumes at this intersection from an adjacent study intersection - #1)

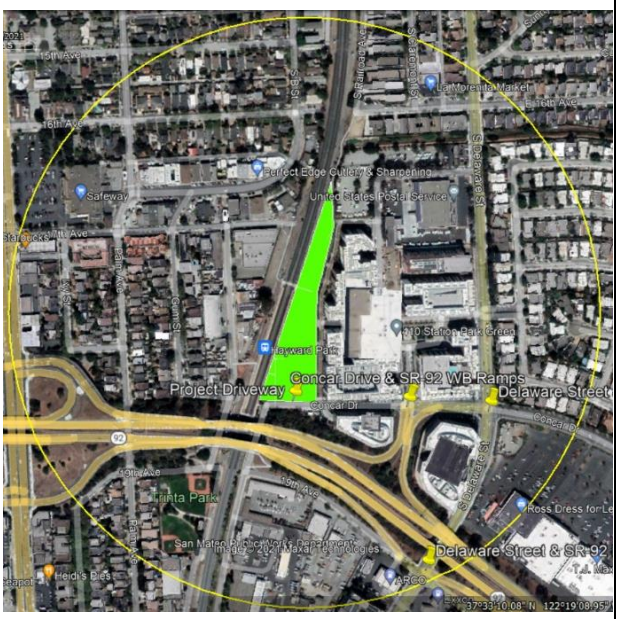
We propose to adjust the traffic counts above to estimated 2021 existing traffic conditions. The adjustments will reflect a variety of factors including local development, and growth in regional traffic in the area. Exhibits 2 and 3 are aerial photos illustrating the study area in 2018 when historic counts were collected and imagery for the latest date available (September 2021, in this case) for context. Looking at the aerial and through conversations with the city, Kittelson included AAA Site, Station Park Green Development, and Bay Meadows II Phase III as the new development that occurred in the vicinity of the Hayward Park station parking lot. The city provided information on the traffic volumes generated by these projects which were added to the 2021 estimated existing volumes at the study intersections for estimating the 2021 existing plus background conditions volumes.

Exhibit 2. Aerial of Study Area in 2018



Source: Google Earth - September 2018

Exhibit 3. Aerial of Study Area in 2021



Source: Google Earth - September 2021

Assuming City staff agrees with the general methodology above, we proceeded with a detailed derivation of 2021 existing volumes (from 2018 historic counts) and 2021 existing plus background conditions volumes. Kittelson will proceed with the project trip distribution and extraction of cumulative volumes from the San Mateo Citywide model after City's review and approval of the 2021 existing volumes and 2021 existing and background conditions volumes.

The growth rates for Project Driveway, Concar Drive, and Delaware Street were calculated by interpolating historical intersection counts. An annual growth rate of one percent (1%) was considered for arterial roads and one and half (1.5%) percent for ramp terminals. This growth rate was applied to 2018 count data at these intersections.

Our steps will include:

1. Adjust SR-92 Westbound Ramps/Concar Drive to;
    a. reflect the calculated annual growth rate of one percent (1%) annually on Concar Drive, and
    b. reflect traffic growth of one and half percent (1.5%) annually on SR-92 Westbound Ramps (the annual growth rate for Concar Drive and SR-92 WB Ramps was calculated by interpolating historical intersection counts).
2. Adjust S Delaware Street/Concar Drive to;
    a. reflect the calculated annual growth rate of one percent (1%) annually on Delaware Street, and
    b. reflect traffic growth of one percent (1%) annually on Concar Drive (the annual growth rate for Concar Drive and Delaware Street was calculated by interpolating historical intersection counts).
3. Adjust SR-92 Eastbound Ramps / Concar Drive to;
    a. reflect the calculated annual growth rate of one percent (1%) annually on Delaware Street, and
    b. reflect traffic growth of one and half percent (1.5%) annually on SR-92 Eastbound Ramps (the annual growth rate for Delaware Street and SR-92 EB Ramps was calculated by interpolating historical intersection counts).
4. Project driveway on Concar Drive: No available historic count data,
    a. derived eastbound and westbound through volumes at this intersection from adjacent study intersection volumes (#1 above)
    b. assumed that the intersection turning movement counts are zero as the parking lot at the Hayward Park Station is underutilized in the existing conditions.

The 2018 historic traffic counts for the study intersections and the estimated 2021 existing volumes (using the methodology above) are provided in Table 1 and Table 2, respectively. As mentioned above, the city provided trip assignment data for three approved projects namely, AAA Site, Station Park Green Development, and Bay Meadows II Phase III. The data provided were dated 2019, so the volumes from the new development were grown to 2021 using the same growth rates mentioned as above. AAA site project trips were ignored based on the conversations with the city as the net trips generated by the AAA site were negative (when compared to the existing development at that site). The proposed projects' 2021 background volumes are shown in Table 3 and the 2021 existing plus background conditions volumes are shown in Table 4.

Next Steps

This memorandum has provided Kittelson's proposed methodology for adjusting historic, pre-COVID-19 conditions to represent reasonable existing conditions for the project's study intersections in 2021. Upon City review and approval of the methodology and outputs, Kittelson will proceed with generating the project's trip distribution and cumulative volumes, and therefore the level of service (LOS) analysis.

Table 1: 2018 Historic Traffic Counts at Study Intersections

AM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	63	0	857	0	0	0	0	23	67	638	38	0	1
S Delaware Street/Concar Drive	181	391	136	110	439	185	219	260	386	86	288	81	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	401	235	344	483	0	238	352	213	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	90	0	0	38	0	1
PM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	40	0	619	0	0	0	0	31	128	749	33	0	1
S Delaware Street/Concar Drive	209	507	112	163	412	143	189	258	210	206	378	169	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	530	396	418	439	0	233	344	89	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	159	0	0	33	0	1

Table 2: 2021 Existing Traffic Volumes at Study Intersections

AM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	66	0	896	0	0	0	0	24	69	657	39	0	1
S Delaware Street/Concar Drive	186	403	140	113	452	191	226	268	398	89	297	83	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	413	242	354	497	0	249	368	223	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	93	0	0	39	0	1
PM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	42	0	647	0	0	0	0	32	132	771	34	0	1
S Delaware Street/Concar Drive	215	522	115	168	424	147	195	266	216	212	389	174	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	546	408	431	452	0	243	359	93	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	164	0	0	34	0	1

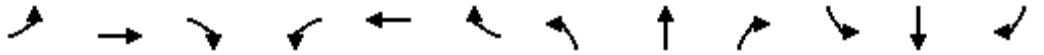
Table 3: 2021 Background/Approved Projects Traffic Volumes at Study Intersections

Station Park Green Development - Project Trips													
AM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	0	19	0	0	64	0	0	0	0	0	0	0	1
S Delaware Street/Concar Drive	33	0	0	0	95	0	0	0	0	0	0	4	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	8	0	69	26	0	25	0	0	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	0	0	0	0	0	1
PM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	0	59	0	2	1	0	0	0	0	0	0	0	1
S Delaware Street/Concar Drive	0	100	0	0	1	0	0	2	0	0	15	0	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	27	0	45	1	0	74	0	0	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	0	0	0	0	0	1
Bay Meadows II Phase III - Project Trips													
AM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	0	0	72	0	0	0	0	0	0	5	0	0	1
S Delaware Street/Concar Drive	5	14	0	0	43	0	0	0	71	0	0	0	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	19	71	0	114	0	0	0	29	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	0	0	0	0	0	1
PM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	0	0	32	0	0	0	0	0	0	14	0	0	1
S Delaware Street/Concar Drive	14	42	0	0	19	0	0	0	32	0	0	0	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	56	210	0	51	0	0	0	13	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 4: 2021 Existing Plus Background Traffic Volumes at Study Intersections

AM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	66	19	968	0	64	0	0	24	69	662	39	0	1
S Delaware Street/Concar Drive	224	417	140	113	590	191	226	268	469	89	297	88	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	441	313	424	637	0	273	368	251	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	93	0	0	39	0	1
PM Peak Hour	Northbound			Southbound			Eastbound			Westbound			PHF
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
SR-92 WB Ramps/Concar Drive	42	59	679	2	49	0	0	32	132	786	34	0	1
S Delaware Street/Concar Drive	230	664	115	168	505	147	195	268	248	212	405	174	1
S Delaware Street/19th Avenue/SR-92 EB Ramps	0	629	618	475	519	0	318	359	106	0	0	0	1
Project driveway at Concar Drive	0	0	0	0	0	0	0	164	0	0	34	0	1

Appendix B: Existing Conditions Synchro Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	24	69	657	39	0	66	0	896	0	0	0
Future Volume (veh/h)	0	24	69	657	39	0	66	0	896	0	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1000	980	1000	1863	1863	1863	1000	980	980	1900	1863	1900
Adj Flow Rate, veh/h	0	24	69	685	0	0	66	0	0	0	0	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	33	94	1230	0	549	198	0	312	0	6	0
Arrive On Green	0.00	0.15	0.15	0.35	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	0	224	643	3548	0	1583	934	0	1467	0	1863	0
Grp Volume(v), veh/h	0	0	93	685	0	0	66	0	0	0	0	0
Grp Sat Flow(s),veh/h/ln	0	0	867	1774	0	1583	934	0	733	0	1863	0
Q Serve(g_s), s	0.0	0.0	3.1	4.8	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	3.1	4.8	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0
Prop In Lane	0.00		0.74	1.00		1.00	1.00		1.00	0.00		0.00
Lane Grp Cap(c), veh/h	0	0	127	1230	0	549	198	0	312	0	6	0
V/C Ratio(X)	0.00	0.00	0.73	0.56	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00
Avail Cap(c_a), veh/h	0	0	553	2553	0	1139	595	0	935	0	1036	0
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)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	12.5	8.1	0.0	0.0	10.2	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	7.9	0.4	0.0	0.0	1.0	0.0	0.0	0.0	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.0	2.4	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	20.3	8.5	0.0	0.0	11.2	0.0	0.0	0.0	0.0	0.0
LnGrp LOS			C	A			B					
Approach Vol, veh/h		93			685			66			0	
Approach Delay, s/veh		20.3			8.5			11.2			0.0	
Approach LOS		C			A			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		9.5		7.5		0.0		13.6
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		15.5		20.5
Max Q Clear Time (g_c+I1), s		3.8		5.1		0.0		6.8
Green Ext Time (p_c), s		0.2		0.3		0.0		2.3

Intersection Summary	
HCM 2010 Ctrl Delay	10.0
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	226	268	398	89	297	83	186	403	140	113	452	191
Future Volume (veh/h)	226	268	398	89	297	83	186	403	140	113	452	191
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.97	1.00		0.96	1.00		0.93
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	1569	1569	1569	1569	1569	1600	1569	1569	1600	1569	1569	1600
Adj Flow Rate, veh/h	226	268	156	89	297	83	186	403	140	113	452	191
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	281	1100	465	133	619	169	295	640	219	161	606	253
Arrive On Green	0.19	0.37	0.37	0.09	0.27	0.27	0.10	0.30	0.30	0.11	0.30	0.30
Sat Flow, veh/h	1494	2980	1258	1494	2294	628	2898	2154	737	1494	2001	835
Grp Volume(v), veh/h	226	268	156	89	191	189	186	277	266	113	335	308
Grp Sat Flow(s),veh/h/ln	1494	1490	1258	1494	1490	1432	1449	1490	1401	1494	1490	1345
Q Serve(g_s), s	12.7	5.5	7.8	5.1	9.4	9.8	5.4	14.1	14.4	6.4	17.7	18.1
Cycle Q Clear(g_c), s	12.7	5.5	7.8	5.1	9.4	9.8	5.4	14.1	14.4	6.4	17.7	18.1
Prop In Lane	1.00		1.00	1.00		0.44	1.00		0.53	1.00		0.62
Lane Grp Cap(c), veh/h	281	1100	465	133	402	386	295	443	416	161	452	408
V/C Ratio(X)	0.80	0.24	0.34	0.67	0.47	0.49	0.63	0.63	0.64	0.70	0.74	0.75
Avail Cap(c_a), veh/h	409	1394	588	204	493	474	364	527	495	239	578	522
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.0	19.2	19.9	38.7	26.8	26.9	37.8	26.6	26.7	37.8	27.5	27.6
Incr Delay (d2), s/veh	7.2	0.1	0.4	5.7	0.9	1.0	2.4	1.7	2.1	5.5	3.8	4.7
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	5.8	2.3	2.8	2.3	4.0	3.9	2.3	6.0	5.8	2.9	7.7	7.2
LnGrp Delay(d),s/veh	41.2	19.3	20.3	44.4	27.7	27.9	40.2	28.3	28.8	43.2	31.3	32.3
LnGrp LOS	D	B	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		650			469			729			756	
Approach Delay, s/veh		27.2			30.9			31.5			33.5	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.4	29.1	10.8	35.4	11.9	29.6	19.5	26.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	29.5	10.5	39.5	9.5	32.5	22.5	27.5
Max Q Clear Time (g_c+I1), s	7.8	16.4	7.1	9.8	7.4	20.1	14.7	11.8
Green Ext Time (p_c), s	0.1	2.8	0.1	2.4	0.1	3.3	0.4	2.0

Intersection Summary		
HCM 2010 Ctrl Delay		30.9
HCM 2010 LOS		C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	249	368	223	0	0	0	0	413	242	354	497	0
Future Volume (veh/h)	249	368	223	0	0	0	0	413	242	354	497	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.97	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	1275	1275	1275				0	1275	1275	1275	1275	0
Adj Flow Rate, veh/h	249	368	94				0	449	218	284	595	0
Adj No. of Lanes	1	1	1				0	2	1	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	407	427	353				0	729	301	322	676	0
Arrive On Green	0.34	0.34	0.34				0.00	0.29	0.29	0.27	0.27	0.00
Sat Flow, veh/h	1214	1275	1052				0	2549	1051	1214	2549	0
Grp Volume(v), veh/h	249	368	94				0	449	218	284	595	0
Grp Sat Flow(s),veh/h/ln	1214	1275	1052				0	1275	1051	1214	1275	0
Q Serve(g_s), s	13.6	21.4	5.2				0.0	12.1	14.8	17.8	17.7	0.0
Cycle Q Clear(g_c), s	13.6	21.4	5.2				0.0	12.1	14.8	17.8	17.7	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	407	427	353				0	729	301	322	676	0
V/C Ratio(X)	0.61	0.86	0.27				0.00	0.62	0.73	0.88	0.88	0.00
Avail Cap(c_a), veh/h	444	467	385				0	997	411	322	676	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.0	24.6	19.2				0.0	24.5	25.5	27.9	27.9	0.0
Incr Delay (d2), s/veh	2.1	14.2	0.4				0.0	0.9	4.0	23.7	12.9	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	4.8	9.1	1.5				0.0	4.3	4.6	8.0	7.4	0.0
LnGrp Delay(d),s/veh	24.1	38.8	19.6				0.0	25.4	29.5	51.6	40.8	0.0
LnGrp LOS	C	D	B					C	C	D	D	
Approach Vol, veh/h		711						667			879	
Approach Delay, s/veh		31.1						26.7			44.3	
Approach LOS		C						C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		25.6		29.6		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.5		27.5		19.5		
Max Q Clear Time (g_c+I1), s		16.8		23.4		19.8		
Green Ext Time (p_c), s		3.1		1.4		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	35.0
HCM 2010 LOS	C

Notes

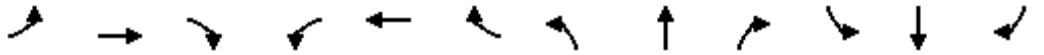
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	93	39	0	0	0
Future Vol, veh/h	0	93	39	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	93	39	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	39	0	-	0	132	39
Stage 1	-	-	-	-	39	-
Stage 2	-	-	-	-	93	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1571	-	-	-	862	1033
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	931	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1571	-	-	-	862	1033
Mov Cap-2 Maneuver	-	-	-	-	862	-
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	931	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1571	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	32	132	771	34	0	42	0	647	0	0	0
Future Volume (veh/h)	0	32	132	771	34	0	42	0	647	0	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	2500	2451	2500	2451	2451	2451	2500	2451	2451	2500	2451	2500
Adj Flow Rate, veh/h	0	32	132	795	0	0	42	0	0	0	0	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	90	372	1817	0	811	590	0	928	0	8	0
Arrive On Green	0.00	0.43	0.34	0.39	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	0	418	1725	4669	0	2083	2334	0	3667	0	2451	0
Grp Volume(v), veh/h	0	0	164	795	0	0	42	0	0	0	0	0
Grp Sat Flow(s),veh/h/ln	0	0	2143	2334	0	2083	2334	0	1833	0	2451	0
Q Serve(g_s), s	0.0	0.0	1.8	4.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	1.8	4.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Prop In Lane	0.00		0.80	1.00		1.00	1.00		1.00	0.00		0.00
Lane Grp Cap(c), veh/h	0	0	462	1817	0	811	590	0	928	0	8	0
V/C Ratio(X)	0.00	0.00	0.36	0.44	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00
Avail Cap(c_a), veh/h	0	0	1457	6126	0	2734	1919	0	3015	0	775	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	8.6	7.1	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.5	0.2	0.0	0.0	0.1	0.0	0.0	0.0	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.1	2.6	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	9.0	7.3	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0
LnGrp LOS			A	A			A					
Approach Vol, veh/h		164			795			42			0	
Approach Delay, s/veh		9.0			7.3			7.1			0.0	
Approach LOS		A			A			A				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		9.5		8.3		0.0		13.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		23.0		18.5		7.0		38.5
Max Q Clear Time (g_c+I1), s		2.3		3.8		0.0		6.0
Green Ext Time (p_c), s		0.1		0.8		0.0		3.4

Intersection Summary	
HCM 2010 Ctrl Delay	7.6
HCM 2010 LOS	A

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	195	266	216	212	389	174	215	522	115	168	424	147
Future Volume (veh/h)	195	266	216	212	389	174	215	522	115	168	424	147
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.91	1.00		0.93	1.00		0.94	1.00		0.91
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	1951	1951	1951	1951	1951	1990	1951	1951	1990	1951	1951	1990
Adj Flow Rate, veh/h	195	266	54	212	389	174	215	522	115	168	424	147
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	237	999	405	255	682	299	300	844	185	207	820	280
Arrive On Green	0.13	0.27	0.27	0.14	0.28	0.30	0.08	0.28	0.30	0.11	0.31	0.33
Sat Flow, veh/h	1858	3707	1503	1858	2446	1072	3605	2988	654	1858	2640	900
Grp Volume(v), veh/h	195	266	54	212	293	270	215	323	314	168	296	275
Grp Sat Flow(s),veh/h/ln	1858	1853	1503	1858	1853	1665	1802	1853	1789	1858	1853	1686
Q Serve(g_s), s	9.2	5.1	2.5	10.0	12.2	12.5	5.2	13.6	13.7	8.0	11.8	12.0
Cycle Q Clear(g_c), s	9.2	5.1	2.5	10.0	12.2	12.5	5.2	13.6	13.7	8.0	11.8	12.0
Prop In Lane	1.00		1.00	1.00		0.64	1.00		0.37	1.00		0.53
Lane Grp Cap(c), veh/h	237	999	405	255	517	464	300	524	505	207	576	524
V/C Ratio(X)	0.82	0.27	0.13	0.83	0.57	0.58	0.72	0.62	0.62	0.81	0.51	0.53
Avail Cap(c_a), veh/h	435	1151	466	443	583	524	495	616	595	360	721	656
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.4	25.9	25.0	37.9	27.9	27.5	40.3	28.1	27.9	39.1	25.5	25.3
Incr Delay (d2), s/veh	7.0	0.1	0.1	6.9	1.0	1.3	3.2	1.4	1.5	7.4	0.7	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	2.6	1.0	5.6	6.4	5.9	2.7	7.2	7.0	4.5	6.1	5.7
LnGrp Delay(d),s/veh	45.4	26.1	25.1	44.9	28.9	28.8	43.5	29.5	29.4	46.5	26.2	26.1
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		515			775			852			739	
Approach Delay, s/veh		33.3			33.2			33.0			30.8	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.6	30.0	16.9	28.8	12.0	32.5	16.0	29.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	17.5	30.0	21.5	28.0	12.4	35.1	21.1	28.4
Max Q Clear Time (g_c+I1), s	10.0	15.7	12.0	7.1	7.2	14.0	11.2	14.5
Green Ext Time (p_c), s	0.2	3.5	0.4	1.8	0.3	3.6	0.4	3.0

Intersection Summary	
HCM 2010 Ctrl Delay	32.5
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	243	359	93	0	0	0	0	546	408	431	452	0
Future Volume (veh/h)	243	359	93	0	0	0	0	546	408	431	452	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	20	20	30				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.96	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	980	980	980				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	243	359	36				0	681	318	294	643	0
Adj No. of Lanes	1	1	1				0	2	1	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	328	344	284				0	1134	463	415	872	0
Arrive On Green	0.35	0.35	0.35				0.00	0.30	0.30	0.23	0.23	0.00
Sat Flow, veh/h	934	980	810				0	3725	1519	1774	3725	0
Grp Volume(v), veh/h	243	359	36				0	681	318	294	643	0
Grp Sat Flow(s),veh/h/ln	934	980	810				0	1863	1519	1774	1863	0
Q Serve(g_s), s	18.6	28.5	2.5				0.0	12.6	15.0	12.4	13.0	0.0
Cycle Q Clear(g_c), s	18.6	28.5	2.5				0.0	12.6	15.0	12.4	13.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	328	344	284				0	1134	463	415	872	0
V/C Ratio(X)	0.74	1.04	0.13				0.00	0.60	0.69	0.71	0.74	0.00
Avail Cap(c_a), veh/h	328	344	284				0	1399	571	480	1009	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	26.2	26.4	22.0				0.0	24.0	24.9	28.6	28.8	0.0
Incr Delay (d2), s/veh	8.7	60.4	0.2				0.0	0.5	2.6	4.0	2.5	0.0
Initial Q Delay(d3),s/veh	103.9	177.2	91.8				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.4	33.4	10.6				0.0	6.6	6.6	6.5	7.0	0.0
LnGrp Delay(d),s/veh	138.8	264.0	114.0				0.0	24.6	27.4	32.6	31.3	0.0
LnGrp LOS	F	F	F					C	C	C	C	
Approach Vol, veh/h		638						999			937	
Approach Delay, s/veh		207.8						25.5			31.7	
Approach LOS		F						C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		27.7		31.5		22.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.0		27.0		20.5		
Max Q Clear Time (g_c+I1), s		17.0		30.5		15.0		
Green Ext Time (p_c), s		4.7		0.0		2.5		

Intersection Summary	
HCM 2010 Ctrl Delay	72.9
HCM 2010 LOS	E

Notes

Intersection	
Int Delay, s/veh	0

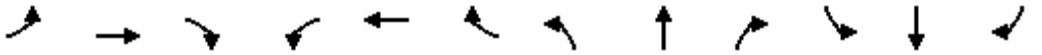
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	164	34	0	0	0
Future Vol, veh/h	0	164	34	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	164	34	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	34	0	-	0	198	34
Stage 1	-	-	-	-	34	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1578	-	-	-	791	1039
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	865	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1578	-	-	-	791	1039
Mov Cap-2 Maneuver	-	-	-	-	791	-
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	865	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1578	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Appendix C: Baseline Conditions Synchro Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	24	69	662	39	0	66	19	968	0	64	0
Future Volume (veh/h)	0	24	69	662	39	0	66	19	968	0	64	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1000	980	1000	1863	1863	1863	1000	980	980	1900	1863	1900
Adj Flow Rate, veh/h	0	24	69	690	0	0	66	19	0	0	64	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	31	90	1077	0	481	126	36	252	0	183	0
Arrive On Green	0.00	0.14	0.14	0.30	0.00	0.00	0.17	0.17	0.00	0.00	0.10	0.00
Sat Flow, veh/h	0	224	643	3548	0	1583	733	211	1467	0	1863	0
Grp Volume(v), veh/h	0	0	93	690	0	0	85	0	0	0	64	0
Grp Sat Flow(s),veh/h/ln	0	0	867	1774	0	1583	944	0	733	0	1863	0
Q Serve(g_s), s	0.0	0.0	4.3	7.1	0.0	0.0	3.4	0.0	0.0	0.0	1.3	0.0
Cycle Q Clear(g_c), s	0.0	0.0	4.3	7.1	0.0	0.0	3.4	0.0	0.0	0.0	1.3	0.0
Prop In Lane	0.00		0.74	1.00		1.00	0.78		1.00	0.00		0.00
Lane Grp Cap(c), veh/h	0	0	122	1077	0	481	162	0	252	0	183	0
V/C Ratio(X)	0.00	0.00	0.76	0.64	0.00	0.00	0.52	0.00	0.00	0.00	0.35	0.00
Avail Cap(c_a), veh/h	0	0	403	1859	0	829	438	0	681	0	754	0
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)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	17.4	12.6	0.0	0.0	15.8	0.0	0.0	0.0	17.7	0.0
Incr Delay (d2), s/veh	0.0	0.0	9.5	0.6	0.0	0.0	2.6	0.0	0.0	0.0	1.1	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.4	3.5	0.0	0.0	1.0	0.0	0.0	0.0	0.8	0.0
LnGrp Delay(d),s/veh	0.0	0.0	26.9	13.3	0.0	0.0	18.4	0.0	0.0	0.0	18.8	0.0
LnGrp LOS			C	B			B				B	
Approach Vol, veh/h		93			690			85			64	
Approach Delay, s/veh		26.9			13.3			18.4			18.8	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		10.2		8.9		7.1		15.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		15.5		20.5
Max Q Clear Time (g_c+I1), s		5.4		6.3		3.3		9.1
Green Ext Time (p_c), s		0.3		0.3		0.2		2.2

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)	226	268	469	89	297	88	224	417	140	113	590	191
Future Volume (veh/h)	226	268	469	89	297	88	224	417	140	113	590	191
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.96	1.00		0.96	1.00		0.93
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	1569	1569	1569	1569	1569	1600	1569	1569	1600	1569	1569	1600
Adj Flow Rate, veh/h	226	268	227	89	297	88	224	417	140	113	590	191
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	277	1059	446	131	582	169	323	707	234	158	694	224
Arrive On Green	0.19	0.36	0.36	0.09	0.26	0.26	0.11	0.32	0.32	0.11	0.32	0.32
Sat Flow, veh/h	1494	2980	1256	1494	2260	655	2898	2176	721	1494	2173	701
Grp Volume(v), veh/h	226	268	227	89	194	191	224	284	273	113	404	377
Grp Sat Flow(s),veh/h/ln	1494	1490	1256	1494	1490	1424	1449	1490	1407	1494	1490	1384
Q Serve(g_s), s	13.8	6.0	13.5	5.5	10.5	10.9	7.1	15.1	15.4	6.9	24.0	24.2
Cycle Q Clear(g_c), s	13.8	6.0	13.5	5.5	10.5	10.9	7.1	15.1	15.4	6.9	24.0	24.2
Prop In Lane	1.00		1.00	1.00		0.46	1.00		0.51	1.00		0.51
Lane Grp Cap(c), veh/h	277	1059	446	131	384	367	323	484	457	158	476	442
V/C Ratio(X)	0.82	0.25	0.51	0.68	0.50	0.52	0.69	0.59	0.60	0.71	0.85	0.85
Avail Cap(c_a), veh/h	378	1288	543	189	455	435	336	487	460	220	534	496
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.1	21.7	24.1	42.0	30.1	30.2	40.6	26.7	26.8	41.0	30.2	30.2
Incr Delay (d2), s/veh	9.6	0.1	0.9	6.1	1.0	1.2	5.8	1.8	2.1	6.4	11.3	12.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.4	2.5	4.8	2.5	4.4	4.4	3.1	6.4	6.3	3.1	11.4	10.7
LnGrp Delay(d),s/veh	46.7	21.8	25.0	48.1	31.1	31.4	46.4	28.5	29.0	47.4	41.4	42.6
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	D	D
Approach Vol, veh/h		721			474			781			894	
Approach Delay, s/veh		30.6			34.4			33.8			42.7	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.1	33.8	11.3	36.7	13.6	33.3	20.6	27.4
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	29.5	10.5	39.5	9.5	32.5	22.5	27.5
Max Q Clear Time (g_c+I1), s	8.9	17.4	7.5	15.5	9.1	26.2	15.8	12.9
Green Ext Time (p_c), s	0.1	2.7	0.0	2.6	0.0	2.6	0.3	2.0

Intersection Summary	
HCM 2010 Ctrl Delay	35.9
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	273	368	251	0	0	0	0	441	313	424	637	0
Future Volume (veh/h)	273	368	251	0	0	0	0	441	313	424	637	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.97	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	1275	1275	1275				0	1275	1275	1275	1275	0
Adj Flow Rate, veh/h	273	368	122				0	533	251	354	735	0
Adj No. of Lanes	1	1	1				0	2	1	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	401	421	347				0	783	323	308	647	0
Arrive On Green	0.33	0.33	0.33				0.00	0.31	0.31	0.25	0.25	0.00
Sat Flow, veh/h	1214	1275	1052				0	2549	1052	1214	2549	0
Grp Volume(v), veh/h	273	368	122				0	533	251	354	735	0
Grp Sat Flow(s),veh/h/ln	1214	1275	1052				0	1275	1052	1214	1275	0
Q Serve(g_s), s	16.1	22.5	7.3				0.0	15.2	18.0	21.0	21.0	0.0
Cycle Q Clear(g_c), s	16.1	22.5	7.3				0.0	15.2	18.0	21.0	21.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	401	421	347				0	783	323	308	647	0
V/C Ratio(X)	0.68	0.87	0.35				0.00	0.68	0.78	1.15	1.14	0.00
Avail Cap(c_a), veh/h	426	447	369				0	955	394	308	647	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.9	26.1	21.0				0.0	25.1	26.1	30.9	30.9	0.0
Incr Delay (d2), s/veh	4.1	16.6	0.6				0.0	1.5	7.7	97.8	79.1	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	5.8	9.8	2.2				0.0	5.5	5.9	15.3	14.4	0.0
LnGrp Delay(d),s/veh	28.0	42.7	21.6				0.0	26.6	33.8	128.7	110.0	0.0
LnGrp LOS	C	D	C					C	C	F	F	
Approach Vol, veh/h		763						784			1089	
Approach Delay, s/veh		34.1						28.9			116.0	
Approach LOS		C						C			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		28.4		30.3		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.5		27.5		19.5		
Max Q Clear Time (g_c+I1), s		20.0		24.5		23.0		
Green Ext Time (p_c), s		3.2		1.1		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	66.4
HCM 2010 LOS	E

Notes

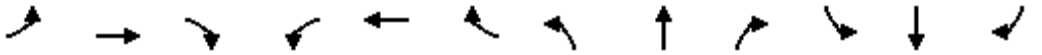
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	93	39	0	0	0
Future Vol, veh/h	0	93	39	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	93	39	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	39	0	-	0	132	39
Stage 1	-	-	-	-	39	-
Stage 2	-	-	-	-	93	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1571	-	-	-	862	1033
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	931	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1571	-	-	-	862	1033
Mov Cap-2 Maneuver	-	-	-	-	862	-
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	931	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1571	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	32	132	786	34	0	42	59	679	2	49	0
Future Volume (veh/h)	0	32	132	786	34	0	42	59	679	2	49	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	2500	2451	2500	2451	2451	2451	2500	2451	2451	2500	2451	2500
Adj Flow Rate, veh/h	0	32	132	810	0	0	42	59	0	2	49	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	76	314	1610	0	719	197	277	723	12	300	0
Arrive On Green	0.00	0.36	0.29	0.34	0.00	0.00	0.32	0.39	0.00	0.18	0.26	0.00
Sat Flow, veh/h	0	418	1724	4669	0	2083	998	1403	3667	96	2350	0
Grp Volume(v), veh/h	0	0	164	810	0	0	101	0	0	51	0	0
Grp Sat Flow(s),veh/h/ln	0	0	2142	2334	0	2083	2401	0	1833	2446	0	0
Q Serve(g_s), s	0.0	0.0	2.5	5.6	0.0	0.0	1.2	0.0	0.0	0.7	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	2.5	5.6	0.0	0.0	1.2	0.0	0.0	0.7	0.0	0.0
Prop In Lane	0.00		0.80	1.00		1.00	0.42		1.00	0.04		0.00
Lane Grp Cap(c), veh/h	0	0	390	1610	0	719	473	0	723	313	0	0
V/C Ratio(X)	0.00	0.00	0.42	0.50	0.00	0.00	0.21	0.00	0.00	0.16	0.00	0.00
Avail Cap(c_a), veh/h	0	0	1135	4775	0	2131	1539	0	2350	603	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	12.4	10.5	0.0	0.0	10.7	0.0	0.0	13.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.7	0.2	0.0	0.0	0.2	0.0	0.0	0.2	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.5	3.5	0.0	0.0	0.8	0.0	0.0	0.5	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	13.1	10.8	0.0	0.0	11.0	0.0	0.0	13.7	0.0	0.0
LnGrp LOS			B	B			B			B		
Approach Vol, veh/h		164			810			101			51	
Approach Delay, s/veh		13.1			10.8			11.0			13.7	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		9.5		8.9		6.7		15.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		23.0		18.5		7.0		38.5
Max Q Clear Time (g_c+I1), s		3.2		4.5		2.7		7.6
Green Ext Time (p_c), s		0.5		0.7		0.0		3.4

Intersection Summary	
HCM 2010 Ctrl Delay	11.3
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	195	268	248	212	405	174	230	664	115	168	505	147
Future Volume (veh/h)	195	268	248	212	405	174	230	664	115	168	505	147
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.91	1.00		0.93	1.00		0.94	1.00		0.91
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	1951	1951	1951	1951	1951	1990	1951	1951	1990	1951	1951	1990
Adj Flow Rate, veh/h	195	268	86	212	405	174	230	664	115	168	505	147
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	236	992	402	254	686	290	315	900	156	207	863	249
Arrive On Green	0.13	0.27	0.27	0.14	0.28	0.29	0.09	0.29	0.30	0.11	0.31	0.33
Sat Flow, veh/h	1858	3707	1502	1858	2478	1046	3605	3130	541	1858	2770	799
Grp Volume(v), veh/h	195	268	86	212	301	278	230	393	386	168	336	316
Grp Sat Flow(s),veh/h/ln	1858	1853	1502	1858	1853	1671	1802	1853	1817	1858	1853	1716
Q Serve(g_s), s	9.4	5.2	4.1	10.2	12.8	13.1	5.7	17.5	17.5	8.1	14.0	14.1
Cycle Q Clear(g_c), s	9.4	5.2	4.1	10.2	12.8	13.1	5.7	17.5	17.5	8.1	14.0	14.1
Prop In Lane	1.00		1.00	1.00		0.63	1.00		0.30	1.00		0.47
Lane Grp Cap(c), veh/h	236	992	402	254	513	463	315	533	522	207	577	535
V/C Ratio(X)	0.82	0.27	0.21	0.83	0.59	0.60	0.73	0.74	0.74	0.81	0.58	0.59
Avail Cap(c_a), veh/h	429	1136	460	437	576	519	489	608	597	356	712	659
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	26.4	26.0	38.4	28.5	28.2	40.7	29.4	29.2	39.7	26.5	26.2
Incr Delay (d2), s/veh	7.1	0.1	0.3	7.0	1.2	1.6	3.3	4.1	4.2	7.5	0.9	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	2.7	1.7	5.7	6.7	6.2	3.0	9.5	9.4	4.6	7.3	6.8
LnGrp Delay(d),s/veh	46.0	26.6	26.3	45.5	29.8	29.8	43.9	33.5	33.5	47.1	27.4	27.3
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		549			791			1009			820	
Approach Delay, s/veh		33.4			34.0			35.9			31.4	
Approach LOS		C			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	30.8	17.0	28.9	12.5	33.0	16.1	29.8
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	17.5	30.0	21.5	28.0	12.4	35.1	21.1	28.4
Max Q Clear Time (g_c+I1), s	10.1	19.5	12.2	7.2	7.7	16.1	11.4	15.1
Green Ext Time (p_c), s	0.2	3.7	0.4	2.0	0.3	4.1	0.4	3.1

Intersection Summary	
HCM 2010 Ctrl Delay	33.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	318	359	106	0	0	0	0	629	618	475	519	0
Future Volume (veh/h)	318	359	106	0	0	0	0	629	618	475	519	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	20	20	30				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.96	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	980	980	980				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	318	359	49				0	517	693	331	720	0
Adj No. of Lanes	1	1	1				0	1	2	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	305	321	265				0	615	1006	425	892	0
Arrive On Green	0.33	0.33	0.33				0.00	0.33	0.33	0.24	0.24	0.00
Sat Flow, veh/h	934	980	810				0	1863	3046	1774	3725	0
Grp Volume(v), veh/h	318	359	49				0	517	693	331	720	0
Grp Sat Flow(s),veh/h/ln	934	980	810				0	1863	1523	1774	1863	0
Q Serve(g_s), s	28.5	28.5	3.8				0.0	22.4	17.2	15.2	15.9	0.0
Cycle Q Clear(g_c), s	28.5	28.5	3.8				0.0	22.4	17.2	15.2	15.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	305	321	265				0	615	1006	425	892	0
V/C Ratio(X)	1.04	1.12	0.19				0.00	0.84	0.69	0.78	0.81	0.00
Avail Cap(c_a), veh/h	305	321	265				0	652	1066	448	940	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.3	29.3	25.6				0.0	27.1	25.3	31.0	31.2	0.0
Incr Delay (d2), s/veh	62.8	86.7	0.3				0.0	9.2	1.8	8.2	5.0	0.0
Initial Q Delay(d3),s/veh	196.7	175.5	113.5				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	32.6	35.4	12.3				0.0	13.1	7.5	8.4	8.7	0.0
LnGrp Delay(d),s/veh	288.9	291.6	139.5				0.0	36.3	27.1	39.2	36.3	0.0
LnGrp LOS	F	F	F					D	C	D	D	
Approach Vol, veh/h		726						1210			1051	
Approach Delay, s/veh		280.1						31.0			37.2	
Approach LOS		F						C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		31.8		31.5		23.9		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.0		27.0		20.5		
Max Q Clear Time (g_c+I1), s		24.4		30.5		17.9		
Green Ext Time (p_c), s		2.6		0.0		1.5		

Intersection Summary	
HCM 2010 Ctrl Delay	93.7
HCM 2010 LOS	F

Notes

Intersection	
Int Delay, s/veh	0

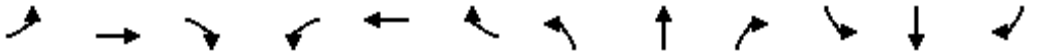
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	164	34	0	0	0
Future Vol, veh/h	0	164	34	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	164	34	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	34	0	-	0	198	34
Stage 1	-	-	-	-	34	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1578	-	-	-	791	1039
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	865	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1578	-	-	-	791	1039
Mov Cap-2 Maneuver	-	-	-	-	791	-
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	865	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1578	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Appendix D: Baseline with Project Conditions Synchro Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	45	74	662	63	0	74	19	968	0	64	1
Future Volume (veh/h)	0	45	74	662	63	0	74	19	968	0	64	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1000	980	1000	1863	1863	1863	1000	980	980	1900	1863	1900
Adj Flow Rate, veh/h	0	45	74	707	0	0	74	19	0	0	64	1
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	58	95	1058	0	472	130	33	254	0	172	3
Arrive On Green	0.00	0.17	0.17	0.30	0.00	0.00	0.17	0.17	0.00	0.00	0.09	0.09
Sat Flow, veh/h	0	334	549	3548	0	1583	750	193	1467	0	1829	29
Grp Volume(v), veh/h	0	0	119	707	0	0	93	0	0	0	0	65
Grp Sat Flow(s),veh/h/ln	0	0	883	1774	0	1583	943	0	733	0	0	1858
Q Serve(g_s), s	0.0	0.0	5.9	8.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	1.5
Cycle Q Clear(g_c), s	0.0	0.0	5.9	8.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	1.5
Prop In Lane	0.00		0.62	1.00		1.00	0.80		1.00	0.00		0.02
Lane Grp Cap(c), veh/h	0	0	153	1058	0	472	163	0	254	0	0	175
V/C Ratio(X)	0.00	0.00	0.78	0.67	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.37
Avail Cap(c_a), veh/h	0	0	375	1699	0	758	400	0	623	0	0	687
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)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	18.1	14.1	0.0	0.0	17.4	0.0	0.0	0.0	0.0	19.5
Incr Delay (d2), s/veh	0.0	0.0	8.1	0.7	0.0	0.0	3.1	0.0	0.0	0.0	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.8	4.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.8
LnGrp Delay(d),s/veh	0.0	0.0	26.3	14.9	0.0	0.0	20.5	0.0	0.0	0.0	0.0	20.9
LnGrp LOS			C	B			C					C
Approach Vol, veh/h		119			707			93			65	
Approach Delay, s/veh		26.3			14.9			20.5			20.9	
Approach LOS		C			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		11.0		11.0		7.3		16.7
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		15.5		20.5
Max Q Clear Time (g_c+I1), s		6.2		7.9		3.5		10.0
Green Ext Time (p_c), s		0.3		0.4		0.2		2.2

Intersection Summary	
HCM 2010 Ctrl Delay	17.2
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	231	272	481	89	301	88	237	417	140	113	590	198
Future Volume (veh/h)	231	272	481	89	301	88	237	417	140	113	590	198
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.96	1.00		0.96	1.00		0.93
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	1569	1569	1569	1569	1569	1600	1569	1569	1600	1569	1569	1600
Adj Flow Rate, veh/h	231	272	239	89	301	88	237	417	140	113	590	198
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	281	1059	446	130	578	165	330	713	236	158	687	230
Arrive On Green	0.19	0.36	0.36	0.09	0.25	0.25	0.11	0.33	0.33	0.11	0.32	0.32
Sat Flow, veh/h	1494	2980	1256	1494	2267	648	2898	2176	721	1494	2150	719
Grp Volume(v), veh/h	231	272	239	89	196	193	237	284	273	113	408	380
Grp Sat Flow(s),veh/h/ln	1494	1490	1256	1494	1490	1425	1449	1490	1407	1494	1490	1379
Q Serve(g_s), s	14.4	6.3	14.6	5.6	10.9	11.3	7.6	15.3	15.7	7.1	24.8	25.0
Cycle Q Clear(g_c), s	14.4	6.3	14.6	5.6	10.9	11.3	7.6	15.3	15.7	7.1	24.8	25.0
Prop In Lane	1.00		1.00	1.00		0.45	1.00		0.51	1.00		0.52
Lane Grp Cap(c), veh/h	281	1059	446	130	380	363	330	488	461	158	476	441
V/C Ratio(X)	0.82	0.26	0.54	0.68	0.52	0.53	0.72	0.58	0.59	0.72	0.86	0.86
Avail Cap(c_a), veh/h	371	1264	533	185	447	428	330	488	461	216	524	485
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.7	22.1	24.8	42.8	30.9	31.1	41.3	27.0	27.1	41.8	30.8	30.9
Incr Delay (d2), s/veh	10.7	0.1	1.0	6.2	1.1	1.2	7.4	1.7	2.0	6.9	12.5	13.7
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	6.7	2.6	5.2	2.5	4.6	4.6	3.4	6.5	6.3	3.2	11.9	11.2
LnGrp Delay(d),s/veh	48.5	22.2	25.8	49.0	32.0	32.3	48.7	28.7	29.2	48.7	43.3	44.6
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	D	D
Approach Vol, veh/h		742			478			794			901	
Approach Delay, s/veh		31.5			35.3			34.8			44.6	
Approach LOS		C			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.2	34.7	11.4	37.4	14.0	33.9	21.2	27.6
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	29.5	10.5	39.5	9.5	32.5	22.5	27.5
Max Q Clear Time (g_c+I1), s	9.1	17.7	7.6	16.6	9.6	27.0	16.4	13.3
Green Ext Time (p_c), s	0.1	2.7	0.0	2.6	0.0	2.4	0.3	2.0

Intersection Summary	
HCM 2010 Ctrl Delay	37.1
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	368	251	0	0	0	0	447	313	430	643	0
Future Volume (veh/h)	280	368	251	0	0	0	0	447	313	430	643	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.97	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	1275	1275	1275				0	1275	1275	1275	1275	0
Adj Flow Rate, veh/h	280	368	122				0	536	253	358	744	0
Adj No. of Lanes	1	1	1				0	2	1	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	401	421	347				0	785	324	307	646	0
Arrive On Green	0.33	0.33	0.33				0.00	0.31	0.31	0.25	0.25	0.00
Sat Flow, veh/h	1214	1275	1052				0	2549	1053	1214	2549	0
Grp Volume(v), veh/h	280	368	122				0	536	253	358	744	0
Grp Sat Flow(s),veh/h/ln	1214	1275	1052				0	1275	1053	1214	1275	0
Q Serve(g_s), s	16.7	22.6	7.3				0.0	15.3	18.2	21.0	21.0	0.0
Cycle Q Clear(g_c), s	16.7	22.6	7.3				0.0	15.3	18.2	21.0	21.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	401	421	347				0	785	324	307	646	0
V/C Ratio(X)	0.70	0.87	0.35				0.00	0.68	0.78	1.16	1.15	0.00
Avail Cap(c_a), veh/h	425	446	368				0	953	394	307	646	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	24.2	26.2	21.0				0.0	25.1	26.1	31.0	31.0	0.0
Incr Delay (d2), s/veh	4.7	16.7	0.6				0.0	1.5	8.0	103.6	85.5	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	6.0	9.8	2.2				0.0	5.5	6.0	15.9	15.0	0.0
LnGrp Delay(d),s/veh	28.9	42.9	21.7				0.0	26.7	34.1	134.6	116.5	0.0
LnGrp LOS	C	D	C					C	C	F	F	
Approach Vol, veh/h		770						789			1102	
Approach Delay, s/veh		34.4						29.1			122.4	
Approach LOS		C						C			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		28.6		30.4		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.5		27.5		19.5		
Max Q Clear Time (g_c+I1), s		20.2		24.6		23.0		
Green Ext Time (p_c), s		3.1		1.1		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	69.3
HCM 2010 LOS	E

Notes

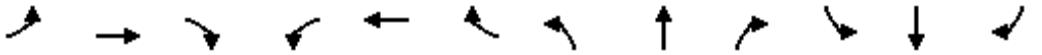
Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	93	39	33	26	1
Future Vol, veh/h	1	93	39	33	26	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	93	39	33	26	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	72	0	-	0	151	56
Stage 1	-	-	-	-	56	-
Stage 2	-	-	-	-	95	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1528	-	-	-	841	1011
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	929	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1528	-	-	-	840	1011
Mov Cap-2 Maneuver	-	-	-	-	840	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	929	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1528	-	-	-	845
HCM Lane V/C Ratio	0.001	-	-	-	0.032
HCM Control Delay (s)	7.4	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	56	138	786	53	0	46	59	679	2	49	0
Future Volume (veh/h)	0	56	138	786	53	0	46	59	679	2	49	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	2500	2451	2500	2451	2451	2451	2500	2451	2451	2500	2451	2500
Adj Flow Rate, veh/h	0	56	138	824	0	0	46	59	0	2	49	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	123	303	1605	0	716	201	258	702	12	294	0
Arrive On Green	0.00	0.39	0.32	0.34	0.00	0.00	0.31	0.38	0.00	0.18	0.25	0.00
Sat Flow, veh/h	0	628	1547	4669	0	2083	1051	1348	3667	96	2350	0
Grp Volume(v), veh/h	0	0	194	824	0	0	105	0	0	51	0	0
Grp Sat Flow(s),veh/h/ln	0	0	2175	2334	0	2083	2398	0	1833	2446	0	0
Q Serve(g_s), s	0.0	0.0	2.9	5.9	0.0	0.0	1.3	0.0	0.0	0.7	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	2.9	5.9	0.0	0.0	1.3	0.0	0.0	0.7	0.0	0.0
Prop In Lane	0.00		0.71	1.00		1.00	0.44		1.00	0.04		0.00
Lane Grp Cap(c), veh/h	0	0	426	1605	0	716	459	0	702	306	0	0
V/C Ratio(X)	0.00	0.00	0.46	0.51	0.00	0.00	0.23	0.00	0.00	0.17	0.00	0.00
Avail Cap(c_a), veh/h	0	0	1119	4636	0	2069	1492	0	2281	585	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	12.0	10.9	0.0	0.0	11.4	0.0	0.0	14.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.8	0.3	0.0	0.0	0.3	0.0	0.0	0.3	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.8	3.8	0.0	0.0	0.9	0.0	0.0	0.5	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	12.8	11.2	0.0	0.0	11.6	0.0	0.0	14.3	0.0	0.0
LnGrp LOS			B	B			B			B		
Approach Vol, veh/h		194			824			105			51	
Approach Delay, s/veh		12.8			11.2			11.6			14.3	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		9.5		9.7		6.7		15.9
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		23.0		18.5		7.0		38.5
Max Q Clear Time (g_c+I1), s		3.3		4.9		2.7		7.9
Green Ext Time (p_c), s		0.5		0.9		0.0		3.5

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	202	272	261	212	409	174	241	664	115	168	505	151
Future Volume (veh/h)	202	272	261	212	409	174	241	664	115	168	505	151
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.91	1.00		0.93	1.00		0.94	1.00		0.91
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	1951	1951	1951	1951	1951	1990	1951	1951	1990	1951	1951	1990
Adj Flow Rate, veh/h	202	272	99	212	409	174	241	664	115	168	505	151
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	1002	406	254	686	287	325	895	155	207	844	250
Arrive On Green	0.13	0.27	0.27	0.14	0.28	0.29	0.09	0.29	0.30	0.11	0.31	0.32
Sat Flow, veh/h	1858	3707	1503	1858	2486	1040	3605	3130	541	1858	2749	815
Grp Volume(v), veh/h	202	272	99	212	303	280	241	393	386	168	339	317
Grp Sat Flow(s),veh/h/ln	1858	1853	1503	1858	1853	1672	1802	1853	1817	1858	1853	1710
Q Serve(g_s), s	9.7	5.3	4.7	10.2	13.0	13.3	6.0	17.7	17.7	8.1	14.3	14.4
Cycle Q Clear(g_c), s	9.7	5.3	4.7	10.2	13.0	13.3	6.0	17.7	17.7	8.1	14.3	14.4
Prop In Lane	1.00		1.00	1.00		0.62	1.00		0.30	1.00		0.48
Lane Grp Cap(c), veh/h	243	1002	406	254	511	461	325	530	520	207	569	525
V/C Ratio(X)	0.83	0.27	0.24	0.84	0.59	0.61	0.74	0.74	0.74	0.81	0.60	0.60
Avail Cap(c_a), veh/h	426	1129	458	434	572	517	486	605	593	354	708	653
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	26.4	26.2	38.7	28.8	28.5	40.8	29.7	29.5	39.9	27.0	26.8
Incr Delay (d2), s/veh	7.1	0.1	0.3	7.1	1.3	1.7	3.3	4.2	4.4	7.5	1.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	2.7	2.0	5.7	6.8	6.3	3.1	9.7	9.5	4.6	7.4	6.9
LnGrp Delay(d),s/veh	46.1	26.6	26.5	45.8	30.1	30.2	44.1	34.0	33.9	47.4	28.0	27.9
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		573			795			1020			824	
Approach Delay, s/veh		33.4			34.3			36.3			31.9	
Approach LOS		C			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	30.8	17.1	29.4	12.8	32.7	16.5	29.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	7.5	30.0	21.5	28.0	12.4	35.1	21.1	28.4
Max Q Clear Time (g_c+I1), s	10.1	19.7	12.2	7.3	8.0	16.4	11.7	15.3
Green Ext Time (p_c), s	0.2	3.6	0.4	2.0	0.3	4.1	0.4	3.1

Intersection Summary	
HCM 2010 Ctrl Delay	34.2
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	322	359	106	0	0	0	0	636	618	484	523	0
Future Volume (veh/h)	322	359	106	0	0	0	0	636	618	484	523	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	20	20	30				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.96	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	980	980	980				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	322	359	49				0	518	697	336	731	0
Adj No. of Lanes	1	1	1				0	1	2	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	304	320	264				0	615	1006	427	897	0
Arrive On Green	0.33	0.33	0.33				0.00	0.33	0.33	0.24	0.24	0.00
Sat Flow, veh/h	934	980	809				0	1863	3046	1774	3725	0
Grp Volume(v), veh/h	322	359	49				0	518	697	336	731	0
Grp Sat Flow(s),veh/h/ln	934	980	809				0	1863	1523	1774	1863	0
Q Serve(g_s), s	28.5	28.5	3.8				0.0	22.6	17.4	15.5	16.2	0.0
Cycle Q Clear(g_c), s	28.5	28.5	3.8				0.0	22.6	17.4	15.5	16.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	304	320	264				0	615	1006	427	897	0
V/C Ratio(X)	1.06	1.12	0.19				0.00	0.84	0.69	0.79	0.81	0.00
Avail Cap(c_a), veh/h	304	320	264				0	650	1063	447	938	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.5	29.5	25.8				0.0	27.2	25.4	31.1	31.3	0.0
Incr Delay (d2), s/veh	67.6	87.8	0.3				0.0	9.4	1.8	8.7	5.4	0.0
Initial Q Delay(d3),s/veh	194.2	175.5	114.2				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	33.0	35.4	12.3				0.0	13.1	7.5	8.6	9.0	0.0
LnGrp Delay(d),s/veh	291.2	292.7	140.3				0.0	36.6	27.3	39.8	36.8	0.0
LnGrp LOS	F	F	F					D	C	D	D	
Approach Vol, veh/h		730						1215			1067	
Approach Delay, s/veh		281.8						31.2			37.7	
Approach LOS		F						C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		31.9		31.5		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.0		27.0		20.5		
Max Q Clear Time (g_c+I1), s		24.6		30.5		18.2		
Green Ext Time (p_c), s		2.6		0.0		1.4		

Intersection Summary	
HCM 2010 Ctrl Delay	94.3
HCM 2010 LOS	F

Notes

Intersection	
Int Delay, s/veh	1.2

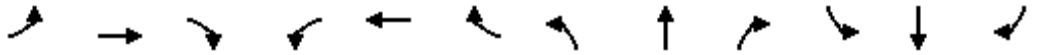
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	164	34	23	30	1
Future Vol, veh/h	1	164	34	23	30	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	164	34	23	30	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	57	0	-	0	212	46
Stage 1	-	-	-	-	46	-
Stage 2	-	-	-	-	166	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1547	-	-	-	776	1023
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	863	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1547	-	-	-	775	1023
Mov Cap-2 Maneuver	-	-	-	-	775	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	863	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1547	-	-	-	781
HCM Lane V/C Ratio	0.001	-	-	-	0.04
HCM Control Delay (s)	7.3	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Appendix E: Cumulative Conditions Synchro Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	213	621	1179	70	0	84	24	1234	0	64	0
Future Volume (veh/h)	0	213	621	1179	70	0	84	24	1234	0	64	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1000	980	1000	1863	1863	1863	1000	980	980	1900	1863	1900
Adj Flow Rate, veh/h	0	213	621	1229	0	0	84	24	0	0	64	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	62	180	1116	0	498	119	34	238	0	135	0
Arrive On Green	0.00	0.28	0.28	0.31	0.00	0.00	0.16	0.16	0.00	0.00	0.07	0.00
Sat Flow, veh/h	0	221	645	3548	0	1583	734	210	1467	0	1863	0
Grp Volume(v), veh/h	0	0	834	1229	0	0	108	0	0	0	64	0
Grp Sat Flow(s),veh/h/ln	0	0	867	1774	0	1583	944	0	733	0	1863	0
Q Serve(g_s), s	0.0	0.0	19.5	22.0	0.0	0.0	7.6	0.0	0.0	0.0	2.3	0.0
Cycle Q Clear(g_c), s	0.0	0.0	19.5	22.0	0.0	0.0	7.6	0.0	0.0	0.0	2.3	0.0
Prop In Lane	0.00		0.74	1.00		1.00	0.78		1.00	0.00		0.00
Lane Grp Cap(c), veh/h	0	0	242	1116	0	498	153	0	238	0	135	0
V/C Ratio(X)	0.00	0.00	3.45	1.10	0.00	0.00	0.70	0.00	0.00	0.00	0.47	0.00
Avail Cap(c_a), veh/h	0	0	242	1116	0	498	263	0	409	0	453	0
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)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	25.2	24.0	0.0	0.0	27.7	0.0	0.0	0.0	31.2	0.0
Incr Delay (d2), s/veh	0.0	0.0	1113.2	58.9	0.0	0.0	5.8	0.0	0.0	0.0	2.6	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	79.4	19.8	0.0	0.0	2.2	0.0	0.0	0.0	1.3	0.0
LnGrp Delay(d),s/veh	0.0	0.0	1138.4	82.9	0.0	0.0	33.5	0.0	0.0	0.0	33.7	0.0
LnGrp LOS			F	F			C				C	
Approach Vol, veh/h		834			1229			108			64	
Approach Delay, s/veh		1138.4			82.9			33.5			33.7	
Approach LOS		F			F			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		14.4		22.5		8.1		25.0
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		15.5		20.5
Max Q Clear Time (g_c+I1), s		9.6		21.5		4.3		24.0
Green Ext Time (p_c), s		0.3		0.0		0.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	473.0
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	235	279	489	194	649	191	634	1180	396	123	638	206
Future Volume (veh/h)	235	279	489	194	649	191	634	1180	396	123	638	206
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.97	1.00		0.96	1.00		0.93
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	1569	1569	1569	1569	1569	1600	1569	1569	1600	1569	1569	1600
Adj Flow Rate, veh/h	235	279	247	194	649	191	634	1180	396	123	638	206
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	280	1039	437	170	619	182	302	684	223	165	695	224
Arrive On Green	0.19	0.35	0.35	0.11	0.27	0.27	0.10	0.31	0.31	0.11	0.32	0.32
Sat Flow, veh/h	1494	2980	1255	1494	2253	662	2898	2184	713	1494	2174	701
Grp Volume(v), veh/h	235	279	247	194	429	411	634	795	781	123	437	407
Grp Sat Flow(s),veh/h/ln	1494	1490	1255	1494	1490	1424	1449	1490	1408	1494	1490	1384
Q Serve(g_s), s	16.0	7.1	16.8	12.0	29.0	29.0	11.0	33.0	33.0	8.4	29.8	29.9
Cycle Q Clear(g_c), s	16.0	7.1	16.8	12.0	29.0	29.0	11.0	33.0	33.0	8.4	29.8	29.9
Prop In Lane	1.00		1.00	1.00		0.46	1.00		0.51	1.00		0.51
Lane Grp Cap(c), veh/h	280	1039	437	170	410	392	302	467	441	165	476	443
V/C Ratio(X)	0.84	0.27	0.56	1.14	1.05	1.05	2.10	1.70	1.77	0.74	0.92	0.92
Avail Cap(c_a), veh/h	340	1158	488	170	410	392	302	467	441	198	480	446
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.3	24.7	27.9	46.7	38.2	38.2	47.2	36.2	36.2	45.4	34.5	34.6
Incr Delay (d2), s/veh	14.5	0.1	1.2	112.2	57.4	59.0	505.1	325.1	356.6	11.6	22.5	24.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.7	2.9	6.0	10.2	18.4	17.7	25.6	55.6	56.4	4.0	15.2	14.4
LnGrp Delay(d),s/veh	55.8	24.8	29.1	158.9	95.7	97.2	552.4	361.3	392.8	57.0	57.0	58.6
LnGrp LOS	E	C	C	F	F	F	F	F	F	E	E	E
Approach Vol, veh/h		761			1034			2210			967	
Approach Delay, s/veh		35.8			108.1			427.3			57.7	
Approach LOS		D			F			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	36.0	15.0	39.8	14.0	36.7	22.8	32.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	29.5	10.5	39.5	9.5	32.5	22.5	27.5
Max Q Clear Time (g_c+I1), s	10.4	35.0	14.0	18.8	13.0	31.9	18.0	31.0
Green Ext Time (p_c), s	0.1	0.0	0.0	2.7	0.0	0.4	0.3	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	229.1
HCM 2010 LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	443	596	407	0	0	0	0	1091	777	471	709	0
Future Volume (veh/h)	443	596	407	0	0	0	0	1091	777	471	709	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.97	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	1275	1275	1275				0	1275	1275	1275	1275	0
Adj Flow Rate, veh/h	443	596	278				0	1323	623	393	818	0
Adj No. of Lanes	1	1	1				0	2	1	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	391	411	339				0	878	363	283	595	0
Arrive On Green	0.32	0.32	0.32				0.00	0.34	0.34	0.23	0.23	0.00
Sat Flow, veh/h	1214	1275	1051				0	2549	1054	1214	2549	0
Grp Volume(v), veh/h	443	596	278				0	1323	623	393	818	0
Grp Sat Flow(s),veh/h/ln	1214	1275	1051				0	1275	1054	1214	1275	0
Q Serve(g_s), s	29.0	29.0	21.9				0.0	31.0	31.0	21.0	21.0	0.0
Cycle Q Clear(g_c), s	29.0	29.0	21.9				0.0	31.0	31.0	21.0	21.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	391	411	339				0	878	363	283	595	0
V/C Ratio(X)	1.13	1.45	0.82				0.00	1.51	1.72	1.39	1.38	0.00
Avail Cap(c_a), veh/h	391	411	339				0	878	363	283	595	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.5	30.5	28.1				0.0	29.5	29.5	34.5	34.5	0.0
Incr Delay (d2), s/veh	86.7	216.3	14.8				0.0	234.0	333.4	194.8	179.3	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	9.1	34.8	7.7				0.0	39.4	42.6	22.3	22.2	0.0
LnGrp Delay(d),s/veh	117.2	246.8	42.9				0.0	263.5	362.9	229.3	213.8	0.0
LnGrp LOS	F	F	D					F	F	F	F	
Approach Vol, veh/h		1317						1946			1211	
Approach Delay, s/veh		160.2						295.3			218.9	
Approach LOS		F						F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		34.0		32.0		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.5		27.5		19.5		
Max Q Clear Time (g_c+I1), s		33.0		31.0		23.0		
Green Ext Time (p_c), s		0.0		0.0		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	234.8
HCM 2010 LOS	F

Notes

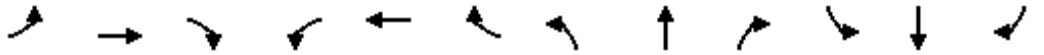
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	417	35	0	0	0
Future Vol, veh/h	0	417	35	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	417	35	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	35	0	-	0	452	35
Stage 1	-	-	-	-	35	-
Stage 2	-	-	-	-	417	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1576	-	-	-	565	1038
Stage 1	-	-	-	-	987	-
Stage 2	-	-	-	-	665	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1576	-	-	-	565	1038
Mov Cap-2 Maneuver	-	-	-	-	565	-
Stage 1	-	-	-	-	987	-
Stage 2	-	-	-	-	665	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1576	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	303	1252	819	35	0	76	106	1228	2	49	0
Future Volume (veh/h)	0	303	1252	819	35	0	76	106	1228	2	49	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	2500	2451	2500	2451	2451	2451	2500	2451	2451	2500	2451	2500
Adj Flow Rate, veh/h	0	303	1252	844	0	0	76	106	0	2	49	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	147	607	1378	0	615	159	222	582	9	227	0
Arrive On Green	0.00	0.70	0.65	0.30	0.00	0.00	0.27	0.32	0.00	0.14	0.19	0.00
Sat Flow, veh/h	0	418	1727	4669	0	2083	1003	1398	3667	96	2350	0
Grp Volume(v), veh/h	0	0	1555	844	0	0	182	0	0	51	0	0
Grp Sat Flow(s),veh/h/ln	0	0	2144	2334	0	2083	2401	0	1833	2446	0	0
Q Serve(g_s), s	0.0	0.0	21.5	9.5	0.0	0.0	3.8	0.0	0.0	1.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	21.5	9.5	0.0	0.0	3.8	0.0	0.0	1.1	0.0	0.0
Prop In Lane	0.00		0.81	1.00		1.00	0.42		1.00	0.04		0.00
Lane Grp Cap(c), veh/h	0	0	754	1378	0	615	381	0	582	236	0	0
V/C Ratio(X)	0.00	0.00	2.06	0.61	0.00	0.00	0.48	0.00	0.00	0.22	0.00	0.00
Avail Cap(c_a), veh/h	0	0	754	3167	0	1413	1021	0	1559	400	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	10.3	18.5	0.0	0.0	19.4	0.0	0.0	22.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	482.9	0.4	0.0	0.0	0.9	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	113.1	6.2	0.0	0.0	2.6	0.0	0.0	0.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	493.2	19.0	0.0	0.0	20.4	0.0	0.0	23.2	0.0	0.0
LnGrp LOS			F	B			C			C		
Approach Vol, veh/h		1555			844			182			51	
Approach Delay, s/veh		493.2			19.0			20.4			23.2	
Approach LOS		F			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		11.2		23.0		7.4		19.6
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		23.0		18.5		7.0		38.5
Max Q Clear Time (g_c+I1), s		5.8		23.5		3.1		11.5
Green Ext Time (p_c), s		0.9		0.0		0.0		3.5

Intersection Summary	
HCM 2010 Ctrl Delay	299.3
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	218	300	278	264	504	217	498	1442	250	208	625	182
Future Volume (veh/h)	218	300	278	264	504	217	498	1442	250	208	625	182
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90	1.00		0.93	1.00		0.94	1.00		0.91
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	1951	1951	1951	1951	1951	1990	1951	1951	1990	1951	1951	1990
Adj Flow Rate, veh/h	218	300	116	264	504	217	498	1442	250	208	625	182
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	255	909	365	300	665	284	431	908	154	243	830	241
Arrive On Green	0.14	0.25	0.25	0.16	0.27	0.28	0.12	0.29	0.30	0.13	0.30	0.31
Sat Flow, veh/h	1858	3707	1489	1858	2466	1054	3605	3140	533	1858	2763	803
Grp Volume(v), veh/h	218	300	116	264	378	343	498	838	854	208	419	388
Grp Sat Flow(s),veh/h/ln	1858	1853	1489	1858	1853	1666	1802	1853	1820	1858	1853	1712
Q Serve(g_s), s	11.9	6.9	6.6	14.4	19.4	19.6	12.4	30.0	30.0	11.4	21.2	21.2
Cycle Q Clear(g_c), s	11.9	6.9	6.6	14.4	19.4	19.6	12.4	30.0	30.0	11.4	21.2	21.2
Prop In Lane	1.00		1.00	1.00		0.63	1.00		0.29	1.00		0.47
Lane Grp Cap(c), veh/h	255	909	365	300	500	449	431	536	526	243	557	514
V/C Ratio(X)	0.86	0.33	0.32	0.88	0.76	0.76	1.16	1.56	1.62	0.86	0.75	0.76
Avail Cap(c_a), veh/h	378	1001	402	385	507	456	431	536	526	313	627	579
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.8	32.2	32.0	42.5	34.8	34.4	45.7	36.9	36.6	44.1	32.8	32.5
Incr Delay (d2), s/veh	11.9	0.2	0.5	16.9	6.3	7.4	93.4	262.5	289.0	16.7	4.5	5.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.0	3.6	2.8	8.8	10.7	9.9	11.7	54.3	57.1	7.0	11.5	10.7
LnGrp Delay(d),s/veh	55.7	32.4	32.5	59.5	41.1	41.8	139.0	299.3	325.6	60.8	37.3	37.5
LnGrp LOS	E	C	C	E	D	D	F	F	F	E	D	D
Approach Vol, veh/h		634			985			2190			1015	
Approach Delay, s/veh		40.4			46.3			273.1			42.2	
Approach LOS		D			D			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.0	34.5	21.3	29.9	16.9	35.6	18.7	32.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	13.5	30.0	21.5	28.0	12.4	35.1	21.1	28.4
Max Q Clear Time (g_c+I1), s	13.4	32.0	16.4	8.9	14.4	23.2	13.9	21.6
Green Ext Time (p_c), s	0.2	0.0	0.4	2.3	0.0	4.2	0.3	2.6

Intersection Summary	
HCM 2010 Ctrl Delay	147.6
HCM 2010 LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	567	642	190	0	0	0	0	629	618	624	682	0
Future Volume (veh/h)	567	642	190	0	0	0	0	629	618	624	682	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	20	20	30				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.96	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	980	980	980				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	567	642	133				0	517	693	435	946	0
Adj No. of Lanes	1	1	1				0	1	2	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	301	316	261				0	610	997	441	926	0
Arrive On Green	0.32	0.32	0.32				0.00	0.33	0.33	0.25	0.25	0.00
Sat Flow, veh/h	934	980	809				0	1863	3045	1774	3725	0
Grp Volume(v), veh/h	567	642	133				0	517	693	435	946	0
Grp Sat Flow(s),veh/h/ln	934	980	809				0	1863	1523	1774	1863	0
Q Serve(g_s), s	28.5	28.5	11.8				0.0	22.9	17.5	21.6	22.0	0.0
Cycle Q Clear(g_c), s	28.5	28.5	11.8				0.0	22.9	17.5	21.6	22.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	301	316	261				0	610	997	441	926	0
V/C Ratio(X)	1.88	2.03	0.51				0.00	0.85	0.70	0.99	1.02	0.00
Avail Cap(c_a), veh/h	301	316	261				0	642	1050	441	926	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.0	30.0	29.6				0.0	27.7	25.9	33.1	33.2	0.0
Incr Delay (d2), s/veh	410.6	475.7	1.7				0.0	10.0	1.9	39.0	35.0	0.0
Initial Q Delay(d3),s/veh	110.1	97.9	194.6				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	61.6	69.4	20.3				0.0	13.3	7.6	15.3	15.7	0.0
LnGrp Delay(d),s/veh	550.7	603.6	225.9				0.0	37.7	27.8	72.1	68.2	0.0
LnGrp LOS	F	F	F					D	C	E	F	
Approach Vol, veh/h		1342						1210			1381	
Approach Delay, s/veh		543.8						32.0			69.5	
Approach LOS		F						C			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		32.0		31.5		25.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.0		27.0		20.5		
Max Q Clear Time (g_c+I1), s		24.9		30.5		24.0		
Green Ext Time (p_c), s		2.4		0.0		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	219.8
HCM 2010 LOS	F

Notes

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	778	235	0	0	0
Future Vol, veh/h	0	778	235	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	778	235	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	235	0	-	0	1013	235
Stage 1	-	-	-	-	235	-
Stage 2	-	-	-	-	778	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1332	-	-	-	265	804
Stage 1	-	-	-	-	804	-
Stage 2	-	-	-	-	453	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1332	-	-	-	265	804
Mov Cap-2 Maneuver	-	-	-	-	265	-
Stage 1	-	-	-	-	804	-
Stage 2	-	-	-	-	453	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1332	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Appendix F: Cumulative with Project Conditions Synchro Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	234	626	1179	94	0	92	24	1234	0	64	1
Future Volume (veh/h)	0	234	626	1179	94	0	92	24	1234	0	64	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1000	980	1000	1863	1863	1863	1000	980	980	1900	1863	1900
Adj Flow Rate, veh/h	0	234	626	1246	0	0	92	24	0	0	64	1
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	65	175	1105	0	493	127	33	250	0	132	2
Arrive On Green	0.00	0.28	0.28	0.31	0.00	0.00	0.17	0.17	0.00	0.00	0.07	0.07
Sat Flow, veh/h	0	236	632	3548	0	1583	748	195	1467	0	1829	29
Grp Volume(v), veh/h	0	0	860	1246	0	0	116	0	0	0	0	65
Grp Sat Flow(s),veh/h/ln	0	0	869	1774	0	1583	943	0	733	0	0	1858
Q Serve(g_s), s	0.0	0.0	19.5	22.0	0.0	0.0	8.2	0.0	0.0	0.0	0.0	2.4
Cycle Q Clear(g_c), s	0.0	0.0	19.5	22.0	0.0	0.0	8.2	0.0	0.0	0.0	0.0	2.4
Prop In Lane	0.00		0.73	1.00		1.00	0.79		1.00	0.00		0.02
Lane Grp Cap(c), veh/h	0	0	240	1105	0	493	161	0	250	0	0	134
V/C Ratio(X)	0.00	0.00	3.59	1.13	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.48
Avail Cap(c_a), veh/h	0	0	240	1105	0	493	260	0	405	0	0	447
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)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	25.6	24.3	0.0	0.0	27.7	0.0	0.0	0.0	0.0	31.5
Incr Delay (d2), s/veh	0.0	0.0	1173.6	69.2	0.0	0.0	6.0	0.0	0.0	0.0	0.0	2.7
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	0.0	0.0	82.8	21.2	0.0	0.0	2.4	0.0	0.0	0.0	0.0	1.3
LnGrp Delay(d),s/veh	0.0	0.0	1199.2	93.5	0.0	0.0	33.7	0.0	0.0	0.0	0.0	34.2
LnGrp LOS			F	F			C					C
Approach Vol, veh/h		860			1246			116			65	
Approach Delay, s/veh		1199.2			93.5			33.7			34.2	
Approach LOS		F			F			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		15.0		22.5		8.1		25.0
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		15.5		20.5
Max Q Clear Time (g_c+I1), s		10.2		21.5		4.4		24.0
Green Ext Time (p_c), s		0.3		0.0		0.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	504.6
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	240	283	501	194	653	191	647	1180	396	123	638	213
Future Volume (veh/h)	240	283	501	194	653	191	647	1180	396	123	638	213
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.97	1.00		0.96	1.00		0.93
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	1569	1569	1569	1569	1569	1600	1569	1569	1600	1569	1569	1600
Adj Flow Rate, veh/h	240	283	259	194	653	191	647	1180	396	123	638	213
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	284	1044	440	169	616	180	300	684	223	165	689	230
Arrive On Green	0.19	0.35	0.35	0.11	0.27	0.27	0.10	0.31	0.31	0.11	0.32	0.32
Sat Flow, veh/h	1494	2980	1255	1494	2256	659	2898	2184	713	1494	2152	718
Grp Volume(v), veh/h	240	283	259	194	431	413	647	795	781	123	441	410
Grp Sat Flow(s),veh/h/ln	1494	1490	1255	1494	1490	1425	1449	1490	1408	1494	1490	1380
Q Serve(g_s), s	16.5	7.2	17.9	12.0	29.0	29.0	11.0	33.2	33.2	8.5	30.4	30.5
Cycle Q Clear(g_c), s	16.5	7.2	17.9	12.0	29.0	29.0	11.0	33.2	33.2	8.5	30.4	30.5
Prop In Lane	1.00		1.00	1.00		0.46	1.00		0.51	1.00		0.52
Lane Grp Cap(c), veh/h	284	1044	440	169	407	389	300	466	441	165	477	442
V/C Ratio(X)	0.84	0.27	0.59	1.15	1.06	1.06	2.16	1.70	1.77	0.74	0.93	0.93
Avail Cap(c_a), veh/h	338	1151	485	169	407	389	300	466	441	197	477	442
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.5	24.8	28.2	47.1	38.6	38.6	47.6	36.5	36.5	45.8	34.9	34.9
Incr Delay (d2), s/veh	15.4	0.1	1.6	115.0	61.2	62.7	530.8	325.6	357.1	11.8	24.1	25.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.0	3.0	6.4	10.3	18.8	18.1	26.5	55.8	56.6	4.0	15.7	14.8
LnGrp Delay(d),s/veh	56.9	24.9	29.8	162.1	99.8	101.3	578.4	362.1	393.6	57.6	59.0	60.7
LnGrp LOS	E	C	C	F	F	F	F	F	F	E	E	E
Approach Vol, veh/h		782			1038			2223			974	
Approach Delay, s/veh		36.3			112.0			436.1			59.5	
Approach LOS		D			F			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	36.2	15.0	40.2	14.0	37.0	23.2	32.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	29.5	10.5	39.5	9.5	32.5	22.5	27.5
Max Q Clear Time (g_c+I1), s	10.5	35.2	14.0	19.9	13.0	32.5	18.5	31.0
Green Ext Time (p_c), s	0.1	0.0	0.0	2.7	0.0	0.0	0.3	0.0

Intersection Summary		
HCM 2010 Ctrl Delay	233.6	
HCM 2010 LOS	F	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	450	596	407	0	0	0	0	1097	777	477	715	0
Future Volume (veh/h)	450	596	407	0	0	0	0	1097	777	477	715	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.97	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	1275	1275	1275				0	1275	1275	1275	1275	0
Adj Flow Rate, veh/h	450	596	278				0	1326	625	397	827	0
Adj No. of Lanes	1	1	1				0	2	1	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	391	411	339				0	878	363	283	595	0
Arrive On Green	0.32	0.32	0.32				0.00	0.34	0.34	0.23	0.23	0.00
Sat Flow, veh/h	1214	1275	1051				0	2549	1054	1214	2549	0
Grp Volume(v), veh/h	450	596	278				0	1326	625	397	827	0
Grp Sat Flow(s),veh/h/ln	1214	1275	1051				0	1275	1054	1214	1275	0
Q Serve(g_s), s	29.0	29.0	21.9				0.0	31.0	31.0	21.0	21.0	0.0
Cycle Q Clear(g_c), s	29.0	29.0	21.9				0.0	31.0	31.0	21.0	21.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	391	411	339				0	878	363	283	595	0
V/C Ratio(X)	1.15	1.45	0.82				0.00	1.51	1.72	1.40	1.39	0.00
Avail Cap(c_a), veh/h	391	411	339				0	878	363	283	595	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.5	30.5	28.1				0.0	29.5	29.5	34.5	34.5	0.0
Incr Delay (d2), s/veh	93.3	216.3	14.8				0.0	235.5	335.8	200.7	185.9	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	9.8	34.8	7.7				0.0	39.6	42.9	22.8	22.7	0.0
LnGrp Delay(d),s/veh	123.8	246.8	42.9				0.0	265.0	365.3	235.2	220.4	0.0
LnGrp LOS	F	F	D					F	F	F	F	
Approach Vol, veh/h		1324						1951			1224	
Approach Delay, s/veh		162.2						297.2			225.2	
Approach LOS		F						F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		34.0		32.0		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.5		27.5		19.5		
Max Q Clear Time (g_c+I1), s		33.0		31.0		23.0		
Green Ext Time (p_c), s		0.0		0.0		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	237.9
HCM 2010 LOS	F

Notes

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	417	35	33	26	1
Future Vol, veh/h	1	417	35	33	26	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	417	35	33	26	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	68	0	-	0	471	52
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	419	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1533	-	-	-	551	1016
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	664	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1533	-	-	-	550	1016
Mov Cap-2 Maneuver	-	-	-	-	550	-
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	664	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1533	-	-	-	560
HCM Lane V/C Ratio	0.001	-	-	-	0.048
HCM Control Delay (s)	7.3	0	-	-	11.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	234	626	1179	94	0	92	24	1234	0	64	1
Future Volume (veh/h)	0	234	626	1179	94	0	92	24	1234	0	64	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1000	980	1000	1863	1863	1863	1000	980	980	1900	1863	1900
Adj Flow Rate, veh/h	0	234	626	1246	0	0	92	24	0	0	64	1
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	129	346	804	0	359	77	20	152	0	79	1
Arrive On Green	0.00	0.55	0.55	0.23	0.00	0.00	0.10	0.10	0.00	0.00	0.04	0.04
Sat Flow, veh/h	0	236	632	3548	0	1583	748	195	1467	0	1829	29
Grp Volume(v), veh/h	0	0	860	1246	0	0	116	0	0	0	0	65
Grp Sat Flow(s),veh/h/ln	0	0	869	1774	0	1583	943	0	733	0	0	1858
Q Serve(g_s), s	0.0	0.0	82.0	34.0	0.0	0.0	15.5	0.0	0.0	0.0	0.0	5.2
Cycle Q Clear(g_c), s	0.0	0.0	82.0	34.0	0.0	0.0	15.5	0.0	0.0	0.0	0.0	5.2
Prop In Lane	0.00		0.73	1.00		1.00	0.79		1.00	0.00		0.02
Lane Grp Cap(c), veh/h	0	0	475	804	0	359	97	0	152	0	0	81
V/C Ratio(X)	0.00	0.00	1.81	1.55	0.00	0.00	1.19	0.00	0.00	0.00	0.00	0.81
Avail Cap(c_a), veh/h	0	0	475	804	0	359	97	0	152	0	0	81
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)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	34.0	58.0	0.0	0.0	67.3	0.0	0.0	0.0	0.0	71.1
Incr Delay (d2), s/veh	0.0	0.0	373.1	253.3	0.0	0.0	151.2	0.0	0.0	0.0	0.0	43.6
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	0.0	0.0	68.8	44.9	0.0	0.0	8.1	0.0	0.0	0.0	0.0	3.6
LnGrp Delay(d),s/veh	0.0	0.0	407.1	311.3	0.0	0.0	218.4	0.0	0.0	0.0	0.0	114.7
LnGrp LOS			F	F			F					F
Approach Vol, veh/h		860			1246			116			65	
Approach Delay, s/veh		407.1			311.3			218.4			114.7	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		18.5		85.0		9.5		37.0
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		14.0		80.5		5.0		32.5
Max Q Clear Time (g_c+I1), s		17.5		84.0		7.2		36.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

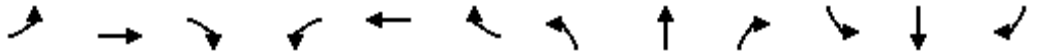
Intersection Summary	
HCM 2010 Ctrl Delay	337.1
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	240	283	501	194	653	191	647	1180	396	123	638	213
Future Volume (veh/h)	240	283	501	194	653	191	647	1180	396	123	638	213
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.92	1.00		0.96	1.00		0.97	1.00		0.93
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	1569	1569	1569	1569	1569	1600	1569	1569	1600	1569	1569	1600
Adj Flow Rate, veh/h	240	283	259	194	653	191	647	1180	396	123	638	213
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	185	721	297	205	575	168	624	1027	336	103	695	232
Arrive On Green	0.12	0.24	0.24	0.14	0.26	0.26	0.22	0.47	0.47	0.07	0.32	0.32
Sat Flow, veh/h	1494	2980	1228	1494	2255	659	2898	2190	716	1494	2153	718
Grp Volume(v), veh/h	240	283	259	194	431	413	647	793	783	123	441	410
Grp Sat Flow(s),veh/h/ln	1494	1490	1228	1494	1490	1423	1449	1490	1415	1494	1490	1380
Q Serve(g_s), s	18.0	11.5	29.4	18.7	37.0	37.0	31.2	68.0	68.0	10.0	41.3	41.4
Cycle Q Clear(g_c), s	18.0	11.5	29.4	18.7	37.0	37.0	31.2	68.0	68.0	10.0	41.3	41.4
Prop In Lane	1.00		1.00	1.00		0.46	1.00		0.51	1.00		0.52
Lane Grp Cap(c), veh/h	185	721	297	205	380	363	624	699	664	103	481	446
V/C Ratio(X)	1.29	0.39	0.87	0.95	1.13	1.14	1.04	1.14	1.18	1.19	0.92	0.92
Avail Cap(c_a), veh/h	185	721	297	205	380	363	624	699	664	103	481	446
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	63.5	46.0	52.8	62.0	54.0	54.0	56.9	38.5	38.5	67.5	47.2	47.3
Incr Delay (d2), s/veh	166.3	0.3	23.4	47.6	88.0	89.6	46.1	77.7	95.7	149.9	22.6	24.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.0	4.8	11.9	10.4	24.5	23.6	16.5	43.0	44.2	8.4	20.1	18.8
LnGrp Delay(d),s/veh	229.8	46.4	76.2	109.7	142.0	143.6	103.0	116.2	134.2	217.4	69.8	71.5
LnGrp LOS	F	D	E	F	F	F	F	F	F	F	E	E
Approach Vol, veh/h		782			1038			2223			974	
Approach Delay, s/veh		112.5			136.6			118.7			89.1	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.0	71.0	22.9	38.1	34.2	49.8	21.0	40.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	66.5	18.4	33.6	29.7	45.3	16.5	35.5
Max Q Clear Time (g_c+I1), s	12.0	70.0	20.7	31.4	33.2	43.4	20.0	39.0
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	1.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	115.7
HCM 2010 LOS	F



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	327	1258	819	54	0	80	106	1228	2	49	0
Future Volume (veh/h)	0	327	1258	819	54	0	80	106	1228	2	49	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	2500	2451	2500	2451	2451	2451	2500	2451	2451	2500	2451	2500
Adj Flow Rate, veh/h	0	327	1258	858	0	0	80	106	0	2	49	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	155	595	1391	0	621	165	219	586	9	225	0
Arrive On Green	0.00	0.70	0.65	0.30	0.00	0.00	0.27	0.32	0.00	0.14	0.19	0.00
Sat Flow, veh/h	0	443	1705	4669	0	2083	1032	1367	3667	96	2350	0
Grp Volume(v), veh/h	0	0	1585	858	0	0	186	0	0	51	0	0
Grp Sat Flow(s),veh/h/ln	0	0	2148	2334	0	2083	2399	0	1833	2446	0	0
Q Serve(g_s), s	0.0	0.0	21.5	9.7	0.0	0.0	3.9	0.0	0.0	1.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	21.5	9.7	0.0	0.0	3.9	0.0	0.0	1.1	0.0	0.0
Prop In Lane	0.00		0.79	1.00		1.00	0.43		1.00	0.04		0.00
Lane Grp Cap(c), veh/h	0	0	750	1391	0	621	384	0	586	235	0	0
V/C Ratio(X)	0.00	0.00	2.11	0.62	0.00	0.00	0.48	0.00	0.00	0.22	0.00	0.00
Avail Cap(c_a), veh/h	0	0	750	3144	0	1403	1012	0	1547	397	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	10.5	18.6	0.0	0.0	19.5	0.0	0.0	23.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	506.1	0.4	0.0	0.0	1.0	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	117.1	6.3	0.0	0.0	2.6	0.0	0.0	0.7	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	516.6	19.1	0.0	0.0	20.5	0.0	0.0	23.5	0.0	0.0
LnGrp LOS			F	B			C			C		
Approach Vol, veh/h		1585			858			186			51	
Approach Delay, s/veh		516.6			19.1			20.5			23.5	
Approach LOS		F			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		11.4		23.0		7.4		19.9
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		23.0		18.5		7.0		38.5
Max Q Clear Time (g_c+I1), s		5.9		23.5		3.1		11.7
Green Ext Time (p_c), s		0.9		0.0		0.0		3.6

Intersection Summary	
HCM 2010 Ctrl Delay	313.5
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	225	304	291	264	508	217	509	1442	250	208	625	186
Future Volume (veh/h)	225	304	291	264	508	217	509	1442	250	208	625	186
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90	1.00		0.93	1.00		0.94	1.00		0.91
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	1951	1951	1951	1951	1951	1990	1951	1951	1990	1951	1951	1990
Adj Flow Rate, veh/h	225	304	129	264	508	217	509	1442	250	208	625	186
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	262	911	366	300	659	279	430	907	154	243	824	245
Arrive On Green	0.14	0.25	0.25	0.16	0.27	0.28	0.12	0.29	0.30	0.13	0.30	0.31
Sat Flow, veh/h	1858	3707	1490	1858	2472	1048	3605	3140	533	1858	2746	815
Grp Volume(v), veh/h	225	304	129	264	380	345	509	838	854	208	421	390
Grp Sat Flow(s),veh/h/ln	1858	1853	1490	1858	1853	1667	1802	1853	1820	1858	1853	1708
Q Serve(g_s), s	12.3	7.0	7.4	14.4	19.6	19.8	12.4	30.0	30.0	11.4	21.4	21.4
Cycle Q Clear(g_c), s	12.3	7.0	7.4	14.4	19.6	19.8	12.4	30.0	30.0	11.4	21.4	21.4
Prop In Lane	1.00		1.00	1.00		0.63	1.00		0.29	1.00		0.48
Lane Grp Cap(c), veh/h	262	911	366	300	494	444	430	535	526	243	556	512
V/C Ratio(X)	0.86	0.33	0.35	0.88	0.77	0.78	1.18	1.57	1.62	0.86	0.76	0.76
Avail Cap(c_a), veh/h	377	999	402	385	507	456	430	535	526	313	626	577
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.6	32.2	32.3	42.6	35.2	34.8	45.7	36.9	36.7	44.2	32.9	32.6
Incr Delay (d2), s/veh	12.9	0.2	0.6	17.0	6.9	8.1	103.7	263.3	289.9	16.7	4.7	5.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	3.6	3.1	8.8	11.0	10.1	12.3	54.3	57.2	7.0	11.6	10.8
LnGrp Delay(d),s/veh	56.5	32.4	32.9	59.6	42.1	42.9	149.4	300.3	326.6	60.9	37.7	37.8
LnGrp LOS	E	C	C	E	D	D	F	F	F	E	D	D
Approach Vol, veh/h		658			989			2201			1019	
Approach Delay, s/veh		40.7			47.0			275.6			42.5	
Approach LOS		D			D			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.1	34.5	21.3	30.0	16.9	35.7	19.1	32.2
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	17.5	30.0	21.5	28.0	12.4	35.1	21.1	28.4
Max Q Clear Time (g_c+I1), s	13.4	32.0	16.4	9.4	14.4	23.4	14.3	21.8
Green Ext Time (p_c), s	0.2	0.0	0.4	2.3	0.0	4.1	0.4	2.5

Intersection Summary	
HCM 2010 Ctrl Delay	148.6
HCM 2010 LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	571	642	190	0	0	0	0	636	618	633	686	0
Future Volume (veh/h)	571	642	190	0	0	0	0	636	618	633	686	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	20	20	30				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.96	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	980	980	980				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	571	642	133				0	518	697	440	957	0
Adj No. of Lanes	1	1	1				0	1	2	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	301	316	261				0	610	998	441	926	0
Arrive On Green	0.32	0.32	0.32				0.00	0.33	0.33	0.25	0.25	0.00
Sat Flow, veh/h	934	980	809				0	1863	3045	1774	3725	0
Grp Volume(v), veh/h	571	642	133				0	518	697	440	957	0
Grp Sat Flow(s),veh/h/ln	934	980	809				0	1863	1523	1774	1863	0
Q Serve(g_s), s	28.5	28.5	11.8				0.0	22.9	17.7	21.9	22.0	0.0
Cycle Q Clear(g_c), s	28.5	28.5	11.8				0.0	22.9	17.7	21.9	22.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	301	316	261				0	610	998	441	926	0
V/C Ratio(X)	1.90	2.03	0.51				0.00	0.85	0.70	1.00	1.03	0.00
Avail Cap(c_a), veh/h	301	316	261				0	642	1050	441	926	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.0	30.0	29.7				0.0	27.7	25.9	33.2	33.2	0.0
Incr Delay (d2), s/veh	416.8	475.9	1.7				0.0	10.1	2.0	42.2	38.5	0.0
Initial Q Delay(d3),s/veh	109.3	97.9	194.8				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	62.1	69.4	20.3				0.0	13.5	7.6	15.8	16.1	0.0
LnGrp Delay(d),s/veh	556.1	603.9	226.1				0.0	37.8	27.9	75.4	71.7	0.0
LnGrp LOS	F	F	F					D	C	E	F	
Approach Vol, veh/h		1346						1215			1397	
Approach Delay, s/veh		546.3						32.1			72.9	
Approach LOS		F						C			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		32.0		31.5		25.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.0		27.0		20.5		
Max Q Clear Time (g_c+I1), s		24.9		30.5		24.0		
Green Ext Time (p_c), s		2.4		0.0		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	221.4
HCM 2010 LOS	F

Notes

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	778	235	23	30	1
Future Vol, veh/h	1	778	235	23	30	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	778	235	23	30	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	258	0	-	0	1027	247
Stage 1	-	-	-	-	247	-
Stage 2	-	-	-	-	780	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1307	-	-	-	260	792
Stage 1	-	-	-	-	794	-
Stage 2	-	-	-	-	452	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1307	-	-	-	260	792
Mov Cap-2 Maneuver	-	-	-	-	260	-
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	452	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	20.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1307	-	-	-	266
HCM Lane V/C Ratio	0.001	-	-	-	0.117
HCM Control Delay (s)	7.8	0	-	-	20.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	327	1258	819	54	0	80	106	1228	2	49	0
Future Volume (veh/h)	0	327	1258	819	54	0	80	106	1228	2	49	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	2500	2451	2500	2451	2451	2451	2500	2451	2451	2500	2451	2500
Adj Flow Rate, veh/h	0	327	1258	858	0	0	80	106	0	2	49	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	281	1080	783	0	350	111	147	394	5	119	0
Arrive On Green	0.00	1.00	1.00	0.17	0.00	0.00	0.19	0.21	0.00	0.08	0.10	0.00
Sat Flow, veh/h	0	443	1706	4669	0	2083	1032	1367	3667	96	2350	0
Grp Volume(v), veh/h	0	0	1585	858	0	0	186	0	0	51	0	0
Grp Sat Flow(s),veh/h/ln	0	0	2149	2334	0	2083	2399	0	1833	2446	0	0
Q Serve(g_s), s	0.0	0.0	86.7	24.5	0.0	0.0	10.6	0.0	0.0	2.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	86.7	24.5	0.0	0.0	10.6	0.0	0.0	2.9	0.0	0.0
Prop In Lane	0.00		0.79	1.00		1.00	0.43		1.00	0.04		0.00
Lane Grp Cap(c), veh/h	0	0	1361	783	0	350	258	0	394	123	0	0
V/C Ratio(X)	0.00	0.00	1.16	1.10	0.00	0.00	0.72	0.00	0.00	0.41	0.00	0.00
Avail Cap(c_a), veh/h	0	0	1361	783	0	350	279	0	427	168	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	60.8	0.0	0.0	55.9	0.0	0.0	63.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	82.5	61.4	0.0	0.0	8.1	0.0	0.0	2.2	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	31.2	22.5	0.0	0.0	7.5	0.0	0.0	2.0	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	82.5	122.2	0.0	0.0	64.0	0.0	0.0	65.9	0.0	0.0
LnGrp LOS			F	F			E			E		
Approach Vol, veh/h		1585			858			186			51	
Approach Delay, s/veh		82.5			122.2			64.0			65.9	
Approach LOS		F			F			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		17.2		94.0		8.9		26.0
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		14.0		89.5		7.0		21.5
Max Q Clear Time (g_c+I1), s		12.6		88.7		4.9		26.5
Green Ext Time (p_c), s		0.1		0.7		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	93.6
HCM 2010 LOS	F

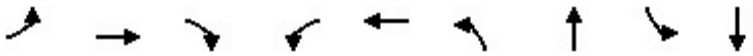
Notes

Appendix G: 95th Percentile Queue Worksheets

Lane Group	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	93	348	348	66	896
v/c Ratio	0.45	0.60	0.59	0.23	0.84
Control Delay	28.6	22.7	22.5	20.9	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	28.6	22.7	22.5	20.9	10.8
Queue Length 50th (ft)	30	106	106	19	0
Queue Length 95th (ft)	73	225	225	54	#133
Internal Link Dist (ft)	514		312	298	
Turn Bay Length (ft)		110			150
Base Capacity (vph)	335	722	727	354	1113
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.28	0.48	0.48	0.19	0.81

Intersection Summary

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



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	226	268	398	89	380	186	543	113	643
v/c Ratio	0.70	0.26	0.61	0.49	0.62	0.54	0.59	0.55	0.75
Control Delay	47.2	24.1	9.3	52.0	38.3	47.4	31.6	51.4	35.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.2	24.1	9.3	52.0	38.3	47.4	31.6	51.4	35.4
Queue Length 50th (ft)	124	63	22	50	110	55	150	63	178
Queue Length 95th (ft)	#232	100	114	113	170	102	235	135	277
Internal Link Dist (ft)		312			420		348		442
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	410	1402	764	205	949	365	1007	239	1082
Starvation Cap Reductn	0	0	8	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.19	0.53	0.43	0.40	0.51	0.54	0.47	0.59

Intersection Summary

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

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	224	415	201	457	198	276	575
v/c Ratio	0.56	1.04	0.42	0.69	0.71	1.00	0.99
Control Delay	30.2	85.8	6.5	31.7	40.9	88.6	69.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.2	85.8	6.5	31.7	40.9	88.6	69.7
Queue Length 50th (ft)	101	~265	0	115	101	~162	~168
Queue Length 95th (ft)	195	#501	53	168	185	#361	#310
Internal Link Dist (ft)		195		436			327
Turn Bay Length (ft)						160	
Base Capacity (vph)	400	400	478	848	356	277	580
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	1.04	0.42	0.54	0.56	1.00	0.99

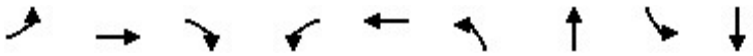
Intersection Summary

~ 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	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	164	401	404	42	647
v/c Ratio	0.30	0.45	0.45	0.07	0.47
Control Delay	19.7	13.4	13.4	18.4	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	19.7	13.4	13.4	18.4	3.4
Queue Length 50th (ft)	37	80	81	9	0
Queue Length 95th (ft)	110	193	193	37	40
Internal Link Dist (ft)	506		312	287	
Turn Bay Length (ft)		110			150
Base Capacity (vph)	950	1826	1838	1239	2211
Starvation Cap Reductn	0	101	105	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.17	0.23	0.23	0.03	0.29

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	195	266	216	212	563	215	637	168	571
v/c Ratio	0.64	0.32	0.43	0.66	0.70	0.52	0.72	0.62	0.59
Control Delay	49.1	32.9	7.8	49.2	39.3	46.8	38.3	50.9	32.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.1	32.9	7.8	49.2	39.3	46.8	38.3	50.9	32.3
Queue Length 50th (ft)	109	70	0	118	162	62	180	94	151
Queue Length 95th (ft)	212	123	60	227	260	119	289	190	242
Internal Link Dist (ft)		312			318		343		544
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	445	1183	622	454	1115	508	1218	369	1380
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.22	0.35	0.47	0.50	0.42	0.52	0.46	0.41

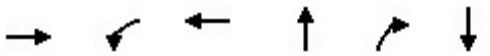
Intersection Summary

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	219	392	84	664	290	289	594
v/c Ratio	0.73	1.29	0.26	0.66	0.68	0.74	0.73
Control Delay	42.6	182.7	7.9	28.9	34.9	42.9	35.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.6	182.7	7.9	28.9	34.9	42.9	35.7
Queue Length 50th (ft)	112	~316	0	170	149	159	163
Queue Length 95th (ft)	#246	#529	34	230	246	#292	234
Internal Link Dist (ft)		195		359			341
Turn Bay Length (ft)						160	
Base Capacity (vph)	302	303	317	1198	506	424	884
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	1.29	0.26	0.55	0.57	0.68	0.67

Intersection Summary

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

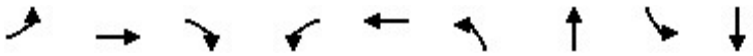
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	93	351	350	85	968	64
v/c Ratio	0.51	0.71	0.70	0.32	0.87	0.24
Control Delay	39.8	36.0	35.6	30.4	12.9	34.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.8	36.0	35.6	30.4	12.9	34.2
Queue Length 50th (ft)	41	162	161	34	0	29
Queue Length 95th (ft)	92	#334	#330	84	#154	67
Internal Link Dist (ft)	514		312	298		176
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	275	593	597	295	1123	508
Starvation Cap Reductn	0	0	0	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	0.34	0.59	0.59	0.29	0.86	0.13

Intersection Summary

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



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	226	268	469	89	385	224	557	113	781
v/c Ratio	0.72	0.27	0.75	0.52	0.64	0.67	0.62	0.58	0.83
Control Delay	50.9	25.1	17.8	55.0	40.1	53.9	33.0	54.5	39.9
Queue Delay	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.9	25.1	17.9	55.0	40.1	53.9	33.0	54.5	39.9
Queue Length 50th (ft)	131	67	84	53	118	71	156	67	232
Queue Length 95th (ft)	#240	100	220	115	171	#140	248	#140	#392
Internal Link Dist (ft)		312			420		348		442
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	382	1305	720	191	882	339	940	222	1020
Starvation Cap Reductn	0	0	11	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.21	0.66	0.47	0.44	0.66	0.59	0.51	0.77

Intersection Summary

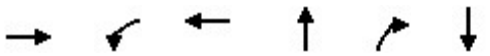
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	246	420	226	526	228	343	718
v/c Ratio	0.63	1.07	0.46	0.76	0.77	1.27	1.27
Control Delay	33.6	97.5	6.8	34.3	45.6	176.9	163.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	97.5	6.8	34.3	45.6	176.9	163.7
Queue Length 50th (ft)	122	~296	0	139	120	~272	~285
Queue Length 95th (ft)	217	#508	57	200	#239	#463	#412
Internal Link Dist (ft)		195		436			327
Turn Bay Length (ft)						160	
Base Capacity (vph)	390	391	488	819	348	271	567
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	1.07	0.46	0.64	0.66	1.27	1.27

Intersection Summary

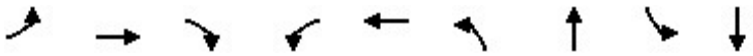
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	164	409	411	101	679	51
v/c Ratio	0.34	0.49	0.49	0.18	0.50	0.13
Control Delay	28.3	19.7	19.6	25.8	3.9	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.3	19.7	19.7	25.8	3.9	32.5
Queue Length 50th (ft)	59	138	140	34	0	19
Queue Length 95th (ft)	143	272	273	92	47	63
Internal Link Dist (ft)	506		312	287		197
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	797	1531	1541	1071	1976	419
Starvation Cap Reductn	0	172	175	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	0.21	0.30	0.30	0.09	0.34	0.12

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	195	268	248	212	579	230	779	168	652
v/c Ratio	0.66	0.32	0.47	0.68	0.73	0.56	0.79	0.64	0.62
Control Delay	51.9	34.3	7.8	52.2	41.7	49.6	41.1	53.9	33.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.9	34.3	7.8	52.2	41.7	49.6	41.1	53.9	33.0
Queue Length 50th (ft)	121	77	0	131	184	73	239	104	185
Queue Length 95th (ft)	212	124	65	227	267	126	363	190	279
Internal Link Dist (ft)		312			318		343		544
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	418	1111	619	426	1048	477	1152	347	1308
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.24	0.40	0.50	0.55	0.48	0.68	0.48	0.50

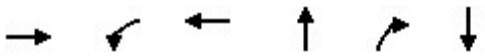
Intersection Summary

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	286	402	95	864	383	323	671
v/c Ratio	1.00	1.41	0.30	0.81	0.83	0.82	0.82
Control Delay	88.0	230.5	8.0	34.1	45.0	50.9	41.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.0	230.5	8.0	34.1	45.0	50.9	41.5
Queue Length 50th (ft)	~176	~346	0	241	216	191	198
Queue Length 95th (ft)	#347	#545	36	319	#385	#343	#286
Internal Link Dist (ft)		195		359			341
Turn Bay Length (ft)						160	
Base Capacity (vph)	285	286	312	1108	477	400	833
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	1.41	0.30	0.78	0.80	0.81	0.81

Intersection Summary

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

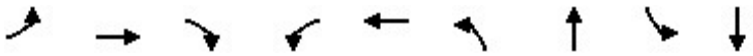
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	119	364	361	93	968	65
v/c Ratio	0.60	0.73	0.71	0.36	0.88	0.25
Control Delay	43.3	37.5	36.7	32.1	13.2	35.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.3	37.5	36.7	32.1	13.2	35.1
Queue Length 50th (ft)	55	180	176	40	0	31
Queue Length 95th (ft)	#125	#351	#346	90	#154	68
Internal Link Dist (ft)	514		312	298		176
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	268	566	572	281	1117	484
Starvation Cap Reductn	0	0	0	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	0.44	0.64	0.63	0.33	0.87	0.13

Intersection Summary

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



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	231	272	481	89	389	237	557	113	788
v/c Ratio	0.74	0.27	0.76	0.53	0.64	0.71	0.61	0.59	0.84
Control Delay	51.8	25.2	19.0	55.5	40.6	56.1	33.1	55.1	40.7
Queue Delay	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.8	25.2	19.1	55.5	40.6	56.1	33.1	55.1	40.7
Queue Length 50th (ft)	136	68	94	54	121	76	158	68	238
Queue Length 95th (ft)	#257	101	235	115	173	#151	248	#140	#397
Internal Link Dist (ft)		312			420		348		442
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	377	1291	716	188	872	335	934	220	1007
Starvation Cap Reductn	0	0	11	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.21	0.68	0.47	0.45	0.71	0.60	0.51	0.78

Intersection Summary

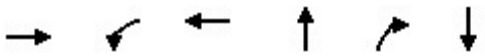
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	252	421	226	528	232	348	725
v/c Ratio	0.65	1.08	0.46	0.75	0.78	1.29	1.28
Control Delay	34.7	99.9	6.8	33.9	46.1	186.4	171.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	99.9	6.8	33.9	46.1	186.4	171.1
Queue Length 50th (ft)	127	~302	0	139	124	~282	~293
Queue Length 95th (ft)	#228	#509	57	201	#243	#472	#417
Internal Link Dist (ft)		195		436			327
Turn Bay Length (ft)						160	
Base Capacity (vph)	389	389	487	816	346	270	565
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	1.08	0.46	0.65	0.67	1.29	1.28

Intersection Summary

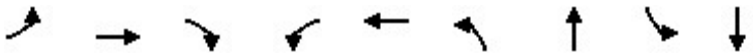
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	194	417	422	105	679	51
v/c Ratio	0.38	0.50	0.50	0.19	0.50	0.13
Control Delay	28.7	20.4	20.4	27.0	4.1	33.9
Queue Delay	0.0	0.1	0.1	0.0	0.0	0.0
Total Delay	28.7	20.4	20.4	27.0	4.1	33.9
Queue Length 50th (ft)	73	147	149	38	0	20
Queue Length 95th (ft)	168	288	290	98	48	65
Internal Link Dist (ft)	506		312	287		197
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	787	1495	1508	1040	1939	407
Starvation Cap Reductn	0	197	201	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	0.25	0.32	0.32	0.10	0.35	0.13

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	202	272	261	212	583	241	779	168	656
v/c Ratio	0.67	0.32	0.49	0.68	0.73	0.58	0.80	0.64	0.63
Control Delay	52.6	34.2	7.7	52.6	42.0	50.1	41.5	54.3	33.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.6	34.2	7.7	52.6	42.0	50.1	41.5	54.3	33.6
Queue Length 50th (ft)	126	78	0	132	187	77	242	105	190
Queue Length 95th (ft)	219	125	66	227	270	132	363	190	282
Internal Link Dist (ft)		312			318		343		544
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	416	1105	626	424	1043	474	1146	345	1298
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.25	0.42	0.50	0.56	0.51	0.68	0.49	0.51

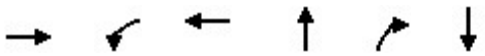
Intersection Summary

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	290	402	95	871	383	329	678
v/c Ratio	1.02	1.41	0.31	0.81	0.83	0.84	0.83
Control Delay	91.8	231.4	8.0	34.4	45.0	52.3	42.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	91.8	231.4	8.0	34.4	45.0	52.3	42.0
Queue Length 50th (ft)	~188	~346	0	243	216	195	201
Queue Length 95th (ft)	#351	#545	36	322	#385	#353	#291
Internal Link Dist (ft)		195		359			341
Turn Bay Length (ft)						160	
Base Capacity (vph)	284	285	311	1108	476	399	832
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.02	1.41	0.31	0.79	0.80	0.82	0.81

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.

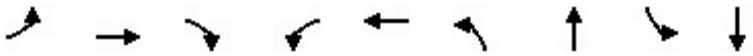


Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	834	625	624	108	1234	64
v/c Ratio	3.92	1.36	1.35	0.47	1.00	0.29
Control Delay	1335.0	203.6	198.2	36.0	31.8	36.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1335.0	203.6	198.2	36.0	31.8	36.6
Queue Length 50th (ft)	~799	~462	~458	48	~20	31
Queue Length 95th (ft)	#981	#702	#697	104	#240	67
Internal Link Dist (ft)	514		312	298		176
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	213	460	463	228	1230	394
Starvation Cap Reductn	0	0	0	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	3.92	1.36	1.35	0.47	1.00	0.16

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	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	235	279	489	194	840	634	1576	123	844
v/c Ratio	0.79	0.26	0.81	1.17	1.09	2.14	1.87	0.68	0.95
Control Delay	60.3	25.0	26.1	166.3	99.3	551.7	423.1	65.4	57.4
Queue Delay	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.3	25.0	27.3	166.3	99.3	551.7	423.1	65.4	57.4
Queue Length 50th (ft)	155	71	152	~166	~360	~371	~912	84	308
Queue Length 95th (ft)	#263	104	#320	#312	#485	#485	#1051	#161	#442
Internal Link Dist (ft)		312			420		348		442
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	332	1136	628	166	768	296	841	193	888
Starvation Cap Reductn	0	0	38	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.25	0.83	1.17	1.09	2.14	1.87	0.64	0.95

Intersection Summary

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

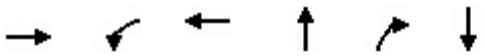
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	399	681	366	1301	567	382	798
v/c Ratio	1.08	1.84	0.64	1.68	1.72	1.49	1.48
Control Delay	101.2	410.2	8.6	335.0	362.6	267.5	256.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	101.2	410.2	8.6	335.0	362.6	267.5	256.1
Queue Length 50th (ft)	~268	~658	0	~599	~527	~332	~347
Queue Length 95th (ft)	#453	#894	85	#735	#747	#523	#468
Internal Link Dist (ft)		195		436			327
Turn Bay Length (ft)						160	
Base Capacity (vph)	370	371	569	776	329	257	538
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.08	1.84	0.64	1.68	1.72	1.49	1.48

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.

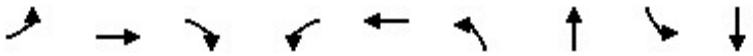


Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1555	426	428	182	1228	51
v/c Ratio	2.71	0.58	0.58	0.28	0.65	0.18
Control Delay	794.1	27.6	27.5	28.4	3.7	41.6
Queue Delay	0.0	0.3	0.3	0.0	0.0	0.0
Total Delay	794.1	27.8	27.8	28.4	3.7	41.6
Queue Length 50th (ft)	~1602	222	223	83	0	28
Queue Length 95th (ft)	#2122	317	317	160	54	69
Internal Link Dist (ft)	506		312	287		197
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	573	1133	1140	771	1985	302
Starvation Cap Reductn	0	233	236	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	2.71	0.47	0.47	0.24	0.62	0.17

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	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	218	300	278	264	721	498	1692	208	807
v/c Ratio	0.74	0.35	0.50	0.81	0.85	1.19	1.68	0.77	0.75
Control Delay	59.5	36.7	7.6	62.9	50.3	150.7	337.7	65.1	39.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.5	36.7	7.6	62.9	50.3	150.7	337.7	65.1	39.1
Queue Length 50th (ft)	151	96	0	181	258	~231	~959	144	273
Queue Length 95th (ft)	235	137	68	#308	#361	#348	#1133	#256	358
Internal Link Dist (ft)		312			318		343		544
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	365	972	595	373	917	417	1008	303	1144
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.31	0.47	0.71	0.79	1.19	1.68	0.69	0.71

Intersection Summary

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

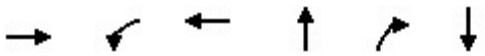
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	510	718	171	864	383	424	882
v/c Ratio	1.80	2.53	0.48	0.81	0.84	1.07	1.06
Control Delay	397.7	715.4	10.2	34.4	45.4	98.5	83.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	397.7	715.4	10.2	34.4	45.4	98.5	83.8
Queue Length 50th (ft)	~465	~770	5	241	216	~298	~309
Queue Length 95th (ft)	#667	#845	64	319	#385	#495	#434
Internal Link Dist (ft)		195		359			341
Turn Bay Length (ft)						160	
Base Capacity (vph)	283	284	353	1102	475	398	829
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.80	2.53	0.48	0.78	0.81	1.07	1.06

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.

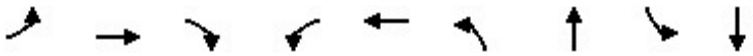


Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	860	637	636	116	1234	65
v/c Ratio	1.78	1.67	1.66	1.20	0.99	0.81
Control Delay	385.0	348.9	342.2	207.6	26.1	127.6
Queue Delay	0.0	1.7	1.7	0.0	0.0	0.0
Total Delay	385.0	350.5	343.9	207.6	26.1	127.6
Queue Length 50th (ft)	~1254	~953	~947	~136	5	64
Queue Length 95th (ft)	#1045	#1207	#1201	#272	#205	#156
Internal Link Dist (ft)	514		312	298		176
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	483	381	384	97	1249	80
Starvation Cap Reductn	0	55	57	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	1.78	1.95	1.94	1.20	0.99	0.81

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	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	240	283	501	194	844	647	1576	123	851
v/c Ratio	1.30	0.39	0.87	0.95	1.17	1.04	1.19	1.21	0.95
Control Delay	218.3	48.0	30.5	112.7	136.1	101.3	127.9	208.7	67.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	218.3	48.0	30.5	112.7	136.1	101.3	127.9	208.7	67.2
Queue Length 50th (ft)	~289	118	132	185	~496	~339	~941	~140	413
Queue Length 95th (ft)	#465	164	#360	#342	#631	#463	#1080	#278	#547
Internal Link Dist (ft)		312			420		348		442
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	184	721	574	204	724	622	1326	102	900
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.30	0.39	0.87	0.95	1.17	1.04	1.19	1.21	0.95

Intersection Summary

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

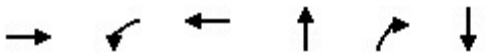
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	405	682	366	1307	567	386	806
v/c Ratio	1.09	1.84	0.64	1.68	1.72	1.50	1.50
Control Delay	106.3	411.4	8.6	338.4	362.6	274.0	262.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	106.3	411.4	8.6	338.4	362.6	274.0	262.5
Queue Length 50th (ft)	~276	~659	0	~603	~527	~338	~352
Queue Length 95th (ft)	#463	#896	85	#740	#747	#528	#474
Internal Link Dist (ft)		195		436			327
Turn Bay Length (ft)						160	
Base Capacity (vph)	370	371	569	776	329	257	538
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.09	1.84	0.64	1.68	1.72	1.50	1.50

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.

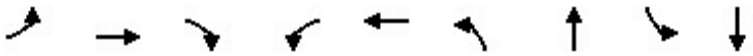


Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1585	434	439	186	1228	51
v/c Ratio	1.17	1.18	1.19	0.67	0.84	0.32
Control Delay	111.0	158.2	159.4	76.2	10.1	72.2
Queue Delay	0.0	1.9	1.9	0.0	0.0	0.0
Total Delay	111.0	160.1	161.3	76.2	10.1	72.2
Queue Length 50th (ft)	~1860	~541	~548	178	17	49
Queue Length 95th (ft)	#2123	#771	#778	264	88	95
Internal Link Dist (ft)	506		312	287		197
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	1358	367	370	276	1468	166
Starvation Cap Reductn	0	57	59	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	1.17	1.40	1.41	0.67	0.84	0.31

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	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	225	304	291	264	725	509	1692	208	811
v/c Ratio	0.76	0.36	0.52	0.81	0.86	1.22	1.68	0.78	0.75
Control Delay	60.5	36.6	8.3	63.2	50.7	162.0	340.3	65.5	39.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.5	36.6	8.3	63.2	50.7	162.0	340.3	65.5	39.5
Queue Length 50th (ft)	156	97	5	182	262	~242	~965	145	276
Queue Length 95th (ft)	242	139	77	#308	#365	#358	#1133	#256	361
Internal Link Dist (ft)		312			318		343		544
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	364	968	598	371	914	416	1005	302	1139
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.31	0.49	0.71	0.79	1.22	1.68	0.69	0.71

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	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	514	718	171	871	383	430	889
v/c Ratio	1.82	2.53	0.48	0.82	0.84	1.08	1.07
Control Delay	404.4	716.2	10.2	34.6	45.3	103.2	86.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	404.4	716.2	10.2	34.6	45.3	103.2	86.7
Queue Length 50th (ft)	~470	~770	5	243	216	~306	~314
Queue Length 95th (ft)	#672	#845	64	322	#385	#504	#439
Internal Link Dist (ft)		195		359			341
Turn Bay Length (ft)						160	
Base Capacity (vph)	283	284	353	1104	474	398	828
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.82	2.53	0.48	0.79	0.81	1.08	1.07

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 H: Supplemental Queueing Analysis

95th Percentile Queue Length Reduction Analysis

Additional analysis was done to determine if any recommendations can be made for addressing project-related queuing impacts. The 95th percentile queue reduction analysis was performed for the Baseline and Baseline plus project scenarios. Only the movements where there was a difference between the Baseline and Baseline plus project 95th percentile queue length and where the queue length was greater than the existing storage length were looked at; these movements are highlighted in Table 1. We adjusted signal timing and proposed turn pocket extensions at the selected study intersections to reduce Baseline plus project queue lengths to Baseline conditions. These recommendations are detailed in the following section.

Table 1: 95th Percentile Queue Lengths for Baseline and Baseline with Project Conditions

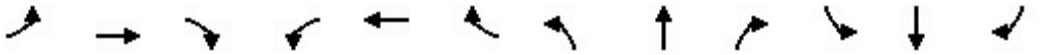
#	Location (Control)	Scenario	95th Percentile Queue Length (number of vehicles)											
			Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Weekday AM Peak Hour														
1	SR-92 Westbound Ramps & Concar Drive	No Project	-	4	-	13	13	-	-	3	6	-	3	-
		Plus Project	-	5	-	14	14	-	-	4	6	-	3	-
2	S Delaware Street & Concar Drive	No Project	10	4	8	5	7	-	6	10	-	6	16	-
		Plus Project	10	4	9	5	7	-	6	10	-	6	16	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	9	20	2	-	-	-	-	8	10	19	16	-
		Plus Project	9	20	2	-	-	-	-	8	10	19	17	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	0	-	-
		Plus Project	-	-	-	-	-	-	-	-	-	0	-	-
Weekday PM Peak Hour														
1	SR-92 Westbound Ramps & Concar Drive	No Project	-	6	-	11	11	-	-	4	2	-	3	-
		Plus Project	-	7	-	12	12	-	-	4	2	-	3	-
2	S Delaware Street & Concar Drive	No Project	8	5	3	9	11	-	5	15	-	8	11	-
		Plus Project	9	5	3	9	11	-	5	15	-	8	11	-
3	S Delaware Street & 19th Avenue & SR-92 Eastbound Ramps	No Project	14	>20	1	-	-	-	-	13	15	14	11	-
		Plus Project	14	>20	1	-	-	-	-	13	15	14	12	-
4	Project Driveway on Concar Drive	No Project	-	-	-	-	-	-	-	-	-	0	-	-
		Plus Project	-	-	-	-	-	-	-	-	-	0	-	-

Highlighted cells indicate movements where Baseline plus project 95th percentile queue lengths are greater than Baseline 95th percentile queue lengths and Baseline 95th percentile queue lengths exceed the existing storage length.

The following recommendations can help restore the Baseline plus project 95th percentile queue lengths to the Baseline scenario for the movements highlighted in Table 1.

- **AM PEAK**
  - SR 92 WB Ramps & Concar Drive
    - Borrow 1.5 seconds of green time from Eastbound movement and assign to Westbound movement
  - Delaware Street & 19th Avenue
    - Extend Southbound Left turn pocket by 25 ft
- **PM PEAK**
  - SR 92 WB Ramps & Concar Drive
    - Borrow 1 second of green time from Eastbound movement and assign to Westbound movement
  - Delaware Street & Concar Drive
    - Borrow 3.4 seconds of green time from Westbound Thru movement and assign to Eastbound Left turn and reduce Westbound Thru Don't Walk by 6.5 seconds
  - Delaware Street & 19th Avenue
    - Extend Left turn pocket by 25 ft

On implementing the above recommendations, the Baseline plus project 95th percentile queue lengths are equal to the Baseline 95th percentile queue lengths. The LOS and control delay does not change with respect to implementing these recommendations.

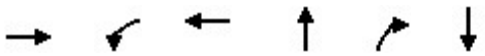


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	45	74	662	63	0	74	19	968	0	64	1
Future Volume (veh/h)	0	45	74	662	63	0	74	19	968	0	64	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	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	1000	980	1000	1863	1863	1863	1000	980	980	1900	1863	1900
Adj Flow Rate, veh/h	0	45	74	707	0	0	74	19	0	0	64	1
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	58	95	1065	0	475	130	33	254	0	172	3
Arrive On Green	0.00	0.17	0.17	0.30	0.00	0.00	0.17	0.17	0.00	0.00	0.09	0.09
Sat Flow, veh/h	0	334	549	3548	0	1583	750	193	1467	0	1829	29
Grp Volume(v), veh/h	0	0	119	707	0	0	93	0	0	0	0	65
Grp Sat Flow(s),veh/h/ln	0	0	883	1774	0	1583	943	0	733	0	0	1858
Q Serve(g_s), s	0.0	0.0	5.9	8.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	1.5
Cycle Q Clear(g_c), s	0.0	0.0	5.9	8.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	1.5
Prop In Lane	0.00		0.62	1.00		1.00	0.80		1.00	0.00		0.02
Lane Grp Cap(c), veh/h	0	0	153	1065	0	475	163	0	254	0	0	174
V/C Ratio(X)	0.00	0.00	0.78	0.66	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.37
Avail Cap(c_a), veh/h	0	0	345	1809	0	807	399	0	620	0	0	685
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)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	18.2	14.1	0.0	0.0	17.5	0.0	0.0	0.0	0.0	19.6
Incr Delay (d2), s/veh	0.0	0.0	8.3	0.7	0.0	0.0	3.1	0.0	0.0	0.0	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.8	4.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.8
LnGrp Delay(d),s/veh	0.0	0.0	26.5	14.8	0.0	0.0	20.6	0.0	0.0	0.0	0.0	20.9
LnGrp LOS			C	B			C					C
Approach Vol, veh/h		119			707			93			65	
Approach Delay, s/veh		26.5			14.8			20.6			20.9	
Approach LOS		C			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		11.0		11.0		7.3		16.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		16.5		15.5		22.0
Max Q Clear Time (g_c+I1), s		6.2		7.9		3.5		10.0
Green Ext Time (p_c), s		0.3		0.3		0.2		2.3

Intersection Summary	
HCM 2010 Ctrl Delay	17.2
HCM 2010 LOS	B

Notes



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	119	364	361	93	968	65
v/c Ratio	0.61	0.71	0.69	0.36	0.88	0.25
Control Delay	45.5	35.6	34.8	32.4	13.2	35.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	35.6	34.8	32.4	13.2	35.4
Queue Length 50th (ft)	56	181	177	41	0	31
Queue Length 95th (ft)	#134	#333	#328	90	#154	68
Internal Link Dist (ft)	514		312	298		176
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	248	607	613	282	1117	485
Starvation Cap Reductn	0	0	0	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	0.48	0.60	0.59	0.33	0.87	0.13

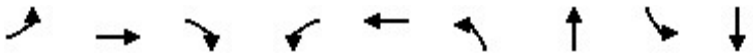
Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	231	272	481	89	301	88	237	417	140	113	590	198
Future Volume (veh/h)	231	272	481	89	301	88	237	417	140	113	590	198
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.96	1.00		0.96	1.00		0.93
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	1569	1569	1569	1569	1569	1600	1569	1569	1600	1569	1569	1600
Adj Flow Rate, veh/h	231	272	239	89	301	88	237	417	140	113	590	198
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	281	1059	446	130	578	165	330	713	236	158	687	230
Arrive On Green	0.19	0.36	0.36	0.09	0.25	0.25	0.11	0.33	0.33	0.11	0.32	0.32
Sat Flow, veh/h	1494	2980	1256	1494	2267	648	2898	2176	721	1494	2150	719
Grp Volume(v), veh/h	231	272	239	89	196	193	237	284	273	113	408	380
Grp Sat Flow(s),veh/h/ln	1494	1490	1256	1494	1490	1425	1449	1490	1407	1494	1490	1379
Q Serve(g_s), s	14.4	6.3	14.6	5.6	10.9	11.3	7.6	15.3	15.7	7.1	24.8	25.0
Cycle Q Clear(g_c), s	14.4	6.3	14.6	5.6	10.9	11.3	7.6	15.3	15.7	7.1	24.8	25.0
Prop In Lane	1.00		1.00	1.00		0.45	1.00		0.51	1.00		0.52
Lane Grp Cap(c), veh/h	281	1059	446	130	380	363	330	488	461	158	476	441
V/C Ratio(X)	0.82	0.26	0.54	0.68	0.52	0.53	0.72	0.58	0.59	0.72	0.86	0.86
Avail Cap(c_a), veh/h	371	1264	533	185	447	428	330	488	461	216	524	485
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.7	22.1	24.8	42.8	30.9	31.1	41.3	27.0	27.1	41.8	30.8	30.9
Incr Delay (d2), s/veh	10.7	0.1	1.0	6.2	1.1	1.2	7.4	1.7	2.0	6.9	12.5	13.7
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	6.7	2.6	5.2	2.5	4.6	4.6	3.4	6.5	6.3	3.2	11.9	11.2
LnGrp Delay(d),s/veh	48.5	22.2	25.8	49.0	32.0	32.3	48.7	28.7	29.2	48.7	43.3	44.6
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	D	D
Approach Vol, veh/h		742			478			794			901	
Approach Delay, s/veh		31.5			35.3			34.8			44.6	
Approach LOS		C			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.2	34.7	11.4	37.4	14.0	33.9	21.2	27.6
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	29.5	10.5	39.5	9.5	32.5	22.5	27.5
Max Q Clear Time (g_c+I1), s	9.1	17.7	7.6	16.6	9.6	27.0	16.4	13.3
Green Ext Time (p_c), s	0.1	2.7	0.0	2.6	0.0	2.4	0.3	2.0

Intersection Summary	
HCM 2010 Ctrl Delay	37.1
HCM 2010 LOS	D



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	231	272	481	89	389	237	557	113	788
v/c Ratio	0.74	0.27	0.76	0.53	0.64	0.71	0.61	0.59	0.84
Control Delay	51.8	25.2	19.0	55.5	40.6	56.1	33.1	55.1	40.7
Queue Delay	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.8	25.2	19.1	55.5	40.6	56.1	33.1	55.1	40.7
Queue Length 50th (ft)	136	68	94	54	121	76	158	68	238
Queue Length 95th (ft)	#257	101	235	115	173	#151	248	#140	#397
Internal Link Dist (ft)		312			420		348		442
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	377	1291	716	188	872	335	934	220	1007
Starvation Cap Reductn	0	0	11	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.21	0.68	0.47	0.45	0.71	0.60	0.51	0.78

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	368	251	0	0	0	0	447	313	430	643	0
Future Volume (veh/h)	280	368	251	0	0	0	0	447	313	430	643	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.97	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	1275	1275	1275				0	1275	1275	1275	1275	0
Adj Flow Rate, veh/h	280	368	122				0	536	253	358	744	0
Adj No. of Lanes	1	1	1				0	2	1	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	401	421	347				0	785	324	307	646	0
Arrive On Green	0.33	0.33	0.33				0.00	0.31	0.31	0.25	0.25	0.00
Sat Flow, veh/h	1214	1275	1052				0	2549	1053	1214	2549	0
Grp Volume(v), veh/h	280	368	122				0	536	253	358	744	0
Grp Sat Flow(s),veh/h/ln	1214	1275	1052				0	1275	1053	1214	1275	0
Q Serve(g_s), s	16.7	22.6	7.3				0.0	15.3	18.2	21.0	21.0	0.0
Cycle Q Clear(g_c), s	16.7	22.6	7.3				0.0	15.3	18.2	21.0	21.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	401	421	347				0	785	324	307	646	0
V/C Ratio(X)	0.70	0.87	0.35				0.00	0.68	0.78	1.16	1.15	0.00
Avail Cap(c_a), veh/h	425	446	368				0	953	394	307	646	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	24.2	26.2	21.0				0.0	25.1	26.1	31.0	31.0	0.0
Incr Delay (d2), s/veh	4.7	16.7	0.6				0.0	1.5	8.0	103.6	85.5	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	6.0	9.8	2.2				0.0	5.5	6.0	15.9	15.0	0.0
LnGrp Delay(d),s/veh	28.9	42.9	21.7				0.0	26.7	34.1	134.6	116.5	0.0
LnGrp LOS	C	D	C					C	C	F	F	
Approach Vol, veh/h		770						789			1102	
Approach Delay, s/veh		34.4						29.1			122.4	
Approach LOS		C						C			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		28.6		30.4		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.5		27.5		19.5		
Max Q Clear Time (g_c+I1), s		20.2		24.6		23.0		
Green Ext Time (p_c), s		3.1		1.1		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	69.3
HCM 2010 LOS	E

Notes

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	252	421	226	528	232	348	725
v/c Ratio	0.65	1.08	0.46	0.75	0.78	1.29	1.28
Control Delay	34.7	99.9	6.8	33.9	46.1	186.4	171.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	99.9	6.8	33.9	46.1	186.4	171.1
Queue Length 50th (ft)	127	~302	0	139	124	~282	~293
Queue Length 95th (ft)	#228	#509	57	201	#243	#472	#417
Internal Link Dist (ft)		195		436			327
Turn Bay Length (ft)						185	
Base Capacity (vph)	389	389	487	816	346	270	565
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	1.08	0.46	0.65	0.67	1.29	1.28

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.

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	93	39	33	26	1
Future Vol, veh/h	1	93	39	33	26	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	93	39	33	26	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	72	0	-	0	151	56
Stage 1	-	-	-	-	56	-
Stage 2	-	-	-	-	95	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1528	-	-	-	841	1011
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	929	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1528	-	-	-	840	1011
Mov Cap-2 Maneuver	-	-	-	-	840	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	929	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	9.4
HCM LOS			A

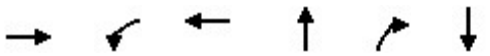
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1528	-	-	-	845
HCM Lane V/C Ratio	0.001	-	-	-	0.032
HCM Control Delay (s)	7.4	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	56	138	786	53	0	46	59	679	2	49	0
Future Volume (veh/h)	0	56	138	786	53	0	46	59	679	2	49	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	2500	2451	2500	2451	2451	2451	2500	2451	2451	2500	2451	2500
Adj Flow Rate, veh/h	0	56	138	824	0	0	46	59	0	2	49	0
Adj No. of Lanes	0	1	0	2	0	1	0	1	2	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	123	302	1606	0	717	201	258	702	12	295	0
Arrive On Green	0.00	0.39	0.32	0.34	0.00	0.00	0.31	0.38	0.00	0.18	0.25	0.00
Sat Flow, veh/h	0	628	1547	4669	0	2083	1051	1348	3667	96	2350	0
Grp Volume(v), veh/h	0	0	194	824	0	0	105	0	0	51	0	0
Grp Sat Flow(s),veh/h/ln	0	0	2175	2334	0	2083	2398	0	1833	2446	0	0
Q Serve(g_s), s	0.0	0.0	2.9	5.9	0.0	0.0	1.3	0.0	0.0	0.7	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	2.9	5.9	0.0	0.0	1.3	0.0	0.0	0.7	0.0	0.0
Prop In Lane	0.00		0.71	1.00		1.00	0.44		1.00	0.04		0.00
Lane Grp Cap(c), veh/h	0	0	425	1606	0	717	459	0	702	307	0	0
V/C Ratio(X)	0.00	0.00	0.46	0.51	0.00	0.00	0.23	0.00	0.00	0.17	0.00	0.00
Avail Cap(c_a), veh/h	0	0	1068	4751	0	2120	1493	0	2283	586	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	12.1	10.9	0.0	0.0	11.4	0.0	0.0	14.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.8	0.3	0.0	0.0	0.3	0.0	0.0	0.3	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.8	3.8	0.0	0.0	0.9	0.0	0.0	0.5	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	12.8	11.2	0.0	0.0	11.6	0.0	0.0	14.2	0.0	0.0
LnGrp LOS			B	B			B			B		
Approach Vol, veh/h		194			824			105			51	
Approach Delay, s/veh		12.8			11.2			11.6			14.2	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		9.5		9.7		6.7		15.9
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		23.0		17.5		7.0		39.5
Max Q Clear Time (g_c+I1), s		3.3		4.9		2.7		7.9
Green Ext Time (p_c), s		0.5		0.9		0.0		3.5

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B

Notes



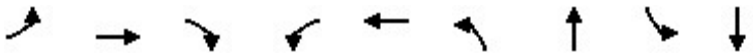
Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	194	417	422	105	679	51
v/c Ratio	0.38	0.50	0.50	0.19	0.50	0.13
Control Delay	28.7	20.2	20.2	26.8	4.0	33.5
Queue Delay	0.0	0.1	0.1	0.0	0.0	0.0
Total Delay	28.7	20.3	20.3	26.8	4.0	33.5
Queue Length 50th (ft)	73	147	149	38	0	20
Queue Length 95th (ft)	167	284	287	96	47	64
Internal Link Dist (ft)	506		312	287		197
Turn Bay Length (ft)		110			150	
Base Capacity (vph)	751	1524	1537	1042	1942	408
Starvation Cap Reductn	0	197	200	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	0.26	0.31	0.32	0.10	0.35	0.13

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	202	272	261	212	409	174	241	664	115	168	505	151
Future Volume (veh/h)	202	272	261	212	409	174	241	664	115	168	505	151
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.91	1.00		0.93	1.00		0.94	1.00		0.91
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	1951	1951	1951	1951	1951	1990	1951	1951	1990	1951	1951	1990
Adj Flow Rate, veh/h	202	272	99	212	409	174	241	664	115	168	505	151
Adj No. of Lanes	1	2	1	1	2	0	2	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	245	991	402	254	677	283	326	900	156	207	848	251
Arrive On Green	0.13	0.27	0.27	0.14	0.27	0.29	0.09	0.29	0.30	0.11	0.31	0.32
Sat Flow, veh/h	1858	3707	1502	1858	2486	1039	3605	3130	541	1858	2749	815
Grp Volume(v), veh/h	202	272	99	212	303	280	241	393	386	168	339	317
Grp Sat Flow(s),veh/h/ln	1858	1853	1502	1858	1853	1671	1802	1853	1817	1858	1853	1711
Q Serve(g_s), s	9.7	5.3	4.7	10.2	13.0	13.3	6.0	17.5	17.5	8.1	14.1	14.3
Cycle Q Clear(g_c), s	9.7	5.3	4.7	10.2	13.0	13.3	6.0	17.5	17.5	8.1	14.1	14.3
Prop In Lane	1.00		1.00	1.00		0.62	1.00		0.30	1.00		0.48
Lane Grp Cap(c), veh/h	245	991	402	254	505	455	326	533	522	207	572	528
V/C Ratio(X)	0.82	0.27	0.25	0.83	0.60	0.61	0.74	0.74	0.74	0.81	0.59	0.60
Avail Cap(c_a), veh/h	498	1136	460	437	507	457	489	608	597	356	712	657
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.6	26.5	26.3	38.4	28.9	28.6	40.5	29.4	29.2	39.7	26.7	26.5
Incr Delay (d2), s/veh	6.9	0.1	0.3	7.0	2.0	2.4	3.3	4.1	4.2	7.5	1.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	2.7	2.0	5.7	6.9	6.4	3.1	9.5	9.4	4.6	7.4	6.9
LnGrp Delay(d),s/veh	45.5	26.6	26.6	45.5	30.9	31.1	43.8	33.5	33.5	47.1	27.7	27.6
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		573			795			1020			824	
Approach Delay, s/veh		33.3			34.8			35.9			31.6	
Approach LOS		C			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	30.8	17.0	28.9	12.8	32.7	16.5	29.4
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	17.5	30.0	21.5	28.0	12.4	35.1	24.5	25.0
Max Q Clear Time (g_c+I1), s	10.1	19.5	12.2	7.3	8.0	16.3	11.7	15.3
Green Ext Time (p_c), s	0.2	3.7	0.4	2.0	0.3	4.1	0.4	2.6

Intersection Summary		
HCM 2010 Ctrl Delay		34.1
HCM 2010 LOS		C



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	202	272	261	212	583	241	779	168	656
v/c Ratio	0.65	0.33	0.49	0.68	0.77	0.58	0.79	0.64	0.63
Control Delay	50.0	34.5	7.9	52.0	44.4	49.5	40.7	53.6	33.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.0	34.5	7.9	52.0	44.4	49.5	40.7	53.6	33.0
Queue Length 50th (ft)	126	78	0	132	188	78	243	105	190
Queue Length 95th (ft)	210	125	66	225	279	131	360	190	279
Internal Link Dist (ft)		312			318		343		544
Turn Bay Length (ft)	120		170	140		230		160	
Base Capacity (vph)	484	1108	628	425	914	476	1150	346	1302
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.25	0.42	0.50	0.64	0.51	0.68	0.49	0.50

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	322	359	106	0	0	0	0	636	618	484	523	0
Future Volume (veh/h)	322	359	106	0	0	0	0	636	618	484	523	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	20	20	30				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.96	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	980	980	980				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	322	359	49				0	518	697	336	731	0
Adj No. of Lanes	1	1	1				0	1	2	1	2	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	304	320	264				0	615	1006	427	897	0
Arrive On Green	0.33	0.33	0.33				0.00	0.33	0.33	0.24	0.24	0.00
Sat Flow, veh/h	934	980	809				0	1863	3046	1774	3725	0
Grp Volume(v), veh/h	322	359	49				0	518	697	336	731	0
Grp Sat Flow(s),veh/h/ln	934	980	809				0	1863	1523	1774	1863	0
Q Serve(g_s), s	28.5	28.5	3.8				0.0	22.6	17.4	15.5	16.2	0.0
Cycle Q Clear(g_c), s	28.5	28.5	3.8				0.0	22.6	17.4	15.5	16.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	304	320	264				0	615	1006	427	897	0
V/C Ratio(X)	1.06	1.12	0.19				0.00	0.84	0.69	0.79	0.81	0.00
Avail Cap(c_a), veh/h	304	320	264				0	650	1063	447	938	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.5	29.5	25.8				0.0	27.2	25.4	31.1	31.3	0.0
Incr Delay (d2), s/veh	67.6	87.8	0.3				0.0	9.4	1.8	8.7	5.4	0.0
Initial Q Delay(d3),s/veh	194.2	175.5	114.2				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.0	35.4	12.3				0.0	13.1	7.5	8.6	9.0	0.0
LnGrp Delay(d),s/veh	291.2	292.7	140.3				0.0	36.6	27.3	39.8	36.8	0.0
LnGrp LOS	F	F	F					D	C	D	D	
Approach Vol, veh/h		730						1215			1067	
Approach Delay, s/veh		281.8						31.2			37.7	
Approach LOS		F						C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		31.9		31.5		24.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		29.0		27.0		20.5		
Max Q Clear Time (g_c+I1), s		24.6		30.5		18.2		
Green Ext Time (p_c), s		2.6		0.0		1.4		

Intersection Summary	
HCM 2010 Ctrl Delay	94.3
HCM 2010 LOS	F

Notes

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	290	402	95	871	383	329	678
v/c Ratio	1.02	1.41	0.31	0.81	0.83	0.84	0.83
Control Delay	91.8	231.4	8.0	34.4	45.0	52.3	42.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	91.8	231.4	8.0	34.4	45.0	52.3	42.0
Queue Length 50th (ft)	~188	~346	0	243	216	195	201
Queue Length 95th (ft)	#351	#545	36	322	#385	#353	#291
Internal Link Dist (ft)		195		359			341
Turn Bay Length (ft)						185	
Base Capacity (vph)	284	285	311	1108	476	399	832
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.02	1.41	0.31	0.79	0.80	0.82	0.81

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.

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	164	34	23	30	1
Future Vol, veh/h	1	164	34	23	30	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	164	34	23	30	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	57	0	-	0	212	46
Stage 1	-	-	-	-	46	-
Stage 2	-	-	-	-	166	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1547	-	-	-	776	1023
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	863	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1547	-	-	-	775	1023
Mov Cap-2 Maneuver	-	-	-	-	775	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	863	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1547	-	-	-	781
HCM Lane V/C Ratio	0.001	-	-	-	0.04
HCM Control Delay (s)	7.3	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1